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A LYTIC LESION OF THE SKULL BASE SURGERY*

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ABSTRACT

A case of a 53 year old male with neuroophthalmologic signs and symptoms is presented. The radiograph and computerized tomographic (CT) scan revealed a lytic lesion of the skull base. Pre-operative diagnosis was a malignant skull base tumor probably a sphenoid sinus carcinoma. An endoscopic sphenoidotomy done drained creamy yellowish discharge. The diagnosis was changed to sphenoid sinus mucocele, confirmed by post-operative CT scan. It is thus illustrated in this report that sphenoid sinus mucocele can present as a destructive lesion of the skull base mimicking a malignancy.

INTRODUCTION

Skull base lesions present with signs and symptoms depending on what adjacent neurovascular structures are involved. This report is about a case presenting with neuroophthalmologic signs and symptoms that posed two diagnostic problems: First, localizing the primary site of an extensive and destructive lesion, and second, determining whether the nature of the lesion was inflammatory or neoplastic in order to ascertain the proper management. This case is reported to increase the awareness of the otolaryngologist, neurologist, neurosurgeon, and ophthalmologist to a possible cause of a destructive lesion of the skull base.

History. A 53 year old Filipino male jeepney driver presented with a history of strabismus of 1 year duration. Nine months PTA, the patient developed severe bitemporal headache, nausea and vomiting, spiking fever, chills, and anosmia followed 4 days later by the onset of sudden bilateral loss of vision. An otolaryngologist the next day diagnosed it as nasal polyposis for which a polypectomy, ethmoidectomy, and antrostomy (PEA) was subsequently performed. Symptoms of headache, nausea and vomiting, and fever resolved, but blindness persisted. A week after the operation, an ophthalmologic consultation was made, and prednisone and B-complex vitamins were prescribed. After a month, recovery of the vision of the right eye was noted. Five months PTA, however, a recurrence of the headache, nausea, and vomiting was experienced with eventual loss of the vision of the right eye. A neurologist consulted gave mannitol and dexamethasone. Computerized tomographic (CT) scan of the head was advised, but was deferred due to financial constraints. Due to the persistence of symptoms, the patient consulted this institution.

Physical examination. The patient appeared to be well nourished, alert, and fully oriented, afebrile, and complained of a persistent bitemporal headache. Blood pressure ranged from 140-200/80-110.

Otolaryngologic examination was esentially normal except for an enlarged right inferior turbinate.

Ophthalmologic examination disclosed bilateral proptosis and left sided ptosis. There was no lid edema, chemosis, nor conjunctival congestion. No light perception was detected. Pupils were 6 mm dilated, non-reactive to light. Fundoscopy showed bilateral optic atrophy with Grade II hypertensive retinopathy. Bilateral extraocular muscle palsy involving the III, IV, VI cranial nerves were noted.

On neurologic examination, the only additional abnormality was a shallow right nasolabial fold and slight hypoalgesia of the right maxillary area.

Radiologic studies. Skull AP-L (9/14/90) revealed an enlarged sella turcica with note of thinning and mural destruction of the floor and posterior clinoid process. The interpretation was a pituitary newgrowth.

CT scan of the head (10/4/90) showed an isodense sellar mass primarily located in the sphenoid area with extension to the posterior ethmoids, to the left orbital apex, and the left cavernous sinus area. There was no enhancement on contrast infusion. Lytic

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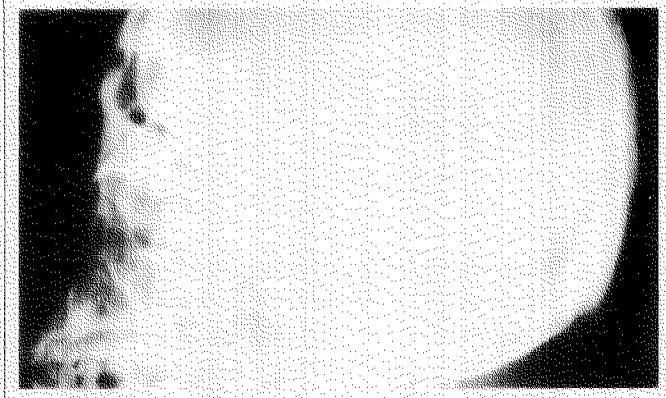
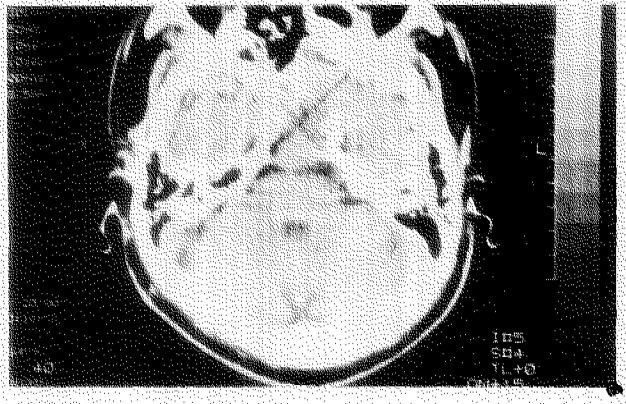


Figure 4. Plain skull lateral x-ray showing enlarged sella turcica with destruction of the sellar floor and posterior process.



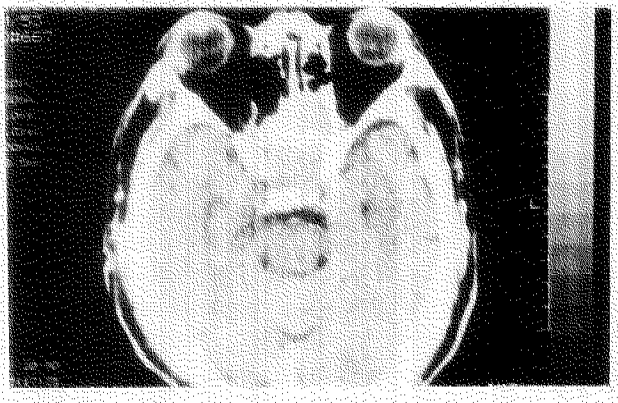


Figure 5. Plain CT scan of the head taken pre-op. Note extensive destruction of the clivus and sellar area by the mass arising from the sphenoid sinus and exhibiting homogenous isodensity with brain parenchyma.

changes were noted in the planum sphenoidale and the clivus. There was extra-axial spread through the basiocciput to the prepontine cistern.

Admitting Impression. The initial impression was Optic atrophy, bilateral, secondary to sphenoid mass, probably sphenoid sinus carcinoma, rule out chordoma, rule out pituitary adenoma.

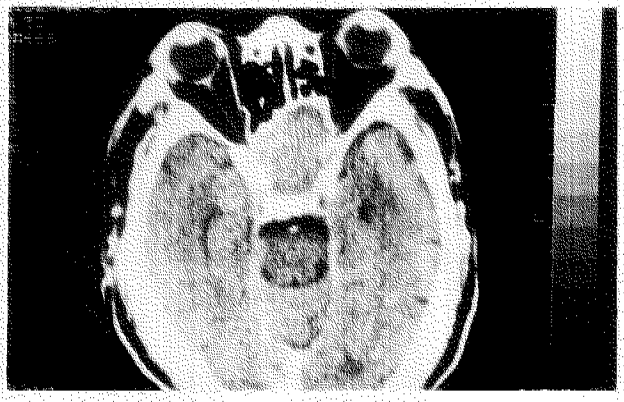


Figure 6. Contrast enhanced CT scan of the head taken pre-op. No rim enhancement of the mass in seen.

Course in the wards. The patient was initially managed medically for increased intracranial pressure by giving mannitol 20% 50 cc intravenously q 6 hours, and dexamethasone 4 mg orally t.i.d.. Headache and vomiting did not resolve, and the doses of mannitol and dexamethasone were increased to 100 cc q 6 hours and 4 mg q.i.d., respectively, without improvement of symptoms. On Oct. 31, 1990 an intranasal, transethmoidal sphenoidotomy was performed under general anesthesia. The nasal cavity was decongested with oxymetazoline . Using a 30° angle endoscope, residual polyps and the anterior and posterior ethmoid cells were removed. A pituitary forcep was used to punch out the anterior wall of the sphenoid sinus on both sides with drainage of approximately 20 cc of an odorless, yellowish viscous fluid. The remaining mucosa was noted to be thickened and pulsating. Tissue biopsy was done and the anterior sinus wall opening enlarged.

The sinus and nasal cavity were packed with oxytetracycline impregnated gause. Minimal bleeding was encountered.

Biopsy specimen showed only chronic inflammatory change. Aerobic culture of the fluid revealed no growth.

The headache resolved one day post-op. After two weeks,the patient regained the sense of smell and

there was full ocular mobility. Also, proptosis subsided and ptosis diappeared. The patient, however, never regained his vision. A CT scan of the head done 1 month after the operation revealed absence of the previously noted mass, and its replacement by air.

On follow-up 4 months after the operation, the patient is doing well, but still has no light perception. The final diagnosis of this case was sphenoid mucocele.

DISCUSSION

The presence of pathology in the sphenoid area, whether it be an expansile or invasive lesion, would encroach on the surrounding neurovascular structure, and understanding the anatomic relationship in the area aids in the comprehension of the presenting signs and symptoms. The average thickness of the sphenoid sinus wall is only 0.5 mm, and it is possible for the surrounding neurovascular structures to lie within the sinus, covered only by the mucosa. The sphenoid sinus is related superiorly to the anterior cranial fossa, optic nerve, and chiasm. The posterosuperior wall is adjacent to the pituitary gland. Inferiorly, it forms the roof of the nasopharynx. Laterally, it is adjacent to the orbital apex, optic canal and nerve, and the cavernous sinus, with the internal carotid artery and cranial nerves III, IV, V and VI passing through it. Posterior to the sinus is the clivus, pons, and the basilar artery, with the pre-pontine cistern, pterygoid canal, and maxillary artery. Anteriorly are the posterior ethmoidal cells which are the area of least resistance for an expanding mass. The posterior ethmoid cells are separated from the orbit by the paper-thin lamina papyracea (Figures 1,2,3). Bony dehiscence is said to be present (Hollinshead, 1982). Briefly,

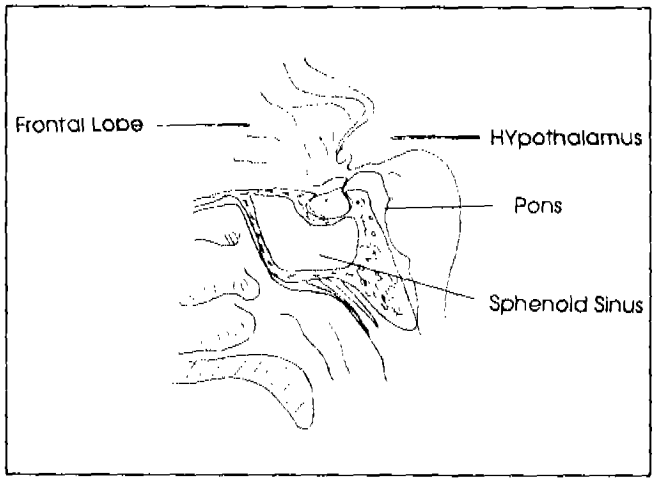


Figure 1. Relations of the sphenoid sinus to the nose, brain and hypophysis in a nearly sagittal section. (Hollinshead, 1982)

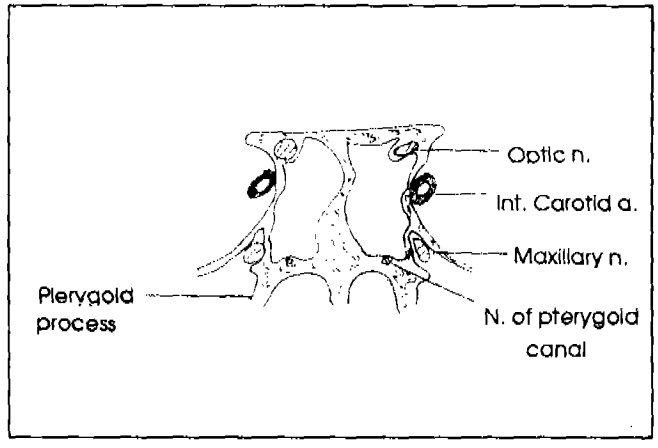


Figure 2. Relations of the sphenoid sinus in a schematic frontal section anter to the hypophyseal fossa. (Holl inshead, 1982)

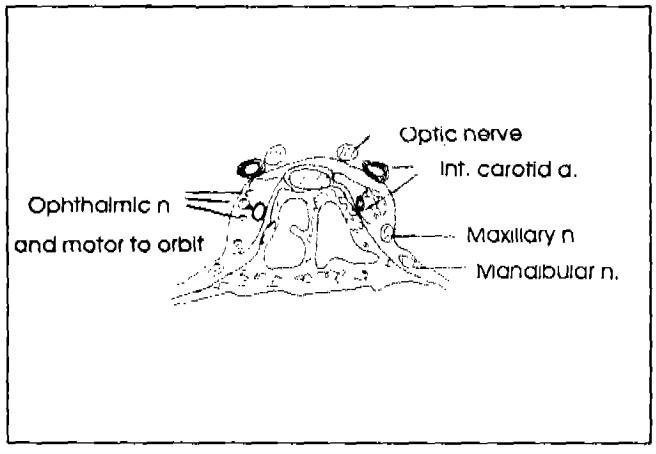


Figure 3. Relation of the sphenoid sinus in a schematic section through the level of the hypophyseal fossa. (Hollinshead, 1982)

the sphenoid sinus is related anatomically to 13 vital structures (Table 1).

In this case, clinical and radiologic findings pointed to a skull base pathology. The CT scan revealed primarily an extra-axial destructive mass, arising from the sphenoid sinus, involving the clivus, sella, and planum sphenoidale, with extension to the posterior ethmoidal cells and the cavernous sinus on the left. Knowing that bone destruction is characteristic of malignant tumor, and that bone expansion is the feature of a slow growing lesion, the primary impression was a malignant tumor.

TABLE I. Important Structures In Relation to the Sphenoid. (Kron, 1983).

Dura	I.C. Arter	V1
Pituitary	VI n.	V2
Optic Nerve	III n.	Sphenopalatine ganglion
Cavrnuos Sinus	IV n	Sphenopalatine artery
Pterygoid canal and nerve		

Since the main bulk of the tumor was occupying the sphenoid sinus, carcinoma of the sphenoid sinus was primarily considered. This is consistent with a destructive lesion. One thing against this entity is the striking homogenous isodensity of the mass with the brain tissue on CT scan. Usually, carcinoma presents with areas of necrosis manifested as hypodense areas. Nevertheless, it cannot be totally ruled out. Another malignant process of the skull base which should be considered is a chordoma, especially in light of the extensive destruction of the clivus.

A pituitary adenoma was a possibility because of an enlarged sella with destruction of the sellar floor and posterior clivus as seen on the skull lateral view. Furthermore, the mass extended superiorly to involve the chiasmatic cistern. In an advanced lesion, the sphenoid sinus can be invaded. However, there was a conspicuous lack of spread to the supra- and parasellar regions. Since these are the areas of least resistance of spread for an enlarging pituitary mass, these are expected to be invaded before bony destruction of the skull base would occur.

Other lesions that can arise and invade the sphenoid sinus to produce opacification and expansion are **meningocoele, encephalocoele, germinoma,** epidermoid tumor, hemangioma, hemangiopericytoma, and nasopharyngeal tumors (**Nugent,** 1970).

In this patient, empirical radiotherapy based on the presumptive diagnosis of an inoperable neoplasm may be considered, but this is undesirable due to the uncertainty of the true diagnosis. A lateral rhinotomy was contemplated to establish a histopatholgoic diagnosis and, at the same time, debulk the tumor before radiotherapy, but was considered to be too radical in light of the uncertain diagnosis. Finally, it was decided that an endoscopically guided sphenoidotomy be done. This resulted in the drainage of an odorless, yellowish viscous fluid. Intra-operatively, diagnosis was changed to sphenoid mucocele. However, based on the highly destructive and invasive lesion on CT scan, a tumor obstructing the sphenoid sinus ostium, causing the formation of mucocele should be considered. **Som** (1980) discussed the possibility of mucocele co-existing with a tumor and presented a case which radiographically showed an expansile lesion verified to be a mucocele, but whose histologic diagnosis was squamous cell carcinoma. The possibility of a reverse situation was entertained, meaning an aspirate consistent with mucocele, but radiographs presenting a tumor with aggressive bone destruction. Should the patient be subjected to another biopsy? Instead, a repeat CT scan of the head was done and revealed the total disappearance of the mass. It turned out that

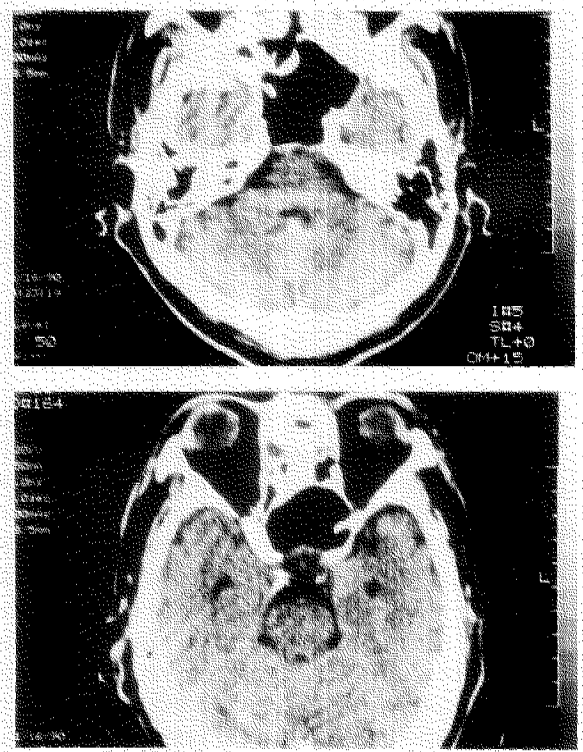


Figure 7. Plain CT scan of the head taken pre-op. The mass has been evacuated with replacement by air.

Figure 8. Contrast CT scan of the head taken post-op. This examination revealed no enchancing areas which could be interpreted as foci of a residual malignant process.

the transethmoid sphenoidotomy was not only diagnostic, but therapeutic. It is tragic to realize that had a sphenoid sinusotomy been done at the time of the PEA procedure, the catastrophic consequence of blindness might have been reversed, as has been documented in other cases (**Sellars**, 1981).

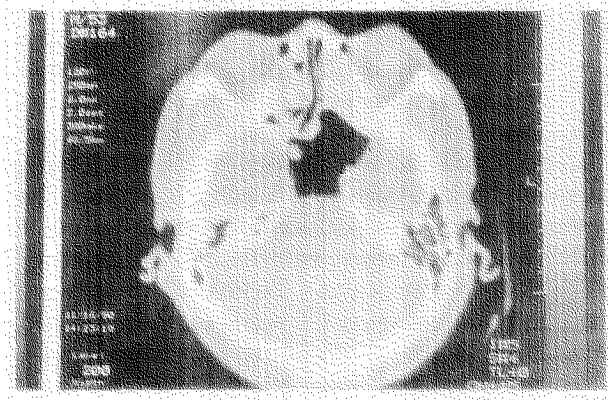


Figure 9. Bone windows of the head taken post-op. This view reveal the extensive bony destruction caused by the tumor.

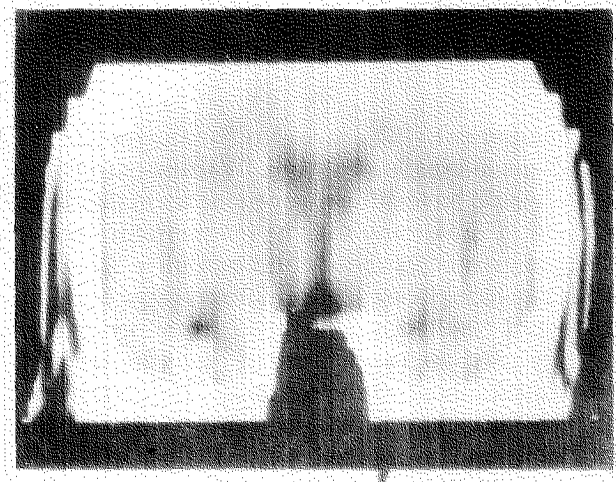


Figure 10. Coronal reconstruction of the head scan taken post-op. Demonstrated is the extent of the bone destruction in the sphenoid area.

Sphenoid sinus mucocele was first described in 1889 by **Berg** (**Sellars**, 1981). Theories as to its development are (**Sellars**, 1981; **Simms**, 1970):

1. Obstruction of sinus ostium by inflamed mucosa/tumor,
2. Cystic degeneration of the epithelial mucus **glands**
3. Cystic degeneration of inflammatory glands
4. Obstruction of ducts of mucus secreting glands

TABLE II. Clinical Features of Sphenoid Sinus Mucocele. (Sellars, 1981).

Neurological	Headache
	Facial Pain
	Anosmia
	Visual Failure
	Ocular Palsy
Orbital	Exophthalmos
Nasal	Rhinorrhea
	Polyposis
Endocrine	Hypopituitarism

It may occur from the second decade thru the sixth decade of life. There is no sex predilection (**Neffson**, 1957).

Sellars summarized the clinical features of sphenoid sinus mucocele (Table 2). Headache is the most consistent, followed by visual failure and ocular palsy. Headache occurs as a result of upward stretching of dura in the region of the planum sphenoidale and floor of the frontal fossa by the expanding mucocele (**Nugent**, 1970). Invasion of the posterior ethmoid cells exerts pressure primarily to the orbital apex, causing impairment or loss of vision, ptosis, ophthalmoplegia, proptosis, and pain. This is known as the orbital apex syndrome (**Rifai**, 1990) or posterior orbital cellulitis (**Slavin**, 1987). **Nugent et al** (1970) analysing 63 patients found that headache was present in 45, visual disturbance in 41, diplopia in 19, exophthalmos in 20, nasal problems in 29, and anosmia. **Phelp** (1969) reported a case of sphenoid sinus mucocele presenting with left sided deafness.

Tomographic section showed erosion of the petrous temporal bone.

In the case reported, the clinical features include ophthalmoplegia, loss of vision, ptosis, proptosis, anosmia, hypoaesthesia of the maxillary area, and pre-existing nasal polyposis and sinusitis. Additional findings of shallow right naso-labial fold suggest compression of the seventh nerve at the brainstem, indicating an extensive lesion.

Radiologic findings. A critical feature in the diagnosis of sphenoid lesions is illustrating radiographically that the primary disease process arose **within the sinus area. The basic views are plain lateral** and submentovertical. The radiologic findings of sphenoid mucocele reported by **Simon** and **Tingwald** (1955) are: opacification of the sphenoid sinus; smooth outlining and rarefaction of the wall of the sinus; destructive changes of the sella turcica and, occasionally, of the anterior and posterior clinoids; destruction of the sphenoid interseptum; displacement of the adja-

cent carotid artery on arteriogram; enlargement of the superior orbital fissure with irregularity of its medial and inferior margins; and lateral displacement or thinning of the lamina papyracea. **Bloom** (1965) reported additional findings of erosion of the optic canal. **Nugent** (1970) stated that the most salient feature is erosion of the sella turcica. In the case presented, the skull AP-L views showed opacification of the sphenoid area, destruction of the floor of the sella and posterior clinoid process and clivus, and absence of the sphenoid septum.

Arteriography is not of much help in the diagnosis of sphenoid mucoceles, although it rules out vascular tumors and aneurysms in the sphenoid region. In sphenoid mucoceles, it shows lateral and upward displacement of the internal carotid artery (**Sellars**, 1981). Bilateral internal carotid occlusion has been reported (**Doyle**, 1972).

X-ray tomography has been advocated by **Minagi** (1972) as important in the diagnosis of sphenoid lesions. The views suggested are lateral, frontal, and submento-vertical projections. Bony margins of the sphenoid sinus and sella are well depicted. Findings include pressure erosion of the planum sphenoidale, lesser sphenoid wings, anterior clinoid process, inferior aspect of the optic canal, medial orbital wall, and medial aspect of the superior orbital fissure (**Roberson**, 1976).

The CT scan is currently the procedure of choice in demonstrating the extent of the lesion and soft tissue involvement (**Gibson**, 1984). In general, mucoceles are contrast nonenhancing lesions, but in the presence of active infection rim enhancement may be seen. The majority are isodense with brain tissue but may vary according to the viscosity of the fluid contents. It has been reported that 5% of sphenoid mucoceles may have calcifications, and these are primarily located in the wall of mucocele with gross calcification within its matrix.

CT scan of the case presented showed an isodense homogenous mass, without calcification, occupying mainly the sphenoid sinus with extension to the posterior ethmoid cells, left orbital apex, and left cavernous sinus. There was also spread to the basiocciput involving the clivus and pre-pontine cistern.

Intracranial extension of mucoceles is extremely rare. **Shikowitz** (1986) reported 2 cases. The first patient's CT scan showed destruction of the sphenoid sinus, the floor of the left temporal area, and the pituitary fossa. The second case revealed opacification of the sphenoid sinus and right posterior ethmoid with bony destruction and fragmentation of the clivus. Close et al were further cited as having reported 3 cases of intracranial extension.

Bacteriology. No microorganism was isolated from the aerobic culture of the aspirate in this case. **Nugent** (1970) mentioned that often the creamy substance contained in sphenoid sinus mucoceles appears purulent but sterile. The culture of this patient might have been affected also by previous antibiotic therapy. Or, there might have been an anaerobic infection. The specimen obtained, however, was odorless, so anaerobic infection was not highly entertained. **Hesselink** (1979)studied 18 mucoceles. Twelve of these were isodense to brain tissue on CT scan. Of these, 11 had negative cultures and 1 grew *Staphylococcus aureus*. Three of the mucoceles were hyperdense, and grew *Staphylococcus aureus* in 2 and *Escherichia coli* in 1 case. The remaining three which were hypodense had no growth. **Sarti et al** (1988) documented a case wherein extensive destruction of the sphenoid sinus area was cause by *Aspergillus flavus*.

Management. The accepted management of sphenoid mucoceles is drainage. Various surgeons, however, would have different approaches to this skull base lesion. Craniotomy may be inadvertently done, resulting in greater morbidity and mortality. **Nugent** (1970) reviewed 63 cases. Craniotomy was done in 16 cases, and resulted in 3 deaths, 2 from meningitis. Commonly used approaches are external, trans-nasal or trans-antral sphenoethmoidectomy. The endoscope guided trans-nasal approach used provided excellent visualization and exposure.

SUMMARY

A case of a sphenoid mucocele was reported. The symptomatology, pathophysiology, radiographic findings, differential diagnosis, and management were discussed. It is emphasized that: first, the differential diagnosis of sphenoid mucocele should be considered in patients presenting with headache and visual disturbances; second, a benign lesion such as a mucocele can simulate a destructive, malignant process. **Van Alyea** stated that "every year or 2, the sphenoid sinus is taken out of obscurity, given an airing and then returned to its normal role as the most neglected of the paranasal sinuses" (**Gibson** 1984). It is hoped that with this report, the sphenoid sinus will not continue its role as such.

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ANOTHER CASE OF BUCCAL MASS*

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Gerardo Cruz, MD** Romeo Villarta, MD***
Mamerto Almelor, MD*** Remigio Jarin, MD***

INTRODUCTION

A mass in the buccal area is an entity not so commonly encountered in ENT practice. Lipomas, papillomas, minor salivary gland tumors and malignancies are among the conditions to be considered.

While the diagnostic approach for a buccal mass may seem simple like performing an incision biopsy, some cases may require careful evaluation.

This case to be presented illustrates an unusual cause of a buccal mass.

CASE REPORT

C.C. a 65 y/o female was admitted at East Avenue Medical Center on January 25, 1991 because of an enlarging mass in the oral cavity. The mass was initially noted as a bulge on the right buccal area opposite the molars. The bulge grew in size over a period of 10 months causing difficulty in chewing. Nevertheless, there was no pain, ulceration nor bleeding. The patient also noted that there was slight prominence of her right infra- auricular area. Upon consultation at the Out Patient Department (OPD), physical examination revealed bulging of the right buccal area approximately 8 cm. x 4 cm. extending to the superior and inferior limits of the buccal mucosa (Fig. 1). It also protruded medially almost reaching the midline. The surface appeared smooth with no ulceration. It was doughy and non-tender on palpation. There was no distortion of the lateral pharyngeal wall and tonsillar pillars. Also noted was the slight prominence of the right infra- auricular area. No neck nodes were seen at the time of examination.

Plain radiographs taken revealed lateral bowing of the right proximal segment of the mandible. No

Figure 1

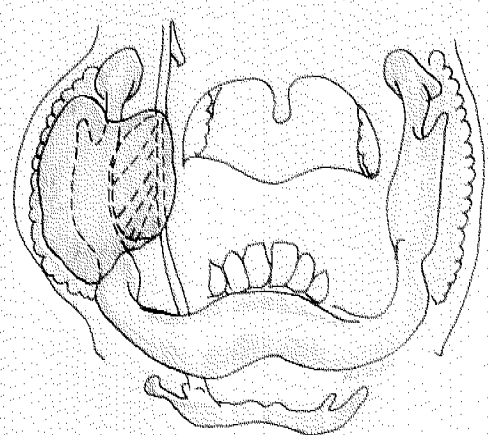

Figure 2. Schematic Diagram Front or Antero-Posterior View illustrating the mass and its anatomic relations the deep lobe tumor passes behind the stylomandibular ligament. The lateral pharyngeal wall is not deviated and the Right Mandible is bowed out.

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bone defects were noted. Sialography results indicated stretching of the duct with non-filling of the distal branches. Fine needle aspiration of both the buccal mass and the right infra- auricular area showed **Pleomorphic Adenoma**. CT scan and MRI were both considered but were not done due to financial constraints. Clinical impression then was a tumor either from the deep lobe of the parotid of a benign mixed type or two separate tumors from the parotid and minor salivary glands.

The patient underwent surgery for removal of the mass via a combined external and midline **mandibulotomy approach**. **Intraoperatively the mass** was seen as a tumor of the deep parotid passing posterior to the stylomandibular ligament then me-

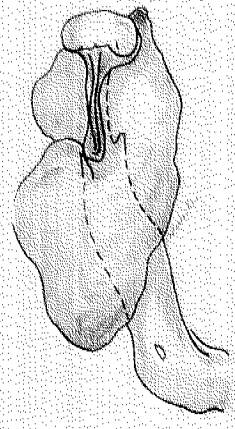

Figure 3. Schematic Diagram Top or Supero-Inferior View showing the mass and its relation to the mandible.

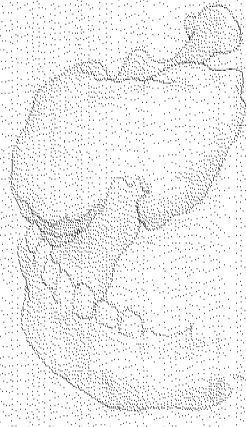

Figure 4. Schematic Diagram Top Left or Medio/Supero-Latero/ Inferior View showing the mass as seen from above and within

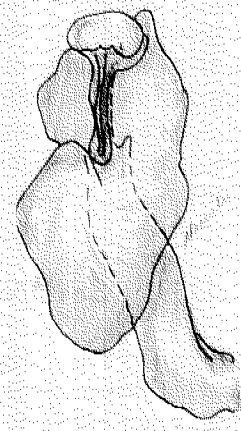

Figure 5. Schematic Diagram Top or Supero-Inferior View showing the mass and its relation to the mandible.

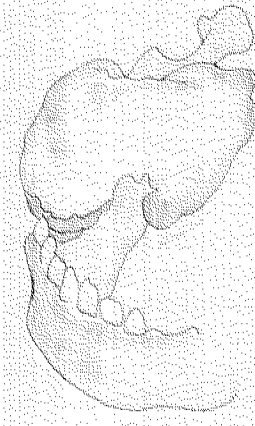

Figure 6. Schematic Diagram Top Left or Medio/Supero-Latero/ Inferior View showing the mass as seen from above and within.

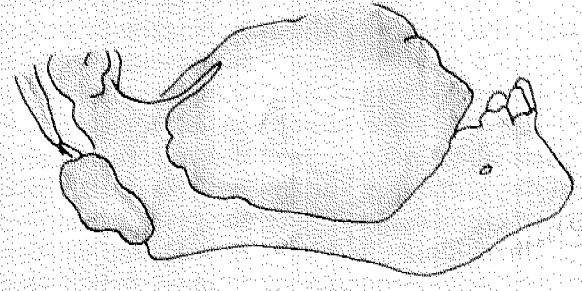

Figure 7. Schematic Diagram Right Lateral View showing the mass and its relation to the mandible.

dially to the mandible and anteriorly to the retromolar and buccal area (Figs. 3 to 7). The recovered mass was 12 cm. long, the buccal side of which was 8 cm. x 4 cm. and connected by a waistlike constriction to the external part which was 5 cm. x 4 cm.

The final surgical pathological report showed Benign Mixed Tumor.

DISCUSSION

When one encounters a buccal mass with a surgical pathological report of Pleomorphic Adenoma, one is led to think of the minor salivary glands. Intraoral minor salivary glands number anywhere from 450 to 750. The lips, cheeks, hard and soft palate, retromolar area, uvula, tongue and floor of the mouth are among the few of its locations.

Rauch, in a series of 6,000 cases, showed that 7% of benign mixed tumor of the minor salivary glands occurred in the oral cavity (**Rauch, et al**: 1970). The hard and soft palate being the most frequent site. The usual history of a mixed tumor is that of a slow growing or apparently stationary, painless mass. Minor salivary gland mixed tumors usually present in patients over 50 years old. However, major salivary gland mixed tumors usually present in patients over 50 years old.

Pleomorphic adenoma makes up 65% of all neoplasms in the parotid gland. It is oftentimes outside the facial nerve and behind the mandibular branch. Parotid tumors account for75-85% of the salivary gland tumors, 80% of which are found in the superficial and caudal parts while 11-12% occur in the deep lobe (**Hanna, et al**: 1968; **Nigro et al**: 1977). The deep lobe of the parotid gland forms part of the lateral wall of the parapharyngeal space. In rare instances, tumors of the deep lobe of the parotid may enter the parapharyngeal space and may present as diagnostic difficulties. The tight stylomandibular tunnel which is formed by the stylomandibular ligament, styloid process, and mandible dictates the growth of deep lobe parotid tumors into the parapharyngeal space. There are two ways by which the tumor can grow into the space: (1) The tumor can grow through the constriction producing a circumferential narrowing of the tumor forming something like a dumbbell (dumbbell tumor); (2) The tumor grows posterior to the stylomandibular ligament into the parapharyngeal space producing a round or oval tumor. In both cases, however, the clinical presentation is that of a mass that produces a bulging in the lateral pharyngeal wall, tonsillar area, or soft palate region. Sometimes a tumor in the deep portion of the gland can develop to such an extent that the superficial part is compressed and the tumor then is falsely considered to be superficial (**Eneroth**:1977).

Because of the anatomic restrictions provided by the skull base superiorly, the mandible laterally, the muscles and vertebra posteriorly, a tumor developing in the deep parotid finds its most unencumbered growth projection medially and inferiorly.

Review of literature showed few reported cases. According to Heeneman, parapharyngeal extension occur in 5% of deep lobe tumors, although not all cases are clinically evident. In **Eneroth's** study, less than 1% of the deep parotid tumors proved to be clinically parapharngeal. Among a total of 481 cases of parotid gland tumors of Rikshospitalet, Oslo, 21 tumors of the dumbbell type were found. A relatively high frequency of parotid lesions bulged into the pharynx with 15 of the 21 seen both parapharyngeally and in the retromandibular fossa. In the rest of the cases the tumor was only seen parapharyngeally (**Eneroth**). In Karolinska, Sjukhuset, only 9 (1%) of 1,108 cases of parotid gland tumors proved to be parapharyngeal (**Eneroth**). **Joson et al.**, in a study of 139 cases of parotid gland tumors did not mention any case extending into the parapharyngeal space. The rarity of these lesions may not only lead to diagnostic difficulties. Surgical management may be difficult or even hazardous.

In this case, this patient presented with a large buccal mass with no displacement or bulging of the lateral pharyngeal wall or soft palate. The clinical presentation was, in every respect, misleading. Preoperatively the connection of the buccal mass with the parotid was not clear since no sophisticated imaging procedure was done. Nevertheless a high index of suspicion was present and operative findings confirmed the impression. Review of available literature, both foreign and local, gives no mention of this type of clinical presentation of a deep lobe parotid mass.

TABLE 1. TYPES OF TUMORS COMPARED

Tumor	Relationship with the Stylomandibular ligament	Presentation	Status of the lateral pharyngeal	Gross appearance of the mass
CASE	Posterior	Buccal	Normal	Dumbbell
DUMBBELL	Anterior	Lateral Pharyngeal wall	Bulging	Dumbbell
ROUND	Posterior	Lateral Pharyngeal wall	Bulging	Round

Clinical evaluation of tumors should start with a complete head and neck examination and systematic evaluation. CT Scan and MRI studies have proven to be refined methods for the evaluation of tumor extent and vascular involvement. In most instances,the MRI

is the study of choice because of better soft tissue detail. Sialography in some cases can be useful.

Tumor cytology can be established by fine needle aspiration techniques and may be of value in planning the management. One might be tempted to perform a transoral open biopsy because of the clinical presentation, but this is contraindicated because of the possibility of tumor seeding and vascular injury (**Coulthard**:1990).

The surgical management chosen depends on the surgeons experience, the extent and size of the tumor, and its histology. Basically, there are four approaches: (1) Transoral, (2) Transcervical, (3) Transcervical-Transparotid, and (4) Transpharyngeal-Transmandibular.

The Transoral route is used only for the smallest and most localized parapharyngeal tumors. The transoral,in combination with the transcervical approach, is useful when increased maneuverability is needed for an extensive, deep parapharyngeal tumor. The transpharyngeal midline mandibulotomy approach is reserved for vascular tumors and large extra-parotid tumors.

The case presented demonstrates an interesting cause of a buccal mass. The reasons for its uniqueness are as follows:

1. The tumor came from the deep lobe of the parotid and the bulk presented in the buccal area.
2. The large parotid mass did not produce any deformity in the lateral parapharyngeal wall nor in the soft palate which are usually seen in extensions to the parapharyngeal space because these are areas of least resistance.
3. The lesion caused the mandible to bow out instead of acting as a barrier for anterolateral spread.

SUMMARY

To the unsuspecting clinician, a pleomorphic adenoma on the buccal area usually comes from the minor salivary glands. It has been the authors' experience that other possibilities do exist and should be considered. Careful evaluation is essential since the management depends on this assessment.

It is recommended that CT Scan or MRI study be done on large tumors for error in the diagnosis may have catastrophic results for the patient as well as the head and neck surgeon.

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AN UNCOMMON CAUSE OF APHONIA*

Ramon V. Alcira, MD**

If one would look at the intricacies of the human body, one can easily recognize that it was made to be perfect, with astounding powers of adaptibility for both physical and mental challenges. However, such a perfectly honed machine is not without its limits. Once these limits are exceeded, its effects on the human being are far reaching and usually bring about serious consequences, sometimes even fatal ones. One may be fortunate enough to survive such an onslaught, but this may leave permanent marks on the individual, constant reminders of the misfortune one experienced previously.

Variability of the human organism, as regards the response to physical and mental insult, is what makes the medical profession interesting. Often, one does not have to look far in search for rare and bewildering cases, for each patient seen is an interestingly unique individual. This is the reason why this case is presented. At a glance, it is a far cry from the other exotic cases one will hear and encounter. But as the case goes deeper, the reasons for presenting it will become appparent.

In the practice of Otolaryngology, most cases of laryngeal granulomas are secondary to the trauma of endotracheal intubation, as most literatures would attest to. Here is a case of subglottic granuloma not attributable to the trauma of intubation, but to some other factor. As the case unfolds, one will get to understand how this granuloma unexpectedly became the cause of aphonia.

To be presented is the case of a 28 year old male from Paranaque, Metro Manila referred from the Department of Surgery, Ospital ng Maynila, because of aphonia. The circumstances on how this problem arose are equally important, thus necessitating their inclusion into the scope of discusion.

The patient was an ex-enlisted man in the Philippine Constabulary who began service in 1985, at the age of 22. Known as a silent individual, an introvert, among family members and peers, with a history of drug abuse since 1985, at about the same time of induction into the military . The drug habit came to a point where hospitalization became necessary. In 1987, the patient was confined at the AFP Medical Center for drug-induced psychosis.

Although with such a history, he has been a frontliner in the past 4 coup attempts, of course, as a government defender. This must have aggravated his preexisting psychological problem, for after such exposure, his behaviour changed. As his immediate family would attest, he became moody, with a tendency towards violence at the slightest provocation.

In late 1989, while in the barracks, a group of soldiers having a drinking bout invited the patient to partake in the merrymaking. When the said invitation was refused, the group then started calling the patient a sissy. This proved to be a fatal mistake, for the group was shot with a service firearm, leaving three dead and two others seriously wounded. During court martial proceedings, the act was judged as self defense and the patient was thus given an honorable discharge.

Subsequently, the patient's psyche deteriorated and became paranoid with the constant thought that people were trying to harm or kill him. In January of 1991, the patient attempted to commit suicide by trying to thrust a screwdriver into the skull.

On the 16th of February, 1991, after having an argument with a brother, another suicide attempt was made by the patient , this time slashing the neck with a kitchen knife. At the emergency room of this hospital, the patient was noted to have an actively bleeding transverse wound on the anterior neck area, with additional lacerations in the right temporoparietal area. Initially seen by the Department of Surgery, the patient was brought directly to the operating room for wound exploration.

Inside the OR, preliminary assessment of the self-inflicted wound revealed that it had partially transected the thyroid cartilage at its inferior pole, slightly below the attachments of the true vocal cords, and that it had been deep enough to violate the mucosa of the larynx. As expected, the airway was filling up with blood and secretions. Orotracheal intubation was attempted, but the agitated state of the patient prevented this. Thus, the suicide wound was converted into a thyrostomy by inserting an endotracheal tube. Intraoperatively, the left sternocleidomastoid muscle was involved, both sternothyroid and sternohyoid muscles were almost completely transected, and both anterior jugular veins were hit. The cricoid cartilage, thyroid gland, cricothyroid muscle and recurrent laryngeal nerves were apparently spared. Hemostasis was secured, the thyroid cartilage was repaired except at the area were the thyrostomy was placed, and the

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wound was closed primarily. Shortly thereafter, the endotracheal tube used for the stoma was replaced with a metal tracheostomy tube. By the first post-operative day, the patient was referred to the ORL Department for asessment of laryngeal integrity. However, both mirror and fiberoptic laryngoscopy proved useless with the patient's anxious state.

On the second postoperative day, weaning from the thyrostomy was started. Upon covering the tube, however, the patient was noted to be aphonic. This loss of voice persisted even until after the thyrostomy was removed 7 postoperative days later. The patient also referred to the Department of Psychiatry, was found to have Functional Psychosis, probably Schizophrenia and was started on appropriate medications.

On the 12th of March, 1991, the patient was transferred to this department because of the persistent aphonia. Mirror and fiberoptic examinations revealed the glottic area to be inflamed, with the left cord immobile and in the paramedian position. At this point, a left recurrent nerve injury was entertained, inspite the fact that it was found to be intact during the previous surgery. Also a fleshy, hyperemic mass was noted in the subglottic area in the region of the anterior commissure, occupying the anterior third of the glottic chink.

On the 26th of March, being the first in our list of priorities, the subglottic mass was excised under suspension laryngoscopy. For that purpose, a tracheostomy was done to provide an unobstructed view of the field during operation, something which could not be accomplished if it were done under general orotracheal anesthesia. As expected, histopathologic studies of the excised specimen revealed chronic inflammatory tissue, a granuloma, presumably obtained from the area of the healing thyroid cartilage.

Postoperatively, up to the present time, follow-up examinations revealed no recurrence of the subglottic mass. The left vocal cord has retained its mobility. However, the cords were noted to be askew during coaptation, with the left cord lower than the right, probably the result of improper healing of the previously injured thyroid cartilage. Thus, although the patient has regained his voice, it is still hoarse, as expected.

The case ends here, but one will be able to realize its value only with the aid of critical evaluation, one that is not intended to downgrade the mistakes of management but to realize them and to avoid them in the future.

First, the thyrostomy, although adequate for the purpose of immediate airway establishment, should be converted into an orderly tracheostomy once the patient's condition permits it.

Second, the loss of voice first noted during weaning of the thyrostomy should have alerted the surgeons of the potential glottic injury. Had this been the case, some positive action could have been done earlier for the vocal problem.

Third, not all cases of cord immobility are neurologic in nature. Another likely posibility one must bear in mind is a mechanical impediment to cord movement. As this case has clearly demostrated, the patient's loss of voice was primarily due to the subglottic mass in the anterior commisure which had impeded motion of the left cord.

Also, taking into consideration the physics of voice production, one must also consider cord tension and cord coaptation together with cord mobility in the genesis of hoarseness. This explains the present voice problem of the patient, which results from the improper coaptation of the askew cords, presumably due to the improper healing of the repaired thyroid cartilage. Thus, an interesting point now is how to repair this "skewness".

Lastly, the head and neck is only a part of the whole individual. Thus, even as Otolaryngologists and Head & Neck surgeons,one should continue practicing medicine in a holistic manner. Management of this patient does not stop here. Constant follow-up for his psychiatric problem is required. And although efforts have begun at rehabilitation, the patient still has not been totally cured of the drug habit as of the present time. So, attention must be focused on this ongoing malady. For what good will one's voice be, if he is not sane enough to use it?

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with the least possible expenditure both for the patient and the institution?"

OBJECTIVES

1. To compare results obtained from plain radiography and computed tomography of the paranasal sinuses.
2. To propose a combination which will give optimal information with the least expenditure.

METHODOLOGY

I. DATA GATHERING

All patients above 15 years old seen at JRRMMC Department of Otorhinolaryngology - Head and Neck Surgery from June 1990 to February 1991, manifesting the clinical signs and symptoms of sinusitis were included in this study. The following clinical triad as proposed by **Stammberger and Wolf**[1] was used as basis for inclusion:

1. nasal obstruction or stuffiness
2. pathologic secretions (purulent, mucoid or serous discharge)
3. headache or tenderness localized to the area of sinuses

The following patients were excluded from this study:

- patients with bleeding disorders
- patients with congenital defects
- patients with endocrine disorder
- patient with malignancy
- patient with skeletal disorder
- patient with previous surgery to paranasal sinuses
- patient with previous trauma to paranasal sinuses

The patients underwent radiographic examination of the paranasal sinuses utilizing the following views:

- Water's closed mouth
- Water's open mouth
- Caldwell
- Lateral
- Basal
- Coronal section computed tomography (CT)

At the most, seven days were allowed for the patients to complete both plain x-ray and CT procedures.

Series of paranasal sinus x-ray combinations were prepared and viewed independently by a radiologist and an otorhinolaryngologist for a period of one month (March 1991). Readings were done at an average of ten patients a day. The combinations were separately and individually presented to the readers, who were blinded to the results of the plates. The CT outcomes were used as the "Gold Standard".

The following were the series of combinations evaluated:

Water's open mouth series (series A)

- Water's open mouth
- Water's open mouth + Lateral
- Water's open mouth + Caldwell
- Water's open mouth + Lateral + Caldwell
- Water's open mouth + Caldwell + Basal
- Water's open mouth + Caldwell + Lateral + Basal/waters closed mouth series (series B)
- Water's closed mouth
- Water's closed mouth + Lateral
- Water's closed mouth + Caldwell + Basal
- Water's closed mouth + Caldwell + Lateral + Basal

The unit of analysis is a sinus and the total number of sinuses analyzed was calculated using this formula:

$$N = \text{No. of patients} \times \text{2 sides (Left and Right)} \times \text{4 sinuses (Frontal Ethmoid, Maxillary, and Sphenoid)}$$

Paranasal sinus x-ray combination results were compared with that of CT as shown below:

Figure 1

		CT +	CT -
X-RAY	+	A	B
X-RAY	-	C	D

Yields were computed using these formulas:

$$\text{A. (+) Yield} = \frac{\text{True positive values (A) of sinusitis detected by plain radiography}}{\text{Total number of positive values (A + C) of sinusitis detected by CT}}$$

$$\text{B. (-) Yield} = \frac{\text{True negative values (C) of sinusitis detected by plain radiography}}{\text{Total number of negative values (B + D) of sinusitis detected by CT}}$$

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- Water's open mouth + Lateral
- Water's open mouth + Caldwell
- Water's open mouth + Lateral + Caldwell
- Water's open mouth + Caldwell + Basal
- Water's open mouth + Caldwell + Lateral + Basal/waters closed mouth series (series B)
- Water's closed mouth
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II. ECONOMIC ANALYSIS:

A. Costing:

Let total direct cost per view = z = a + b + c + d + e + f where

a = cost of plate = P 30.00 / plate

$$b = \text{cost of developing solution} = \frac{\text{cost/gallon}}{\text{no. of plates developed / day} \times \text{no. of days/gallon consumed}}$$

$$= \frac{P2{,}500.00}{200\ (5)}$$

= P2.50 / plate

c = wear and tear of x-ray machine

$$= \frac{\text{present acquisition of machine}}{\text{no. of plates developed/day} \times \text{no. of working days/year} \times \text{Annualization Factor*}}$$

$$= \frac{P\ 2{,}500{,}000.00}{200 \times 317 \times 3.3522}$$

d = wear and tear of rapid film processor

$$= \frac{\text{present acquisition cost of machine}}{\text{no. of plates developed/day} \times \text{no. of working days/year} \times \text{Annualization Factor*}}$$

$$= \frac{P\ 600{,}000.00}{200 \times 317 \times 3.3522}$$

= P 2.82/plate

e = cost of labor for plate processing

$$= \frac{\text{Daily salary of radiology technician} \times \text{No. of technicians in 3 shifts}}{\text{No. of plates processed/day}}$$

$$= \frac{P\ 113.33 \times 3}{200}$$

= P 1.70/plate

f = cost of labor for consultant reading plate

$$= \frac{\text{Daily salary of Radiologist} \times \text{No. of Radiologist in one day}}{\text{No. of plates processed/day}}$$

$$= \frac{P\ 80.00 \times 2}{200}$$

= P0.80/plate

Therefore,

z = P 30.00 + P 11.76 + P 2.82 + P0.94 + P1.70 + P0.80
= P 48.02 (or roughly P50.00)

N.B. Excluded from the costing were use of building, land, light, water, administration and other overhead costs.

B. If z = P 50.00 and P = x-ray plate

Then, for 100 patients:

1 P ——————> (P 50.00) (100) = P 5,000.00
2 P ——————> 2 (P 50.00) (100) = P 10,000.00
3 P ——————> 3 (P 50.00) (100) = P 15,000.00
4 P ——————> 4 (P 50.00) (100) = P 20,000.00

C. Cost-effectiveness ratio was computed for each combination:

$$\text{Cost-effectiveness ratio} = \frac{\text{Cost}}{\text{+ Yield}}$$

e.g.:

(A) Waters open mouth COST-EFFECTIVENES RATIO	VS.	(B) Waters open mouth + Lateral COST-EFFECTIVENESS RATIO
If + Yield of A = 60%		If + yield of B = 70%
Then,		
P 5,000.00 / 60		P 10,000.00 / 70
= P 83.33 per affected sinus detected		= P 142.85 per affected sinus detected

D. Comparison of incremental costs and outcomes of the different x-ray combinations was done as follows:

$$\text{Incremental cost} = \frac{\text{(Cost B) - (Cost A)}}{\text{(+ Yield B) - (+ Yield A)}}$$

e.g.:

	If + Yield A = 60% A (Waters open mouth)	If + Yield B = 70% B (Waters open) mouth + Lateral)	Incremental Cost
Cost	P 5,000.00	P 10,000.00	P 5,000.00
+ Yield	60%	70%	10%
Cost/ + Yield	P83.33	P142.85	P500.00/ extra affected sinus detected

* From Drummond: factor at 15% discount rate over 5 years.

RESULTS

Thirty patients, 16 males and 14 females, with ages ranging from 16 to 84 years and a mean of 31 years, were included in this study. Therefore, a total of 240 sinuses were under review.

Of the 240 sinuses evaluated, 133 were read as positive for sinusitis by CT, giving a prevalence rate of 55.4%. The distribution of affected sinuses are shown in Tables A and B.

When the x-ray combinations were compared to CT, more affected sinuses were detected as more plates were used. However, there are minimal differences, and in some instances,no change at all, of the (+) yields of combinations requiring 3 plates and 4 plates. In general, there was a decreasing trend in the (-) yield as more plates were used (Table C).

The combinations were interpreted by a radiologist and an otorhinolaryngologist on different days under the same conditions. Agreement beyond chance between the readers was poor as shown on Table C.

As more plates were used, the costs increased. Consequently, even though there was an upward trend in the number of (+) yields, there was a corresponding rise in the cost-effectiveness ratio.

The lowest ratio obtained from the radiologist's readings was that of the Water's open mouth view but it had a (+) yield of 69% only (Table D). This was followed by the Water's closed mouth view with a (+) yield of 62%, then the Water's open mouth + Caldwell combination with a (+) yield of 80% and the Water's closed mouth + Lateral set with a (+) yield of 75%. Waters open mouth + Lateral views and Water's open mouth + Caldwell + Lateral + Basal views had higher ratios in spite of having (+) yields similar to those of other combinations using fewer plates (Table D).

Since both Water's closed mouth and Water's open mouth views have the same costs, incremental cost effectiveness analysis was not applicable. Analysis of Water's open mouth view against Water's open mouth + Caldwell combination showed that an additional P 455 was needed just to detect an extra reading of affected sinus in 100 patients (Table E). On comparison with other combinations, an additional P 769 to P 1071 would be spent to improve the (+) yield and detect one more affected sinus in 100 patients (Table E).

Since the Water's open mouth + Caldwell combination had the lowest cost-effectiveness ratio among the two-view sets, this was used for comparison against the 3-, 4-view series. The lowest incremental cost was obtained against the Water's closed mouth + Caldwell + Basal combination at P 1,667 per extra affected sinus detected in 100 patients. The other sets costed more at P 2,500 to P 5,000 per extra affected sinus detected (Table E).

DISCUSSION

The resources available to produce goods and services are scarce in relation to the demands placed on them to satisfy human wants and desires. Prudent decisions, therefore, must be made as to what to produce, how to produce it and how the output should be distributed.

Health care delivery is no exception. If resources are applied to a particular need, the oppurtunity to use it in any other way would be lost. In government institutions, the administration has to contend with a restricted budget which must be used productively. Minimizing the expenses with judicious use of ancillary procedures would be one way to operate cost-effectively.

It is so with the use of radiographic examination. An extra plate used will mean more electric current used, more films utilized, more solutions mixed, more wear and tear on the machines, more time spent waiting for the processing and more time consumed by the consultant in reading the plates. All these will be translated into additional costs, directly and indirectly, not only to the patient but for the involved institution as well.

In otorhinolaryngology, radiology is a valuable tool in evaluating the paranasal sinuses. Most clinicians consider this essential, especially prior to surgical management. The number of examinations would understandably be substantial, and consequently, sound utilization would provide considerable savings.

Sinusitis is detected on x-ray as an alteration in the contour and thickness of the lining membrane either with or without fluid formation and changes in the bony wall.[2] Because there are 22 bones in the skull which cast multiple shadows on the film in a sinus roentgenogram, great care is needed when reading films. As such, multiple views are done to provide more accuracy in sinus assessment.

Water's closed mouth view, first described in 1915, gives an excellent view of the maxillary sinuses. The frontal and ethmoid sinuses are also visualized but the sphenoid sinus is covered by the mandible. The modification of opening the mouth displaces the mandible inferiorly and provides a good visualization of the sphenoid sinuses.

The lateral view, when taken in a true lateral projection, gives a good account of the sphenoid sinuses and its relationship with a sella turcica. The anterior and posterior tables of the frontal sinuses may also be evaluated. Its drawback is that if only one side

is affected, the affected side can not be distinguished from the unaffected side.

The basal or submentovertical view is taken with the x-ray beam at right angle through the base of the skull. The size and shape of the sphenoid sinuses are particularly evaluated well. Caldwell view shows the frontal and ethmoid sinuses excellently, with good emphasis on the latter.

It will be noted that while there is only one view mentioned which can show all the sinuses, there is overlapping of information obtainable from the other views. Permutations of the different views which can give a complete account of the sinuses would then have to include at least a Waters open mouth view or a Water's closed mouth view + an additional view which can show the sphenoid sinuses. The authors came up with the two series: Water's open mouth and Water's closed mouth. However, since Water's closed mouth view was used by a local sinusitis expert, it was included in this study for completion purposes.

The choice of computed tomography as the "Gold Standard" is based on foreign studies which showed that of the battery of radiographic examination available for the evaluation of the sinuses, CT provided both good bone detail and soft tissue imaging.[3,4,5,6,7,8] Magnetic resonance has recently replaced CT as the optimum method of showing soft tissues, especially with the introduction of the paramagnetic contrast agent **Gadolinium.**[4] However, CT is readily available in our institution and is by itself an excellent source of information.

This study included patients who had first been evaluated clinically and were diagnosed on the basis of presentation of the triad as espoused by **Stammberger** and **Wolf.**[1] The exclusion criteria ensures that no other radiologic abnormality will be confused with sinusitis.

The readings were done on the same negatoscope within the same time span each day. To eliminate bias, the different combinations were presented one at a time for separate readings. As shown on Table C, both readers gave different readings, with poor agreement. Therefore, further studies should be conducted to determine the difference in the reading techniques of radiologist and otorhinolaryngologists so that interpretations will be standardized.

Paranasal sinus x-rays are not the sole domain of the rhinologist. Other clinicians also utilize them. As such, the radiologist's reading will be relied on, probably more frequently. It is for this reason that the authors decided to make use of the radiologist's (+) yield as basis for evaluation.

The lowest (+) yield was noted with the Water's closed mouth view. The inability to assess the sphenoid sinuses was a major factor in this limitation.

The increase in (+) yield as more plates were used (Table C) resulted from the added information gathered, with subsequent reconfirmation of the same sinuses evaluated from a different angle. Minimal differences observed among the (+) yields of the 3 and 4-plate combinations were, therefore, due to the overlapping of information. The additional views were then either just confirmatory or merely gave further data on one or two more sinuses.

The decreasing trend in the (-) yields may be attributed to a tendency to overread or underread the plain films. Davidson found that there was an inclination to overread the maxillary sinus and to underread the ethmoid sinus.[7] This was also the pattern in this study because as more plates were used, the margin for error also increased. Further studies should therefore be done to know which particular view would detect changes in a particular sinus. Basic cost accounting principles[9,10] were utilized in this paper with two strategies employed in analyzing cost-effectiveness. The simple cost-effectiveness ratios of the individual combinations were evaluated and incremental costs and benefits were compared.

As more views were used, costs also increased. Even though there was increased (+) yield, the corresponding cost-effectiveness ratios also went up. The Waters open mouth view had the lowest ratio since it only needed one plate and had a relatively good (+) yield, detecting 69% of the sinusitis present (Table D).

Among the 2-plate combinations, the Water's open mouth + Caldwell combination, having the highest (+) yield (80%) had the lowest cost-effectiveness ratio (P 125.00), overshadowing the rest (Table D). The authors attributed this to the additonal information from the Caldwell view with its emphasis on the ethmoid and frontal sinuses.

The Water's closed mouth + Caldwell + Basal combination was best among the 3-plate combinations with a (+) yield of 83% and a ratio of P 180.72 (Table D). The additional 3% in (+) yield as compared to the Water's open mouth + Caldwell may be credited to the excellent exposure of the sphenoid sinuses by the Basal view.

The best set observed in this study was the Waters closed mouth + Caldwell + Lateral + Basal combinations which showed 84% (+) yield (Table D). However, the additional costs also affected the ratio which was among the highest of tthe aforementioned combinations.

Water's open mouth view had the lowest cost-effectiveness ratio but may not necessarily be the best choice compared to the other combinations. Although it cost less, the (+) yield was also less. Was the additional benefit from the other combinations worth

the extra cost? Increment cost analysis, therefore, was done and the analysis for all possible comparisons between combinations are presented in Table E.

The best views observed in terms of (+) yields and cost-effectiveness ratios were the following: Water's open mouth, Water's open mouth + Caldwell, Water's closed mouth + Caldwell + Lateral and Waters closed mouth + Caldwell + Lateral + Basal. Discussion on the increment cost-effectiveness analysis will be centered on comparisons between these combinations.

Computations showed that the addition of Caldwell view to Water's open mouth view increased the (+) yield by 11%. However, incremental cost-effectiveness analysis revealed that another P455 will be needed for every extra sinusitis that would be detected in 100 patients. A comparison of Water's open mouth + Caldwell combination and Water's closed mouth + Caldwell + Basal combination showed an increased (+) yield of 3% and an incremental cost of P1,667 just to detect an extra case of sinusitis. On the other hand, Water's closed mouth + Caldwell + Lateral + Basal combination revealed a 1% increase in (+) yield with an incremental cost of P5,000 for every extra sinusitis detected in 100 patients when compared with the Water's closed mouth + Caldwell + Basal combination.

Presented with the above data, what would be the most appropriate choice? Would it be the combination with the highest (+) yield, or would it be the set with the lowest cost-effectiveness ratio? The answers to these questions depend on whether one thinks it is worth paying the extra incremental cost to detect additional sinusitis.

Definitely, the choice between the Water's closed mouth + Caldwell + Lateral + Basal combination and the Water's closed mouth + Caldwell + Basal combination can already be settled. The incremental cost of P5,000 will not justify the purpose of detecting one extra case of sinusitis in 100 patients. The same judgement can be rendered for the incremental cost of P1667 to detect one extra case of sinusitis using the Water's closed mouth + Caldwell + Basal combination as compared to Water's open mouth + Caldwell combination.

Thus the true decision point is whether it is worth paying an additional P455 just to detect an extra sinusitis in 100 patients - or the choice between Waters open mouth view and Water's open mouth + Caldwell combination. Before this question can be answered, the nature of sinusitis and its diagnosis and treatment will be briefly discussed.

Sinusitis is defined as the inflammation of the mucous membrane lining the paranasal sinuses.[11,12] For clinicians, the presence of the clinical triad proposed by Stammberger and Wolf[1] is enough to warrant medical treatment which is the same for all types of sinusitis. In refractory cases, plain radiography will be essential, especially if surgical intervention is contemplated. The type of surgery will depend upon the particular sinus affected. Therefore, the clinician who evaluated the patient would be in the best position to justify the request for additional views.

Water's open mouth view, having the least cost but having an acceptable (+) yield, would be adequate for initial screening procedures. If the additional information is needed, a Caldwell view may be requested, which from this study showed an increase of 11% in the (+) yield. The decision to request more than these two views is left to the judgement of the clinician by referring him to Table E as a guide.

CONCLUSION

The authors conclude that:

1. The concordance between the results obtained from plain radiography and computed tomography is good, as shown by the high levels of (+) yield.
2. The following combinations projected the best results among their groups:
   - Water's open mouth
   - Water's open mouth + Caldwell
   - Water's open mouth + Caldwell + Basal
   - Water's closed mouth + Caldwell + Lateral + Basal
3. Water's closed mouth view is a good screening tool in evaluating the paranasal sinuses.
4. Caldwell view is a good complement to Water's open mouth view.
5. The use of three and four view combinations increased the (+) yield minimally when compared to the Water's open mouth view + Caldwell combination.

RECOMMENDATION

The authors forward two levels of recommendation:

I. Institutional program recommendation:
   A. Water's open mouth view will be used as the screening procedure for all suspected cases of sinusitis.
   B. For indigent patients, the institution will subsidize the cost of the procedure.
   C. For any additional view that might be requested by the clinician, the cost will be shouldered by the patient.

II. Individual patient recommendation:
   A. Waters open mouth view will be used as the screening procedure for all suspected cases of sinusitis.
   B. For auxiliary views, the clinician will refer to the Incremental Cost-effectiveness Table (Table E) to determine if the additional information gathered will justify the extra cost.

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TABLE A
DISTRIBUTION OF SINUSITIS DETECTED BY CT SCAN
N = 30 patients

FRONTAL		ETHMOID		MAXILLARY		SPHENOID	
RT n(%)	LT n(%)	RT n(%)	LT n(%)	RT n(%)	LT n(%)	RT n(%)	LT n(%)
10(33)	12(40)	21(70)	23(77)	23(77)	24(80)	9(30)	11(37)

TABLE B
DISTRIBUTION OF PATIENTS BY NUMBER OF AFFECTED SINUSES

NO. OF AFFECTED SINUSES	NO. OF PATIENTS
None	4
1	2
2	2
3	0
4	8
5	0
6	7
7	3
8	4
TOTAL NUMBER OF PATIENTS	30

TABLE C
COMPARISON OF YIELD OBTAINED BETWEEN RADIOLOGIST AND OTORHINOLARYNGOLOGIST

	YIELD 1 [%]		YIELD 2 [%]		KAPPA VALUE
	(+)	(-)	(+)	(-)	(%)
SERIES A:					
1. WO	69	76	61	73	30
2. WO + L	69	76	67	71	36
3. WO + C	80	71	79	71	37
4. WO + C + L	82	67	85	69	42
5. WO + C + B	82	59	80	71	27
6. WO + C + L + B	83	60	85	70	32
SERIES B:					
1. WC	62	91	62	76	47
2. WC + L	75	80	72	66	38
3. WC + C + L	81	72	85	66	40
4. WC + C + B	83	72	83	71	33
5. WC + C + L + B	84	67	85	69	30

LEGEND:
WO: WATER'S (OPEN MOUTH)
WC: WATER'S (CLOSED MOUTH)
C : CALDWELL'S
L : LATERAL'S
B : BASAL

YIELD 1: RADIOLOGISIT'S READING
YIELD 2: OTORHINOLARYANGOLOGIST'S READING

KAPPA VALUE: INTEROBSERVER RELIABILITY TEST
Excellent agreement ≥ 80 %
Good agreement 60 % < 80 %
Fair agreement = 60 %
Poor agreement < 60 %

TABLE D

COST - EFFECTIVENESS RATIOS
OF THE DIFFERENT ALTERNATIVE PROGRAMS

If z = P 50.00, in 100 patients:

	COST	+ YIELD (Radiologist)	COST EFFECTIVENESS RATIO (Peso/Affected sinus detected)
SERIES A:			
1. WO	P 5,000.00	69%	72.46
2. WO + L	P10,000.00	69%	144.93
3. WO + C	P10,000.00	80%	125.00
4. WO + C + L	P10,000.00	82%	182.93
5. WO + C + B	P15,000.00	82%	182.93
6. WO + C + L + B	P20,000.00	83%	240.96
SERIES B:			
1. WC	P 5,000.00	62%	80.64
2. WC + L	P10,000.00	75%	133.33
3. WC + C + L	P15,000.00	81%	185.18
4. WC + C + B	P15,000.00	83%	180.72
5. WC + C + L + B	P20,000.00	84%	238.09

LEGEND:

WO: WATER'S (OPEN MOUTH)
WC: WATER'S (CLOSED MOUTH)
C : CALDWELL'S
L : LATERAL
B : BASAL

TABLE E

INCREMENTAL COST ANALYSIS OF DIFFERENT X-RAY COMBINATIONS
(COST OR SAVINGS IN PESOS FOR EVERY EXTRA SINUSITIS DETECTED)

ALTERNATIVE CHOICES

INITIAL CHOICES	A	B	C	D	E	F	G	H	I	J	K
A	—	X	455	833	769	769	833	714	1071		1000
B	Y	—	714	278	385	500	500	526	476	714	682
C	X	-714	—	Y	Y	385	385	417	357	714	667
D	-455	-287	Y	—	Y	2500	2500	5000	1667	3333	2500
E	-833	-385	Y	Y	—	714	714	833	625	1250	1111
F	-769	-500	-385	-2500	-714	—	YY	Y	5000	2500	
G	-769	-500	-385	-2500	-714	Y	—	Y	Y	5000	2500
H	-833	-526	-417	-5000	-833	Y	Y	—	Y	2500	1667
I	-714	-476	-357	-1667	-625	Y	Y	Y	—	X	5000
J	-1071	-714	-714	-3333	-1250	-5000	-5000	-2500	X	—	Y
K	-1000	-682	-667	-2500	-1111	-2500	-2500	-1667	-5000	Y	—

LEGEND:

A - Water's open mouth
B - Water's closed mouth
C - Water's open mouth + Lateral
D - Water's open mouth + Caldwell
E - Water's closed mouth + Lateral
F - Water's open mouth + Lateral + Caldwell
G - Water's open mouthy + Caldwell + Basal
H - Water's closed mouth + Lateral + Caldwell
I - Water's closed mouth + Caldwell + Basal
J - Water's open mouth + Caldwell + Lateral + Basal
K - Water's closed mouth + Caldwell + Lateral + Basal
X - Poor choice because of similar yield at higher cost
Y - Combinations with same costs
N.B. (-) sign means acquired savings

APPENDIX: COMPARISON BETWEEN PLAIN RADIOGRAPHY AND COMPUTED TOMOGRAPHY

SERIES A:

1. WATER'S OPEN MOUTH

O*	CT +	SCAN -	
X +	92	24	116
RAY -	41	83	124
1	133	107	240

(+) YIELD = 69%
(-) YIELD = 76%

O**	CT +	SCAN -	
X +	81	29	110
RAY -	52	78	130
2	133	107	240

(+) YIELD = 61%
(-) YIELD = 73%

2. WATER'S OPEN MOUTH + LATERAL

O*	CT +	SCAN -	
X +	92	24	116
RAY -	41	83	124
1	133	107	240

(+) YIELD = 69%
(-) YIELD = 76%

O**	CT +	SCAN -	
X +	89	31	120
RAY -	44	76	120
2	133	107	240

(+) YIELD = 67%
(-) YIELD = 71%

LEGEND:
* RADIOLOGIST
** OTORHINOLARYNGOLOGIST

3. WATER'S OPEN MOUTH + CALDWELL'S

O* OBSERVER 1	CT +	SCAN -	
X +	106	31	137
Y -	27	76	103
	133	107	240

(+) YIELD = 80%
(-) YIELD = 71%

R

O** OBSERVER 2	CT +	SCAN -	
X +	105	31	136
Y -	28	76	104
	133	107	240

(+) YIELD = 79%
(-) YIELD = 71%

4. WATER'S OPEN MOUTH + CALDWELL + LATERAL

O* OBSERVER R	CT +	SCAN -	
X +	109	35	144
Y -	24	72	96
	133	107	240

(+) YIELD = 82%
(-) YIELD = 67%

O** OBSERVER R 2	CT +	SCAN -	
X +	113	33	146
Y -	20	74	94
	133	107	240

(+) YIELD = 85%
(-) YIELD = 69%

5. WATER"S OPEN MOUTH + CALDWELL'S + BASAL

O* OBSERVER 1	CT +	SCAN -	
X +	109	44	153
Y -	24	63	87
	133	107	240

(+) YIELD = 82%
(-) YIELD = 59%

O** OBSERVER 2	CT +	SCAN -	
X +	106	31	137
Y -	27	76	103
	133	107	240

(+) YIELD = 80%
(-) YIELD = 71%

6. WATER'S OPEN MOUTH + CALDWELL + LATERAL + BASAL

O*	CT +	CT -	
+	111	43	154
-	22	64	86
1	133	107	240

(+) YIELD = 83%
(-) YIELD = 60%

O**	CT +	CT -	
+	113	32	145
-	20	75	95
2	133	107	240

(+) YIELD = 85%
(-) YIELD = 70%

SERIES B:

1. WATER'S CLOSED MOUTH

O*	CT +	CT -	
+	82	10	92
-	51	97	148
1	133	107	240

(+) YIELD = 62%
(-) YIELD = 91%

O**	CT +	CT -	
+	82	26	108
-	51	81	132
	133	107	240

(+) YIELD = 62%
(-) YIELD = 76%

2. WATER'S CLOSED MOUTH + LATERAL

O*	CT +	CT -	
+	100	21	121
-	33	86	119
1	133	107	240

(+) YIELD = 75%
(-) YIELD = 80%

O**	CT +	CT -	
+	96	36	132
-	37	71	108
2	133	107	240

(+) YIELD = 72%
(-) YIELD = 66%

3. WATER'S CLOSED MOUTH + CALDWELL'S + LATERAL

O*	CT +	SCAN -	
+	108	30	138
-	25	77	102
1	133	107	240

(+) YIELD = 81%
(-) YIELD = 72%

O**	CT +	SCAN -	
+	113	36	149
-	20	71	91
1	133	107	240

(+) YIELD = 85%
(-) YIELD = 66%

4. WATER'S CLOSED MOUTH + CALDWELL'S + BASAL

O*	CT +	SCAN -	
+	111	30	141
-	22	77	99
1	133	107	240

(+) YIELD = 83%
(-) YIELD = 72%

O**	CT +	SCAN -	
+	110	31	141
-	23	76	99
2	133	107	240

(+) YIELD = 83%
(-) YIELD = 71%

5. WATER'S CLOSED MOUTH + CALDWELL'S + LATERAL + BASAL

O*	CT +	SCAN -	
+	112	35	147
-	21	72	93
1	133	107	240

(+) YIELD = 84%
(-) YIELD = 67%

O**	CT +	SCAN -	
+	113	33	146
-	20	74	94
2	133	107	240

(+) YIELD = 85%
(-) YIELD = 69%

AUTOLOGOUS FIBRIN TISSUE ADHESIVE*

Ma. Clarissa Fortuna, MD**

ABSTRACT

The theoretical usefulness of fibrinogen based adhesive derived from pooled human plasma has long been recognized. However, due to the risk of transmitting blood borne diseases, a technique for making an autologous fibrin glue has been developed. The average bonding strength of the adhesive after glueing two pieces of fresh rat skin at 10 and 30 minutes were 42 g/cm2 and 170 g/cm2 respectively. This was not significantly different from the commercial product which held 57 g/cm2 at 10 minutes and 123 g/cm2 at 30 minutes. Closure of skin incisions in experimental animal models was compared using the conventional suture and fibrin sealant. Gross observation and histologic response were similar in both sites. Fixation of full thickness skin graft was also done with the adhesive.

INTRODUCTION

For a long time, sutures have been the standard method of tissue and wound edge repair in surgery. Sophisticated suturing techniques and highly developed suture materials have not, however, always been sufficient to prevent complications. Thread fistula and granulomas are still phenomenon surgeons are all too familiar with. These factors as well as wound dehiscence, wound edge necrosis and tissue ischemia led to the development of various tissue sealants which originated from the basic desire for hemostasis, and, at the same time, atraumatic tissue repair.

Research into the fundamental principles of biology led to the basic insights into the biochemical process of blood coagulation and physiological wound healing. Early investigators used fibrinogen powder and plasma concentrates mixed with thrombin for the purpose of tissue bonding and sealing.

In 1905 **Morawitz** [1] presented his model of blood coagulation. He perceived that by the action of calcium ions and tissue fluid, the prothrombin present in blood is converted to active thrombin initiating the conversion of fibrinogen to fibrin. **Tidrick et al** and **Cronkite et al** [2] used blood plasma and fibrin solution respectively which they clotted by adding thrombin for fixation of skin grafts.

Although these early attempts suggested the basic advantages using biomaterial for improved wound healing and tissue tolerance, there was on the other hand, a relatively high rate of failure due to poor adhesive strength and insufficient concentration of fibrinogen. It was not until the 1970s that a method was developed by **Matras et al** [2] which made use of highly concentrated fibrinogen as an adhesive to repair severed nerves in animals.

This initial attempt led to the development of fibrinogen based adhesive derived from pooled human plasma. This became commercially available in Europe under the name **Tisseel (Immuno, Viena)**.[1] The Fibrinogen and Factor XIII components in the system are derived by cryoprecipitation. One solution which contains Factor XIII, Fibrinogen and Aprotinin (a bovine derived fibrinolysis inhibitor) is added to a second that contains thrombin and calcium (Fig. 1).

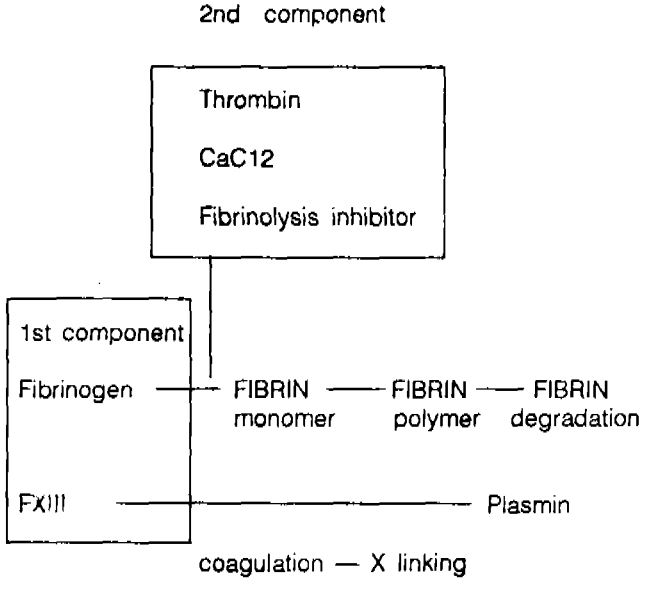

FIGURE 1. FIBRIN ADHESIVE SYSTEM

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* Presented at the 11th Boehringer Ingelheim Clinical Research Contest, held at Silahis Hotel, Oct. 11, 1991.

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A major drawback with the commercial adhesive is that fibrinogen is isolated from pooled human plasma. Therefore, the risk of transmitting Hepatitis, AIDS and possible immune reaction cannot be excluded. It is for this reason that the use of this tissue adhesive as presently manufactured has not been approved for use in the U.S.

In order to overcome this limitation, a method was developed to produce an autologous fibrinogen based adhesive (AFTA). This could eventually permit the isolation of fibrinogen and Factor XIII from the patient in whom the adhesive is to be used, thus eliminating transfusion related risks of the commerical adhesive.

OBJECTIVES

1. To evaluate a method of making a fibrin tissue adhesive from a patient's own blood.
2. To evaluate the tensile strength of this adhesive system.
3. To demonstrate its application in experimental animal models.

MATERIALS AND METHODS

Preparation of Autologous Fibrin Tissue Adhesive

In this study, an autologous, fibrinogen based tissue adhesive was made using the ammonium sulfate method as reported by **Wolf** [3] (Figs. 2-7).

Thirty six cc of patient's own blood are mixed with 4 cc of 10% sodium citrate solution equally divided into 4 test tubes and centrifuged at 3,200 rpm for 10 minutes. The plasma obtained is placed into 4 different tubes with 1.3 cc of cold, saturated solution

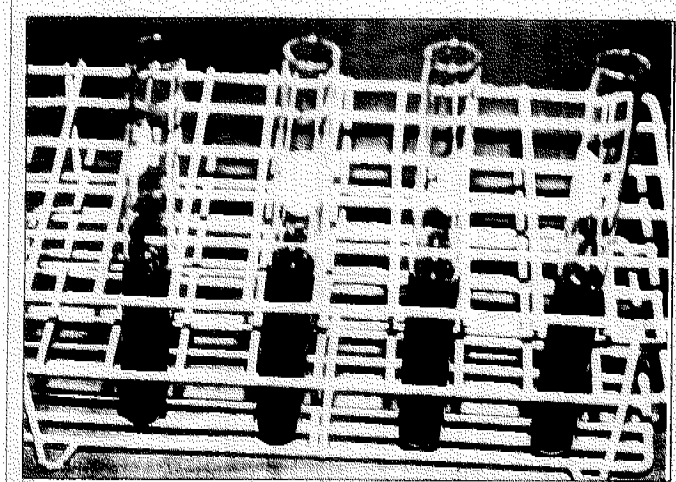

Figure 2. Parient's blood mixed with 4 cc of 10% Sodium Citrate

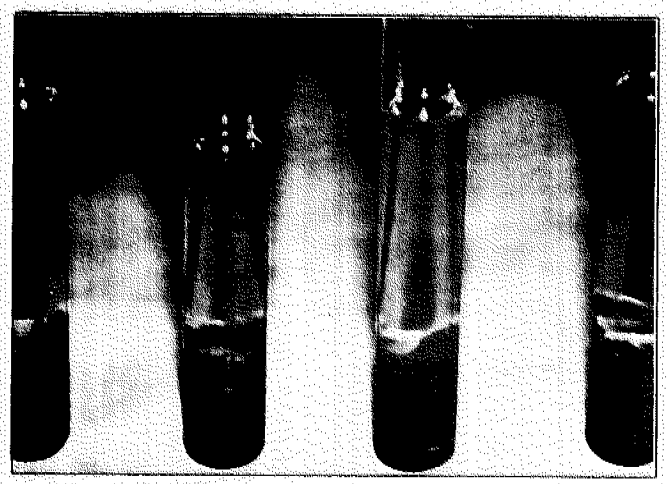

Figure 3. Plasma obtained after centrifujation

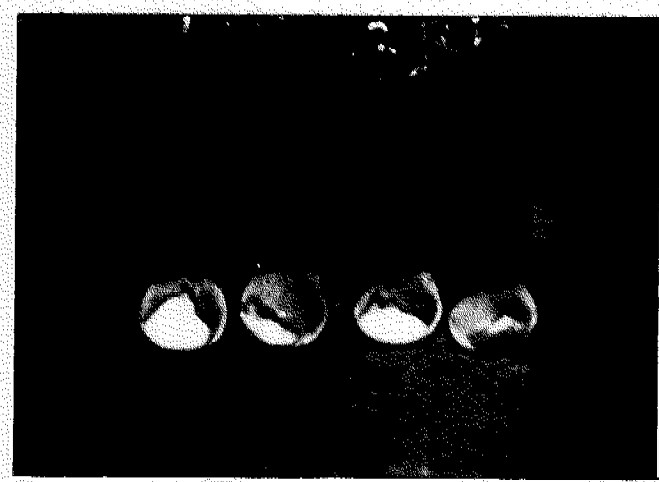

Figure 4. Fibrinogen (at bottom of each tube) after the addition of 1.3 cc of Ammonium Sulfate

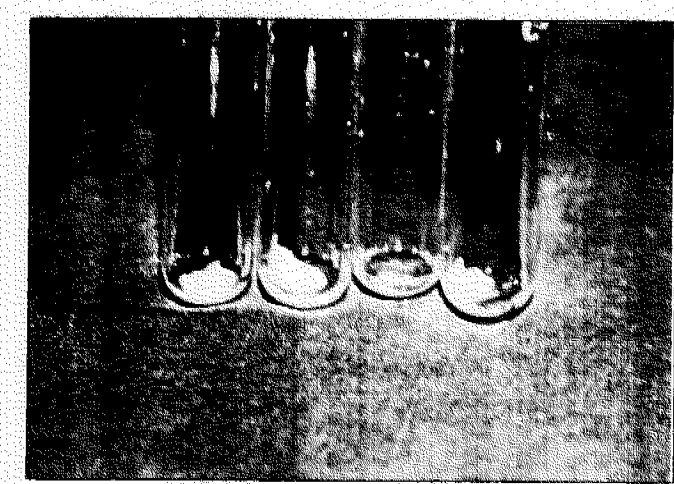

Figure 5.

of purified ammonium sulfate added to each tube. Fibrinogen immediately precipitates. Then, the 4 tubes are centrifuged at 3,200 rpm for 3 minutes and the whitish precipitated fibrinogen in all 4 test tubes

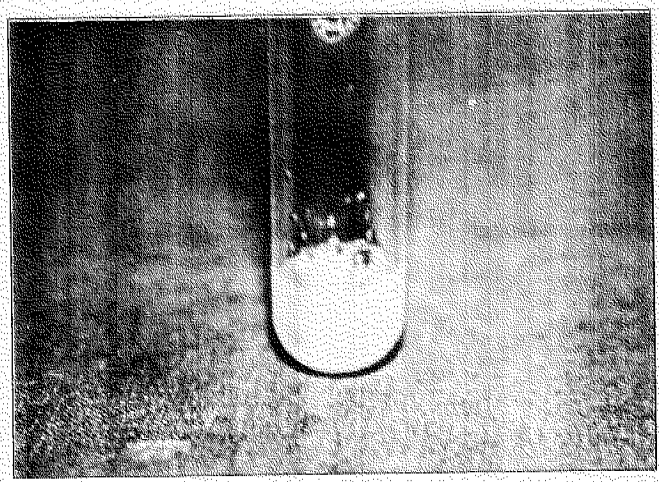

Figure 6. Component 1 of the adhesive: Fibrinogen diluted with 1 cc of Calcium Chloride

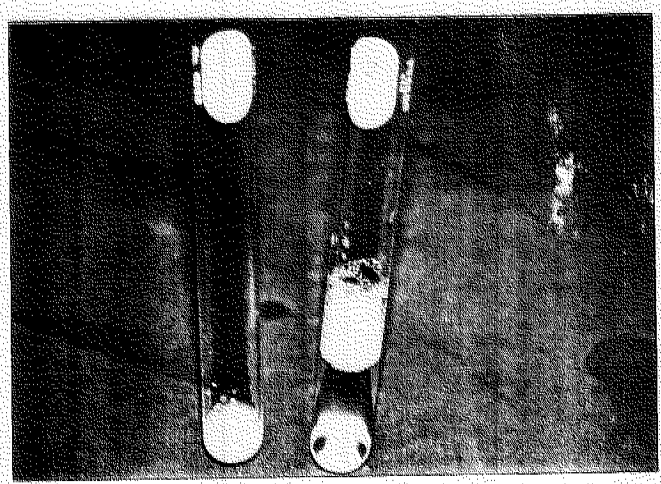

Figure 7. Left, component 1 containing fibrinogen and Factor XIII Right, component 2 Bovine thrombin diluted in water

are collected into one tube. Shortly before the tissue adhesive is needed for the procedure, the fibrinogen is diluted with 1 cc of calcium chloride (40 mosm) solution forming component 1 of the adhesive. To make component 2, 3,000 NIH units of bovine thrombin (Sigma Chemical Co.) are dissolved in sterile water.

Equal parts of both solutions can be mixed in a double syringe and alternately applied to the site for glueing.

Measurement of Bonding Strength

Tensile strength was measured with a simple suspension apparatus and weights (Fig. 8). Equal amounts of components 1 and 2 were applied to cover the surface of a 1 cm^2 piece of fresh rat skin. A second piece of skin of the same size and shape was then glued to the first. Suture was placed on one piece of rat skin, fastened to a hook and mounted on a

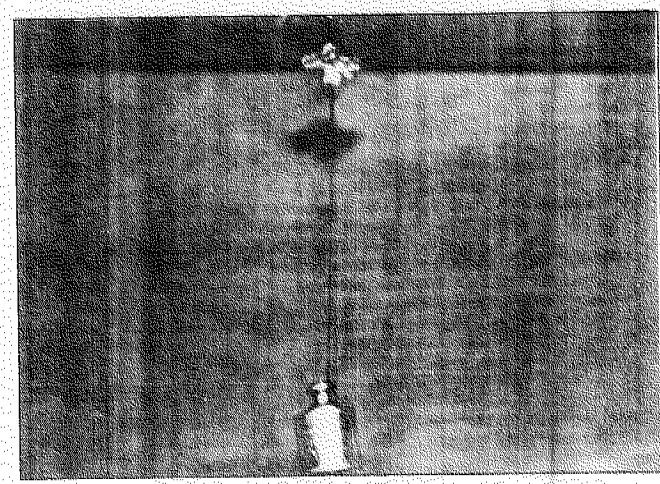

Figure 8. Measurement of Adhesive strenght

laboratory stand. At a variable time interval (10 and 30 minutes) the second piece of skin was exposed to a continuously increasing tension load with brass weights until it was completely detached. The weight suspended in this manner across two 1 cm^2 surfaces before separation was recorded as the bonding strength.

Animal Experiment

Ten rats weighing 225 to 261 grams were used in these studies. Sedation using inhalation with petroleum ether solution was done prior to each procedure. Animals (n=10) were randomly allocated to 2 groups depending on study protocol.

GROUP 1 (N=5)

Operative Technique

Dorsum of each rat is shaved and prepared with povidone iodine (Betadine). A 2.5 cm linear skin incision was done on one side. Skin edges were approximated by simultaneously applying both components of the adhesive system. Subsequent compression of the wound area is done for at least 10 minutes. A similar incision was made on the other side of the animal which served as control. Wound was closed with interrupted 4-0 silk suture. Both incisions were equally spaced relative to each other and to the opposite of the animal. Both wound sites were covered with light dressing. All rats were maintained in a unit where food and water are available on demand and routine animal care provided.

Gross Observation and Grading

During the postoperative period, the wound was examined daily for signs of infection, necrosis and

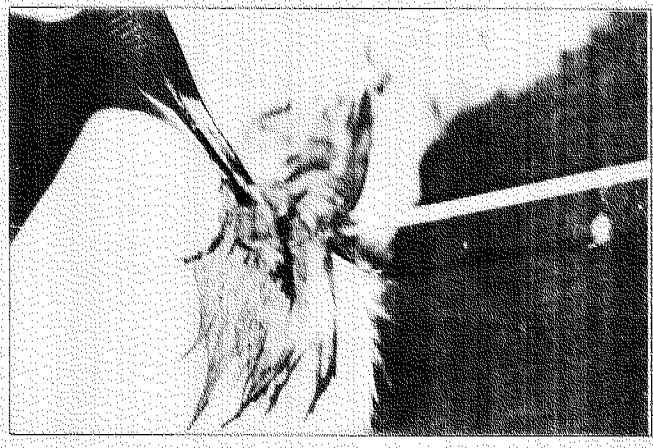

Figure 9. Skin incision sealed with the adhesive

seromas. Each observation was graded using a scale of 0, +1, +2, +3 in which 0 means none is present, +1 minimal, +2 moderate, +3 extensive. The mean score was recorded. Tissue samples were taken for histological examination in both wound sites using the conventional suture and fibrin sealant on day 5. All sections were stained with hematoxylin and eosin and examined by a pathologist who had no knowledge of whether specimen was obtained from the control (suture) or glued side.

GROUP 2 (N=5)
Operative Technique:

Donor site (Fig 10): A full thickness skin graft measuring 2.5 cm^2 diameter is harvested from the right dorsal surface of each rat. The defect is covered with a flat layer of fibrin sealant. The area is covered with a compression bandage maintained for 5 days. The wound is inspected daily for sign of infection.

Recipient site (Fig. 11): Another skin incision of the same size and shape was done on the left side of each rat. The defect was then covered with the full thickness graft obtained from the right side using fibrin sealant. The skin graft has to be held on the wound for a few minutes with slight pressure in order to achieve strong adhesion of the fibrin fiber to the tissue.

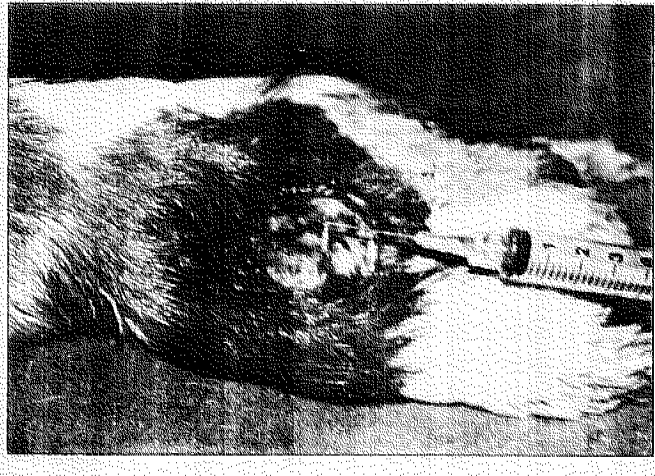

Figure 10. Donote site

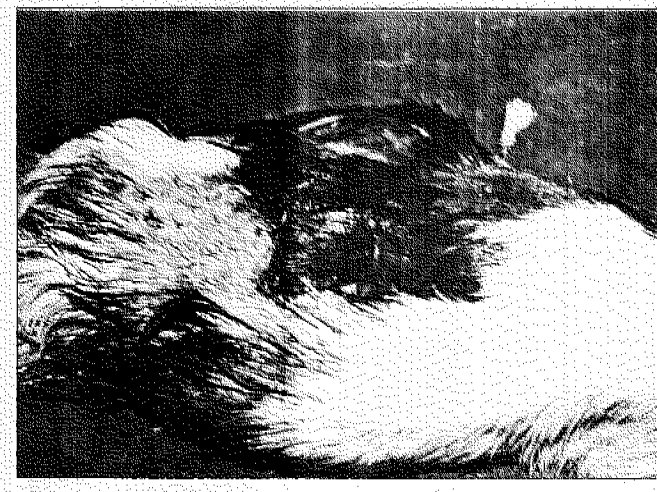

Figure 11. Full thickness graft

Histology

Donor and recipient site were examined histologically on Day 8.

RESULTS

Preparation of Autologous Fibrin Tissue Adhesive

(Ammonium Sulfate Method - Wolf)

The fibrinogen precipitate (component 1) when mixed with bovine thrombin solution (component 2) formed a white, firm, rubbery clot upon application to tissue.

The entire process takes approximately 45 minutes to perform. No specialized equipment is needed and from a clinical standpoint, this is an optimum length of time to prepare the adhesive during a surgical procedure.

Fibrinogen Glue Strength Evaluation

The bonding of the AFTA made with Ammonium Sulfate done 10 minutes and 30 minutes after glueing two pieces of fresh rat skin together revealed that the glue held an average of 42 g/cm^2 at 10 minutes and 170 g/cm^2 at 30 minutes. We have observed that the longer time period after glueing, the greater is the bonding strength.

Table 1 shows the adhesive strength of the AFTA after five successive measurements and its comparison with the commercial glue.

AUTOLOGOUS FIBRIN GLUE

NO. OF TESTS (N=5)	ADHESIVE STRENGTH G/CM²	
	10 MINUTES	30 MINUTES
1	45	220
2	40	150
3	30	200
4	50	180
5	45	100
Mean	42 g/cm²	170 g/cm²

COMMERCIAL GLUE

Mean	57 g/cm²	123 g/cm²

Animal Experiment

Group 1

(Tables 2-6)

For each rat in this group, comparisons were made between the skin incision sealed with the adhesive and the one closed with suture (control).

None of the animals developed infection on the control site from Day 1 until sutures were removed on Day 5. The glued side was noted to be dry and well coaptated 10 seconds after application. Subsequent postoperative assessment is not significant except for one animal which developed wound dehiscence.

TABLE 2

GROUP I n=5 Day 1

	RAT 1		RAT 2		RAT 3		RAT 4		RAT 5	
	c	g	c	g	c	g	c	g	c	g
INFECTION	0	0	0	0	0	0	0	0	0	0
NECROSIS	0	0	0	0	0	0	0	0	0	0
SEROMA	0	0	0	0	0	0	0	0	0	0
OTHERS (dehiscence)	0	0	0	0	0	+1	0	0	0	0

Legend:Control (suture side: c.
Glued side : g

0 none is present
+1 minimal
+2 moderate
+3 extensive

TABLE 3

GROUP I n=5 DAY 2

	RAT 1		RAT 2		RAT 3		RAT 4		RAT 5	
	c	g	c	g	c	g	c	g	c	g
INFECTION	0	0	0	0	0	0	0	0	0	0
NECROSIS	0	0	0	0	0	0	0	0	0	0
SEROMA	0	0	0	0	0	0	0	0	0	0
OTHERS	0	0	0	0	0	+2	0	0	0	0

TABLE 4

GROUP I n=5 DAY 3

	RAT 1		RAT 2		RAT 3		RAT 4		RAT 5	
	c	g	c	g	c	g	c	g	c	g
INFECTION	0	0	0	0	0	0	0	0	0	0
NECROSIS	0	0	0	0	0	0	0	0	0	0
SEROMA	0	0	0	0	0	0	0	0	0	0
OTHERS	0	0	0	0	0	+2	0	0	0	0

TABLE 5

GROUP I n=5 DAY 4

	RAT 1		RAT 2		RAT 3		RAT 4		RAT 5	
	c	g	c	g	c	g	c	g	c	g
INFECTION	0	0	0	0	0	0	0	0	0	0
NECROSIS	0	0	0	0	0	0	0	0	0	0
SEROMA	0	0	0	0	0	0	0	0	0	0
OTHERS	0	0	0	0	0	+2	0	0	0	0

TABLE 6
GROUP I
n=5
DAY 5

RAT 5	RAT 1		RAT 2		RAT 3		RAT 4			
	c	g	c	g	c	g	c	g	c	g
INFECTION	0	0	0	0	0	0	0	0	0	0
NECROSIS	0	0	0	0	0	0	0	0	0	0
SEROMA	0	0	0	0	0	0	0	0	0	0
OTHERS	0	0	0	0	0	+2	0	0	0	0

Histologic findings:

Suture side (control)

Histologic sections disclose re-epithelialization with dense fibrocollagenization in the dermis. Fibroblasic proliferation associated with moderate amount of inflammatory cells are also seen (Fig. 12).

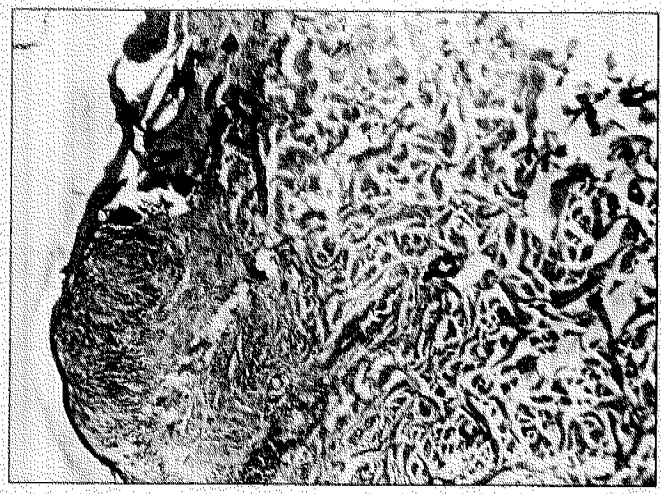

Figure 12. Suture site: section shows re-epithelializationand fibrocollagenization of dermis.

Proliferation of fibroblasts in the apposed area is seen. The epithelial covering is thin. Beneath the scar are numerous acute inflammatory cells (Fig. 13).

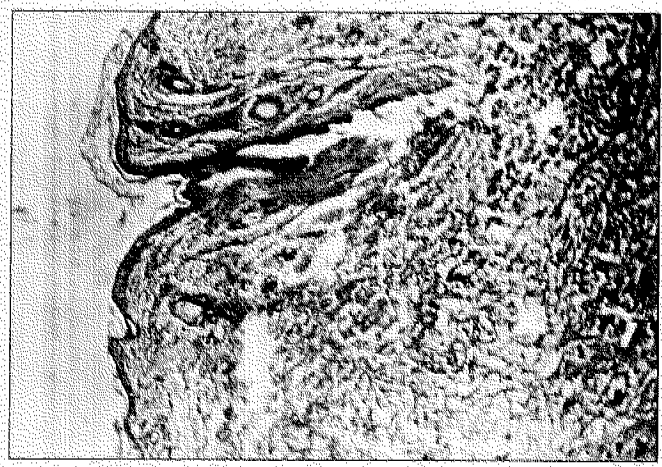

Figure 13. Glued side: thin epithelial lining and fibro-blastic

Group 2

Donor site

With the use of AFTA the resultant bleeding from donor site was prevented. There was spontaneous cessation of capillary bleedings soon after application of the glue. No infection was noted grossly during an observation period of one week. The defect was noted to be covered with a dry thick layer of fibrin.

Histologic Findings:

A thin epithelial lining is already evident. The dermal connective tissue contains numerous red blood cells and inflammatory cells. Also noted are fibrin deposits on the surface with enmeshed cellular debris (Fig. 14).

Figure 14. Surface shows incomplete epithelial lining with numerous inflammatory cells

Recipient site.

The fibrin sealed graft did not exhibit any infection nor tissue edema during the postoperative period. Wound edges in one animal appeared rolled up but was repaired with reapplication of the sealant and adaption sutures.

Grossly, fixation of the graft was observed in all animals as early as the sixth postoperative day.

Histologic findings:

An epithelium lining is also seen. Beneath the epithelium are neutrophils admixed in fibrin matrix. There is evidence of fibroblastic proliferation and revascularization (Fig. 15).

Figure 15. Graft: section shows evidence of fibroblastic proliferation and revascularization

DISCUSSION

The method of developing an autologous fibrinogen based adhesive should have the following characteristics: 1) it should have a high yield of

fibrinogen content to ensure effectiveness as an adhesive with mechanical properties similar to the commercially available product, 2) an adequate quantity for surgery can be made from a small volume of plasma (50 ml or less), 3) it should be simple enough to be performed with equipments available in most hospitals.

A variety of techniques exist for the isolation of fibrinogen from human plasma namely[4]: precipitation by ethanol, normal centrifugation, cryoprecipitation and precipitation using polyethylene glycol (PEG). The ammonium sulfate method of **Wolf** was used because it has been found to be relatively simple and has a high yield of fibrinogen. In addition, this technique requires few reagents, none of which have potential for toxic side effects. The speed of biodegradability regulated by the addition of fibrinolysis inhibitor, E-aminocaproic acid, was not evaluated due to inavailability of this reagent. One of the most important parameters of the fibrin glue is the adhesive strength. Maximum strength as demonstrated in previous studies is directly dependent on the cross linking between fibrin alpha chains.[5] Fibrin sealant itself contains sufficient Factor XIII (which is activated by thrombin) to produce a high degree of cross linking.

In this study, the average tensile strength of the autologous fibrin tissue adhesive after five successive measurements were 42 and 170 g/cm^2 at 10 and 30 minutes respectively. This was not significantly different from the results of the commercial adhesive which held 57 g/cm^2 at 10 minutes and 123 g/cm^2 at 30 minutes.[4] Results of this study with glued rat skin is expected to be very comparable with glueing biological tissues. Factors that can affect the bonding strength, like dryness of the tissues and the environmental temperature have yet to be determined.

Tissue sealing with fibrin adhesive presupposes its regeneration capacity. The fibrin gel deposited in wound does not only act like a plug but serves as a biological matrix for ingrowth of fibroblasts and later on becomes organized into a connective tissue or granulation tissue.

As demonstrated in animal models (Fig. 16), primary adhesion of wound margin is already attained within 3-5 minutes after fibrin application. The gross appearance of the glued and suture (control) sites were similar during an observation for one week. No toxic or foreign body reaction was demonstrated. Therefore,it is biocompatible. Histologically, re-epithelialization and fibroblastic proliferation are already evident in the glued side (Fig. 13), a finding which is identical with the process of primary wound healing seen in the suture (control) side. It should be mentioned, however, that tissue adhesion with fibrinogen cannot completely replace the conventional sutures as a means of tissue conjunction. However, it provides a valuable adjunct if not a better choice in surgical procedures where apposition is prevented because of inaccessibility of surgical sutures threatened by vascular insufficiency.

Fibrin also plays a vital role in wound repair. The use of concentrated fibrinogen adhesive acts as an inducer of final fibrous healing hence allows an absolutely tight and flat fixation between a skin graft and its wound bed. Studies by **Braun et al** have demonstrated the function of granulation tissue in fixation of grafts with fibrinogen than with conventional suture. This is seen histologically in all animal models where fibroblasts and revascularization are already evident on the grafted side on the eighth postoperative day (Fig. 15). Although flat adhesion and mechanical fixation is achieved with the sealant, exact approximation of wound edges was not always possible resulting in bulging scars. To avoid such scar formation, adaption sutures may be used. The primary hemostatic effect of the fibrin sealant achieved soon after application in the graft is also beneficial since detachment of graft due to hematoma is also prevented.

In all donor areas, the viscous fibrin film led to to a sealing of punctuate tissues and formation of a tough elastic bandage. After only a few days, an epithelial lining is already seen (Fig. 14).

CONCLUSION

The principle of biological sealing with autologous glue is based on natural processes. This report presents a technique that could make it possible to isolate autologous adhesive components from a small amount of patient's blood. This method is relatively simple and reproducible without the use of sophisticated equipment.

The experiment shows that autologous fibrin sealant produce an adhesive strength that is at best, half that of homologous commercial product.

Its hemostatic effect, tissue synthesis and healing enhancement are essential merits which justify its application in various surgical procedures.

The ultimate method of fibrin sealing has certainly not yet been determined, and there are many questions regarding its efficacy, quality and safety. Results achieved so far are encouraging. For this reason, it is recommended that the technique be further applied to validate its results.

RECOMMENDATIONS

1) Further application of the adhesive in other surgical procedures (Table 7 shows the different indications of fibrin sealant in ENT surgery).

2) As a first step towards the application of this system in humans, further studies should be done on its biochemical composition as well as potential toxicity.

3) The addition of a fibrinolysis inhibitor in the form of E-aminocaproic acid should be done to evaluate the speed of biodegrability.

TABLE 7

APPLICATION OF FIBRIN SEALANT IN ENT SURGERY

Fixation of Cartilage, Bone, or Artificial Implants
Tympanoplasty
Reconstruction of the Posterior Wall of the Auditory Canal
Reconstructive Surgery of the Facial Bones
Correction of the Nasal Septum
Tracheostenosis

Dura and Fascia Grafts
Fronto - and Laterobasal Fractures with Dural Lesions
Tympanic Membrane Perforations
Ruptures of Major Arterial Vessels
Septal Perforations
Dural Lesions following Surgery

Closure of C.S.F. Fistula (combines suturing-sealing technique)

Clot-welding of Neuroanastomoses
Insertion of Nerve Grafts

Fixation of Flaps and Grafts
Laryngoplasty
Cordopexy
Partial Pharyngectomy
Saunder's Plasty
Repair of Defects After Tumour Excision
Sealing of the Oral Mucous Membrane
Lining the Underside of Pedicled Flaps
Aural Seroma

Sealing of Wounds
Donor Areas of Split-thickness Skin Grafts
Vocal Cord Removal of Rhinophyma
Uranoplasty
Recurrent Perforation of Tympanic Membrane

Local Hemoostasis in Patients with Bleeding Disorders
Tonsillectomy
Adenoidectomy
Repair of Mucous-Membrane Defects

Sealing of Sutures
Extensive Flaps
Large surgical Defects
Reconstructive Surgery on the Trachea and Esophagus

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GARLIC IN YOUR EARS*

Ferdinand Pamintuan, MD**
Eusebio Llamas, MD***

ABSTRACT

It is the objective of this study to determine the efficacy of garlic by comparing the in-vitro sensitivity of garlic extract with conventional otic drops in the treatment of otitis externa caused by gram negative and fungal organism and to compare the efficacy of garlic extract with the antibiotics frequently used in the treatment of otitis externa. A double blind randomized clinical trial was done. Thirty patients with otitis externa were included in the study. Pretreatment evaluation and otoscopic examinations were done. Local treatment using garlic extract, conventional otic antibiotic and sterile oil were used. All 10 patients who received garlic extract were cured whether caused by bacterial or fungal organism. Seven patients were cured using conventional antibiotic . All patients who received sterile oil were not cured. Statistical analysis using the chi-square test revealed a significant association betweem treatment recovery for patients using garlic extract comparedwith conventional otic antibiotic. Using the Z test for significance of proportion, there is a greater proportion of subjects sensitive to garlic extract compared to polymixin. Cost comparison reveals the commercially prepared otic antibiotic drops are ten times more expensive than garlic extract.

INTRODUCTION:

Otitis externa is a prevalent condition seen at the Out-Patient Department comprising 12% (1.683) of the 14,033 cases seen from January to December of 1989. It is an inflammatory condition of the external auditory canal lining due to bacterial, viral or fungal infection. Predisposing factors are change in canal skin pH, increased temperature, humidity, trauma from insertion of objects used to clean the ear, swimming, and even the use of hearing aid. The condition is further aggravated by lack of medical attention and proper hygiene. The principle of treatment which applies to all types of otitis externa can be outlined as: 1) ear toilette; 2) local medications; 3) relief of associated symptoms; 4) general advice after the condition has been controlled and 5) appropriate antibiotic therapy.

Diagnosis and treatment of otitis externa is easy but the high cost of medical consultation coupled with the spiralling prices of medicines leave many cases unrecognized and untreated causing further complications.

Allium is genus of some 500 species belonging to the family of Liliaceae. However, only a few of these are important, notably onion and garlic. Such plants have been used for many centuries for pungency, flavoring, maintaining and strengthening health, preservative agent, medicinal properties or even as a protection from evil. Greek physician **Hippocrates**, noted as the Father of Medicine, described in his writings the unique medicinal effect of garlic especially for wound, toothaches, leprosy, epilepsy and chest pain.

There are certainly many studies suggesting that garlic is beneficial for a variety of human ailments such as typhoid, hypertension, hypercholesterolemia, digestive disorders and possibly even carcinoma. In **Martindale's**[1] Extra Pharmacopoeia[2], it is stated "garlic has an expectorant, dysphoretic, disinfectant and diuretic properties, used as a syrup for treatment of chronic bronchitis and other pulmonary conditions. The juice maybe given by mouth, used as a gargle or throat spray."

The history of garlic as food, medicine and indeed a reputed miracle worker dates back 5000 years. The Egyptians put clay models of garlic in tombs presumably to make life in the next world as palatable as possible. The children of Israel having escaped from Egypt into the desert looked back with longing on the variety of food they left behind. They particularly spoke of the onions, garlic and leeks. **Herodotus**[3], 400 BC, told us that engraved on the pyramids in Egyptian characters are some facts about the diet of the workmen. They were provided with radishes, onions and garlic.

In China, garlic is called Suan. In the "calendar of Hsia", published around 2000 BC, garlic is qouted as being good for colds, tonsillitis, and catarrh.[4] It has been known for a long time that a clove of garlic worn around the neck will keep away vampires. In 16th century Transylvania, garlic clove was used to treat earache.

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* Presented at the 11th Boehringer Ingelheim Clinical Research Contest held at Silahis Hotel, Manila, Oct. 11, 1991.

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*** Consultant, Dept. of ENT

Thus from all over the world - China, India, Africa, Eastern and Western Europe and the United States over periods spanning many centuries, we find many references to the use of garlic in treating ear disorder. Is this just a folklore? Does garlic really have any value as a form of medical treatment? These questions led the authors to conduct the study on the use of fresh garlic extract for the local treatment of otitis externa caused by gram positive and gram negative bacteria and fungal organisms.

OBJECTIVES

1. To compare the in-vitro sensitivity of garlic extract with conventional antibiotic drops in the local treatment of otitis externa caused by gram positive and gram negative bacteria and fungal organisms.
2. To compare the efficacy of garlic extract with antibiotics frequently used in the treatment of otitis externa.

PREPARATION OF GARLIC EXTRACT

Mature garlic bulbs were used in this study. Extraction of the garlic bulbs were done by expression with the use of a Carber Press. One hundred grams of mature garlic bulbs yielded an average of 55 - 60 cc. of milky garlic juice. Propylene glycol was then added to the garlic juice which acts as a diluent. Fifty cc. of garlic juice and 100 cc. of propylene glycol make a 33% concentration which was used in the study.

MATERIALS AND METHOD

A randomized double blind clinical trial was performed to determine the efficacy of the garlic extract for the treatment of otitis externa. Properly informed and consenting patients seen at the Out-Patient Department were included in the clinical trial. A total of 30 patients, 6 males and 24 females, from 12 to 53 years of age were included.

Clinical history was taken after which a thorough otoscopic examination was performed on each subject by the author. Excluded in the study were patients with malignant otitis externa, eczematoid dermatitis, chronic middle ear infection with perforated tympanic membrane or other conditions requiring the immediate use of systemic antibiotics.

After cleaning the outer portion of the external auditory canal with alcohol using a sterile cotton applicator, a swab of the external auditory canal of the affected ear was taken from each subject and was cultured. For suspected cases of otomycosis, KOH smears was done. The specimen taken was immediately submitted to the Microbiology-Parasitology laboratory for in-vitro testing. The swab was then transferred to Tripticase soy broth and was left to stand and observed until fluid became turbid. The inoculum was then streaked to Blood Agar, chocolate agar and Mac Conkey agar plates, incubated for 18-24 hours at 37 degrees centigrade. If no growth after 24 hours was seen, this was reincubated. A portion of the broth was gram stained to identify whether the organism is gram positive or gram negative. Another portion of the broth was inoculated into the Muller Hinton Agar culture medium. If a fungal growth was noted the fungi was then inoculated to Saboraud Dextrose Agar culture media. For gram positive organism, antibiotic disc of garlic extract, neomycin, polymixin, were used. For gram negative garlic extract, polymixin, neomycin and for fungal organism, garlic extract and nystatin. The culture medium was then incubated at 37 degrees centigrade for 24 hours and the zone of inhibition was measured using the Vernier caliper in millimeters. The growth characteristic on the media together with the biochemical reactions were noted and the organisms were identified.

For the in-vivo portion of the study, sterilized dark colored bottles containing 10 cc. preparations of 33% garlic extract, sterile oil (placebo), conventional antibiotic otic drops were prepared and labelled with a code number by an assistant. The type of content of the coded bottle was known only to the assistant.

After the ear swab was taken, the patient was given one of the coded bottles containing the preparation and was instructed to clean the ear with hydrogen peroxide then dry cotton before instilling and to avoid excessive manipulation. Three to four drops were instilled to affected ear thrice daily. The patients' name, number, and corresponding code were recorded. The patient was instructed to come back every three days for re-evaluation.

Patients who did not show any significant improvement of signs and symptoms after 3 follow-up visits were considered non responders and were subsequently treated with appropriate medicines. patient's name, number, and corresponding code were otoscopic findings for otitis externa were considered cured and the number of days from the time of treatment to asymptomatic stage taken down. For otomycosis, a negative culture after being asymptomatic and negative otoscopic findings was considered cured. At the end of the study, the content corresponding to the coded bottles were revealed and the patients

name, number were matched according to the mode of treatment received whether garlic extract, sterile oil, or conventional antibiotic ear drops.

Results of the study were analyzed using the chi-square test to determine if the garlic extract medication is associated with cure and z test for significance of proportions in comparing garlic with other antibiotic medicines given for otitis externa.

RESULTS

Of the 30 patients seen 6 were male and 24 females. The most common presenting symptoms were itching, pain, discharge and hearing loss. There were 25 bacterial infections and 5 fungal infections. Thirteen of the bacterial cultures were gram positive and 12 were gram negative. The most common gram positive organism cultured was *S. aureus* (40%), *S. epidermis* (3%) while for the gram negative the most common was *Pseudomonas sp.* (27%). Fungal isolates seen were *Candida sp.* (13%) and *Aspergillus sp.* (3%). Disc diffusion studies demonstrated that garlic extract had very good activity against strains of *S. aureus, Pseudomonas sp., Candida sp.* and *Aspergillus sp.* cultured. (Table 2). Ten patients each received garlic extract, sterile oil and conventional otic drops.

DISCUSSION

Interest in herbal medicine is now enjoying a renaissance among both scientists and non scientist. In these days of rising inflation, countries of the third world acutely feel the painful pinch of economic deprivations. In the Philippines, it has been very difficult for people especially those in the low income group to meet the basic needs. On account of economic limitations, priority has to be given to the most basic needs namely food, clothing, shelter and medicine. Medicines have become beyond the reach of many poor families so they are resorting to the use of local natural materials for alleviating their medical problems. The present interest is to look for antimicrobials among our medicinal plants for use in the primary health care. The search is on for antimicrobials that are relatively non-toxic and efficacious against a wide variety of organisms, relatively stable and easy to prepare.

In the choice of herbal medicines for the treatment of infections of the external ear, the unique effects of garlic are worth careful consideration. What are the active chemical components of garlic that might be responsible for these remarkable properties? Although the use of garlic goes back to pre-historic ages, scientific and analytical approach to garlic and its effects was undertaken only in recent years. The following table gives a breakdown of garlic's main components.

Table 1 Main Ingredients of Garlic:

Nutrient absorption rate	25.00	gm
Calorie	84.00	cal
Moisture content	70.00	gm
Protein	4.40	gm
Lipid	0.20	gm
Galactolipid	23.00	gm
Fiber	0.70	gm
Ash content	1.30	gm
Calcium	5.00	gm
Phosphorous	44.00	gm
Iron	0.40	gm
Vitamin A Effective Value	16.00	I.U.
Carotene	50.00	I.U.
Vitamin B1	0.24	gm
Vitamin B2	0.03	gm
Vitamin C	3.00	gm
Nicotinic Acid	0.90	gm

In 19th century, a German scientist succeeded in extraction of allylcompounds (diallyl monoside and diallyl disulfide). In 1940's, Stoll, a Swiss chemist extracted alliin (garlic oil) which plays the most important role in garlic's medical performance. Animase is the substance that produces the particular smell of garlic. In the bulb of garlic, these 2 substances are completely separated from each other by the cellular membrane and the bulb. When alliin comes in contact with aminase, it produces the compound allicin. Allicin is a powerful disinfectant that even when diluted to 1/80,000-1/120,000 water, garlic juice still kills cholera and typhoid germs. Its antibacterial performance even surpasses penicillin by as much as 15 times. It has a very strong in-vitro inhibitory effects against many pathogenic bacteria including *Staphylococcus aureus, Streptococcus pneumoniae, Neisseria meningitidis, Salmonella typhosa* and *Corynebacterium diphteriae*. Garlic preparations have significant inhibitory effects in-vitro against many pathogenic fungi. Allicin also readily binds with Vitamin B and proteins and stimulates the absorption of digested ingredients when taken internally. Allicin performs antibacterial action by destroying the bacterial wall while it stimulates the secretion of gastric juice. In-vitro mechanism of action, is by inhibition of bacterial and antifungal activity Studies of the mechanism of action of *Allium sativum* by electron microscopy and cell leakage studies showed that garlic treatment affected the structure and integrity of the outer surface of yeast cells. Blockade of lipid synthesis is likely an important component of anticandidal activity of garlic.[9]

In this study, garlic extract demonstrated its antibacterial and antifungal activity thru in-vitro and

in-vivo studies. In-vitro results compared well with the results of **Guevarra R., et al**[10] on the antimicrobials properties of garlic.

Chow, V., et al[11] showed *Pseudomonas* as the most frequent causative organism followed by *Staphylococcus aureus*. In this study, *Staphylococcus aureus* was the primary organism cultured followed by *Pseudomonas*. With regards to fungal infection, **Oliveri S. et al, Manni**[12] and **Kuylen**[13] showed Aspergillus as the most frequently encountered. Compared to this study, *Candida sp.* was the most predominant.

The complications such as skin irritation leading to eczema[14] and burns[15] did not occur.

ANALYSIS OF DATA

Statistical analysis of the clinical response of patients with otitis externa to garlic extract and antibiotic ear drops was done. Using the chi-square test ($p<0.05$), there is a significant association between the treatment and recovery for those patients using garlic extract compared with conventional otic antibiotic (p 0.0001).

Comparing the in-vitro response of the micro-organism to garlic extract, especifically *Staphylococcus aureus* which is the organism most frequently cultured in this study, using the Z test for significance of proportion ($p<0.03$), there is a greater proportion of subjects sensitive to garlic extract compared to Polymixin ($p<0.03$). Likewise, similar results were obtained when neomycin was compared to polymixin. For the rest of the bacterial and fungal organism cultured 100% sensitivity for garlic extract was seen. (Tables 3 & 4)

SUMMARY AND CONCLUSION

It has been established thru in-vitro and in-vivo tests that garlic extract has antibacterial and antifungal activity against organism most frequently cultured causing otitis externa and its use is significantly associated with treatment.

Thirty patients with otitis externa were included in this study. Pretreatment evaluation and otoscopic findings were obtained. Local treatment using garlic extract, conventional otic antibiotic and sterile oil were used.

This study showed that there was a significant correlation of in-vitro antimicrobial activity of garlic extract with actual clinical response. It is recommended that further investigation be done on the efficacy of garlic extract for inflammatory conditions of the ear.

Table 2

					Zone of Inhibition						#days		Post Tx
No.	Age	Sex	GS	Culture	Ga	Po	Ne	Ny	Oil	Rx	Tx	Remarks	Culture
1	12	F	+	Sa	37	6	8	-	-	1	7	T	-
2	12	F	-	PS	35	14	18	-	0	3	>9	U	-
3	52	F	+	Sa	34	6	17	-	-	2	7	T	-
4	25	F	+	Sa	30	6	16	-	-	1	5	T	-
5	28	F	-	Bs	35	9	14	-	-	1	5	T	-
6	29	F	+	Sa	36	7	17	-	0	3	>9	U	-
7	25	F	F*	As	37	-	-	20	-	2	>9	U	-
8	16	F	+	Sa	36	6	17	-	-	1	6	T	-
9	18	F	-	Ps	26	17	14	-	-	1	9	T	-
10	12	F	+	Sa	27	17	13	-	-	1	6	T	-
11	12	F	-	Ps	18	14	15	-	-	2	10	T	-
12	29	F	+	Sa	36	6	18	-	-	1	7	T	-
13	30	F	-	Ps	16	14	12	-	-	1	9	T	-
14	42	M	-	Ps	7	13	13	-	0	3	>9	U	-
15	24	M	F*	Cs	45	-	-	27	-	1	15	T	NC
16	53	M	+	Sa	35	12	22	-	-	1	6	T	-
17	35	M	F*	Cs	46	-	-	24	-	1	16	T	NC
18	23	M	+	Sa	28	10	20	-	-	2	6	T	-
19	33	F	+	Se	31	18	9	-	-	2	7	T	-
20	27	F	-	Es	18	19	16	-	0	3	>9	U	-
21	33	F	-	Ps	23	14	19	-	-	2	5	T	-
22	12	F	F*	Cs	42	-	-	28	-	2	>9	U	-
23	21	F	-	Ps	35	9	12	-	0	3	>9	U	-
24	37	F	+	Cs	30	13	20	-	0	3	>9	U	-
25	35	F	F*	Cs	39	-	-	22	-	2	>9	U	-
26	22	F	+	Ps	32	12	17	-	-	2	8	T	-
27	38	F	-	Ps	28	16	13	-	0	3	>9	U	-
28	20	F	-	Pt	26	12	12	-	0	3	>9	U	-
29	21	F	+	Sa	38	14	20	-	0	3	>9	U	-
30	22	M	-	Ps	29	13	14	-	0	3	>9	U	-

Legend:

F	-	female	Ga	-	Garlic extract
M	-	male	Po	-	Polymixin
F*	-	Fungus	Ne	-	Neomycin
(-)	-	gm negative	Ny	-	Nystatin
(+)	-	gm positive	1	-	Garlic extract
Sa	-	Staph. aureus	2	-	antibiotic otic drops
Ps	-	Pseudomonas sp.	3	-	sterile oil
Bs	-	Bacillus subtilis	NC	-	Culture negative
As	-	Aspergillus sp.	C	-	Culture positive
Cs	-	Candida sp.	U	-	untreated
Se	-	Enterobacter sp.	T	-	treated
Pt	-	Proteus sp.	GS	-	gram stain

Table 3. IN-VITRO CULTURE AND SENSITIVY

ORGANISM	NO	GARLIC		POLYMIXIN		NEOMYCIN		NYSTATIN	
		S%	R%	S%	R%	S%	R%	S%	R%
S. aureus	12	100	0	41.7	58.3	100	0	-	-
Psoudomonas	8	87.5	22.5	87.5	22.5	75	25	-	-
B. subtilis	1	100	0	0	100	100	0	-	-
S. epidermidis	1	100	0	100	0	100	0	-	-
Enterobacter	1	100	0	100	0	100	0	-	-
Proteus	1	100	0	100	0	100	0	-	-
Aspergillus	1	100	0	-	-	-	-	100	0
Candida sp.	4	100	0	-	-	-	-	100	0

Table 4. IN-VIVO RESULTS COMPARING TREATMENT USE WITH RECOVERY AND FAILURE

	RECOVERED TREATED		FAILED		TOTAL
				F-2	
GARLIC	10	B-8	0		10
NEOMYCIN/		F-0		F-3	
POLYMIXIN	7	B-7	3	B-0	10
				F-10	
OIL	0		10	B-0	10
					30

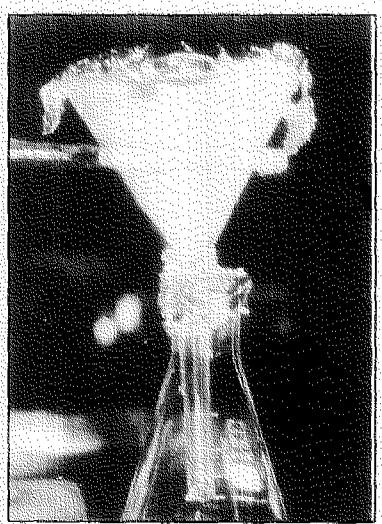
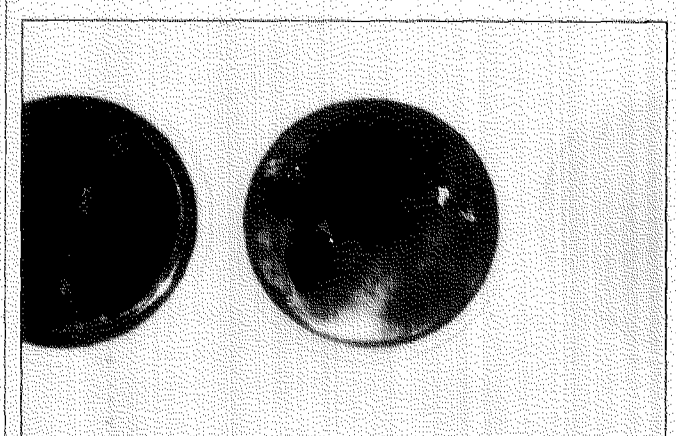


Figure 1. Freshly Prepared Garlic Extract

Figure 2. Culture Media use in the study.



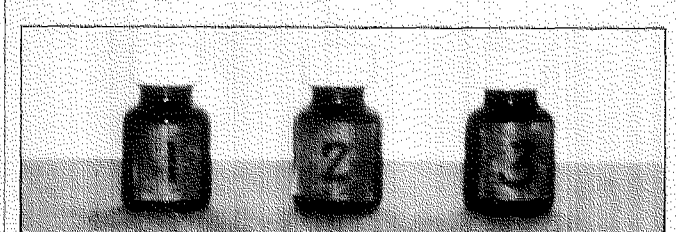


Figure 3. Coded Dark Colored Bottles used in the Study.

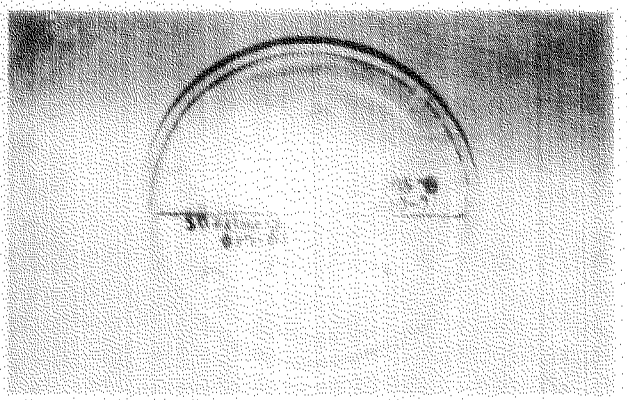


Figure 4. Culture and Sensitivity Results with B. subtilis and S. aureus

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AN UNCOMMON PRESENTING SYMPTOM IN NASOPHARYNGEAL CARCINOMA:*

A CASE REPORT

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ABSTRACT

A 59 year old male with nasopharyngeal carcinoma is presented. A delay in diagnosis, despite early consultations, occurred due to the uncommon presenting symptom of shoulder and nape pains. Anatomical correlations with regards to the clinical symptomatology and mode of spread are discussed.

INTRODUCTION

Malignant tumors of the nasopharynx is a relatively common disease entity encountered by the otolaryngologist. However, patients with nasopharyngeal malignancy have a wide array of signs and symptoms. Sometimes, the nasopharynx is difficult to examine even by physicians experienced in diagnosis and examination of this region.

Scanlon et al, described this difficulty as such: "Always a challenging problem, both from the diagnostic and therapeutic standpoint, malignant lesions of the nasopharynx are perhaps the most commonly misdiagnosed, most poorly understood, and most pessimistically regarded of all tumors of the upper part of the respiratory tract ."

The poor prognosis for patients with nasopharyngeal carcinoma is principally due to its advanced stage at the time of diagnosis. Curative treatment of nasopharyngeal carcinoma in its early stage, is most successful. But quite often, it is only after the disease has spread to adjacent structures, that nasopharyngeal carcinoma is diagnosed.

The following case will be presented with the following objectives:

1) To gain further insight into the diagnostic problems posed by nasopharyngeal malignancy and the need for early detection.

2) To instill awareness among general physicians, otorhinolaryngologists, ophthalmologists, neurologists and other specialties of the signs and symptoms of nasopharyngeal carcinoma and its anatomical correlations and possibilities.

3) To establish the need for multidisciplinary approach , if presented with similar problems, in the management of nasopharyngeal carcinoma.

CASE REPORT

N.M., 59 year old male, from Indang, Cavite was admitted for the first time on July 12, 1989, for left shoulder and neck pain.

History started about 1 1/2 years PTA, when patient experienced left shoulder pain, aggravated by movement and associated with gradual onset of paresthesia over the left arm. The patient consulted several physicians who prescribed analgesics which afforded only temporary relief of symptoms.

One year PTA, the patient noted increasing intensity of shoulder pain with radiation to the nape and associated with constricting left-sided headache prompting consultation with several physicians and for which various medications were given to no avail. Three months PTA, patient experienced weakness of the left arm.

Two months PTA, weakness of voice was noted. A month later, difficulty in swallowing both liquid and solid food developed. There was persistent nape and shoulder pains. Due to this condition, patient consulted at the admitting section. Initial assessment was Cervical Osteoarthritis, Hypertension, mild, controlled, and PTB, minimal, and was managed accordingly. Pain, however, was unrelieved, prompting referral to Rehabilitation Medicine, where the patient underwent physical therapy, to no avail. Due to the further progression of pain despite treatment, a metastatic lesion affecting the cervical spine was considered. The Neurology section then admitted the patient, with a working impression of Extramedullary

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Cord Compression, at C4-C5 level, probably secondary to Bronchogenic Ca, r/o Intracranial Metastasis. Pertinent physical findings on admission revealed weak gag on the left, with deviation of the uvula to the right, decreased hearing on the left, decreased motor strength over the shoulder and elbow, with limitation of extension and abduction over the left shoulder. Horner's syndrome on the left, was also noted.

Radiographic studies confirmed the previous impression of minimal PTB (See Fig. 2), and cervical hypertrophic degenerative osteoarthropathy (See Fig. 1). Hepatobiliary ultrasound revealed normal findings. Other laboratory work-ups were unremarkable.

Figure 1. Cervical APL showing lesion of the spine

Initial management consisted of anti-hypertensives, triple anti-tuberculosis therapy, and analgesics. Referrals to the Pulmonary Section, Pain Clinic and ENT, was likewise done. Bronchogenic cancer, was discounted by the Pulmonary Section, given the physical and chest x-ray findings. ENT evaluation revealed additional history of decreased hearing and tinnitus over the left ear of two months duration. Otologic findings include a bulging tympanic membrane, hypoesthesia in the V2 and V3 distribution on the left, and tenderness of left lateral area of the neck. Neck nodes were not present. Mirror examinations were not done, due to inability of the patient to tolerate the examination. Fiber optic nasopharyngoscopy was performed, and this revealed an exophytic mass occupying the posterosuperior area of the nasopharynx, with extension to the left lateral wall. A biopsy of the mass revealed squamous cell carcinoma, poorly differentiated.

Other work-ups done include pure tone audiometry, which showed mild to moderate conductive hearing loss, A.S., with a type B tympanogram. CT scan findings confirmed the nasopharyngeal growth,

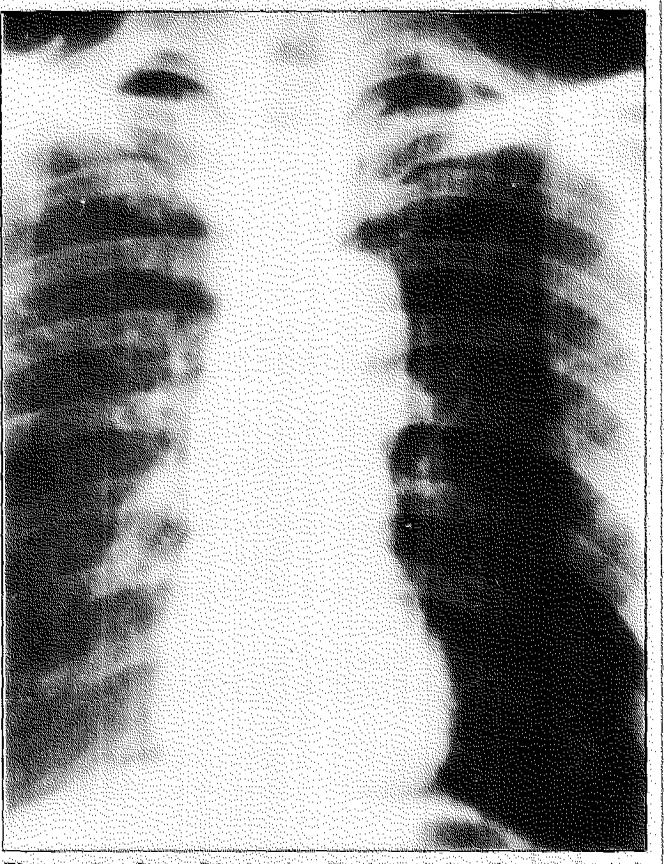

Figure 2. Chest PA showing fibrohazed densities on the Left upper lung field.

with note of increased soft tissue density at the left parapharyngeal area, interpreted as an enlarged node (See Fig. 3 and 4).

Consequently, the patient was subjected to radiotherapy, but due to the deteriorating condition and unrelieved pain despite treatment, the patient went home against medical advice.

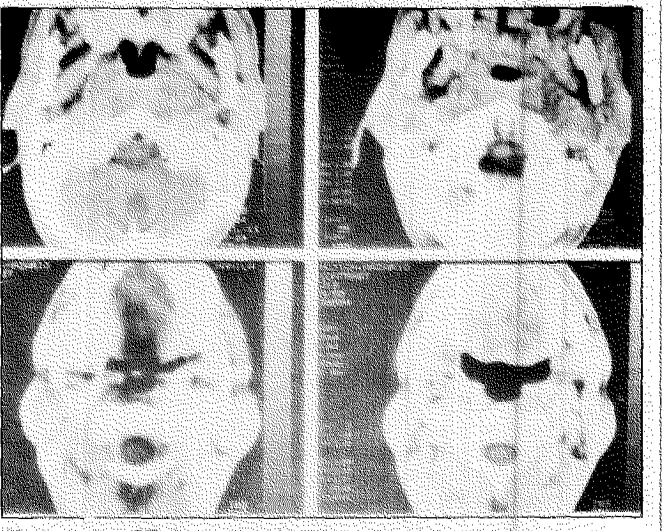

Figure 3. CT Scan showing the nasopharyngeal mass

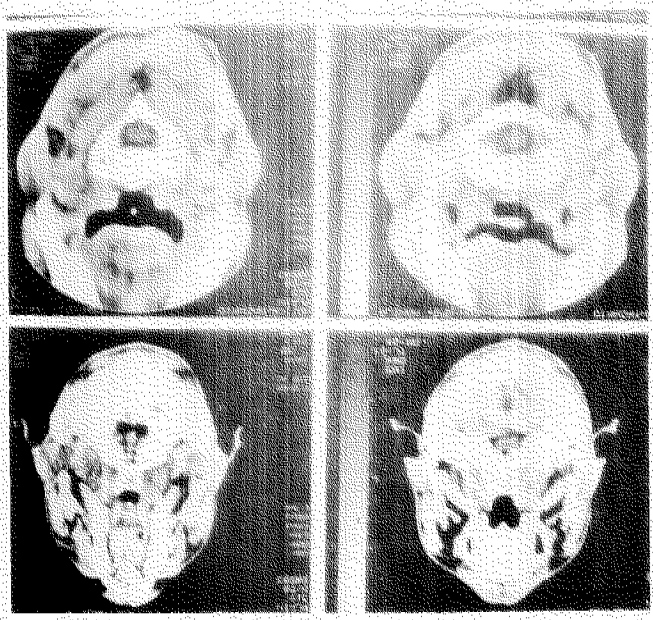

Figure 4. CT Scan showing the left parapharyngeal node

DISCUSSION

The incidence of nasopharyngeal cancer, differs among races. It is rare among Caucasians, but of main significance to certain Oriental groups, such as Chinese, Malay, Indonesians, Vietnamese, and Filipinos. The geographic predilection among these Oriental groups suggests primarily a genetic cause. There is an association between nasopharyngeal carcinoma and the presenceof HLA-A2 haplotype, with fewer than two antigens at B locus. The effect of the genetic predisposition has been demonstrated by migration trends in prehistoric times from Southwest China, to Southeast Asia.

The Central Tumor Registry of the Philippines reported in 1977, the incidence of NPCA for males and females, as 31/100,000 and 1.3/100,000 respectively. The Tumor registry in this institution, in 1981, listed 87 cases of NPCA, out of 1,837 malignancies. It ranked third behind lung and breast cancer.

Though a relatively common encountered malignancy, NPCA can present with a variety of signs and symptoms, that may be confusing to primary care physicians and otorhinolaryngologists as well as other specialists. Diagnosis is usually made when the disease has reached an advanced stage, as seen in this case. The duration of symptoms prior to the diagnosis ranged widely from one to thirty six months. The mean interval from onset of symptoms until initial evaluation was six months.

Bates, et al, in their review of 228 cases of NPCA, revealed the following *presenting symptoms:*

cervical mass	57%
hearing loss	48%
otitis media	37%
nasal obstruction	30%
epistaxis	28%
headache	19%

The Mayo Clinic series present the following signs and symptoms *at the time of diagnosis:*

neck lump	60%
ear fullness	41%
hearing loss	37%
nasal bleeding	30%
nasal obstruction	29%
neck pain	13%
weight loss	10%
diplopia	8%

In a local review by **Yatco e. al** (1985), 64% of the patients had nasopharyngeal symptoms, consisting of obstruction and epistaxis. Otologic complaints ranging from serous discharge, tinnitus and decrease hearing acuity accounts for about 60% of these symptoms; 34% have ophthalmoneurologic manifestations, such as blurring of vision, diplopia, and ptosis. About 77% have neck masses. Nuchal pain and pain on yawning and mastication, were noted in another 30%. The rest of the symptoms consists of numbness and paralysis of the face. Local and foreign literature showed that neck mass, is the most common initial presenting symptom in NPCA.

This patient presented with shoulder and nape pains as the initial symptoms. Later in the disease process, the patient developed weakness of the left arm, tinnitus, and difficulty in hearing, hoarseness, dysphagia, Horner's syndrome, as well as numbness of the left side of his face. There was no note of neck nodes nor epistaxis. The delay of the diagnosis, despite early consultations, was primarily due to the atypicality of the initial symptomatology. In this regard, it is important for one to describe the nature of spread of nasopharyngeal carcinoma in relation to the presenting symptoms.

To understand the clinical manifestation of a space occupying lesion in the nasopharynx, it is essential to be familiar with the basic anatomy of this structure. The nasopharynx is an area that lies just posterior to the nasal passage or posterior choanae. The soft palate forms the caudal margin of the nasopharynx. The cephalic margin is a bony structure formed by the basisphenoid and the basiocciput, sloping to form the posterior wall of the anterior arch of the atlas and the

body of the axis. The posterior boundary of the nasopharynx is the superior pharyngeal constrictor muscle and fascia as it meets in the midline anterior to the bodies of the upper cervical vertebrae. Laterally, the nasopharynx communicates with the middle ear via the eustachian tube. The fossa of Rosenmuller is a recess above and behind the eustachean tube. Multiple foramina are located at the base of the skull in close relationship to the nasopharyngeal region. The foramina provides access for intracranial extension of nasopharyngeal neoplasm. Knowledge of the foraminal anatomy and distribution of cranial nerves, allows one to predict the extent of tumor spread, by the symptomatology of the patients. Sensory deficits in V2 and V3 suggest involvement of foramen ovale and rotundum respectively. Deficits of cranial nerves III, IV and VI indicate tumor invasion of the cavernous sinus. If tumor extends into the carotid canal from the nasopharyngeal space, lower cranial nerve involvement is frequently seen as a result of the proximity of cranial nerves IX, X and XI exiting from the jugular foramen, and XII, exiting from the hypoglossal canal. The cervical sympathetics enlace the internal and external carotid arteries and are vulnerable where there is pericarotid extension of the neoplasm (See Fig. 5). Cervical sympathetic involvement manifests as Horner's syndrome, consisting of ptosis, miosis and anhidrosis, and is usually seen in conjunction with lower cranial nerve deficits.

Local invasion of the surrounding areas, would produce the symptoms referrable to the ear, as seen in extension to the lateral wall, nasal congestion and bleeding, present in expansion of the mass to the nasal cavity.

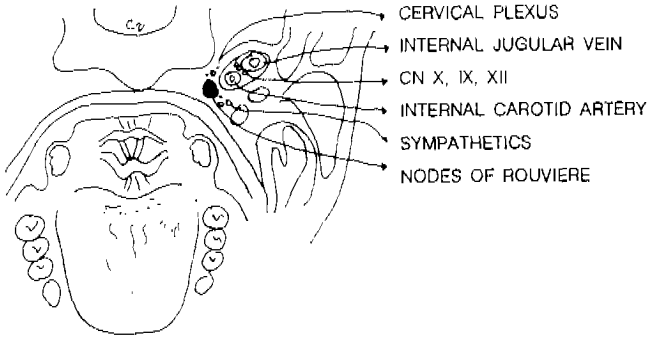

Figure 5. Parapharyngeal space showing correlation of node of Rouviere with adjacent structures.

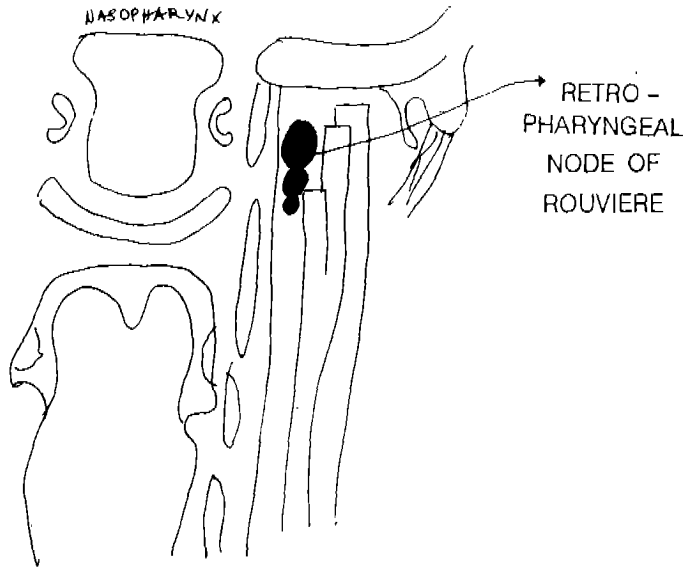

Figure 6. Lymphatic Drainage of the Nasopharynx

Now that the mode of spread of nasopharyngeal carcinoma with its corresponding symptomatology has been reviewed, it is imperative that the patient's clinical manifestations be explained.

Neoplasms of the nasopharynx extend not so much by expansive spread into contiguous natural cavities but by infiltration of neighboring regions, such as the cranial cavity and parapharyngeal spread (**Lederman**, 1978). Most authorities agree that metastasis to cervical lymph nodes occur early while the primary lesion is still quite small (**Theoh**, 1972). It can thus be surmised that the nasopharyngeal lesion of this patient started at the posterior wall later spreading to the left lateral wall. The mass at an earlier stage has already metastasized to the node of Rouviere present in the retropharyngeal compartment (See Fig. 6). It has been found that metastatic involvement of these nodes may lead to secondary invasion of the carotid sheath and content as well as destruction of the upper cervical vertebrae (**Batsakis,1982**). Cervical plexus involvement would then explain the shoulder pain and paresthesia in the left arm as experienced initially by the patient. As the nasopharyngeal mass increase in size to involve the lateral wall and roof of the nasopharynx, the patient then manifested other symptoms which were more typical of NPCA i.e., hearing loss, tinnitus, jugular foramen syndrome, and Horner's syndrome. However, even at the time of discharge, the patient did not show any neck nodes, nor any signs of nasal obstruction and epistaxis, two of the most common presenting symptoms of NPCA, making this case, more atypical.

Presently, the management of nasopharyngeal carcinoma is built around radiotherapy, primarily because of surgical inaccessibility. Treatment of NPCA is almost curative at an early stage. If the lesions are small, and no nodes are present, approximately half of these patients can be cured (Wang et al, 1971). The five year survival rate is as low as 16% in late stage tumors, and in those with neurological symptoms. Considering that most cases are only diagnosed at a late stage, (91% Stage III and IV, Yatco review), the prospect of cure is very nil. A high index of suspicion and awareness should thus be instilled not only among otorhinolaryngologists but to all medical practitioners as well.

SUMMARY

A case of nasopharyngeal carcinoma, presenting as shoulder and nape pains was presented. Several consultations were done before this was diagnosed. The delay of diagnosis was primarily due to the atypicality of the presenting symptoms. Only when extensive spread of the tumor occurred that common symptomatologies of NPCA surfaced. As a result, there is a lesser chance for cure. This case indeed shows the need to understand the complexities of nasopharyngeal carcinoma and the importance of having a good clinical eye in detecting this common disease entity to ensure early management and cure.

Furthermore, this case highlights the misgivings of late referrals for thorough specialized evaluation. Head and neck complaints warrant otorhinolaryngologic assessment. To the specialist in this field, this case serves as a reminder that each and every patient deserves the utmost attention.

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CRICOID RESECTION AND THYROTRACHEAL ANASTOMOSIS IN CHRONIC SUBGLOTTIC LARYNGEAL STENOSIS

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INTRODUCTION

For over 2 decades, the approach to subglottic stenosis has been marked by various advances in technique. However, regardless of etiology, subglottic stenosis continues to be difficult to manage. Treatment must be individualized according to age, pathology, general condition of the patient, and degree of stenosis. Although different treatment methods are technically diverse, the principles of management remain the same. The primary goal in treatment is the achievement of a patent airway without the need for a permanent tracheostomy. The secondary goals include an adequate voice, successful deglutition without aspiration, and satisfactory tracheobronchial clearance.

Immediate management of subglottic stenosis by cricoid resection and thyrotracheal anastomosis has been gaining interest and is now the favored technique in selected cases. This study is a report on the clinical experience of the Department of Otorhinolaryngology of the Philippine General Hospital (PGH) with cricoid resection and thyrotracheal anastomosis. Presented below are the three cases seen by the Department from 1990 to 1991.

REPORT OF CASES

Case 1:

A 29 year-old Filipino male was admitted for the first time to the Department of Otorhinolaryngology of the PGH last November 24, 1990 for upper airway obstruction. The history started one month prior to admission when the patient sustained multiple injuries in a vehicular accident. He was rushed unconscious to a nearby hospital. Attempts at endotracheal intubation were unsuccessful, thus necessitating an emergency tracheostomy. During the next month, efforts at removing the tracheostomy tube resulted in dsypnea. He was then referred to the PGH for further evaluation and management.

On admission, the patient underwent fiberoptic laryngoscopy. There was note of edematous but mobile arytenoids, slightly mobile true vocal cords on the right, fixed true vocal cords on the left, and a fibrotic mass 1 cm below the level of the true vocal cords causing a complete obstruction. The same findings were seen on direct rigid laryngoscopy under general anesthesia done during the fifth hospital day. Under retrograde fiberoptic laryngoscopy, the fibrotic mass was seen to extend to the area just above the tracheostome, which was estimated to be at the level of the second tracheal ring. Radiography showing the lateral view of the soft tissues of the neck (Fig. 1) demonstrated obliteration of the laryngotracheal air

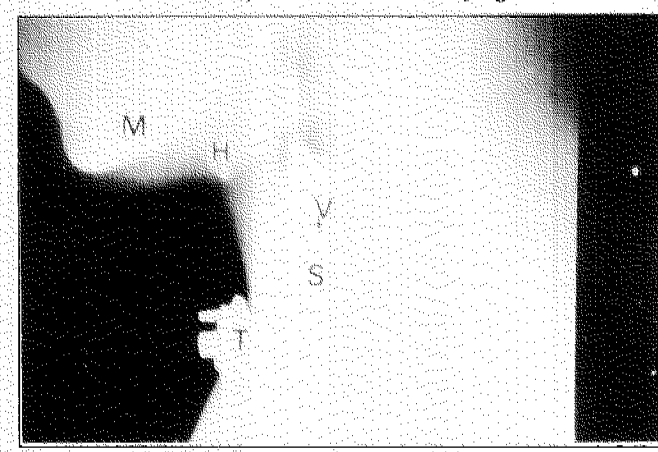

Figure 1. [Case 1] Complete subglottic stenosis (S) above the level of the tracheostomy tube (T) with failure of the contrast material (D) to pass through the obstruction.

column but with no clear delineation of the lesion. Laryngogram revealed complete subglottic stenosis of about 2.5 to 3.0 cm in length (Fig. 2). The patient was then prepared for cricoid resection with thyrotracheal anastomosis under general anesthesia.

Operative Technique

An apron incision was made and skin flaps were developed. The fascia and the strap muscles were divided at the midline and were retracted laterally. By means of sharp dissection, the laryngotracheal complex, extending from the hyoid bone to the fourth

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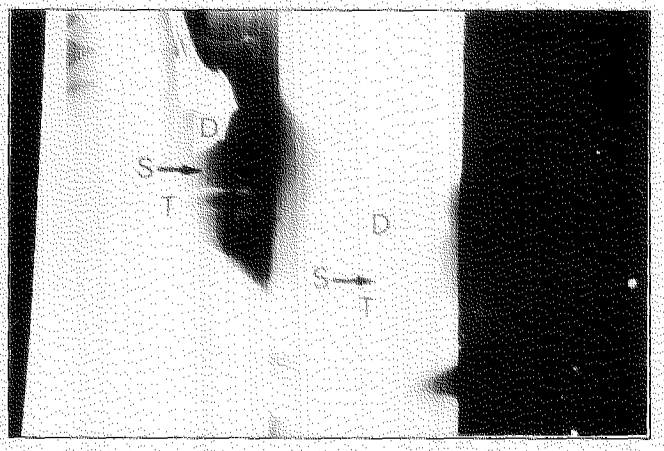

Figure 2. [Case 1] Complete subglottic stenosis (S) above the level of the tracheostomy tube (T) with failure of the contrast material (D) to pass through the obstruction.

tracheal ring, was exposed. The tracheostome was then seen to be at the second tracheal ring. The anterolateral walls of the cricoid and of the first and second tracheal rings were collapsed. Anterior midline splitting of these structures revealed a complete stenosis at the level of the first and second tracheal rings and an 80% luminal obstruction at the level of the cricoid. The rest of the adjacent structures were normal.

Total resection of the first and second tracheal rings was done. A partial resection of the cricoid cartilage was then performed, totally excising the anterolateral wall of the cricoid and dissecting the inferior half of the posterior plate from the subperichondrium, leaving the superior half intact (Fig. 3).

The stenotic segment was excised, resulting in a 3 cm defect. The resected edge of the laryngeal stump measured 1 cm anteriorly and 1.5 cm posteriorly from the inferior margin of the vocal cords. To reconstruct the defect created, the laryngeal stump was made to drop about 3 cm via suprahyoid release and the tracheal stump was pulled up about 2 cm after mobilization via blunt dissection. Prior to anastomosis, a new tracheal window was created at the fifth tracheal ring. End to end anastomosis of the third tracheal ring of the tracheal stump with the thyroid cartilage and remnant of the cricoid of the laryngeal stump was then performed by full thickness suturing of the perichondrium, cartilage, and mucosa using interrupted nylon 2-0 sutures (Fig. 3). Suturing in a posterior to anterior fashion, with knots placed outside, was continued until no air leak with positive ventilatory pressure could be elicited.

Prior to closure, the operative site was irrigated with iodine and sterile saline, and drains were placed. The soft tissues were closed primarily, while the neck was sutured in 2 layers. A nasogastric tube (NGT) was carefully inserted. The neck was kept in a flexed position, and check sutures from the chin to the chest were placed.

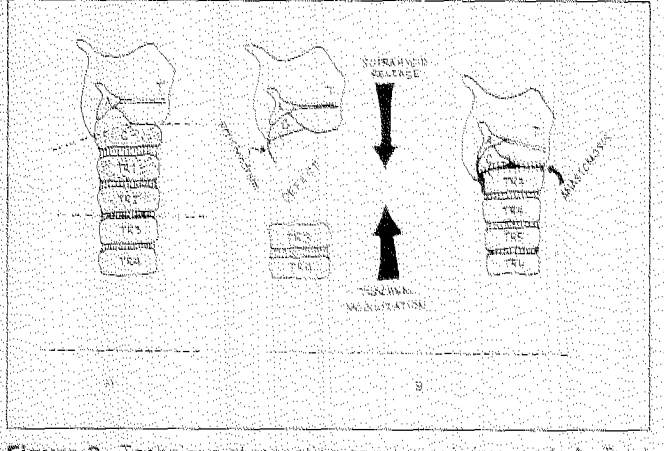

Figure 3. Technique of resection-anastomosis in case 1. A. Total resection of the first (TR 1) and second (TR2) tracheal rings and partial resection of the cricoid (C) with total excision of the anterolateral walls and subperichondral dissection of the inferior half of the posterior plate. B. Anastomosis completed by suturing the third tracheal ring (TR3) to the remaining posterior cricoid plate (C) and the thyroid cartilage (T) after suprahyoid release and tracheal mobilization.

Postoperative Course

Nutrition was maintained through the NGT. Antibiotics, consisting daily of 2 gms of cloxacillin and 2 gms of chloramphenicol, was given intravenously for 2 days and then given via NGT for the succeeding 2 weeks. An analgesic was also given for pain relief. The drains were removed after 3 days and the sutures after 1 week. Soft diet was started after 2 weeks and regular diet after 3 weeks.

Weaning off the tracheostomy tube was started during the third week post-operatively, with total success after a week (Fig. 4). Prior to removal of the

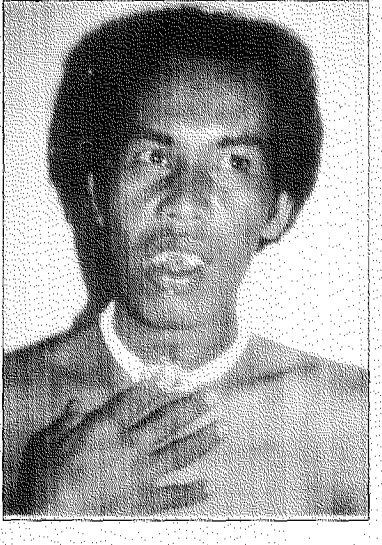

Figure 4. [Case 1] Patient prior to decannulation with patent airway and acceptable voice.

tracheostomy tube, a lateral radiographic study of the soft tissues of the neck was done, revealing a patent airway with healing process at the anastomotic site (Fig. 5). Indirect laryngoscopy was also done, showing a functioning true vocal cord on the right and a paralyzed one on the left. The patient was later discharged with home medications.

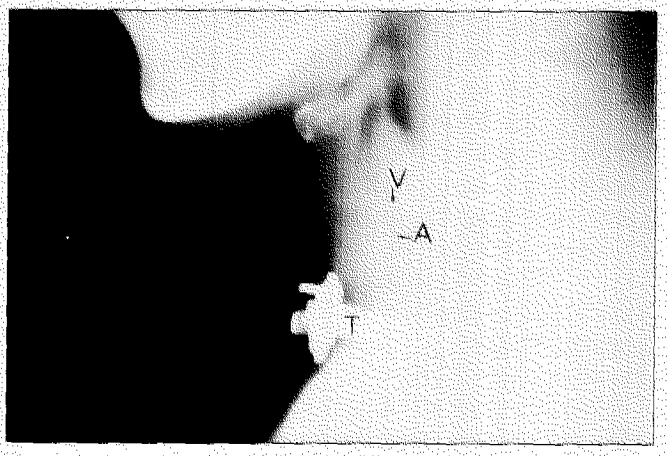

Figure 5. [Case 1] Soft tissue lateral view of the neck prior to decannulation showing a patent airway at the anastomotic site (A) between the vocal cords (V) and the tracheostomy tube (T).

During follow-up consultations, the patient presented with an acceptable voice, a completely healed tracheostome, and an absence of dyspnea (Fig. 6). A lateral radiographic study of the neck, taken 8 months postoperatively, revealed patency of the airway at the level of the anastomosis (Fig. 7). Fiberoptic laryngoscopy demonstrated a fully functional true vocal cord on the right, a paralyzed true vocal cord on the left at the paramedian position but with compensatory movement, and a healed subglottic anastomosis with minimal scar formation.

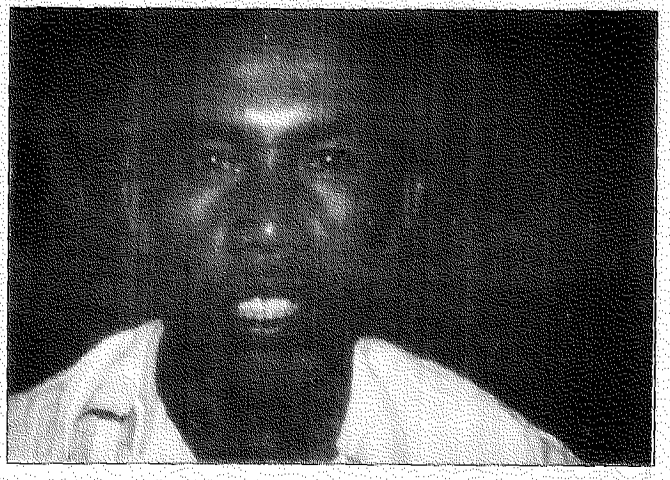

Figure 6. [Case 1] Patient eight months postoperatively with an acceptable voice and absence of dyspnea.

Figure 7. [Case 1] Soft tissue lateral view of the neck taken eight months postoperatively a showing patent airway at the anastomotic site (A) below the vocal cord (V).

Case 2:

A 35 year-old Filipino female, diagnosed as a case of demyelinating disease, was admitted to the Department of Otorhinolaryngology of the PGH last April 25, 1991. History of present illness started 5 months prior to admission when the patient consulted at the PGH Admitting Section (AS) for cough, fever, and dyspnea. During her 3-day stay at the AS, she was treated as a case of acute bacterial laryngotracheobronchitis. There was relief of symptoms and she was sent home with home medications. Two days later, however, she again experienced severe dyspnea and was rushed to the Lung Center of the Philippines, where an emergency tracheostomy was performed. Initial assessment at the Lung Center was bilateral cord paralysis secondary to demyelinating disease in relapse. She was treated for 2 months without significant improvement, and was subsequently referred to the PGH.

At the PGH, the patient was observed and treated for 3 months by the Department on an out-patient basis, with note of gradual return of both vocal cord function. However, attempts at decannulation resulted in dyspnea. On the day of admission, direct laryngoscopy done under general anesthesia revealed a circumferential fibrotic stricture located 1 cm below the true vocal cords, resulting in a 70% luminal obstruction. The same lesion was noted on retrograde fiberoptic scoping located about 1.5 cm superior to the tracheostome. The lesion was not demonstrated on plain radiography. Chest PA and lateral views showed essentially normal findings (Fig. 8).

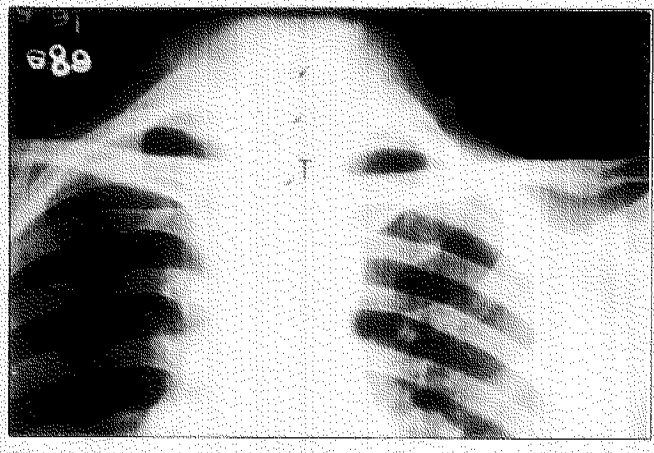

Figure 8. [Case 2] Chest PA showing an unobstructed air column (arrows) above the tracheostomy tube (T).

Operative Procedure

The patient underwent partial cricoid resection with thyrotracheal anastomosis on May 13, 1991 using the same technique as in Case 1 to expose to laryngotracheal complex. The tracheostome was seen to be at the level of the second tracheal ring. The anterior wall of the cricoid was fibrotic and on anterior splitting a circumferential fibrotic tissue causing a 70% luminal obstruction over the entire vertical length of the cricoid was noted. The rest of the adjacent structures were normal.

An oblique anterior cricoid resection was done followed by stripping of scarred and thickened mucosa from the posterior plate which was left intact. Superior release of the laryngeal stump, which had a resected edge 1 cm anteriorly and 2 cm posteriorly from the inferior edge of the vocal cords, was done along the thyrohyoid membrane. The distal tracheal stump was also mobilized by blunt dissection. End to end anastomosis and closure, as in Case 1, were completed (Fig. 9).

Postoperative Course

Nutrition was maintained via the NGT. Antibiotics, consisting daily of 4 M units of Penicillin G and 2 gms of chloromycetin, were given intravenously for 2 days and then given via NGT for two weeks. An analgesic was also given for pain relief. The drains were removed after 5 days and the sutures after 1 week. Soft diet was started after 2 weeks and regular diet after 3 weeks. The tracheostomy tube was removed on the seventeenth day postoperatively without difficulty. The patient was discharged with home medications.

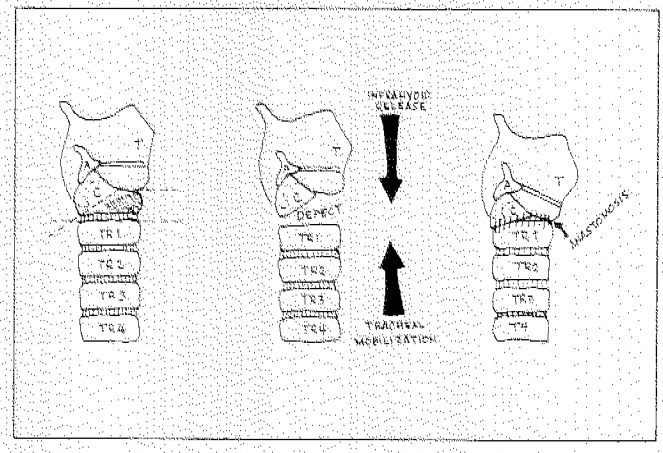

Figure 9. Technique of resection-anastomosis in case 2; A. Oblique anterior partial cricoid resection involving the anterior wall of the cricoid (C) with the posterolateral plate of the cricoid left intact; B. Anastomosis completed by suturing the first tracheal ring (TR1) with the remnant of the cricoid (C) and to the tracheal cartilage (T) after infrahyoid release and tracheal mobilization.

On regular follow-up consultations, the patient remained asymptomatic, with an adequate and acceptable voice. Six months postoperatively, fiberoptic laryngoscopy done under local anesthesia showed a paramedian paralysis of the left true vocal cord, a mobile, compensating right true vocal cord, and a clean subglottis without granulation tissues. A lateral radiographic study of the soft tissues of the neck demonstrated a patent airway and a narrowing corresponding to the anastomotic site (Fig. 10). The patient was scheduled for revision of the anterior neck scar (Fig. 11).

Case 3:

A 12 year-old Filipino male was referred from a provincial hospital and was admitted for the first

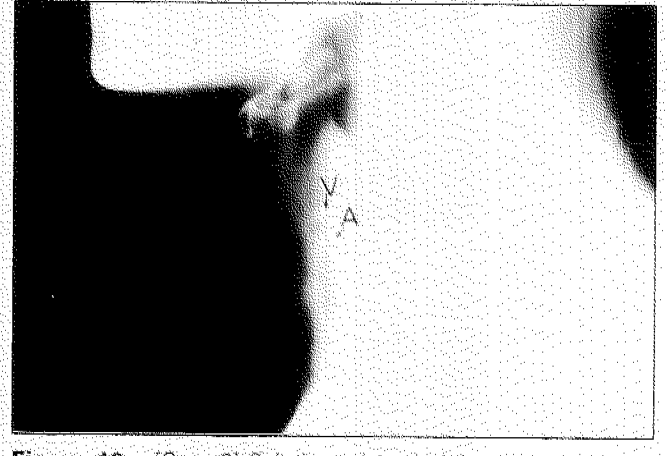

Figure 10. [Case 2] Soft tissue lateral of the neck showing a patent airway at the level of the anastomosis (A) below the vocal cords (V).

Figure 11. [Case 2] Patient remained asymptomatic six months postoperatively with acceptable voice and healed tracheostomy scar (for revision).

time to the Department of Otorhinolaryngology of the PGH last April 22, 1991. History of present illness started 10 months prior to admission when the patient experienced dyspnea after being strangled with a rope by a playmate during a fight. He was brought to a provincial hospital, where an emergency tracheostomy was performed. Attempts at decannulation failed, prompting transfer to the PGH.

On admission, fiberoptic laryngoscopy revealed a slightly mobile right true vocal cord, a paralyzed left true vocal cord, and a fibrotic scar in the subglottic space with a >90% luminal obstruction. Lateral radiographic view of the soft tissues of the neck showed partial obliteration of the laryngeal air column but without accurate delineation. Direct laryngoscopy done under general anesthesia demonstrated circumferential fibrotic tissue below the true vocal cords extending inferiorly to about 1.5 cm above the tracheostome, and a 90% luminal obstruction. The stenosis was estimated to be 2.5 cm long, extending from the subglottic space to the first tracheal ring.

Operative Technique

The patient underwent surgery on July 23, 1991. After exposure of the laryngotracheal complex in a manner similar to Cases 1 and 2, the anterolateral wall of the cricoid and the first tracheal ring were seen to be collapsed. Anterior midline splitting of these structures revealed an almost complete obstruction of the lumen by a circumferential fibrotic scar, causing stenosis of the whole cricoid cartilage and first tracheal ring. The rest of the adjacent structures were normal.

The first tracheal ring was excised. Near-total resection of the cricoid then was done by excising the anterolateral walls, and by subperichondrally dissecting the inferior 3/4 of the posterior plate. The left true vocal cord was anchored laterally to the thyroid cartilage using nylon 3-0 sutures. The laryngeal stump,with its resected edge about 0.75 cm anteroposteriorly from the vocal cords, was dropped via suprahyoid release, while the distal tracheal stump was mobilized via blunt dissection. A new tracheostome was created at the level of the third tracheal ring. End to end anastomosis and closure, as in Cases 1 and 2, were performed (Fig. 12).

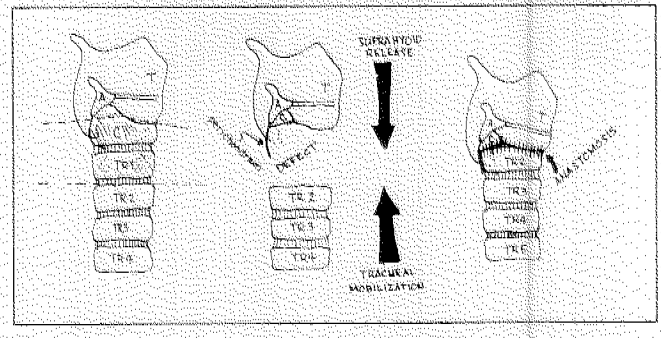

Figure 12. Technique of resection-anastomosis in case 3. A. Near total cricoid resection leaving only the superior one-fourth of the posterior plate of the cricoid cartilage (C) and total excision of the first tracheal ring (TR1); B. Anastomosis completed by suturing the second tracheal ring (TR2) to the remnant of the cricoid cartilage (C) and the thyroid cartilage (T) after suprahyoid release and tracheal mobilization.

Postoperative Course

Nutrition was given via NGT. Antibiotics, consisting daily of 6 M units of Penicillin G and 1.5 gms of Metronidazole, was given intravenously for 4 days then via NGT for 2 weeks. An analgesic was also given for pain relief. The penrose drains were removed after 2 days and the sutures after 1 week. Soft diet was started after 2 weeks and regular diet after 3 weeks. Attempts at decannulation could not be tolerated by the patient. He was discharged after 3 weeks of confinement with a tracheostomy tube.

Direct laryngoscopy done 1 and 2 months postoperatively revealed midline paralysis of the left true vocal cord and inadequate lateralization of the left true vocal cord producing a 3 mm glottic opening. Retrograde fiberoptic scoping of the anastomotic site showed good healing and patent airway. Patient was then advised revision of the cord-lateralizing procedure. Patient, however, did not comply and was subsequently lost to follow-up.

DISCUSSION

Laryngeal stenosis is a partial or complete cicatricial narrowing of the endolarynx. The incidence of

laryngeal stenosis among pediatric patients is unknown. In 1985, Stell and coworkers have estimated the incidence of laryngeal stenosis among adults in the United Kingdom to be 1.5 cases per million patients per year.[1] No similar studies among Filipinos have yet been published. Few cases have been treated at the Department of Otorhinolaryngology of the PGH. From 1984 to 1991, a total of 9 patients have been seen; 4 of whom with subglottic stenosis, while 5 with glottic stenosis.

Chronic subglottic stenosis, the most common type of chronic laryngeal stenosis, is the most difficult to treat.[2] Usual presentation is that of dyspnea secondary to upper airway obstruction requiring tracheostomy. Chronic subglottic stenosis is a complication most commonly resulting from external or internal trauma to the larynx such as blunt or penetrating neck injuries, prolonged intubation, burns, irradiation, or previous surgery. Other etiologies include chronic infection, chronic granulomatous diseases, and neoplasm. In some cases, the etiology remains unknown. In a review by **Pearson** and coworkers of 28 cases of chronic subglottic stenosis, 17 were attributed to trauma.[3] Similarly, 2 out of the 3 cases treated in 1991 at the PGH, as reported in this study, were due to trauma; there was no identifiable principal cause for the remaining case (Case 2) though a history of upper respiratory tract infection was suggestive of a post-infectious process.

Chronic subglottic stenosis can be detected even by mere mirror examination. Other studies, however, have stressed the need for preoperative evaluation by plain and contrast radiography and tomography[4] and by direct laryngoscopy[5] to further delineate the extent of the lesion. In this study, antegrade laryngogram, done in Case 1, was useful in accurately defining the upper extent and degree of the stenosis. And although retrograde laryngogram could have also delineate the inferior extent of the lesion, this was technically difficult. Rigid and fiberoptic direct laryngoscopy done in all 3 cases revealed findings comparable to those seen intraoperatively. Plain radiography, however, was not useful in delineating the lesions. Instead, it only demonstrated stenosis in 2 out of 3 cases (cases 1 and 3). Studies by **Gerwat** and **Bryce** have found radiographic assessment to be misleading in most cases.[5]

The management of chronic subglottic stenosis has remained a challenge to laryngologists. Several treatment modalities have been advocated, although no single method has universally been successful. Aside from the resulting airway obstruction, the preservation of vocal cord function has been a problem of great concern brought about by the close proximity of the stenosis to the vocal cords and to the course of the recurrent laryngeal nerve. This problem is aggravated in pediatric cases, where the lesion is found in a growing larynx. The management of these pediatric patients have remained controversial.

The treatment of chronic subglottic stenosis is of 2 types: the endoscopic and the external surgical methods. Important factors to consider in treatment include the age of the patient and the degree of stenosis. Other limiting factors are cost and availability of materials, occurrence of morbidity, multiplicity of procedures, and experience of the surgeon.

In 1984, **Cotton** suggested a grading scale to determine the severity of stenosis (Table 1).[6] In this scale, grades III and IV lesions, as seen in Case 3 and Case 1, respectively, are likely to require external methods; grade I lesions should be managed endoscopically; while grade II lesions, as seen in Case 2, may be amenable to either external or endoscopic methods. In general, any case of subglottic stenosis not requiring tracheostomy is a mild case and will most likely respond to endoscopic treatment. More advanced cases, including those with mature, hard, and fibrous scars, remain an indication to major surgery.

TABLE 1. GRADING OF LARYNGEAL STENOSIS

Grade	Percentage of laryngeal lumen obstruction
Grade I	Less than 70%
Grade II	70% to 90%
Grade III	More than 90%; identifiable lumen is present (no matter how narrow)
Grade IV	Complete obstruction; no lumen present

In pediatric patients, endoscopic and conservative external surgical methods, which do not require cricoid resection, are preferred to prevent possible interference in the normal development of the larynx. Studies by **Fearon** and **McMillin** using young primates, however, have shown cricoid resection and thyrotracheal anastomosis to be feasible in young primates corresponding in size to a small child.[7]

Endoscopic methods include repeated dilatation,[8] prolonged dilatation,[9] intralesional injection of steroid,[10] combined use of dilatation and steroid,[11] laryngeal stents,[12] and endoscopic excision of strictures with skin grafting and stent[13]. More advanced endoscopic excision methods include micro-cauterization,[14] cryosurgery,[15] and carbon dioxide laser surgery, which is presently the recommended endoscopic method because of technical precision and

minimal damage to healthy tissues.[16] However, these advanced endoscopic tools are still unavailable at the PGH.

External surgical methods are indicated when conservative efforts are inappropriate or when such efforts have failed. Techniques include the Trough method,[17] the anterior laryngofissure method with anterior augmentation using costal cartilage,[18] and hyoid cartilage,[19] the combined laryngofissure and posterior cricoid division methods,[20,21] the anterior cricoid split operation,[22] which is recommended for pediatric cases, and the cricoid resection with thyrotracheal anastomosis, which is the most radical surgical approach.

Cricoid resection and thyrotracheal anastomosis offers a one-stage cure for subglottic stenosis without the inconvenience of repeated minor procedures and permanent tracheostomy. Decannulation can be made early and vocal cord function can be preserved. This technique had been first suggested by **Conley**[23] in 1953. It took years, however, before its application could gain interest. The feasibility of excision and primary repair by end to end anastomosis had been demonstrated by **Dedo** in 1969 for tracheal stenosis,[4] and had been established for subglottic stenosis by **Bryce**,[24] **Fearon**,[25] **Gerwat**, and **Pearson**.[26]

The operative procedures in this study are similar to those established by **Pearson** and by **Gerwat**, but with some exceptions. First, instead of a Sorensen or collar incision, an apron incision is used to maximize exposure and to minimize traction on the external flaps. Second, cricoid resection is carefully and meticulously performed respectively, without deliberate attempts at identification of the laryngeal nerve to avoid nerve injury; nerve identification is an essential step for Gerwat, while for Pearson, identification of the laryngeal nerve is done only for cases of neoplasm, where nerve sacrifice is indicated. Third, the supralaryngeal drop used in this study to mobilize the laryngeal stumps prior to anastomosis include 2 equally effective procedures, both different from the infrahyoid releasing procedures adopted from Dedo by Pearson and by Gerwat: the infrahyoid releasing procedure of **Ogura**[27] done in Case 2 and the suprahyoid releasing procedure of **Montgomery**[28] done in the more extensive resections of Cases 1 and 3. The risk to laryngeal nerve injury, which characterizes the postoperative course of Case 2, has been seen to be higher in the infrahyoid releasing procedure by Ogura compared to that by Dedo. Fourth, a lateralizing procedure, recommended by Ogura and by **Grillo**[29] for suspected cases of bilateral nerve paralysis, is performed in Case 3, despite paralysis of only the right true vocal cord prior to operation, due to a high suspicion of left true vocal cord injury. Fifth, nylon 2-0 sutures are used, instead of wire, to adequately hold the end to end anastomosis. The procedures performed in all 3 cases have been well tolerated without serious postoperative problems. The problem of aspiration has not been experienced. The results in this study are summarized in Table 2.

TABLE 2. SUMMARY OF CASE REPORTS

DATA	CASE 1	CASE 2	CASE 3
Patient, Age/Sex Etiology Pathology	N.V., 29/F Trauma Circumferential stenosis with collapse of the cricoid and tracheal rings 1 and 2	V.V., 35/F Unknown Circumferential stenosis along the vertical length of the cricoid	C.R., 12M Trauma Circumferential stenosis along the cricoid to tracheal ring 1 with collapse of the cricoid
Degree of luminal obstruction	100%	70%	>90%
Preoperative vocal cord function	Limited, R; paralyzed, L	Intact, R; Intact, L	Paralyzed, R; Limited, L
Extent of cricoid resection	Anterolateral walls removed; subperichondrial resection of the inferior half of the posterior plate	Anterior wall removed; intact posterolateral plate	Anterolateral walls removed; subperichondrial resection of the inferior 3/4 of the posterior plate
Extent of tracheal ring resection	Tracheal rings 1 and 2	None	Tracheal ring 1
Type of supra-laryngeal release	Suprahyoid	Infrahyoid	Suprahyoid
Special procedures	None	None	Lateralization of the right true vocal cord
Distance of the anastomotic site from vocal cords (anterior - posterior)	1cm - 1.5cm	1cm - 2cm	0.75cm - 0.75cm
Post-op condition of the airway, last follow-up	Intact, 8 months	Intact, 5 months	Not decannulated, 2 months
Postoperative condition of the vocal cords	Functional, R; paralyzed, L	Functional, R paralyzed, L	Inadequate lateralization, R; paralyzed, L
Voice after decannulation	Adequate, socially acceptable	Adequate, socially acceptable	

SUMMARY

From 1990 to 1991, 3 patients with chronic subglottic stenosis were admitted to the Department of Otorhinolaryngology of the PGH. Each presented with varying degrees of stenosis, preoperatively determined by the combined use of radiography and direct laryngoscopy. The combined use of antegrade and retrograde direct laryngoscopy proved to be reliable in delineating the extent of the lesion with findings comparable to those seen intraoperatively. Antegrade contrast radiography provided additional information. On the other hand, the use of plain radiography was limited to the demonstration of stenosis in 2 out of 3 cases.

The technique of cricoid resection was described and performed in all 3 cases. In this study, some important observations could be made. First, nerve identification was not essential for nerve preservation. Nerve injury was avoided by careful and meticulous dissection in preserving the cricoid perichondrium, and by working close to the tracheal cartilage. Second, although there was little difference in the amount of laryngeal drop obtained using the infrahyoid releasing procedure as against the suprahyoid procedure, the latter was easier to perform and had a lower risk of nerve injury. Third, readily available ordinary nylon sutures were able to adequately hold the end to end anastomosis and to produce acceptable results, making the use of Tevdek and wire sutures not absolutely necessary for success.

Despite failure of decannulation in one case, a patent airway at the level of the anastomosis was still achieved in all the 3 cases. This failure was due to insufficient glottic opening secondary to midline paralysis of the left true vocal cord and to inadequate lateralization of the right true vocal cord.

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NON-ASPIRATING FINE NEEDLE BIOPSY OF SOLID HEAD AND NECK MASSES: A SIMPLIFIED TECHNIQUE*

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ABSTRACT

Diagnosis of head and neck masses requires a sound clinical judgment and strict adherence to sound oncologic principle. Among the diagnostic modalities with a high accuracy rate is fine needle aspiration biopsy. However, this technique requires expertise and proficiency in obtaining adequate representative material and thus a satisfactory yield. A simpler and easier method of non-aspirating needle biopsy was evaluated in the region of head and neck in comparison with fine needle aspiration. Thirty five patients with ultrasonically proven solid head and neck masses underwent needle biopsy with both techniques. Satisfactory specimens for cytology were obtained in 24 patients (60%) using NAFNB and 16 patients (40%) using FNA. Comparing the two groups of patients as to cytologic yield showed a statistically significant difference ($p<0.01$) and Kappa value of 32.25%. Complications associated with both techniques are transient and minor. Seven (30%) patients from NAFNB and 4 (25%) patients from FNA were found to be positive for malignancy. Our findings showed that NAFNB is a useful procedure and twice better than the FNA in obtaining satisfactory smears from solid head and neck masses.

INTRODUCTION

Evaluation of head and neck tumors continues to be a challenge to the clinician. It has always been emphasized that no neoplasia in the head and neck should be treated as a local pathology without concomittant attention directed to the search for a primary source. In most cases, the etiologic entity is found in the upper aero-digestive tract.

Various modalities have been used to assist the clinician in obtaining the correct diagnosis. Ultimately, it is the acquisition of a representative specimen which will be most helpful.

The previous practice of open biopsies is presently discouraged and less invasive procedures have been introduced. One highly recommended technique is fine-needle aspiration biopsy (FNA). This is the study of cells obtained by a small gauged needle with a vacuum system provided by an air tight syringe.[1] It utilizes 22 to 25 gauge needles for biopsy.[1,2,4,5,6,7] All areas of the body are suitable sites for the procedure,[1-13] but it is probably in the region of the head and neck where fine needle aspiration biopsy has its greatest usefulness.

When compared with more conventional methods of performing biopsy, fine needle aspiration biopsy enjoys several advantages. Its speed, safety, accuracy and cost-effectiveness have been cited in several studies worldwide.[1-13] Complications are transient and minor in contrast to the conventional methods.

Despite its numerous advantages, this procedure requires expertise and proficiency. It has been recommended that 100 to 200 aspirations should be performed in a short period of time under expert guidance before it is utilized as a diagnostic modality for patient care.[2,5] It is also advised that at least 10 procedures a week should be performed in order to achieve proficiency. Furthermore, a highly experienced cytopathologist is recommended to achieve optimum accuracy in the histopathological interpretation.[1,2]

With these things in mind, a simpler and easier method is introduced, obviating the need for aspiration and the expertise required in order to achieve a

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satisfactory yield. Review of foreign literature showed that there is no available reference of this modification of the standard technique. However, a local pilot study using this simplified technique was initiated in solid thyroid nodules.

This study shall evaluate the application of this simplified technique in head and neck tumors other than thyroid nodules. Specifically, the objectives are:

1. To compare a simplified technique to be called non-aspirating fine needle biopsy (NAFNB) with the standard fine needle aspiration biopsy as to its satisfactory yield in the region of the head and neck.
2. To report an initial experience on non-aspirating fine needle biopsy by solid head and neck masses.

MATERIALS AND METHODS

All patients who presented with head and neck masses at the Out-patient Department of this institution from June to September, 1991 were evaluated. Patients with clinically palpable head and neck masses measuring 1 cm or more which were solid or predominantly solid on ultrasonic examination were included in this study. Imaging was done by one of the authors (JBC) using the TOSHIBA Sonolayer-L SAL 32 B Ultrasound machine. Excluded were patients with thyroid nodules, those with previously biopsied masses, patients with bleeding and clotting disorders, and uncooperative patients. Informed written consent was secured from all patients.

Simple random sampling was employed on the study population to create two groups for technique alternation. Group A patients underwent NAFNB after which FNA was done on the same mass a few millimeters from the initial biopsy site. The reverse sequence in which FNA is done first followed by NAFNB in the same nodule was employed on Group B patients.

Kappa statistics and Chi square test with Yates correction (with p value < 0.05 as level of significance)were used to analyze the data.

Technique

Non-aspirating fine needle biopsy

The patient was placed in a supine position. The site of biopsy was first cleansed with an antiseptic solution (70% alcohol, povidone iodine or benzalkonium chloride). Using the aseptic technique, the nodule was stabilized with the thumb and index finger. A one-inch gauge 23 needle was inserted gently and firmly into the mass, and moved back and forth in different directions within the mass until blood or tissue appeared in the hub of the needle. The needle was then withdrawn and attached to a syringe filled with air to expel the sample from the needle on to the slide which was promptly smeared. The slide was fixed with 95% alcohol then sent to the pathologist for Papanicolaou staining and interpretation.

Fine needle aspiration biopsy:

A similar needle as in NAFNB was utilized in FNA. The needle was attached to a 20 ml syringe with a Luer-lock tip and introduced into the mass. One hand manipulated the syringe holder while the other hand fixed the mass between 2 fingers. A negative volume pressure of approximately 8-10 ml was maintained on the syringe while the needle was moved back and forth within the mass. The negative pressure was released by letting the syringe plunger return to the resting position before withdrawing the needle. The needle containing the samples was detached from the syringe. The syringe was filled with air and the needle was reattached. The air was used to expel the sample from the needle on the slide which was promptly smeared. The slide was fixed with 95% alcohol then sent to the pathologist for Papanicolaou staining and interpretation.

All specimens were obtained and smeared by one of the authors (MBA), who had prior experience with FNA but not with NAFNB. The slides were then read by the pathologist who was blinded as to which technique was utilized. The specimen was read as satisfactory if sufficient number of cells were seen clearly and their architecture maintained in order to arrive at a diagnosis. Unsatisfactory specimen was defined as insufficient number of cells and considerable inflammation, debris or blood were seen obscuring the cells.[1] Patients were followed-up 24 hours after the procedure and weekly thereafter for 2 weeks to determine complications.

RESULTS

A total of 60 patients presenting with head and neck masses were seen between June and September 1991. Thirty five (35) patients satisfied the criteria for inclusion into the study and 25 were excluded (20 had predominantly cystic lesions by ultrasound; 3 did not undergo ultrasonic evaluation and were lost to follow-up; 2 refused to undergo procedure).

The age range of the study population was 8 through 76 years (mean of 43 years; median of 42 years). There were 23 (65.42%) males and 12 (34.8%)

females. Group A (19 patients) underwent NAFNB first followed by FNA while 16 patients (Group B) had FNA first followed by NAFNB. Table II shows the provisionary diagnoses for the two groups of patients.

TABLE 1: PROVISIONARY DIAGNOSIS OF GROUPS A AND B

Group A (NAFNB first, FNA second)

Lateral neck mass	
r/o NPCA	9
Etiology (?)	3
r/o tongue malignancy	2
r/o TB adenitis	2
r/o Lymphoma	1
Parotid Newgrowth	
r/o Pleomorphic adenoma	1
prob. metastatic from Retinoblastoma	1
TOTAL	19

Group B (FNA first, NAFNB second)

Lateral neck mass	
r/o NPCA	6
r/o laryngeal malignancy	2
Etiology (?)	2
r/o Lymphoma	1
r/o floor of mouth malignancy	1
r/o palatal malingnancy	1
Submandibular newgrowth	2
Parotid newgrowth	1
TOTAL	16

A higher rate of satisfactory yield was obtained using NAFNB, whichever technique was used first (Relative risk of 1.78, 95% confidence limit of 1.17 <RR> 2.72). Statistical analysis in both groups showed significant differences, with p values of less than 0.01. However, there was poor agreement beyond chance by Kappa statitics. (Table II)

TABLE II YIELDS OF CYTOLOGIC SMEARS

	Satisfactory smear	Unsatisfactory smear
Group A n=19		
NAFNB first	14	5
FNA second	10	9
Group B n=16		
NAFNB second	10	6
FNA first	6	10
Total n=35		
NAFNB	24	11
FNA	16	19

P value < 0.01*
Kappa value 32.25%

* Chi square test with Yate's correction

Malignancy was detected in 7 NAFNB samples and 4 FNA samples. Excision biopsies done on 2 of these patients were consistent with non-Hodgkin's lymphoma and correlated well with cytologic diagnosis.

Both procedures are safe. Most of the patients reported bearable pain (Table III), with 3 patients from Group B (FNA first, NAFNB second) experiencing pain that required analgesics.

Persistent bleeding and hematoma formation were noted in both groups, but these can be remedied by gentle firm pressure and warm or cold compresses after the procedure.

TABLE III
COMPLICATIONS

	Group A (N=19)	Group B (N=16)
Tolerable pain	17	10
Pain requiring analgesic	1	3
Hematoma	1	1
Persistent bleeding	1	2

DISCUSSION

Diagnosis of head and neck masses requires sound clinical judgment and strict adherence to oncologic principles. The value of aspiration cytology for the diagnosis of lymphoma, nodal metastases and soft tissue proliferation in this region cannot be overemphasized. This diagnostic modality is widely used to distinguish benign from malignant masses.

It has been reported in literature that the accuracy of FNA ranges from very low (9.50%) to very high (79%).[1-13] The wide range was attributed to the differences in the histologic interpretative skills among pathologists and the proficiency in obtaining adequate representative samples by the clinicians.[2,6]

The many advantages of this quick, simple,almost painless technique in the head and neck region includes immediate office evaluation, identification of constituent tissues such as fat, lymph node or salivary gland, biopsy of several masses without scar formation and without tissue distortion complicating reentry as in radical neck dissection, provision of cellular details to complement a difficult histologic diagnosis e.g. lymphoma or anaplastic carcinoma, facilitation of a planned surgical approach, early evaluation of recurrent neoplasm and an indicator of the effect of chemotherapy.[1]

The need to obtain adequate and representative samples is the pivotal point in establishing the usefulness of aspiration biopsies. The variables of expe-

rience and proficiency will be critical elements in assuring a favorable outcome. These elements were eliminated by using the simplified technique of non-aspiration. In this study, the NAFNB technique provides satisfactory specimens twice better than the standard fine needle aspiration biopsy (RR of 1.78), whichever method is done first. A statistically significant difference of p value of less than 0.01 was noted. The negative pressure generated by FNA may produce hemorrhage within the nodule or the aspirating needle may suck proteinaceous materials which would obscure the substantial cells needed for a satisfactory diagnosis. There is also the possibility of cells being sucked from the needle shaft to the syringe barrel.[4] These problems can be avoided when non-aspirating fine needle biopsy is employed because the technique relies on cytologic material being pushed mechanically into the needle shaft.

In conclusion, the initial data show that the modified technique of non-aspirating fine needle biopsy is a potentially useful procedure in the evaluation of head and neck masses. Further study is thereby recommended. It is also mandatory that sensitivity and specificity tests of this new technique be studied in comparison with the standard FNA technique.

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(g22 needle) on neck nodes, however only 10 cases were sampled.

MATERIALS AND METHODS

SUBJECTS:

A total of 55 patients with palpable head and neck nodes were subjected to FNAB from May 1989 to August 1991. Criteria for selection were: (1) nodes should not be smaller than 2 cm in diameter; (2) there should be no sign of frank infection (e.g. erythema, pointing) involving the node to be sampled; (3) excluded were nodes which could be obtained thru punch biopsy i.e. open nodes or nodes with breaks in the skin.

Specimens were collected and fixed in slides and sent to the Pathology department for staining. A master list was kept containing the patient's name, age, sex, node size, location and character, and cytologic diagnosis. Those patients who consented to formal surgery or biopsy were placed in a separate list with the final histopathologic report. The matching FNAB slides were then retrieved and sent to the Santo Tomas University Hospital, Department of Pathology for formal cytologic evaluation. Only one cytopathologist read all of the slides which were all coded to correspond with the respective patients.

Information regarding the patient's history, diagnosis and histopathology results were witheld from the cytopathologist. Following cytologic evaluation, cytologic diagnosis were obtained and correlated to the corresponding patients.

MATERIALS

The following materials were used:
- disposable gauge 22 x 1 in. needle
- 50cc syringe
- VIGO extension tube
- povidone antiseptic
- microscope glass slides
- 95% ethyl alcohol as fixative

TECHNIQUE

For the series, a 50cc syringe was used with an extension tube attached to it. The g22 needle is attached to the other end of the extension tube. The area is cleaned with antiseptic then carefully palpated and fixed in one hand by the surgeon with the other hand holding the needle. The 50cc syringe is held by an assistant. The extension tube gives the surgeon ease and, at the same time, manueverability in making 'passes' in the node once aspiration has commenced.

The needle is inserted into the mass and negative pressure is applied (by the assistant). In order to obtain sufficient material, the needle is moved or 'passed' back and forth in the mass four or five times. Throughout this manuever, negative pressure is maintained. When aspiration has been completed,the pressure from the syringe is allowed to equalize and the needle is withdrawn. It is important that no difference in pressure exist in the system when the needle is withdrawn or else the specimen may be drawn to the extension tube.

The contents of the needle are transferred to a glass slide by first disconnecting the needle, filling the syringe with air and, after having reconnected the needle to the syringe, by using pressure, all of the aspirated materials are expressed to the glass slide.

Semi-solid aspirate is spread along the slide by the use of flat pressure with another glass slide. If the aspirate is hemorrhagic or if it contains a fairly large volume of tissue fluid, it is spread as an ordinary blood smear. Any large tissue fragments that collect at the end of the smear are gently but firmly squeezed to the glass slide by flat pressure.

Smear is air dried, properly labelled and placed in 95% ethyl alcohol fixative. The fixed specimen is sent to the laboratory for Papanicolaou staining.

RESULTS

In the 24 month period, 55 patients underwent FNAB. Histologic samples for correlation were obtained through (1) formal surgery i.e. as part of therapy, (2) planned open biopsy i.e. when indicated, (3) biopsies done outside of this institution. Histophatologic correlation was available only in 30 patients. There were 17 males and 13 females with an age range of 11-78 yrs. old. The location of the nodes were indicated according to its relation to the sternocleidomastoid muscle i.e. anterior and posterior triangle. Fourteen (47%) were located in the anterior triangle and 53% (16) were in the posterior triangle. One (1) node was located in the posterior auricular area. The smallest node aspirated was 2 x 2 cm while the largest was 6 x 7 cm. Three (3) of the patients had 2 nodes aspirated, making a total of 33 aspirates. There were three (3) failed aspirates. Cytologic diagnosis were sufficient in 30 aspirates (90%).

Needle aspiration cytology was consistent in all 17 malignant cases. No false positive were reported. In the 13 benign aspirates one (1) was a false negative reading with the histopathology being a malignant lymphoma.

The diagnostic value of FNAB in detecting malignancy for lymph nodes of the head and neck was determined by computing for its sensitivity and specificity. Sensitivity being defined as the proportion of cases with malignancy detected on positive FNAB, was 94%. Specificity, defined as the proportion of cases who have benign histology and were negative on FNAB,was 93%. (See table I) Correct specific cytologic diagnosis was also available in FNAB. (See table II)

Table I: Diagnostic Value of FNAB

	FNAB	Histo	SENSITIVITY	SPECIFICY
Malignant	17	18	94%	93%
Benign	13	12		
TOTAL	30	30		

Table II. Frequency of correct specific diagnosis by FNAB

Malignant:	Squamous cell ca., mets.	8
	Malignant Lymphoma	4*
	Undifferentiated ca., mets.	4
	Adenocarcinoma mets.	1
	Benign: Chr. granulomatous inf.	8*
	Chr. inflammation	3
	TOTAL	28

Note: * = one node read as chronic inflammation

DISCUSSION

Lymph nodes are encapsulated bean-shaped organs composed of lymphoid tissue lying along the course of lymph vessels. The lymph enters the node by the afferrent lymph vessels situated at the convex portion; these vessels empty into the marginal sinuses, which finally converge into the efferent lymph vessels.

The most frequent cause of an enlarged lymph node is a reactive process. This reactive process may be due to infection or malignancy. If the node in question persists or increases in size even after a trial course of antibiotics, additional investigation is then necessary. Biopsy only should be done after a complete head and neck examination using direct and indirect endoscopies and radiographic methods. Excision biopsy is often the final diagnostic test of preference because a bigger tissue sample is available for histopathologic examination. But because of the disadvantages of open biopsy, FNAB is offered as a safer alternative.

However, FNAB has its disadvantages also: (1) a negative or suspicious FNAB result would still dictate an open biopsy, (2) presence of few experienced cytopathologist especially in this country, (3) limited number of surgeons are experienced in the technique.

The most important aspect then in FNAB cytodiagnosis is the differentiation between benign lymphadenopathies and malignant processes. The latter may be primary neoplasms of lymphopathic tissues (e.g. lymphoma) or metastatic spreads from a distant primary epithelial or mesenchymal malignancies. Malignant cells aspirated from carcinoma are most easily detected. Aptly named by **Sodenterom** as 'alien' the diagnostic accuracy of foreign authors ranges from 90%-96%. In 13 cases of carcinomas in the series all were correctly diagnosed by FNAB. Location of the primary tumor were all in the upper aero-digestive tract.

In the 5 lymphoma aspirates in the series, one false negative result was obtained. The diagnostic accuracy of FNAB for lymphomas has generally been less compared with metastatic tumors because the very diagnosis of lymphoma is difficult to establish. Many disease entities inherent to the nodes can mimic lymphoma such as reactive hyperplasia and lymphoreticular diseases. **Goodwin** in 1956 reported an accuracy rate of only 10%. **Loseke** and **Craver's** report was 56% in 1954. **Betsill** in 1980, reported a 62% accuracy. **Pontifex** in 1984, reported 180 diagnostically useful aspirates out of 213 (84%).

While the emphasis of FNAB in recent years has been on the diagnosis of tumours and lymphomas, infectious diseases can also be diagnosed. In our 12 benign nodes, 8 were correctly diagnosed as chronic granulomatous infection.

CONCLUSION

The initial results obtained (sensitivity 94%, specificity 93%) are encouraging. The authors believe that FNAB in this present series has proved to be valuable in differentiating malignant from benign neck nodes. Aspirated samples can reveal specific cytologic diagnosis comparable with post-operative histopathologic diagnosis. The results in this series are at par if not better than some quoted studies. The surgeons have gained experience in performing the technique of FNAB, as shown by the a high yield of diagnostic aspirates. The cytophatologic diagnosis of lymph node aspirates as demonstrated by high sensitivity and specificity results.

Encouraged by the results seen in neck nodes, the authors plan to include FNAB in the evaluation

of other head and neck masses such as the salivary glands especially the parotid which presents a more diagnostic and therapeutic challenge to the Head and Neck Surgeons. To quote Longfellow:

"Let us, then be up and doing
With a heart for any fate;
Still achieving, still pursuing
Learn to labor and to wait."

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FINE NEEDLE ASPIRATION BIOPSY OF HEAD AND NECK NODES (A PRELIMINARY REPORT)*

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ABSTRACT

Fine Needle Aspiration Biopsy (FNAB) has been performed as a diagnostic procedure on patients with head and neck lymphadenopathy. This preliminary report covers a 24 month period (May 1989 - August 1991) and reviews the result of the initial 33 aspirates. Cytological diagnosis was accurate in majority and the specificity was 93%. The initial results prove encouraging. FNAB is useful and accurate procedure with many advantages over open biopsy.

INTRODUCTION

The differential diagnosis of a palpable node in the head and neck covers several possibilities including congenital, inflammatory and neoplastic, primary or metastatic. Early determination of the nature of the node is, therefore, necessary for definitive management to be instituted. One way is the use of open or excision biopsy wherein the node is sampled or removed thru a skin incision. But this procedure has several disadvantages such as: (1) of disruption the fascial planes and lymphatic channels, (2) seeding of the disease thru manipulation. These, then, decreases the chances for a clean surgical excision or cure. Fine Needle Aspiration Biopsy (FNAB) is a diagnostic procedure capable of detecting the benignity and malignancy of a node based on the aspirate obtained. Its advantages include (1) it is done on an out-patient bases, (2) it prevents the violation of the neck in patients with known or suspected malignancy, (3) it can in some cases e.g. lymphoma, cut short the need for other diagnostic workups needed to be done e.g. endoscopies.

This paper describes our experience on FNAB of head and neck nodes which was undertaken in the Department of Otolaryngology - Head and Neck Surgery, along with the Department of Pathology, East Avenue Medical Center and in collaboration with the Department of Pathology of the Santo Tomas University Hospital.

OBJECTIVES

1. To determine the diagnostic value of FNAB against the post-operative histodiagnosis in terms of
   a. ability to differentiate between benign and malignant lesions.
   b. give specific cytologic diagnosis based on aspirated samples.
   c. to compare our results with foreign studies
2. For the surgeons to gain experience and eventually expertise in the technique of FNAB of head and neck nodes.
3. For the cytopathologist to gain more experience and eventually expertise in the cytopathologic study of lymph node aspirates.

HISTORICAL REVIEW

Aspiration biopsy of lymph nodes was one of the earliest applications of FNAB. **Grieg et al**, used this technique in 1904 to search for trypanosomes. In 1914, **Ward** used aspiration biopsy as a diagnostic technique in neoplastic disease. **Guthrie** in 1921, reported aspiration of lymph nodes. **Martin and Ellis** popularized the technique in the U.S. Soon thereafter, this technique became more accepted and monographs dealing with this subject appeared in the literature.

In the local setting, much of the articles written on FNAB in the head and neck area were on the thyroid. Little has been written on lymph node aspiration biopsy. In 1981 **Flor et al.**, biopsied 34 neck nodes using a gauge 17 needle with a reported sensitivity of 83%. **Dela Cruz et al.**, in 1986 reported the use of FNAB

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A GREAT MIMIC*

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INTRODUCTION

Tuberculosis, malaria and typhoid fever are disease entities which are considered to be "Great Mimics" because they can simulate a large number of unexpected diseases. They can also present in an unusual manner posing a diagnostic challenge for every physician. These diseases, particularly during their initial stages, can be misleading even after exhausting all work-ups possible. Sometimes only when the manifestations become peculiar that the diagnosis becomes obvious.

This case presents another disease entity which was once thought to have characteristic manifestations now presenting in an unusual manner.

CASE REPORT

A 27 year old male, fisherman, consulted the Rizal Medical Center OPD for chief complaint of right facial assymetry and difficulty of opening the mouth.

History revealed that the condition started 9 days prior to consultation when the patient allegedly hit his head on a rock as he dived for "Kuhol" from a height of about 12 feet resulting in right facial swelling. No loss of consciousness was experienced. The swelling progressed prompting consultation with a private physician who prescribed antibiotics and an anti-inflammatory enzyme. Three days PTC, the patient experienced right facial paralysis accompanied by difficulty in opening the mouth. Vitamin B Complex was prescribed with no apparent improvement of complaints. Hence, consultation was sought at this hospital and the patient was subsequently admitted.

Past medical history was unremarkable.

Pertinent P.E. findings revealed a contusion hematoma at the right suborbital area with swelling noted at the right mandibular area. There was right sided facial paralysis and depressed malar prominence with trismus noted. The rest of the ENT findings were unremarkable.

Topographic testing of the facial nerve paralysis revealed the following results:

Schirmer's Test: OD = 35 mm
OS = 15 mm

Taste Test:
Equal taste sensations on both sides (100%)

Tuning Fork Tests: Weber = No lateralization
Rinne = AC > BC, bilateral

Ophthalmologic examination revealed inability to close the right eye with increased lacrimation. The rest of the findings were unremarkable.

An impression of maxillofacial trauma probably temporal bone fracture, (Longitudinal) with facial nerve paralysis; Tripod fracture, R/O mandibular fracture was entertained.

COURSE IN THE WARD

Upon admission, the patient was placed on osterized feeding. X-rays of the temporal bone, mandible and temporomandibular joint were requested. Parenteral antibiotics (Pen G Na), steroids (Dexamethasone), and analgesics were started. Official X-ray results revealed no evidence of fracture in all views. Additional X-ray basal view was requested. Likewise, result showed no radiologic evidence of fracture. These findings ruled out zygomatic and mandibular fractures. Temporal bone fracture was still considered since, at times, this may not show on conventional x-rays. Trismus was attributed secondary to masseter muscle inflammation with possible abscess formation, R/O parapharyngeal abscess. Steroid therapy was continued.

Inspite of medications, facial nerve paralysis did not improve and trismus worsened. On the 4th hospital day, the patient developed abdominal rigidity and generalized muscle spasm. Because of this, another disease entity was entertained. A revised impression of tetanus was made.

The patient's history was reviewed and physical examination reevaluated. It was discovered that the patient sustained an open wound at the right supraorbital area after diving. Physical examination

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reevaluation revealed a scar at the supraorbital area with an underlying fluctuant area. Incision and drainage was done and purulent discharge was obtained as well as foreign bodies which appeared to be pieces of wood. Culture and sensitivity study of the discharge was done, result of which was negative for organisms.

On the strength of this clinical diagnosis, the patient was given Tetanus Hyperimmune Globulin 500 "U" intramuscularly and anti-tetanus serum 10,000 "U" intramuscularly. Intravenous diazepam (D5W 500 cc + 40 mg Diazepam) was given to control the muscle spasm. Parenteral dexamethasone was discontinued. The patient's condition remained guarded. No respiratory difficulty was encountered. After 3 days the patient's condition gradually improved and could open the mouth with difficulty but able to manage soft diet. There was still abdominal rigidity and muscle spasm on stimulation.

Following 7 days of anti-tetanus therapy, trismus further improved and the patient can open the mouth with little difficulty. The generalized muscle spasm disappeared but there was still occasional abdominal cramps. Facial paralysis likewise improved with increased muscle tone and appearance of the nasolabial groove.

Two weeks after admission, patient could open the mouth easily with no abdominal spasms noted. Inoculation of the last dose of tetanus toxoid 0.5 ml IM was given. Patient was placed on full diet. Only residual facial paralysis was noted with prominence of the previously ill-defined nasolabial groove. The patient was disharged the following day improved.

Four weeks later, the patient had improved greatly with no evidence of facial nerve paralysis and had remained asymptomatic.

DISCUSSION

When one is confronted with a patient having facial nerve paralysis associated with closed head injury, only one impression comes to our mind - that is, temporal bone fracture. According to **Paparella** (1980), when there is a complete facial paralysis following closed head injury, there is always an associated fracture of the temporal bone. This sign becomes diagnostic. Diagnosis of temporal bone fracture is made mainly on clinical grounds in the absence of the CT Scan. Conventional radiologic examinations are unreliable. In this patient, temporal bone fracture was highly considered even when clinical manifestations are not evident because of the following reasons:

1. History of closed head injury.
2. Normal otoscopic and tuning fork findings are still possible and further, could be due to medications given with subsequent improvement.
3. Delayed onset of facial paralysis may be explained by the fact that this might be a longitudinal type of fracture.
4. Negative radiologic findings may be due to difficulty in determining temporal bone fracture by conventional x- rays.

Another problem of the patient was trismus. With the history of trauma, zygomatic bone fracture and mandibular fracture were entertained. However, radiologic findings were negative. Hence, these two fractures were ruled out. Furthermore, there was no significant bone deformity on physical examination. The flattening of the malar prominence may be explained by the presence of periorbital swelling making the malar prominence appear depressed. Trismus was attributed to be secondary to masseter muscle inflammation with possible local abscess formation. This could explain the delayed onset of the trismus.

Being convinced that this is truly the result of temporal bone fracture, longitudinal type, and masseter muscle inflammation with possible abscess formation, the patient was given steroids and antibiotics. No improvement was noted after several days and in fact, trismus became more severe. This may indicate that antibiotic given had a slow effect on the infection. It was only when the patient developed abdominal rigidity with generalized muscle spasm that the clinician considered another disease entity - Tetanus. No other disease resembles a fully developed tetanus. On review of the history, the patient sustained an open wound that had closed at the right supraorbital area, which, later, was found to contain foreign bodies. Toxin production in wounds by *clostridiumtetani* is favored by necrotic tissue, foreign bodies, calcium salts and associated infections which establish low oxidation-reduction potential. Infection caused by tetanus bacillus remains strictly localized, but the toxin produced is transported to the central nervous system via neural pathways. Incubation period would range from 3 days to 3 weeks. This would explain the pathologic process in this patient.

There is no doubt that this is a case of tetanus even with a negative culture finding. According to Harrison's Principles of Internal Medicine, the diagnosis of tetanus is entirely clinical and does not depend on bacteriologic confirmation. Frequently, the organism is not detected either by Gram's stain or by culture even in the presence of definite tetanus.

Could the tetanus be the cause of the facial nerve paralysis? According to **Mandell, Douglas and Bennett**

(1985), the most common cranial nerve involved in cephalic tetanus is the facial nerve. "Cephalic tetanus is an unusual form of the disease occasionally occurring with chronic otitis media or following injuries to the head. Isolated or combined dysfunction of any of the cranial motor nerves may occur, but involvement of CN VII is most often encountered." Although facial nerve paralysis in tetanus is not frequent, definitely it can ocur in any of these cases.

Another possibility entertained was Bell's Palsy occuring simultaneously with tetanus. There has been no report in any medical literature of such a case. Bell's Palsy could easily be entertained due to the fact that it is idiopathic in cause and spontaneously heals. However, it was pointed out that facial nerve paralysis can develop with tetanus and the fact that it improved simultaneously with the improvement of the trismus after anti-tetanus therapy, really convinced the clinician that this is not Bell's Palsy but is truly secondary to tetanus.

Tetanus is not uncommon. The incidence of tetanus worldwide is probably 300,000 to 500,000 each year (Harrison). At theSan Lazaro Hospital, there is an average of 1415 cases per year. The overall case fatality ratio ranges between 40-60%. Local experience at San Lazaro Hospital shows a lower rate of 9.68% which is still significant. Tetanus can present initially with stiffness of the jaw and trismus. At this stage it may mimic other local causes of jaw pain, like parapharyngeal abscess and peritonsillar abscess making diagnosis difficult. It then presents with spasms of the abdominal, back and neck muscles, laryngospasm and later, convulsions causing fatal asphyxia. Antiserum does not neutralize tetanus toxin once it is fixed in the central nervous system, hence early diagnosis is important and injection of human tetanus immune globulin should be given as soon as tetanus is detected, so it may not reach the stage when it is irreversible and fatal. Therefore, tetanus should always be considered in patients with a history of a wound with muscle stiffness or spasm. At times, a history of wound is not apparent. Patients could have sustained what appears to be an insignificant wound a few days or weeks before the onset of symptoms and have forgotten about it as in this patient. It is here where there should be a high index of suspicion so that the history may be re-evaluated. Given a history of head injury with resulting trismus and facial nerve paralysis, the initial impression would be a temporal bone fracture with a zygomatic fracture R/O mandibular fracture. However work-up did not confirm this and the patient did not respond to the treatment. Only when the more common manifestations of tetanus appeared was the diagnosis of tetenus considered. A closer look at the history revealed that the patient had sustained an open injury. A complete history and physical examination with a high index of suspicion could have made the difference.

SUMMARY AND RECOMMENDATION

Tetanus presents with otolaryngologic manifestations. With its presentations in the head and neck, a number of them will be seen or referred to an otolaryngologist especially at a time when it is not yet fully evident. This report was made to make clinicians more aware that tetanus is not a rare disease. It can develop in any person who sustains an open wound or even a patient with chronic otitis media. It can present with trismus misleading one to impressions of zygomatic bone fracture, mandibular bone fracture or local infections like peritonsillar or parapharyngeal abscess. More so, although unusual , it may present with facial nerve paralysis which can mislead us to impressions of temporal bone fracture or Bell's palsy. The mortality rate is high. There should be a high index of suspicion in all patients with a history of wound developing muscle spasm so that prompt management can be given. When diagnosed early, tetanus is still reversible.

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ANGIOSARCOMA OF THE NECK
(A Case Report)*

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INTRODUCTION

Soft somatic connective tissue, such as blood vessels and muscles, constitutes a substantial part of the human body. However, they rarely undergo malignant transformation. In the head and neck region, there are three principal malignant vasoformative tumors. These are hemangiopericytoma, angiosarcoma or hemangiosarcoma and Kaposi's sarcoma. All are extremely uncommon and provide challenges for the pathologist and the therapist as well.

Angiosarcoma or hemangiosarcoma is an exceedingly rare malignancy which accounts for only 2 percent of all soft tissue sarcomas. It usually arises in soft tissue, but has been found in almost every organ, including bone. In the head and neck region, reports show that it arises from the scalp, skin and buccal cavity but rarely in the neck.

This lesion has been reported in foreign literature. The MD Anderson Hospital in Houston, Texas recorded seven (7) cases of Angiosarcoma in the head and neck from 1945 - 1960 (**Batsakis**,1979). In a series of 449 tumors of the soft tissue, **Martin et al.** (1965) found only one case of hemangioendothelioma / angiosarcoma. **McCarthy** and **Feinersman** (1969) found only 2 cases in the head and neck and the predominant site is the scalp and skin. In the local literature, there is one reported case which originated from the oral cavity. After reviewing both foreign and local journals, probably this will be the first locally documented case of angiosarcoma of the neck.

Objectives of the Report

1. To increase consciousness among the otolaryngologist and general practicioner as to the nature of the lesion.
2. To present the therapeutic dilemma in the management of such tumor in the neck area.

Case Report

The patient is J.P., 59 year old, male, married, from Quezon City, admitted for the first time because of a left neck mass of 2 months duration.

The present condition started around 2 months PTA, when the patient noted a gradually enlarging mass located over the left neck area. Prior to this,the patient noted on and off pain on the left neck area radiating to the left upper extremity. No history of any injury or previous operation was obtained. Initial size could not be ascertained. Upon consultation with a physician, laboratory work-ups like EKG and CXR were done but showed negative results.

Three days PTA, the patient developed hoarseness, slight difficulty of swallowing and ptosis of the left eye. Due to the persistence of these signs and symptoms, the patient consulted this department and was subsequently admitted.

The patient is a known hypertensive and has a 9 year smoking history.

Pertinent physical examination revealed a soft, movable, non-tender, non-pulsatile left neck mass measuring approximately 8 x 9 cms. which does not move with deglutition. The left eye was noted to be ptotic. A fiberoptic laryngoscopy showed left true vocal cord paralysis. Other ear and nose findings were essentially normal.

Radiologic examination of the neck showed a soft tissue density over the left neck area. Computed tomography showed a large non-homogenous, slightly hypodense mass in the left side of the neck with rounded densities within. There was also deviation of the trachea to the right and partial compression of the thyroid gland in its postero-lateral border. The nasopharyngeal area was clear.

A Lee-Needle (gauge #18) aspiration and biopsy was done under general anesthesia. Final histopathological report showed pieces of tissue composed of fibrocollagenous tissue interspersed with some slit-like vascular channels, a few of which were filled with bizarre cells characterized by scant cytoplasms and dark hyperchromatic nuclei. DIAGNOSIS: Angiosarcoma.

Two days post-op, patient was noted to have yellowish discoloration of the skin starting from the

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TABLE I: Patients Whose Local Lesions Were Cleared by Radiotherapy (**Holden, et al.**, 1987)

Age & sex	Site and Size of Lesion	Treatment	Outcome
59/M	Bruise on Nose and cheek, 4-6 cms.	Excision followed by 6084 cgy over 45 days	Completely disease free for 12 yrs.
70/M	Soft tissue swelling, malar area, 5 cms.	Electron beam-5000 cgy over 28 days	Disease-free for 5 years Pulmonary mets after 5 years
81/M	Diffuse swelling at the tip of the nose	60 Co-gamma irradiation 5000 cgy over 40 days	Died suddenly of unknown cause at 18 mo.p/tx.
74/F	8 cm dia. plaque on scalp	4450 cgy over 28 days	No local disease
83/F	4.5 cm. crusted Scalp lesion	Electron beam-4400 cgy over 21 days	No evidence of disease, died of pulmonary embolus 1 yr. later.
61/M	Bruise-like area on scalp and forehead 6 cm.	Electron beam 4400 cgy over 23 days	Cleared. 10 yrs. later died of pul. mets.
80/F	Ulcerated lesion on scalp & face 3x2 cm. in size	Electron beam-4400 cgy over 17 days	No angiosarcoma days noted, died after 18 mo. later-unknown

Summary and Conclusion:

Angiosarcoma of the neck is a rare malignancy which calls for awareness as to its etiology, treatment and prognosis.

Although currently, all main reports have emphasized the bad prognosis of angiosarcoma, it does appear that a few patients can be treated successfully. However, it is unclear if surgery or radiotherapy offers the greatest hope, but recent journals and this case report shows that radiotherapy is slightly superior as a treatment modality.

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left neck down to the chest, but was noted to subside spontaneously.

The patient underwent cobalt therapy and received a total dose of 5000 rads in 30 days. Mass is noted to be decreasing in size, but hoarseness and slight pain over the left upper extremity still persisted. Since discharge, the patient has been under monthly observation.

Discussion:

Hemangiosarcoma, commonly termed as angiosarcoma is a malignant vascular tumor forming clusters of atypical endothelial cells in the reticulin sheath and anastomosing vascular channels (**Stout**, 1943). These tumors spread by local infiltration to the surrounding tissues, including muscle, fat and blood vessels. It has been reported that angiosarcoma can originate from the different tissues or organs. **Maddox** (1981) reviewed 44 cases which were seen to originate at the breast, scalp and even in the ileum. **Williamson** (1988) reported one case of angiosarcoma originating from the maxillary antrum.

The etiology of this highly invasive tumor is still unknown. Theories point to trauma as one possible initiating factor particularly that affecting the capillaries of the granulation tissue. Trauma can present as exposure to x-rays or toxic wastes. **Williamson** and **Ramsden** (1988) suggested etiological body factors in the causation of angiosarcoma in other parts of the body which include exposure to x-ray, thorium and, most importantly, vinyl chloride monomer. Preceding trauma, the occurence at the site of herpes zoster and as complication of a telangiectatic nevus or other vascular or lymphatic anomalies have been considered to be possibly relevant in the etiology of individual cases of angiosarcoma. In a report by **Callen** (1984), it showed a 57 year old woman, diagnosed to have herpes zoster 10 years previously developed angiosarcoma in the same dermatomal distribution. Recent evidence linking viral infection and vascular tumors is examined as it might apply to the pathogenesis of angiosarcoma.

Males and females are equally affected and there is no racial distinction. **McCarthy** and **Feinerman** (1969) found the incidence to be more common in patients 10 to 40 years of age.

Management and Prognosis:

A high incidence of clinical suspicion and early biopsy are very essential if the tumor is to be diagnosed at the stage when effective treatment can be undertaken. **Holden** (1987) stated that lesions greater than 10 cm in diameter appeared to have a uniformly bad prognosis whereas smaller lesions offer some hope of prolonged survival, or even cure, if aggressive treatment had been pursued. Most literature advocated surgical excision for small angiosarcomas. **Bardwil et al** advocated wide excision of the tumor, with resection of the regional lymph nodes of the neck. However, the results of this method of treatment have not been found satisfactory. **McCarthy** and **Pack** treated 20 patients by surgery with or without radiation but noted a 5 year survival rate of only 9 percent. Due to the rapid clinical course of angiosarcoma, patient is usually treated with primary surgical excision in 50% or succumbs to the disease within 3 years.

More recently, radiotherapy has been preferred in the treatment of angiosarcoma. **Agarwal** (1980) advocated radiation as the single method of treatment especially if the lesion is extensive and surgery would have been mutilating. **Kardmody** and **Kim** (1980) emphasized that such tumors contain actively proliferating blood vessels and respond maximally to radiation. **Holden** had a lower incidence of metastasis using radiotherapy as the primary treatment. Radiotherapy is given around 5000 cgy-6000 cgy over a 45 day period, as seen in Table I. Reports also show that chemotherapy is ineffective.

Prognosis of such lesion is usually poor. **Maddox** and **Evans** have detailed some of the clinicopathologic aspects that can influence the prognosis such as the amount of lymphocytic inflammation admixed with and surrounding the tumor is significant in determining local recurrence and survival. Tumor size of less than 5 cm was a favorable sign. **Panje** (1986) in a study of 11 cases of angiosarcoma, noted a 2 year survival rate of 50% and the 5 year survival rate was 22%. Regional metastases were seen in 18%. Metastasis occur via the bloodstream and lymphatics. **Maddox, et al.**, in the review of 38 cases involving the scalp-face, revealed the different sites of metastasis:

Lymph nodes	
Cervical	7
Axillary	1
Thoracic	3
Abdominal	2
Skeleton/bone marrow	2
Lung	6
Pleura/Diaphragm	1
Larynx	1
Heart/pericardium	2
Esophagus	1
Liver	4
Kidney	1
Adrenal	2
Thyroid	1
Soft tissue	1
Retroperitoneal	1
Lumbar	1
Mediastinal	1
Brain	1

IS A POST-TREATMENT ROENTGENOGRAPH OF THE MAXILLARY SINUS NECESSARY?*

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INTRODUCTION

In the field of Otorhinolaryngology, conventional radiographic examination although approaching obsolescence still gives invaluable information that is complimentary and supplementary to the clinical findings. An example of this is sinusitis. One of the diagnostic modalities in the management of sinusitis is the Water's view wherein the lucency of the maxillary sinus is compared to other structures. In acute purulent maxillary sinusitis, one tries to find an air–fluid level and sinus opacity. These radiographic changes in correlation with the history and physical examination constitutes a diagnosis of acute suppurative maxillary sinusitis. Treatment requires antimicrobial agents or supportive and symptomatic treatment depending upon its etiopathogenesis. Berg and Ledjeborn[1] in their recent study have emphasized the importance of repeated drainage as a major therapeutic principle especially in cases of purulent maxillary sinusitis. For patients who do not manifest clinical improvement after a week of oral antibiotic therapy, some authors advocate antral puncture. It has been a common practice to repeat the x–ray examination after the surgical procedure to determine any possible objective resolution of the radiologic changes and correlate with any persisting symptomatology. Ritter[2] recommend that patients on follow–up should have a repeat radiographic examination to monitor the progression or recovery from the disease. Wilson and Montgomery[3] also advocated post–treatment radiography for the same reasons. Some practitioners routinely ask for a repeat X–ray examination to base their next mode of management on its results. In this time of economic crisis, this would obviously mean added expenditure. The next thing to ask therefore is whether a post–treatment x–ray is mandatory . This study was designed to determine the importance of a post–treatment radiograph among patients who clinically present with acute purulent maxillary sinusitis.

OBJECTIVES

General: To determine whether a post–treatment radiograph of the maxillary sinus is necessary

Specific: To compare pre– and post– antral lavage radiographs, as to:

a) incidence of resolution of sinus opacity after the procedure
b) incidence of disappearance of air–fluid level after the procedure

MATERIALS AND METHODS

A. Selection of Patients

Patients seen at the Outpatient Department of the Ospital ng Maynila from the period of June, 1990 to August, 1990 were included in the study, based on the following inclusion criteria: a) those with signs and symptoms of acute purulent maxillary sinusitis such as nasal discharge, headache, nasal obstruction, sensation of fullness over the face, etc. within a period of one (1) to six (6) weeks. b) at least eighteen (18) years of age c) persistence of symptoms after an initial 7 day course of antimicrobial therapy and, d) consent to undergo antral puncture

Excluded from the study are patients who had recent history of antrostomy or antral irrigation.

B. Methodology

1. Clinical Assessment of Patients

Complete history and physical examination were done on all patients. Those with an impression of acute purulent maxillary sinusitis based on clinical manifestations were requested to have an initial radiographic examination (Upright Water's view) and were prescribed a 7–day course of antibiotics. (Amoxycillin 500 mg, 1 cap every 8 hours). These patients were advised to return after a week for re–evaluation.

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On follow-up, those who were unrelieved of symptoms were scheduled for antral puncture.

2. Radiographic Evaluation

Occipitomental projection of the skull (Water's view) on upright position were taken by only one radiologic technician on all patients during the initial consultation and three (3) weeks after treatment. The maxillary sinuses of these patients were evaluated radiographically as to the presence of air–fluid level and sinus opacity by the author and one certified radiologist. Similar evaluation was conducted on post-treatment radiogaphs.

3. Surgical Procedure

After decongestion with Oxymetazoline–soaked cotton strips, local anesthesia was done via anterior ethmoidal and sphenopalatine ganglion block using Lidocaine 4% solution applied topically using sterile cotton buds to both nasal chambers. Mucosal anesthesia was enhanced with Lidocaine 10% spray.

An inferior meatal opening was done on the radiographically involved maxillary sinuses with the technique illustrated below:

Antral lavage was done with about 80–100 ml of sterile normal saline solution until a clear return flow was obtained.
All patients were requested to come back after three (3) days for repeat irrigation.

4. Statistical Analysis

Significance of the results were calculated using the student's paired t–test.

RESULTS

Table I: Duration of Symptoms Among Patients Examined for Acute Maxillary Sinusitis

Total Number of Patients	Duration of Symptoms (Weeks)
11	4
5	6
2	3

Eighteen patients, fifteen females and three males with an average age of 32 years were enrolled in the study. The duration of symptoms varied among the patients, with a mean of 4.6 weeks as shown in Table I.

The patients presented similarly with headache, rhinorrhea, nasal obstruction and facial pain.

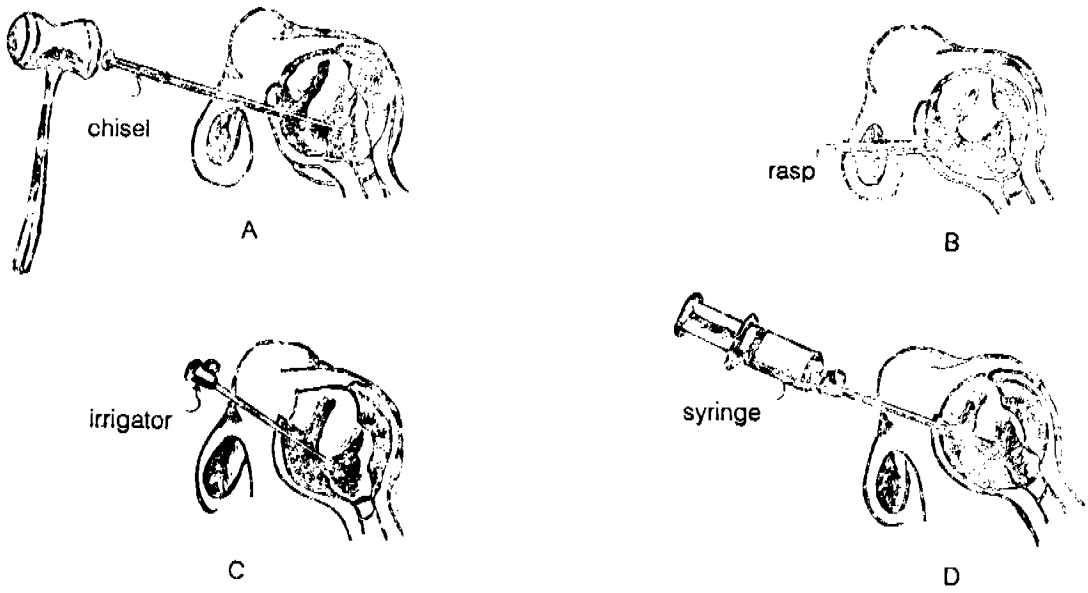

Table II: Comparison of the Radiologic Findings of Patients Before and After Antral Lavage

RADIOLOGIC FINDINGS

NO. OF PATIENTS	SINUS OPACITY				AIR FLUID LEVEL			
	ANTRAL LAVAGE				ANTRAL LAVAGE			
	Before		After		Before		After	
	R	L	R	L	R	L	R	L
1	+	+	–	–	–	–	–	–
2	+	+	–	–	–	–	–	–
3	–	+	–	–	–	–	–	–
4	+	+	+	+	–	–	–	–
5	+	+	–	–	–	–	–	–
6	–	+	–	–	+	–	–	–
7	+	+	–	–	–	–	–	–
8	–	–	–	–	+	–	–	–
9	–	+	–	–	–	–	–	–
10	–	–	–	–	+	+	–	–
11	+	–	–	–	–	–	–	–
12	+	+	+	+	–	–	–	–
13	+	+	–	–	–	–	–	–
14	+	+	+	+	–	–	–	–
15	+	–	–	–	–	–	–	–
16	–	+	–	–	–	–	–	–
17	+	+	–	–	–	–	–	–
18	+	+	–	–	–	–	–	–

Table II shows the radiologic findings on upright Water's projection of patients before and after the surgical procedure. Likewise it is shown from the table that most all patients had radiologic signs of bilateral sinus involvement. Only six (6) patients had either a right or left sided maxillary inflammatory disease.

Table III: Summary of the Radiologic Observation Noted Among the Thirty Sinuses Before and After Antral Lavage

Radiologic Observation	Before Antral Lavage	After Antral Lavage
Sinus Opacity	26	6
Air-fluid Level	4	0

A total of thirty (30) maxillary sinuses were noted to be unhealthy based on the stipulated radiologoic signs of acute sinusitis. Twenty-six of the thirty sinuses (87%) were found to be diffusely opaque or hazy and only four out of the thirty sinuses (13%) showed air-fluid levels prior to the antral washing. Post-treatment radiographic films showed 100% (four out of four) disappearance of the air-fluid level. Seventy-seven (77) percent (twenty out of twenty-six) of the sinuses showed complete resolution of opacity after antral lavage. However, twenty-three (23) percent (six out of twenty-six) of the sinuses failed to show complete resolution of the opacity after treatment.

DISCUSSION

The maxillary sinuses, one of the earlier pneumatized sinuses have been the most commonly affected with inflammatory disorders. Vicente and Hernandez et al[4] attributed this to its position as a reservoir for the other paranasal sinuses with its ostium entering the middle meatus of the nasal cavity in an unfavorable anatomic position. Inflammatory diseases which may either be infectious or non-infectious involving the paranasal sinuses results in swelling of the lining membrane that can lead to obstruction of the sinus ostia. Malow and Creticos[5] emphasized the observations of earlier researchers regarding a patent sinus ostium as the most important factor in the pathogenesis of sinusitis.

Maxillary sinusitis maybe classified as acute or chronic based on: 1) duration of symptoms; 2) microbial etiology and 3) radiographic evidences of pathology in the maxillary antra. The signs and symptoms of acute sinusitis are often nonspecific such as headache, rhinorrhea and facial pain. Prolonged or repeated episodes may lead to irreversible injury to the mucosa resulting to the chronicity of the disease. Air-fluid level and sinus opacity are the most common roentgenographic signs of acute purulent maxillary sinusitis. Intrasinus fluid levels are secondary to retained secretions and noted when radiographs are taken with the patient upright. A loss of translucency resulting in a hazy diffuse opacity is observed as a result of thickened lining membranes and the presence of inflammatory exudate.[6]

Patients with acute maxillary sinusitis improve with an initial course of antibiotic therapy. The choice of antibiotics should be guided with appropriate bacteriological studies. For patients who do not show clinical improvement from the antimicrobial treatment, antral puncture or irrigation at least three times should be done prior to the more radical transbuccal maxillorhinostomy. This study demonstrated that the two most common radiologic findings in acute purulent maxillary sinusitis were the presence of air-fluid level and sinus opacity. There were no significant radiologic changes noted in the maxillary sinuses before and after lavage. This observation is based on the t-computed value of 1.5 at p= 0.05 level of significance (Appendix). The six (6) opaque sinuses that failed to show objective resolution after the lavage maybe attributed to thickened bony walls or antral hypoplasia. Incidentally, these sinuses belong to patients who experienced some difficulty during the procedure.

CONCLUSION

In summary, it may be inferred from this study that there is no need to request for another radiograph after irrigation among patients with acute purulent maxillary sinusitis. Clinical symptomatology of patients on follow-up may guide the clinician as to the resolution or progression of the disease process. Hence, routinary post-treatment X-ray films may not be necessary.

RECOMMENDATIONS

It is recommended that further studies be conducted using a larger sample size to re-assess the value of post-treatment roentgenography.

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APPENDIX

Student's T-test Computation for the paired observations

Observations	Antral Lavage Before	After	d_1	d_1^2
Sinus opacity	26	6	20	40
Air-fluid level	4	0	4	16
Sum ( )	30	6	24	416
Mean ($\bar{X}$)	15	3		

$$S^2 = \frac{d_1^2 - \frac{(d_1)^2}{n}}{n-1}$$

$$= \frac{416 - \frac{(24)^2}{2}}{2-1}$$

$$= 128$$

$$\bar{S}d = \sqrt{\frac{128}{2}} = \sqrt{64} = 8$$

$$T = \frac{\bar{X}_A - \bar{X}_B}{S\text{-}d} = \frac{15-3}{8} = 1.5$$

CONCLUSION

Since the T computed value, 1.5 is outside the critical region ($-12.71 < T > 12.71$ at $p = 0.05$), the conclusion is that the mean difference of observation before and after antral lavage is zero.

FIRST BRANCHIAL CLEFT FISTULA: A CASE REPORT*

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ABSTRACT

The overwhelming majority of branchial cleft anomalies encountered in the neck area are those of the second cleft origin. The incidence of first branchial cleft anomalies based on previous reports have ranged from uncommon to extremely rare. This is the first locally reported case of a first branchial cleft fistula. This type of congenital anomaly proved to be interesting because it is a clinical problem that can become difficult to diagnose and subsequently treat even for experienced medical practitioners. Correct diagnosis and successful management depends on the ability to appreciate the exact nature of the defect which is based on the knowledge of the development of the branchial apparatus. Surgical excision, the treatment of choice, required a standard parotidectomy incision and protection of the facial nerve from injury because of its intimate position relative to the fistulous tract.

Introduction:

It was not until 1923 when Frazer alerted physicians to the possibility of first branchial cleft defects.[1-3] He described the topography of such anomaly based on embryological anatomy. Credit however, goes to **Hyndman** and **Light** when in 1929, they reported the first case of branchial cleft anomaly.[1-3] Since then, various authors have reported cases of embryological defects of the first branchial cleft the largest of which was the report of 38 cases by **Olsen et al.**[1-7] The incidence according to these authors have ranged from uncommon to extremely rare. Regardless of the incidence, the fact remains that this type of anomaly is fascinating and interesting because it is a clinical problem that can become difficult to diagnose and treacherous to treat if one is not aware of the condition owing to the intimate position of the lesion to the facial nerve.[3]

The **objectives** of this paper are:

1. to present the first documented case of a first branchial cleft diagnosed and managed in this institution and in the country , and
2. to review and discuss the embryology and important facts about such anomaly.

CASE REPORT

R.P.M., a one-year and nine-month old male was admitted for the first time at the Jose R. Reyes Memorial Medical Center because of discharge coming from the left submandibular area. One day after birth, the patient was noted to have a scanty, serous, nonfoul discharge coming from a pinpoint hole below the angle of the left mandible. The amount of discharge progressively increased in quantity as the infant grew. Three months prior to admission, a 1 x 1 cm. soft, tender, progressively enlarging mass appeared at the left submandibular area. The patient also developed intermittent moderate grade fever. A private physician was consulted and a diagnosis of suppurative lymphadenitis was entertained. Incision and drainage was then performed and cloxacillin and acetaminophen were prescribed which afforded only temporary relief. One month PTA, the swelling recurred. A second physician was consulted and he noted discharge coming from the left ear. Cloxacillin was again prescribed and afforded relief. Nine days PTA, swelling was again noted. A third physician was consulted who referred the patient to this institution where an impression of a first branchial cleft fistula was made.

There is no history of congenital nor developmental defects in the family.

Pertinent physical examination revealed a pinpoint hole with scanty, whitish, nonfoul discharge at the area below the angle of the left mandible. The left pinna and pre-auricular area were normal. On plugging the external opening with simultaneous exertion of pressure on it, a similar discharge was noted at the osseocartilaginous junction of the left external auditory canal. The left tympanic membrane

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was grossly unremarkable. The rest of the ear, nose, throat, head, neck and general examination findings were normal.

Radiographic examinations showed a normal left mastoid and no evidence of osteomyelitis of the mandible. Tympanometry revealed a Type A tympanogram which is normal.

The patient underwent **fistulectomy** on November 17, 1990. The lesion was exposed through a standard parotidectomy incision. A fistulous tract was noted from its cutaneous opening at the left submandibular area running superiorly into the substance of the parotid gland and passing medial to the facial nerve trunk with its other opening at the osseocartilaginous junction of the anteroinferior wall of the external auditory canal (Figure 1). Meticulous dissection was done to avoid injury to the facial nerve by gently retracting it away from the fistulous tract. The whole tract was completely excised. The postoperative course was uneventful and no evidence of facial nerve injury whatsoever was noted.

Histopathologic examination revealed skin, cartilage, and soft tissues lined by thin layers of stratified squamous epithelium. A tract lined by stratified squamous to cuboidal epithelium without atypia was noted. There were some remnants of glandular structures lined by a single layer of cuboidal cells within the deeper layer of segments around the tract. The fluid was composed of fragments of keratin materials. There was no evidence of malignancy. The microscopic examination findings were compatible with the histologic pictures of a **branchial cleft fistula.**

EMBRYOLOGY

The normal development and differentiation of the **branchial apparatus** responsible for the formation of the jaws and the neck begins during the third week of embryonic life and is usually completed by the seventh week.[2,3,7,8,9] This structural group is composed of **five paired arches of mesoderm** separated by four pairs of invaginations of **ectodermic grooves of clefts** and **endodermic pouches** (Figure 2). Each arch is supplied by its own artery and nerve and has a condensation of the mesoderm called a **branchial bar** which gives rise to cartilaginous, bony, and muscular structures in the fully developed fetus. The tragus arises from the first branchial arch and the rest of the pinna is thought to arise from the second branchial arch.[10-11]

The **first branchial cleft** is unique in the sense that it is the only cleft that does not become obliterated completely. The dorsal and middle portions of the first cleft forms the external acoustic meatus and the cavum conchae respectively. The ventral portion disappears. Cell rests of the ventral portion of the first cleft that are buried or incompletely obliterated results to subsequent cleft defects.[2,7]

Since the development of the branchial apparatus is complete by the **seventh week** of embryologic life, anomalies involving the first branchial cleft would have been formed at this period.

The **parotid gland** initially develops as an epithelial flange near the angle of the mouth at the sixth week. During the next two weeks this tissue elongates, forms a tube and branches backwards and upwards toward the ear. In addition, the facial nerve and its muscles migrate superiorly at about the same time.

Initially, the external ear is located anteromedially. By the second month, the mandible and face develop and, as a result, the pinna is repositioned dorsolaterally when the mandible grows forward and downward. Therefore, **anomalies of the first branchial cleft** would be expected to be found at a level between the main derivation of the first and second branchial arches and should be closely or intimately related to the external auditory canal, parotid gland, angle or horizontal ramus of the mandible and/or facial nerve.[2,7,12]

Figure 1. Operative findings showing the fistulous tract and its superior attachment to the external auditory canal.

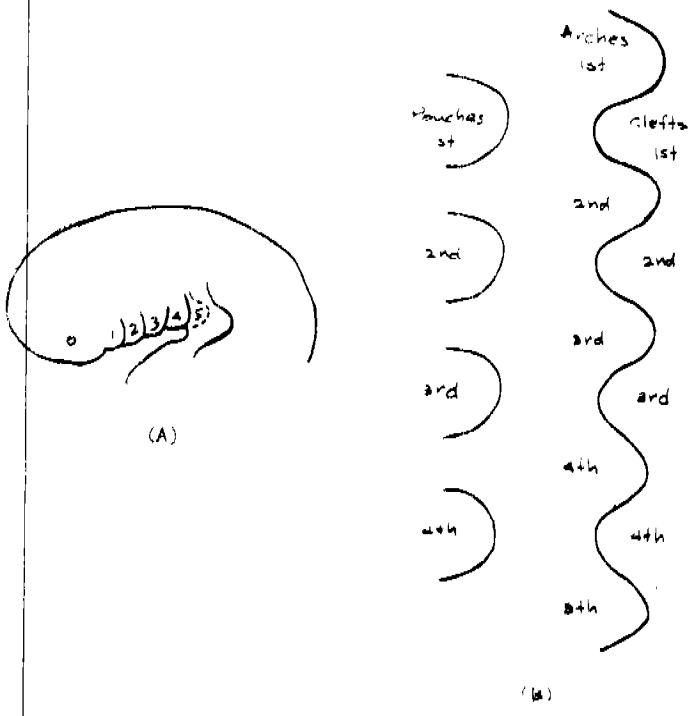

Figure 2. The branchial apparatus. (A) Embryo at 4 weeks old. (B) Schematic representation of the 5 branchial arches separated by the cleft externally and pouches internally

DISCUSSION

Congenital anomalies of the branchial apparatus are commonly encountered in the neck area. The overwhelming majority of these abnormalities are of the second cleft origin while those arising from the first cleft are **relatively rare** comprising less than 1% of all branchial cleft anomalies.[13] Olsen et al discovered 38 defects of the first branchial cleft out of 460 cases of branchial cleft anomalies constituting approximately 8%.[7]

Batsakis stated that because of its rarity, there is: (1) **failure to recognize** these lesions clinically; (2) **inadequate excision** that can lead to surgical failure, infection, and recurrence; (3) danger of **injury to the facial nerve** during surgical treatment; and (4) **general unawareness** of the histopathological appearances of the lesions by the pathologists.[13]

The key to the understanding regarding this rare and interesting type of congenital defect rests on the thorough knowledge of the embryological development of the branchial apparatus and hence, **diagnose and offer definitive treatment** to such disease entity without much difficulty.

Work[4] has proposed the classification of first branchial cleft defects in those derived from the first cleft which results in duplication of the membraneous external auditory canal as **Type I (ectodermal origin)** and those associated with the first cleft and the first arch which result in duplication of the membraneous external auditory canal and cartilaginous elements as **Type II (ectodermal and mesodermal origin). Type I** lesions are situated characteristically medial, posterior, and inferior to the concha and course above the facial nerve, parallel to the normal external auditory canal and terminate in a cul-de-sac at the bony plate at the level of the mesotympanum (Figure 3). Microscopic findings would reveal that these are lined with squamous epithelium and contain keratin formation with or without the presence of accessory skin structures. **Type II** anomalies occur earlier in childhood than Type I. They manifest as superficial cysts or sinuses below the angle of the mandible. The tract travels upward and backward over the angle or body of the mandible, pierces the parotid gland substance, lying medial or lateral to the facial nerve and end blindly or openly in the lumen of the external auditory canal at its osseous and cartilaginous junction (Figure 4). The histologic picture of Type II is similar to Type I except for the presence of cartilage.

Olsen[7] **proposed a simpler classification** wherein first branchial cleft defects are referred to as **cysts, sinuses or fistulae. A cyst** would refer to a structure lined with mucosa or epithelium with no opening. This occurs when buried cell rests from the ventral portion of the first branchial cleft are trapped. **A sinus** refers to a tract with or without a cyst that communicates to either the external auditory canal or the skin. This arises when there is incomplete obliteration of the whole or most of the ventral cleft. A **fistula** refers to a tract with openings at both surface epithelium and external auditory canal resulting from incomplete closure of the first cleft.

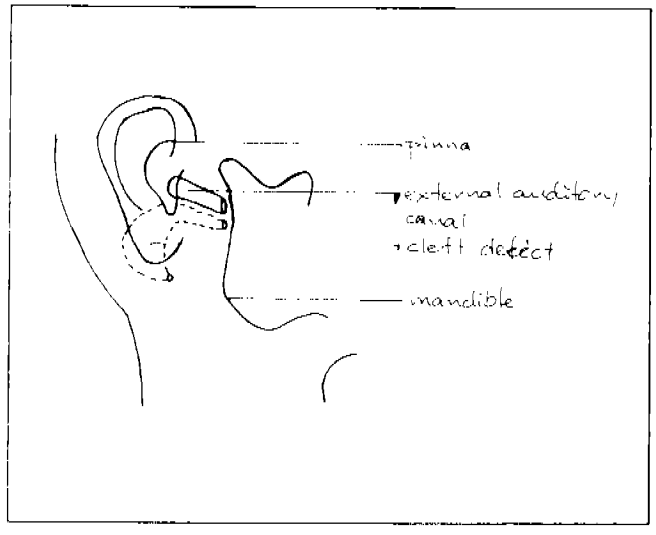

Figure 3. First branchial cleft defect Type I.

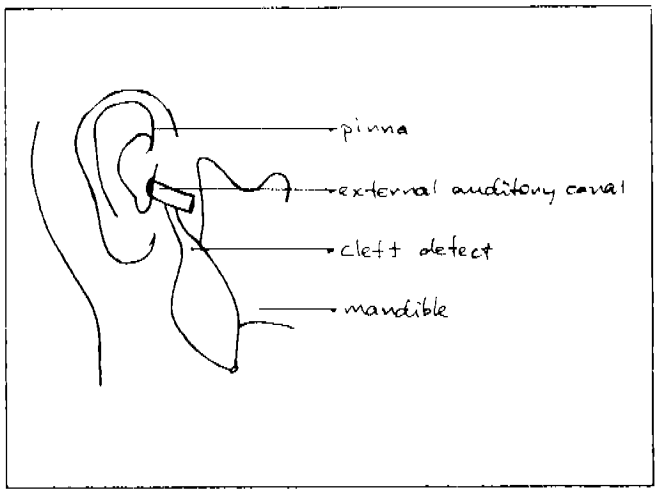

Figure 4. First branchial cleft defect Type II.

Both classifications were aimed at aiding in the diagnosis and improving surgical intervention.

There is general agreement that first branchial cleft anomalies should be considered **distinct clinically** from pre-auricular sinuses, cysts, and auricular tags which arise from abnormalities in the embryologic development of the first and second branchial arches.[1,2,4,7,11,13]

First branchial cleft anomalies are usually characterized by **episodes of infection with subsequent repeated incision and drainage.**

There is no sex predominance and these anomalies may present at any age period although cysts are most commonly noticed during the second through fourth decades of life. Cysts are known to be temporarily enlarged with or without tenderness during episodes of upper respiratory tract infections.

First branchial cleft sinuses and fistulae are usually noted at or shortly after birth or during childhood. **Aimi** and **Takino** emphasized the observation of **Byars** and **Anderson** that in making the diagnosis, the presence of a cyst or a fistula high in the neck associated with aural discharge in the absence of otitis media should suggest the possibility of the first branchial cleft anomaly. A sinus with opening into the external auditory canal or at the bony plate at a level of the mesotympanum can be coverted into a fistula after being subjected to incision and drainage.

A mass, with or without discharge, located in the lateral neck area may be a neoplasm, inflammation, or congenital malformation. **Neoplasms** of the lateral neck are characterized by progressive enlargement and firm to hard consistency. **Inflammatory conditions** like benign inflammatory adenitis may be mistaken for branchial cleft cysts because they enlarge and regress in size during and after infection. The final diagnosis is based on microscopic examination.

Branchial cleft sinuses and fistulae are noted shortly after birth or early in infancy as draining dimples. Repeated infections and swelling may make the diagnosis difficult. However, head and neck surgeons who are aware of this congenital anomaly rarely mistake sinuses or fistulae for **other disease entities** which include, among others, suppurative lymphadenitis, dentoalveolar abscess, odontogenic cysts with osteomyelitis, or chronic otitis media with Bezold's abscess. As in branchial cleft cysts, the **final diagnosis** is confirmed by **histopathologic** examination.

Surgical excision is the treatment of choice which should be performed when the patient is free from infection. Adequate surgical exposure, often necessitating a standard parotidectomy incision, is widely advised. The surgeon must be extra careful in dissection to avoid injury to the facial nerve and its branches. If one is to follow these sound surgical principles rigidly, permanent cure without recurrence is the rule rather thanthe exception.

Work suggested marsupialization of type I lesions to promote and enhance wound healing.[4]

Based on Work's classification this case is classified as **first branchial cleft fistula, type II.** The condition was noted shortly after birth. Initial management by different physicians proved unsuccessful in affording a cure because of their failure to appreciate the exact nature of the defect. Fortunately enough, the case was referred to this institution. The clinical history, physical examination, operative findings and histopathological examination confirmed initial impression of a first branchial cleft anomaly. Six months after the operation, the patient was noted to be asymptomatic with no sign of recurrence.

Summary:

This is the first locally reported case of a first branchial cleft fistula, Type II. Initial diagnosis proved to be difficult as evidenced by the failure to treat the disease effectively inspite of the repeated previous medical and surgical interventions. Surgical excision, the treatment of choice, was done when the patient was infection-free. The fistulous tract was noted to be intimately related medially to the facial nerve and connected with the external auditory canal. With the working knowledge of embryology, the facial nerve was protected by predicting the course of the fistula after adequately exposing the operative field through a standard parotidectomy incision.

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AUDIOMETRIC ASSESSMENT OF TYMPANIC MEMBRANE PERFORATIONS*

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INTRODUCTION

The tympanic membrane is useful through its sound transformation mechanism to the oval window and its sound protection properties to the round window. Any form of force/trauma that distorts or violates its anatomical configuration will, in turn, produce some degree of hearing impairment.

This study deals with the role of the tympanic membrane as a sound transforming organ that transmits sound waves to the inner ear. Thus, we are limiting the study to the vibratory surface of the tympanic membrane, pars tensa. This study also attempts to prove if the tympanic membrane truly does have a role in sound protection.

OBJECTIVE

The objective of this study is to determine audiometrically the degree of hearing loss following tympanic membrane perforations, correlating the size and site of perforation with degree of hearing loss.

METHODOLOGY

This is a prospective study of patients diagnosed to have tympanic membrane perforations. The subjects ages ranged from 12 to 66 years with an average age of 28 years . A total of 100 consecutive audiometric tracings for each category were included. The study was carried out in the following manner.

1) After thoroughly cleaning the external auditory canal, patients with tympanic membrane perforations were examined using a 30 degree Hopkins rigid sinuscope for better illumination and visualization. The perforations were subjectively estimated by three (3) examiners and the average of which were recorded and entered into our data.

2. The tympanic membrane (pars tensa only) was divided into two halves, anterior and posterior, the midpoint of which is the umbo. Perforations were quantified and labelled "small" and "large" depending on the average estimates done by the 3 examiners. "Small" perforations are those approximately having 25% ± 10 and "large" having 75% ± 10 of its vibrating surface gone. Perforations were likewise grouped according to their location. They were labelled "anterior" or "posterior" accordingly. However, a pure anterior or posterior perforation seldom exist. Overlapping was more oftenly seen in our patients. Thus, we have decided to include only those whose "excess" does not exceed 1/3 of its bulk.

3. Patch testings were done to evaluate the integrity of the ossicular chain. We assume that a threshold improvement of at least 5 dB on audiometry is satisfactory in assuming the patency of the ossicular chain and thus were included in the study.

4. Patients with purely conductive losses of greater than 50 dB from normal were assumed to have ossicular discontinuity, and were thus disqualified.

5. All patients included in the study have asymptomatic or dry ears for at least six (6) months and a concomitant negative findings on their mastoid series.

6. Audiometric tracings were done by the same audiomet- rist and audiometer, after proper calibration by a reputable company and clinical audiometry on "normal" clinical clerks and interns. The average threshold results were taken and these were used as the correction factor to be added or subtracted from the threshold results for each frequency. Audiometric zero (0 dB) was used as reference point in this study.

7. Only pure tone (air conduction) results with normal bone conduction were included in the study. Excluded from the study are patients with sensorineural & mixed types of hearing loss and patients with any ossicular chain pathology.

8. The average of pure tone threshold at 500 Hz, 1,000 Hz, 2,000 Hz, 3,000 Hz (speech frequencies) will be used to quantify hearing impairment.

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* Presented at 11th Boehringer Ingelheim Clinical Research Contest, held at Silahis Hotel, Manila, Oct. 11, 1991.
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RESULTS

Table 1 AUDIOMETRIC RESULTS OF TM PERFORATIONS

		500 Hz	1,000Hz	2,000Hz	3,000 Hz
	ANTERIOR				
n=100	SMALL (dB)	12.70	13.33	13.60	14.00
n=100	LARGE (dB)	34.70	33.45	34.55	32.35
	POSTERIOR				
n=100	SMALL (dB)	18.85	18.80	19.05	19.45
n=100	LARGE (dB)	37.90	36.85	36.65	35.10

Given a sample X1, X2, ..., Xn of size n. The sample variance is defined as follows:

$$S^2 = \frac{1}{n} \quad (X_i - x)^2$$

The expected value of S^2 is

$$E(S^2) = \frac{n-1}{n} \quad \sigma^2 = \sigma^2 - \frac{\sigma^2}{n}$$

The unbiased estimate of S^2 is $\hat{\sigma}^2$ where

$$\hat{\sigma}^2 = \frac{1}{n-1} \quad (X-\bar{X})^2$$

Thus S^2 is the sample variance and $\hat{\sigma}^2$ is the unbiased estimator of the population variance.

The t statistic of a sample with mean and variance

σ^2 is $t = \dfrac{\bar{x} -}{\sqrt{\dfrac{(X-\bar{x})^2}{n(n-1)}}}$

t testing

1) Null Hypothesis, Ho: $M_1 = M_2$

There is no significant difference between the degree of hearing loss determined audiometrically between anterior and posterior TM perforations for a given frequency.

2) Alternative Hypothesis, H1: $M_1 \quad M_2$

There is a significant difference between the degree of hearing loss determined audiometrically between the anterior and posterior TM perforations for a given frequency.

alpha $\alpha = 0.0005$

If computed t is greater than the t value (3.291) from the t table, then, there is a significant difference and, the null hypothesis is rejected. This means that the probability of such Δ t occuring is less the 0.0005%.

Table 2

		alpha	t	conclusion
1)	ant. perf. small vs. post. perf. small	0.0005	6.69	reject Ho
2)	ant. perf. small vs. post. perf. small 1000 Hz	0.0005	6.89	reject Ho accept H1
3)	ant. perf. small vs. post. perf. small 2000 Hz	0.0005	6.36	reject Ho accept H1
4)	ant. perf. small perf. small 3000 Hz	0.0005	6.22	reject Ho vs. post accept H1
5)	ant. perf. large vs. post. perf. large 500 Hz	0.0005	9.55	reject Ho accept H1
6)	ant. perf. large vs. post. perf. large 1000 Hz	0.0005	9.59	reject Ho accept H1
7)	ant. perf. large post. perf. large 2000 Hz	0.0005	2.29	acceptHo vs
8)	ant. perf. large vs. post. perf. large	0.0005	3.14	accept Ho 3000 Hz

DISCUSSION

The physiology of hearing starts from the sound waves that traverse the external auditory canal and impinging on the tympanic membrane thereby causing it to vibrate. However, of the approximately 70-80 sq. mm., only 2/3 (55 sq. mm.) is set into vibration. Any distortion on the vibrating surface of the tympanic membrane would theoretically produce a certain degree of hearing loss. By the process of impedance matching, the acoustic energy in the air-bone sound is efficiently transformed into vibratory energy in the fluid-filled cochlea. Thus, it can be expected through the laws of physics that any diminution of the vibrating surface of the tympanic membrane would correspond to a proportional hearing impairment as energy transmitted to the oval window is also diminished.

The results indicate that there is an increasing degree of hearing impairment noted with a concomitant increase in tympanic membrane perforation. However, Katz pointed out that a greater degree of hearing impairment on perforations directly above the round window can be appreciated. This area, located posteroinferiorly gave us a higher pure tone threshold compared to an anteriorly located perforation. He attributed a "cancelling" effect on the perilymph for the marked diminution of hearing. The inertia produced by the in and out movement of the footplate on the oval window is neutralized by the "backward" waves produced by sounds impinging on the round window, in effect decreasing the velocity and amplitude of the waves. The same results were shared by Crowe and Hughson when they reported that a puncture of the

drum has little effect on the sound whether the puncture is in the anterior or posterior. However they noted a 15 dB improvement on hearing when the round window niche was covered by cotton. **Juers**, on the other hand suggested that hearing loss caused by perforation maybe related to the part played by the tympanic membrane in modifying or damping the intensity of the sound waves transmitted through the tympanic cavity to the round window.

Furthermore, the middle ear is confined in a bony compartment. Any sound wave that would traverse the middle ear cavity would cause a proportional degree of reflected sound wave pressure that would cause some degree of distortion on the surface area of least resistance. In effect, the round window absorbs most of these reflected sound wave pressure because of the pliability the membrane exhibits. In turn, the perilymph, like other form of liquids, is believed to be in constant movement basically caused by the movement of the footplate of the stapes on the oval window and, secondly, from the round window membrane. In this aspect, we attribute part of the lost inherent sensitivity of the human ear compared to other forms of lower animals to the "backward" flow which makes the inertia and amplitudes of the ongoing waves diminished.

Tympanic membrane perforations and its effect on audiogram were likewise studied by **Anthony** and **Harrison** confirming a greater loss in the low frequencies in the posterior inferior quadrant when compared to the anterior inferior quadrant. However, studies on the round window by **Goycoolea** (1989) revealed that the round window is a semipermeable membrane that lacks the vibratory properties of the tympanic membrane. They were able to conclude that the round window, however anatomically similar to the tympanic membrane, is physiologically different.

Secondly, the anatomical location of the round window does not permit direct stimulation because it is somewhat protected by a niche of bone, the subiculum, and the window is posteriorly and inferiorly located. Therefore, even a large central perforation that lies directly above the round window would produce a significant hearing loss on the basis of its diminished surface area and its altered hydraulic properties rather than the "cancelling" effects produced on the round window.

Similarly, this study was designed to compare the hearing thresholds at different frequencies and correlate with the size and site of tympanic membrane perforations. A significant difference of pure tone thresholds were obtained when the values obtained from tympanic membrane perforation at different locations were compared. From the results, posteriorly located perforations, whether small or large, have poorer thresholds compared to their anteriorly located counterparts. This may indicate that the cancelling effect produced on the round window may indeed exist and thus the sound protection functions of the tympanic membrane could indeed be valid.

CONCLUSION

From the above results, it can be concluded that the larger the tympanic perforation, the greater the amount of hearing loss. However, the size of tympanic perforation is not the only determining factor to be considered. The site plays a major role as well in determining the degree of hearing impairment an individual develops with TM perforation. Thus, even a small perforation, located posteriorly could give a considerable degree of hearing loss. In effect, this may substantiate the claim that the tympanic membrane may indeed provide sound protection to the round window.

Since this is the first local study of this sort to date, it is suggested that further studies of similar nature be made to prove or disprove the validity of these results.

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SUBPERIOSTEAL AND BEZOLD'S ABSCESSES IN CHRONIC SUPPURATIVE TYMPANO-MASTOIDITIS WITH CHOLESTEATOMA — A Report of Sixty Cases*

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ABSTRACT

Among the developed countries of the world, chronic suppurative tympano-mastoiditis with cholesteatoma and subperiosteal abscess is practically unheard of. Conversely, in Third World countries in Asia, complications of subperiosteal abscess as a sequelae of chronic tympanomastoiditis is not uncommon, probably due to the delay in treatment of ear problems.

From July 1990 to July 1991, a series of sixty cases of chronic suppurative tympanomastoiditis with cholesteatoma and subperiosteal abscess were seen. Huge cholesteatoma were found in fifty-six cases with osteomyelitis and granulation tissues in the site of the cortical breaks; four cases had granulation tissues in the antrum and in the attic. Cholesteatoma in suchsituations were aggressive, destroying bone and causing other related complications thus radical surgery is advocated. This is at variance with the more benign and acute forms in patients in developed countries.

INTRODUCTION

Subperiosteal abscess and Bezold's abscess as complications of chronic suppurative tympano-mastoiditis (CTM) with cholesteatoma is seldom reported in developed countries. As **Cummings** (1986) put it "... they are likely to be associated with acute mastoiditis rather than chronic otitis media and mastoiditis with bone destruction ...". **Rosen et al** (1986) found sixteen patients with subperiosteal abscess, all of whom, had acute otitis media. **Rubin and Wei** reviewed 34 cases, all again with acute otitis media. **Hawkins and Dru** (1983) found that only three out of their nineteen patients had subperiosteal abscess associated with chronic disease, two of whom had tuberculous otitis, and one with cholesteatoma. In a symposium sponsored by the National Institute of Health (Brown 1990), an article on the complications and sequelae of chronic suppurative otitis media did not even mention subperiosteal abscess as a complication.

On the other hand, in the Philippines and other developing countries, subperiosteal abscess as a complication of CTM is not uncommon. **Ibekwe** (1988) reported 16 cases over a five-year period in Nigeria. **Lee** (1991) puts the incidence at 41.9%, a similar figure given by **Shenoy** (1987) of Indian children. In this preliminary study, we report sixty (60) cases of CTM with cholesteatoma and subperiosteal or Bezold's abscess with a view to describe its difference and try to find reasons for these variances from those in developing countries, and to suggest ideal management for such.

OBJECTIVES

The objectives of this study are:

1. To describe clinical and surgical findings of CTM with subperiosteal or Bezold's abscess in a developing country like the Philippines, with emphasis on difference with that seen in developed countries.
2. To expound on the reasons for differences between subperiosteal abscess in developed versus developing countries.
3. To use the data as a guide in the management of similar cases of chronic suppurative tympano-mastoiditis with cholesteatoma and subperiosteal abscess.

MATERIALS AND METHODS

From July 1990 to July 1991, sixty (60) cases of chronic suppurative tympano mastoiditis with subperiosteal abscess or Bezold's abscess were admitted at this institution and all underwent explor-

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atory mastoidectomy. Most of these cases were emergency procedures without the benefit of radiographic or audiological examinations. Some patients with persistent or healed postauricular fistulas were admitted as regular cases and underwent the said examinations. Past experiences with these conditions has given us a fair amount of confidence, so that the X-rays became academic and not really a necessity.

On admission, a special form entitled "CTM and Subperiosteal abscess form" was incorporated in the chart, putting initial emphasis on clinical history, symptomatology, character of ear discharge, degree of hearing loss and otoscopic findings (Cf. Appendix A).

During surgery, the following things were considered:

1. Presence of mastoid cortex break - location and associated granulation tissue
2. condition of the mastoid cavity
3. type of pathology found in antrum and attic
4. condition of the middle ear
5. associated complications
6. surgical procedure of choice

Location of the cortical break was noted and a piece of bone surrounding the break together with associated granulation if any, was sent for histopathology. The mastoid cavity was measured using a standard plastic-type of caliper to the nearest 10th of a centimeter. This was done after saucerization where overhang was removed and the pathology traced. In the absence of an enlarged cavity, the mastoid antrum was entered and measured as well. Post-operatively, the surgeons were asked to complete the SPA form, and this was then collected by the junior authors.

RESULTS

The clinical features and surgical findings of the sixty cases and some other complications and summarized in Table 1.

Chronic Suppurative Tympano-mastoiditis

All sixty (60) cases seen had chronic suppurative tympano-mastoiditis. At the time the patients were seen, the discharge varied from viscid mucopurulent to purulent, both foul-smelling.

Almost all cases presented with near to total perforations of the tympanic membrane, together with large polyps or polypoid middle ear mucosa and epithelial debris in the attic region.

Age

The majority of patients were found between ages 6-15 years, consistent with data in foreign literature. The youngest patient was an eleven month old baby. The oldest was twenty-nine years old (Cf. Table II). A review of the adult cases however showed that most of these started with otologic problems during childhood.

Sex

There was no definite sex predilection. Of sixty patients, twenty-eight were males and thirty-two were females.

Duration of Disease

All patients presented with a chronic duration of ear complaints, the shortest being two years and the longest, fifteen years.

Subperiosteal Abscess

Thirty-four (34) out of sixty cases had postauricular abscess. Out of these, four (4) had both postauricular and intracanal abscess.

Nine (9) out of the sixty had intracanal subperiosteal abscess. This was manifested by marked sagging of the postero-superior wall with tenderness on palpation.

Nineteen (19) cases had postauricular fistulas. Most had foul-smelling discharge with granulation surrounding them.

Two of the sixty cases (Cases 4 and 41) had Bezold's abscess. During exploratory mastoidectomy, the mastoid tips were necrotic and filled with granulation tissue.

Cortical Breaks

During exploratory mastoidectomy, the cortical breaks were found behind the spine of Henle in the cribriform area. Some of these were as large as 2.0 x 2.8 cm with granulation tissue in and around the defects. These were found among the postauricular SPA and fistulas. On the other hand, intracanal subperiosteal abscesses showed their cortical breaks in the posterosuperior portion of the bony external canal. The two Bezold's abscesses presented with necrotic mastoid tips also surrounded by granulation. Histopathology of bone and granulation showed signs of osteomyelitis (Cf. Plates 1 and 2).

Cholesteatoma in Antrum and Attic

Fifty-six out of the sixty cases had huge cholesteatoma in the antrum with an average size of 6.7 cm^3 (Cf. Table III) All antral cavities were markedly enlarged. Of these, the cholesteatoma of all except

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
1	6	M	3.5 yrs.	VPFD	2 wks.	(+) L Cor Brk	(+) Post. sup. Bony Canal	(-)	(-)	Pus Choles Gra. T	Choles Gra.T. No os-sicles	Choles Gra.T.	Eroded horizontal facial canal No facial paralysis
2	20	F	18 yrs.	VPFD	4 wks	(+) R Cor Brk	(+) Choles Post. sup. Bony Canal	(-)	(-)	Pus Gra.T. No os-sicles	Choles Polyps	Gra.T.	Eroded tegmen No epidural abscess
3	6	F	5 yrs.	VMFD	1 week	(+) L Cor Brk	(-) Choles	(-)	(-)	Pus Gra.T.	Choles Gra.T.	Choles	None
4	14	F	10 yrs.	VPFD	1 week	(-) L Mastoid Tip	(-) Choles	(-)	(+) L	Pus Gra.T. Ne-Gra.T. crotic	Choles Gra.T. No os-sicles with Gra.T.	Choles	None

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
5	29	F	24 yrs	VPFD	10 days	(+) R Cor Brk	(+) R Cor Brk Post. sup. Bony Canal	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Choles Gra.T Polypoid mucosa	Eroded horizontal facial canal No facial paralysis
6	12	F	11 yrs.	VMFD	3 mos.	(+) L Cor Brk	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Choles Gra.T. No ossicles	Eroded tegmen Gra.T. on dura No intra-cranial complications
7	14	F	10 yrs.	VMFD	3 wks.	(+) L	(-)	(+) L CorBrk	(-)	Pus Choles Gra.T.	Choles Gra.T.	Gra.T. No ossicles	None
8	20	F	8 yrs.	VPFD	8 yrs.	(+) Ruptured	(-)	(+) R Cor Brk McEwen's	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Gra.T. No ossicles	None
9	26	M	15 yrs.	VPFD	1 week	(+) R Cor Brk Behind spine of Hinle	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra. T	Pus Choles Gra.T. No ossicles	Eroded facial canal without paralysis eroded tegmen without epidural abscess
10	7	F	4 yrs.	VMFD	2 wks	(+) R Cor Brk Cribriform area	(-)	(-)	(-)	Pus Gra.T.	Choles Gra.T.	Pus Choles Gra.T. No ossicles	None
11	21	F	16 yrs.	VPFD	4 mos.	(+)	(-)	(+) L Huge Cor Brk 2.0 1/4 1.8 cms with Gra.T.	(-)	Pus ~~Choles~~ (Huge) Gra.T.	Choles ~~Gra~~.T.	Pus & ~~Choles~~ Epithelium Gra.T. No ossicles	Fistula to horizontal ~~semi-circular canal left~~; destruction of facial recess by Ccholes into Middle Ear canal stenosis

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
12	11	F	6 yrs.	VMFD	1 week	(-) Cor Brk Post. sup. Bony canal	(+) R	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Gra.T.	None
13	7	M	4 yrs.	VPFD	3 yrs 1 yr. 2 wks.	(+) R Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles Gra.T.	Choles	Gra.T. Poly- Poid Mucosa	None
14	15	M	10 yrs.	VPFD	6 mos.	(+) R Cor Brk Post. sup. Bony canal	(+) R	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Polypoid mucosa No ossicles	None
15	10	F	9 yrs.	VMFD	2 wks	(+) L Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Polypoid mucosa No ossicles	None
16	24	M	5 yrs.	VMFD	3 wks	(+) R Cor Brk behind spine of Hinle	(-)	(-)	(-)	Pus Choles Gra.T.	Gra.T.	Poly- poid mucosa No ossicles	None
17	7	M	5 yrs.	VMFD	6 wks	(+) R Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles Gra.T.	Choles, Gra.T.No ossicles	Gra.T.	None

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezoid's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
18	14	M	10 yrs.	VPFD	2 mos.	(+) S/P,I & D	(-)	(+) R Cor Brk Cribriform area	(-)	Pus Choles Gra.T.	Choles	Polypoid mucosa No ossicles	Eroded horizontal facial canal No facial paralysis
19	7	F	4 yrs.	VMFD	2 wks	(+) L Cor Brk Cribriform area	(-)	(-)	(-)	Not enlarged Gra.T.	Choles	Polypoid mucosa Stapes foot plate (+)	None
20	24	F	19 yrs.	VPFD	2 mos.	(+)	(-)	(+) R Cor Brk behind spine of Hinle	(-)	Pus Choles Gra.T.	Choles	Gra.T. No ossicles	Eroded facial canal without facial paralysis
21	17	F	12 yrs.	VMFD	2 days	(+) L Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles Gra T	Pus Choles Gra.T.	Pus Choles Gra.T. only foot-plate seen	None
22	11	F	8 yrs.	VMFD	6 days	(-)	(+) R Cor Brk Post. sup. Bony canal	(-)	(-)	Pus Choles Gra.T.	Choles	Gra.T. Polypoid mucosa No ossicles	None

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
23	13	M	12 yrs.	VPFD	2 wks	(+) R Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Gra.T. No ossicles	None
24	8	M	4 yrs.	VMFD	1 week	(+) R Cor Brk Mc-Ewen's	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Gra.T. No ossicles	None
25	11	M	10 yrs.	VMFD	1 week	(+) L Cor Brk McEwen's	(-)	-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Gra.T. No ossicles	None
26	14	M	13 yrs.	VMFD	2 days	(+) R Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles	Choles Gra.T.	Pus Gra.T. No ossicles	None
27	11	F	10 yrs.	VPFD	2 mos.	(+) L Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles	Choles Gra.T. No ossicles	Pus	None
28	9	M	7 yrs.	VPFD	4 days	(+) L Cor Brk behind spine of Hinle	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T.	Eroded tegmen and lateral sinus plate with epidural No os-abscess and lateral siclessinus thrombophlebitis; Gra.T. on dura
29	15	F	5 yrs.	VPFD	2 weeks	(+) L Cor Brk behind spine of Hinle	-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. No ossicles	Eroded facial canal without facial paralysis; eroded lateral sinus plate without thrombo-phlebitis

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
30	8	M	6 yrs.	VMFD	10 days	(+) R Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles Gra.T.	Choles	Pus Choles Gra.T. Polypoid mucosa No ossicles	Eroded horizontal facial canal without paralysis
31	7	M	5 years	VMFD	9 days	(-)	(+) R Cor Brk Post. sup. Bony canal	(-)	(-)	Pus Choles Gra.T.	Choles	Poly-poid mucosa No ossicles	None
32	6	F	5 yrs.	VMFD	2 weeks	(+) R Cor Brk Crib area	(-)	(-)	(-)	Pus Choles Gra.T.	Pus Choles	Pus Gra.T. No ossicles	None
33	12	M	8 yrs.	VPFD	3 weeks	(+) R Cor Brk Cribriform area	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. No ossicles	None
34	7	M	5 yrs.	VPFD	4 months	(+)	(-)	(+) L Cor Brk behind spine of Hinle	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Polypoid mucosa	Eroded horizontal facial canal w/o facial paralysis; eroded tegmen w/o eppidural abscess
35	22	F	16 years	VPFD	3 years	(+)	(-)	(+) L Cor Brk Cribriform area with Gra.T.	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. No ossicles	Eroded horizontal facial with left facial paralysis

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
36	14	F	10 years	VPFD	1 year	(+)	(-)	(+) R Cor Brk behind spine of Hinle	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Poly-poid mucosa No os-sicles	None
37	14	F	11 years	VPFD	4 months	(+)	(-)	(+) L Huge Cor Brk with Gra.T.	(-)	Pus Huge Choles	Choles Gra.T.	Pus Choles Gra.T. No os-sicles	Eroded horizontal facial canal with facial paralysis (left) 10 yrs.
38	7	M	4 years	VPFD	4 months	(+)	(-)	(+) L Cor Brk behind spine of Hinle	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Polypoid mucosa No os-sicles	Eroded horizontal facial canal w/o facial paralysis
39	14	F	10 years	VPFD	2 years	(+)	(-)	(+) L Cor Brk Crib-riform area with Gra.T.	(-)	Pus Choles Gra.T.	Choles	Pus Gra.T. No ossicles	None
40	25	F	22 years	VMFD	2 weeks	(-)	(-)	(-)	(+) R Necro-sis w/ Gra.T. Mas-toid tip	Pus Choles Gra.T.	Choles	Poly-poid mucosa No ossicles	None

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
41	5	M	3 years	VMFD	1 week	(+) L Cor Brk Cribriform area	(-)	(-)	(-)	Pus Gra.T.	Gra.T.	Pus Gra.T. No ossicles	None
42	26	M	6 years	VPFD	1 year	(+)	(+) L Huge Cor Brk Post. sup. Bony canal	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Polypoid mucosa	Eroded lateral sinus plate with sinus abscess
43	8	M	6 years	VPFD	1 year	(+)	(-)	(+0 L Cor Brk below temp. line with Gra.T.	(-)	Pus Choles Gra.T.	Choles Gra.T.	Gra.T. No ossicles	None
44	18	M	10 years	VPFD	2 weeks	(+) R Cor Brk behind spine of Hinle	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. No ossicles	Eroded tegmen w/o epidural abscess; total hearing loss
45	11 mos.	M	6 mos.	VMFD	1 month	(+)	(-)	(+) R Cor Brk behind spine of Hinle with Gra.T.	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. necrotic malleus incus and stapes	Suppurative Meningitis without erosion of tegmen and lateral sinus plate

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
46	27	M	15 years	VPFD	3 years	(+)	(-)	(+) L Cor Brk behind spine of Hinle with Gra.T.	(-)	Pus Choles Gra.T.	Choles	Gra.T. No os-sicles	None
47	15	M	10 years	VMFD	3 weeks	(+) L Cor Brk behind spine of Hinle with Gra.T.	(-)	(-)	(-)	Pus Choles Gra.T.	Choles	Gra.T. Choles Gra.T. Polypoid mucosa No ossicles	Eroded tegmen without epidural abscess
48	22	F	19 years	VPFD	1 week	(+) R Cor Brk behind spine of Hinle	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Gra.T. Polypoid mucosa No ossicles	Eroded tegmen without epidural abscess
49	18	M	15 years	VMFD	3 mos.	(+)	(-)	(+) L Cor Brk behind spine of Hinle with Gra.T.	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Gra.T. No ossicles	None
50	6	M	5 years	VPFD	3 mos.	(+) L Cor Brk behind spine of Hinle	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Polypoid mucosa No ossicles	None

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
51	6	F	2 years	VPFD	1 week	(+) R Cor Brk behind spine of Hinle	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Gra.T. No ossicles	None
52	7	F	5 years	VPFD	2 mos.	(+) L Cor Brk behind spine of Hinle with Gra.T.	(-)	(-)	(-)	Pus Choles Gra.T.	Choles	Gra.T. Pus No ossicles	None
53	16	F	10 years	VPFD	1 year	(+)	(-)	(+) L Cor Brk behind spine of Hinle with Gra.T.	(-)	Pus Choles Gra.T.	Choles	Gra.T. Polypoid mucosa Pus No ossicles	Eroded horizontal facial canal w/o paralysis
54	11	F	4 years	VPFD	1 week	(+) R Cor Brk behind spine of Hinle with Gra.T.	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Polypoid mucosa No ossicles	Eroded tegmen w/o epidural abscess
55	22	M	10 years	VPFD	2 years	(+)	(-)	(+) R Cor Brk behind spine of Hinle with Gra.T.	(-)	Pus Choles	Choles	Pus Gra.T. Polypoid mucosa No ossicles	None

No.	Age	Sex	Duration of Discharging Ear		Duration of Abscess	FINDINGS DURING EXPLORATORY MASTOIDECTOMY							
						Subperiosteal Abscess		Post Auricular Fistula	Bezold's Abscess	Findings in Mastoid			Other Complications aside from SPA
			Duration	Character of Discharge		Post Auricular	Intracanal			Antrum	Attic	Middle Ear	
56	14	M	13 years	VMFD	2 weeks	(-)	(+) L Huge Cor Brk Post. sup. Bony canal	(-)	(-)	Pus Choles Gra.T.	Choles	Gra.T. Pus No ossicles	Eroded facial canal without paralysis
57	5	F	4 years	VMFD	1 week	(+) L Cor Brk behind spine of Hinle with Gra.T.	(-)	(-)	(-)	Pus Choles Gra.T.	Choles Gra.T.	Pus Choles Gra.T. Polypoid mucosa No ossicles	None
58	24	F	13 years	VPFD	3 years	(+)	(-)	(+) L Huge Cor Brk behind spine of Hinle	(-)	Pus Choles Gra.T.	Choles	Pus Gra.T. No ossicles	None
59	7	M	6 years	VMFD	3 weeks	(+) L Cor Brk behind spine of Hinle	(-)	(-)	(-)	Pus Choles Gra.T.	Choles	Pus Gra.T. No ossicles	None
60	21	F	18 years	VPFD	3 years	(+) Cor Brk behind spine of Hinle	(-)	(+) R Huge	(-)	Pus Gra.T. No ossicles	Choles	Pus Gra.T.	Right facial paralysis with erosion of facial canal

one extended from the attic. Of the fifty-five attico-antral cholesteatoma, twenty-six had further extension from the middle ear. Three of these had cholesteatoma in the attic and only granulation in the antrum. One case had only granulation tissue in both antrum and attic, and no cholesteatoma. When the matrix of the cholesteatoma was peeled off from the antral cavity, very often granulation tissue was seen outside of the matrix attached to the mastoid bone.

Findings in the Middle Ear

Surgical findings in the middle ear were more variable. Many of them had a lot of granulation tissue with aural polyps or polypoid middle ear mucosa. Some had epithelialization of the medial wall of the middle ear. Cholesteatoma was found in 27 cases. In practically all cases, there were no ossicles or, if any left, they were too necrotic for use. The region of the footplate of the stapes was usually heavily covered with granulation tissues.

Other Complications associated with SPA

Besides having subperiosteal abscesses, cases of chronic suppurative tympano-mastoiditis presented with other complications (Cf. Table IV). The most common is the erosion of the horizontal portion of the seventh nerve canal with or without facial nerve paralysis, followed by erosion of the tegmen with granulation tissue, but without epidural abscess, or intracranial complication. One case of a 11 month old baby with suppurative meningitis. This patient had no erosion of the lateral sinus plate or tegmen.

DICUSSION

Subperiosteal abscess is a collection of pus adjacent to the mastoid that results from acute or chronic mastoiditis with bone destruction. It occurs commonly over Macewen's triangle, but occasionally over the root of the zygoma or the tip of the mastoid (Bezold's). In developed countries it is usually associated with acute mastoiditis, unlike in developing countries where it is usually seen in chronic suppurative tympano-mastoiditis with cholesteatoma. This can be attributed to two things: First, the socio-economic status of the patients, and second, the ignorance of the patients on the disease process. Very often, the patient's condition becomes serious due to failure to bring them during the early stages of the illness.

There are basically five types of subperiosteal abscess: postauricular, intracanal, zygomatic, Bezold's and parapharyngeal. Scott-Brown adds a sixth rare type: Citelli's abscess, a submandibular swelling occuring from spread of pus from the mastoid tip along the digastric muscle. The most common type is the postauricular followed by the intracanal abscess. In this study 57% had postauricular abscesses, 32% with postauricular fistulas and 10% with intracanal type. Bezold's and zygomatic abscess are not common in our society. The formation of subperiosteal abscess is still not very clear. Escape of the infection to the subperichondrial region could be due to:

1. thrombophlebitis of blood vessels in the cribriform area
2. congenital or acquired dehiscences in the mastoid bone
3. bone necrosis

Tumarkin suggested that this was due to direct pressure on the bone by cholesteatoma, while Berger believes that an inflammatory reaction is responsible. It has been shown that granulation tissue adjacent to eroded bone is able to produce a variety of enzymes and mediators to enhance bone destruction. Bretlau (1982) showed that inflammation was not always necessary, and that epithelial cells in the subepithelial tissues of cholesteatomas produced enzymes with bone lytic actions.

In this study, almost all, except three, had cholesteatoma in the antrum where the break in the mastoid cortex occurred. The fact that granulation tissue were found in some antral cavities suggest that cholesteatoma is not always necessary for cortical breaks to occur. The presence of osteomyelitic and inflammatory reactions in the bones surrounding the cortical breaks suggest that pressure necrosis from cholesteatoma may not necessarily be the only cause for bone resorption. We suggest that the presence of cholesteatoma and granulation in the attic prevents trapped pus in the antral cavities from draining. This may lead to osteomyelitis of the cortical bone or mastoid tip, producing the breaks. It is still difficult to resolve the problem on the pathogenesis of subperiosteal abscess, but perhaps it will be safe to say that a combination of factors is responsible.

Around half of the cholesteatoma associated with subperiosteal abscess were atticoantral, the other half being apparently mesotympanic extending to the attic and antrum. Almost all were associated with total and near total perforations, mostly of the pars tensa with attic cholesteatoma in varying degrees. Lee (1991) and Raffu (1990) state that cholesteatoma in children are mostly of the retraction pocket type. Shenoy's (1989) study correlates with the present one that the migration type is more common. The latter was shown to be more aggressive versus the attic and retraction pocket types. This is bourne out by our study wherein

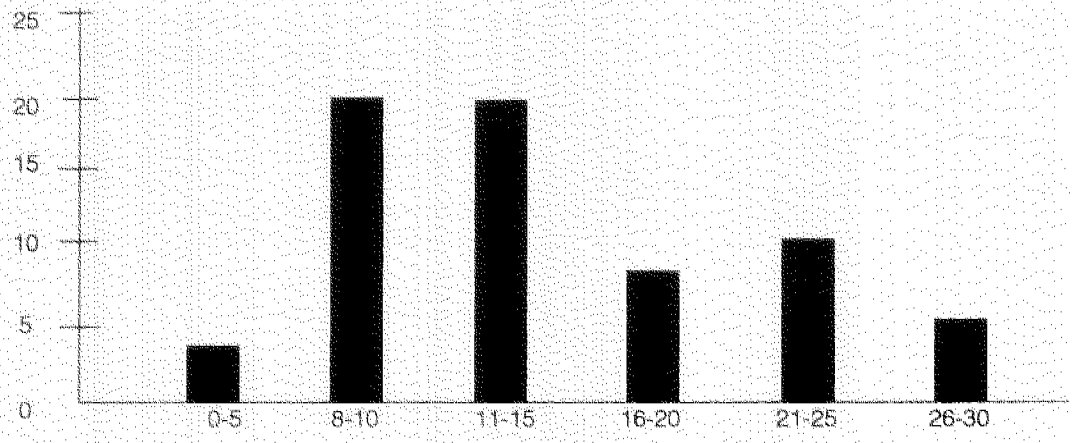

Table II. Age distribution of Patients with Subperiosteal abscess at the PGH July 1990-91

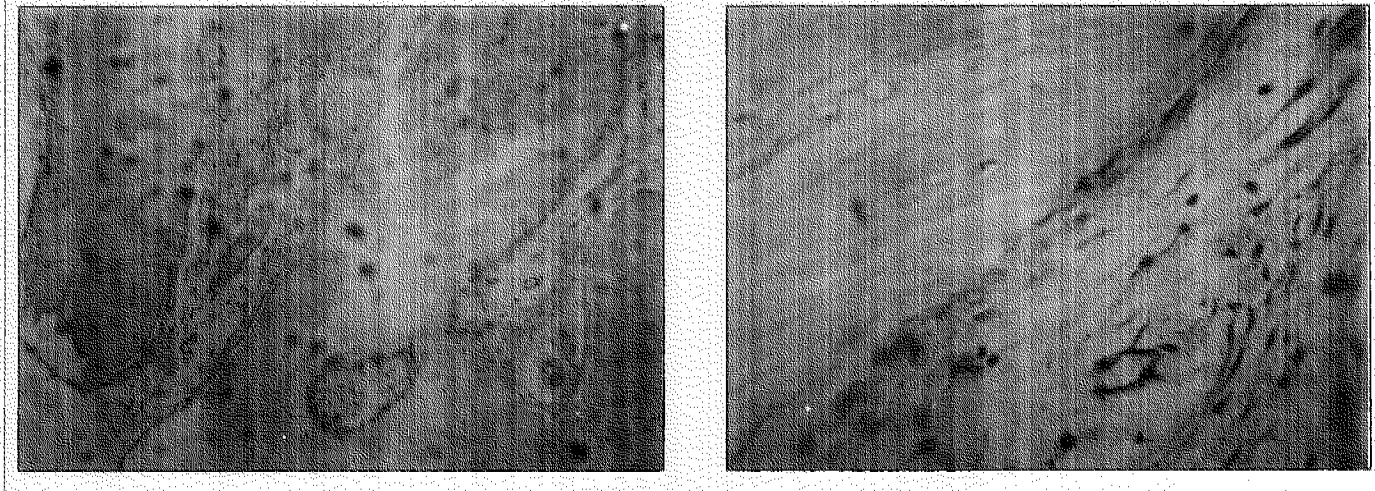

Plate 1. (A) LPO showing areas of normal bone with lamellated dead bone (B) HPO of the same view

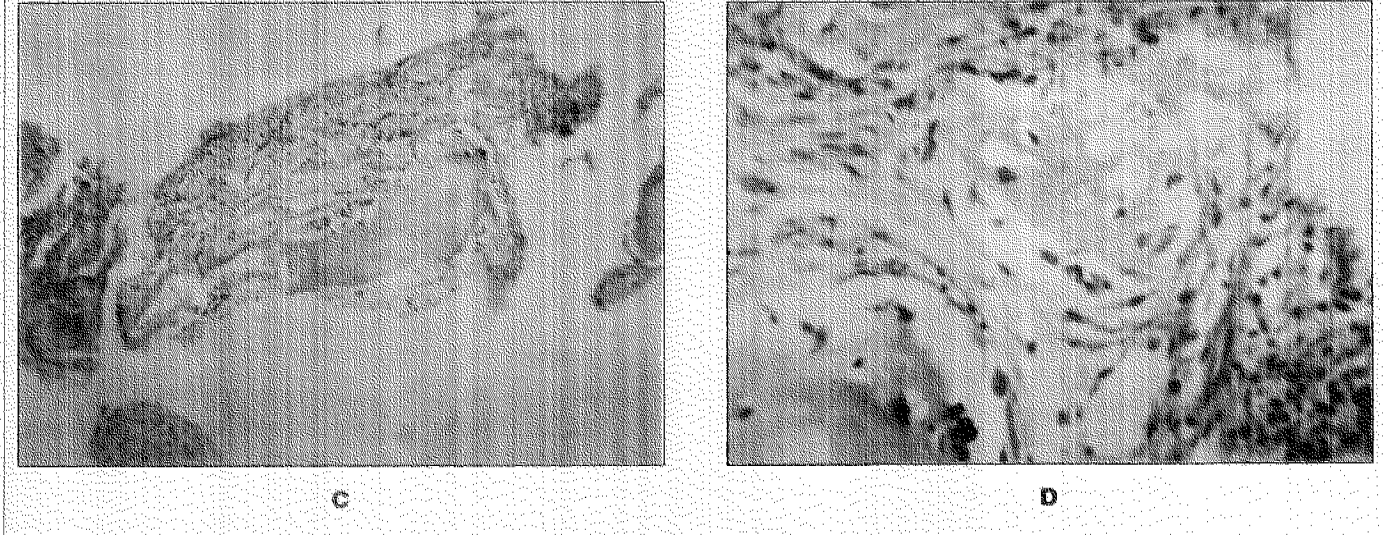

Plate 2. (C) LPO view showing dead bone with inflammatory reaction (B) HPO of the same view.

Table III Mastoid Antrum Size and Volume (PGH July 1990 - July 1991)

Patient No.	Dimensions (cm) Height	Width	Depth	Volume (cm3)	Comments
1	1.6	1.6	1.7	4.4	
2	1.5	1.5	1.5	3.4	
3	1.8	1.4	2.5	6.3	
4	2.0	2.4	2.6	12.4	
5	2.0	2.0	2.6	10.4	
6	1.8	1.5	1.2	3.2	
7	2.1	2.0	2.2	9.2	
8	1.8	1.8	1.5	4.9	
9	2.0	2.0	2.5	8.4	
10	1.9	1.5	1.4	4.0	
11	2.0	2.0	2.1	8.4	
12	1.5	1.5	1.6	3.6	
13	2.0	2.0	1.5	6.0	
14	2.0	2.0	1.5	6.0	
15	2.2	1.2	1.8	4.8	
16	2.0	3.0	2.0	12.0	
17	1.5	2.0	1.5	4.5	
18	2.0	2.0	1.5	6.0	
19	0.9	1.1	1.5	1.5	Attic Chol.
20	2.3	2.0	2.0	9.2	
21	2.5	2.0	2.1	10.5	
22	1.5	2.0	2.0	10.5	
23	2.1	2.1	1.5	6.6	
24	2.0	2.1	1.5	6.3	
25	2.0	2.0	1.5	6.0	
26	1.7	1.0	0.5	0.8	
27	2.4	2.4	2.0	11.5	
28	1.8	1.8	1.4	4.5	
29	1.8	1.0	1.0	1.8	
30	2.7	1.8	2.0	9.7	
31	1.5	1.5	1.0	2.2	
32	1.5	1.2	1.2	2.2	
33	1.5	1.0	1.0	1.5	
34	1.5	1.5	1.5	2.1	
35	1.5	1.0	1.0	1.5	
36	1.5	1.4	1.0	2.1	
37	1.9	1.5	1.4	4.0	
38	1.4	1.2	0.8	1.3	
39	1.5	1.5	1.0	2.2	
40	1.8	1.5	1.0	2.7	
41	2.6	2.6	2.1	14.2	
42	2.2	1.4	0.7	2.2	
43	1.5	1.4	1.0	2.1	
44	2.0	2.0	2.0	8.0	
45	2.0	2.0	2.1	13.6	
47	2.0	1.5	1.5	4.5	
48	1.4	1.6	2.0	4.5	
49	3.0	2.0	1.5	9.0	
50	1.5	1.5	1.0	2.2	
51	1.5	1.5	1.0	2.2	
52	1.5	1.0	1.0	1.5	
53	3.0	2.0	2.5	15.0	
54	2.4	2.1	1.5	7.6	
55	2.8	3.2	1.8	16.1	
56	1.6	1.8	2.0	5.8	
57	1.5	1.4	1.6	3.4	
58	2.0	1.8	2.2	7.9	
59	1.8	1.5	1.0	2.7	
60	0.6	1.0	1.0	0.6	No Cholesteatoma
TOTAL	**112.5**	**103.8**	**94.1**	**403.0**	
Average	**1.9**	**1.7**	**1.6**	**6.7cm³**	

Table IV. Other Complications of Chronic Suppuative Tympano-Mastoiditis with Subperiosteal Abscess, Bezold's Abscess and Cholesteatoma

1.	Erosion of horizontal facial canal without facial paralysis	11 cases
2.	Erosion of horizontal facial canal with facial paralysis	3 cases
3.	Erosion of tegmen without epidural abscess but with granulation tissues	8 cases
4.	Erosion of tegmen with epidural abscess	1 case
5.	Erosion of lateral sinus plate with perisinus abscess and granulation tissues	2 cases
6.	Erosion of lateral sinus plate with lateral sinus thrombophlebitis	1 case
7.	Suppurative meningitis	1 case
8.	Fistula to horizontal semicircular canal with occasional vertigo	1 case
9.	Destruction of facial recess connecting with the middle ear	1 case
	Total	**29 cases**

the cholesteatoma in all 60 cases displayed an aggressive ossicles, and causing other complications.

Due to the severe destruction encountered in these cases, the depressed socio-economic condition of the patients, and the difficulty in making follow-up treatment, a classical radical mastoidectomy with a canal down approach is advocated. At a glance, the severe osteitis, damage to the ossicles, and pathology in the middle ear suggest that any reconstruction would be frustrating even to an experienced otologist. One would rather opt for a dry and safe ear, fully keeping in mind the large post-operative cavity and its disadvantages in the young patient.

SUMMARY

A series of sixty cases of chronic suppurative tympano-mastoiditis with cholesteatoma and subperiosteal abscess was reported, majority of which were in the age group 6-15 years of age. Huge cholesteatoma was found in 53 enlarged antral cavities; granulation tissue in 4 cavities, all presenting with

osteomyelitis of the mastoid bone. Pathogenesis of subperiosteal abscess could be a combination of factors. Cholesteatoma in such situations were aggressive, destroying bone and causing other related complications. Because of severe destruction and for practical reasons, radical surgery is advocated. This is at variance with the more benign and acute forms in patients of developed countries.

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The Trapezius Myocutaneous Flap in Head and Neck Reconstruction East Avenue Medical Center Experience: A Preliminary Report*

Mamerto Almelor, MD**
Edgar O. Polintan, MD***
Cheryll B. Bumanglag, MD***

INTRODUCTION:

Reconstructive surgery underwent a nonpareil renaissance in the late 1970's with the advent of myocutaneous flaps. Although the pectoralis major myocutaneous flap subsequently has become the "workhorse of head and neck reconstruction", other myocutaneous flaps such as the trapezius myocutaneous flap may be better suited for selected cases in head and neck reconstruction. The trapezius muscle, which is of ample size, closely adherent to its overlying skin and with a rich vascular supply, is a ready source of myocutaneous flaps.

OBJECTIVES

General

1. To review the techniques of the trapezius myocutaneous flap, their applications, advantages, disadvantages and limitations.
2. To bring into focus the trapezius myocutaneous flap as part of the overall spectrum of reconstructive techniques available to the head and neck surgeon.

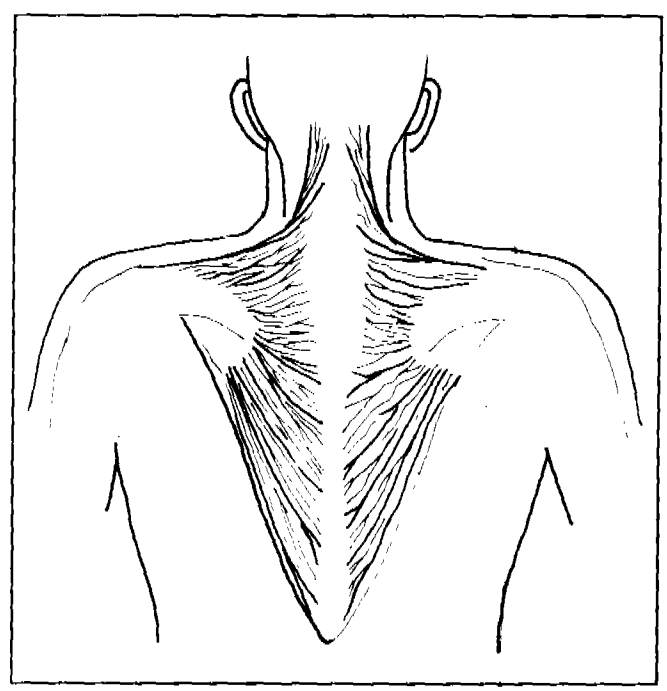
Specific

1. To present the East Avenue Medical Center experience on the use of the trapezius myocutaneous flap.
2. To compare the East Avenue Medical Center experience on the trapezius myocutaneous flap with foreign experience.

THE TRAPEZIUS MYOCUTANEOUS FLAP - A Review of Techniques

Surgical Anatomy:

The trapezius is a large triangular muscle covering the superior posterior part of the neck and shoulders (Fig. 1). It has a broad base of origin. Fibers originate from the medial third of the superior nuchal line of the occipital bone, the external occipital protruberance, and ligamentum nuchae. Further, fibers originate from the seventh cervical vertebrae and the spinous and supraspinous ligaments of all the thoracic vertebrae. The muscle fans out to insert in essentially 3 bundles. The upper portion directs to the lateral third of the clavicle. The middle fibers are directed to the acromion process horizontally and the inferior fibers are directed upward and laterally to insert in the medial end of the spine of the scapula.



TRAPEZIUS MUSCLE

Fig 1. The trapezius muscle originates from the midline structures of the neck and the back, and inserts into the lateral 1/3 of the clavicle, acromion process and the medial end of the scapular spine.

* 3rd Prize - Surgical Innovation Contest, 33rd Annual Convention of the PSO-HNS held at the Lung Center of the Philippines on December 9, 1989.

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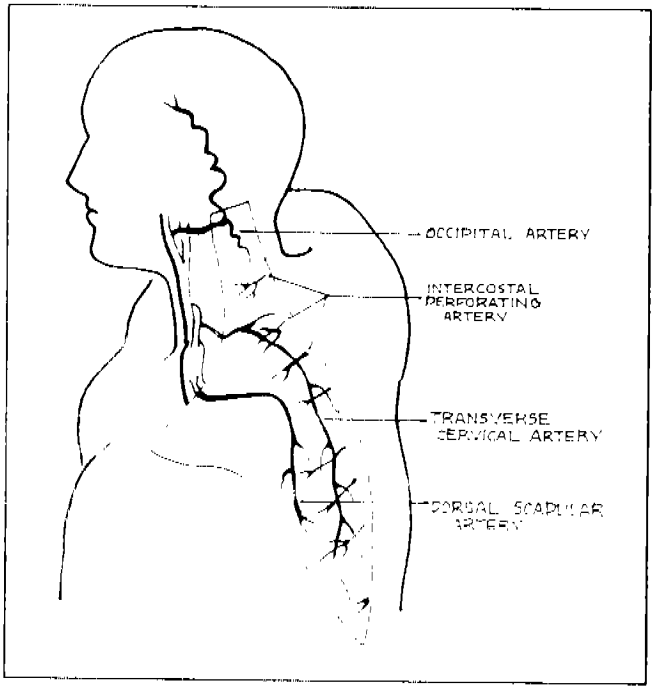
Arterial Blood supply (Fig. 2):

1. Transverse Cervical Artery
2. Dorsal Scapular Artery
3. Branches of the Occipital Artery
4. Perforating branches of the Posterior Intercostal Arteries



VASCULAR SUPPLY TO TRAPEZIUS MUSCLE

Figure 2. Vascular supply to the trapezius muscle and its overlying skin. This vascular pattern allows for creation of 3 distinct myocutaneous flaps.

The transverse cervical artery arising from the thyrocervical trunk in 80% of cases provides the primary blood supply to the trapezius muscle (Fig. 3). When the transverse cervical artery comes from the subclavian artery (20%), it may course through or under the cords of the branchial plexus dividing into its branches.

Venous Drainage: Transverse Cervical Vein

There are 3 main paths of venous drainage in the neck (Fig. 4). In 60%, the vein courses medially, accompanying the transverse cervical artery. In 15%, the vein runs laterally and is entrapped under portions of the branchial plexus. In the remaining 25%, the vein appears to enter the subclavian laterally but actually ran medially under the clavicle for several centimeters before its termination. In the majority of cases, the transverse cervical vein travels deep to the posterior belly of the omohyoid muscle terminating into the medial subclavian system. For the rest of the

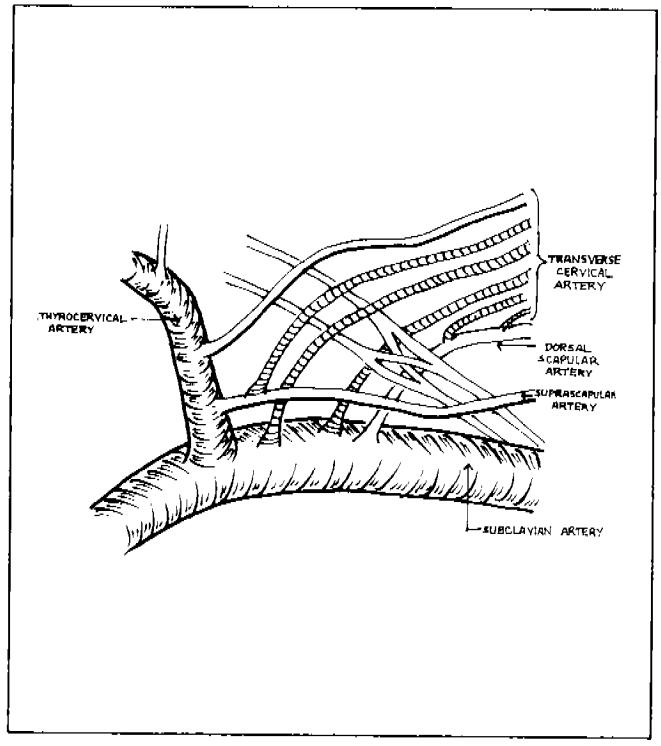


Figure 3. The transverse cervical artery provides the primary blood supply to the trapezius muscle. Its origin in the neck is variable, it may arise from either medial or lateral location in relation to the anterior scalene muscle. Solid vessels designate most common locations. Striped vessels show major variations.

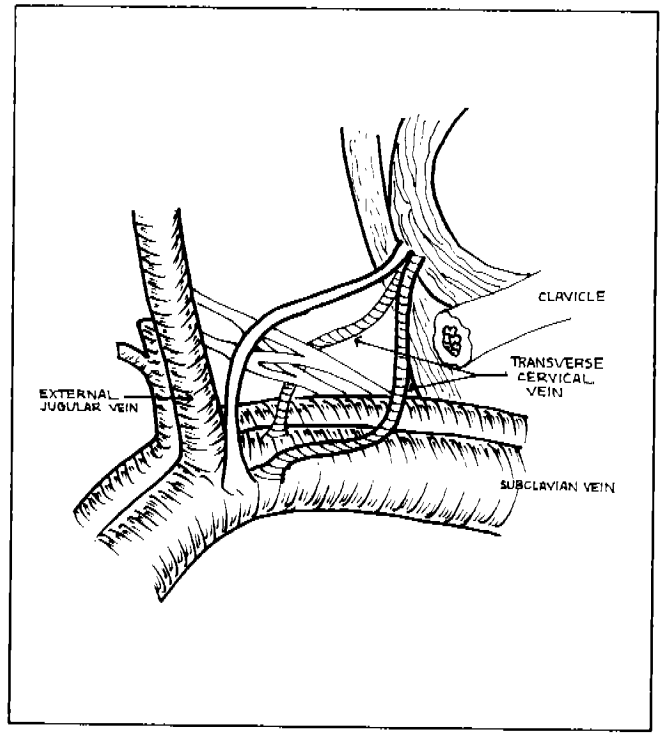


Figure 4. The 3 main paths of the transverse cervical vein. Solid vessels show most common locations. Striped vessels show major variations.

cases, the transverse cervical vein drained directly into the external jugular vein or through any of its superficial branches.

Nerve Supply:

1. Spinal Accessory: Motor
2. Third and Fourth Cervical Nerves: Sensory

Trapezius Action:

The various muscle bundles act in a coordinated effort. Subdivided, the upper fibers elevate the scapula, the middle fibers pull the scapula medially, and the lower fibers pull the medial border of the scapula downward. These efforts assist in elevation of the arm and rotation of the shoulder.

Operative Techniques:

Three distinct myocutaneous flaps may be constructed using the trapezius muscle and its overlying skin. These include the following:

a. Superior Trapezius Flap
b. Lateral Island Trapezius Flap
c. Extended Island (Posterior) Trapezius Flap

This study uses the lateral island trapezius flap based on the transverse cervical artery and the superior trapezius flap based on the paraspinous muscle perforators and branches of the occipital artery.

The lateral island trapezius flap is a true pedicled myocutaneous flap (Fig. 5). It has a broad range of application but is less reliable primarily because of its variable vascular supply. It can be readily contoured (eg. tubed, bivalved) to fit complex defects because of its thin muscle with sparse subcutaneous tissue.

1. With the patient upright and the arms at the side, the acromio-clavicular joint is identified. This preoperative maneuver determines the center of the island of skin muscle to be transferred later.

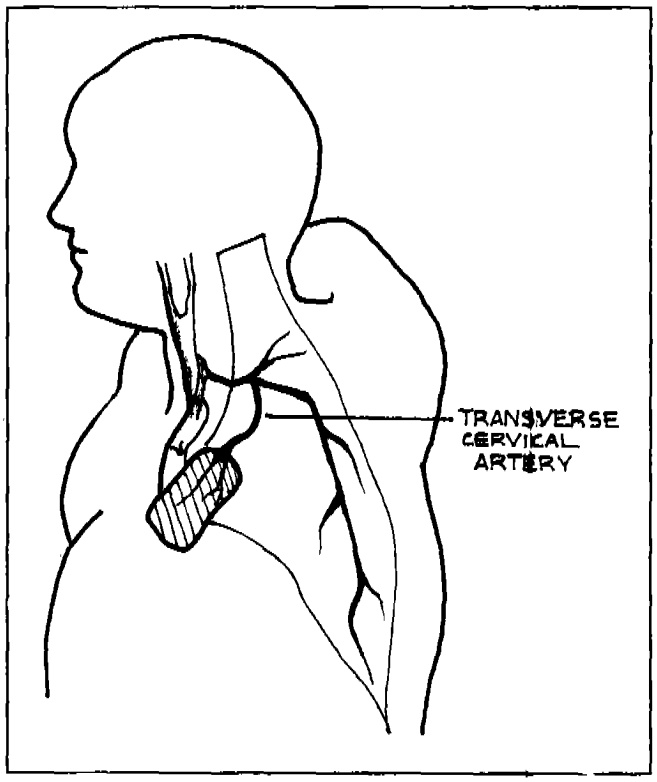
2. After anesthesia has been given, 2 large folded sheets are placed in the interscapular region under the occiput. This maneuver elevates the shoulders and head off the table and provides access to the upper and lateral portions of the trapezius muscle.

3. The defect is measured.

4. Skin, subcutaneous tissue and trapezius muscle are incised down to the trapezius fascia. The flap formed is elevated from lateral to medial until edge of the flap is encountered.

5. Blunt dissection will separate the muscle bundles from its clavicular and acromial insertions.

6. Identification of the blood supply: The venous drainage is superficial and should be identified. The transverse cervical artery is identified during radical neck dissection.



LATERAL ISLAND TMF

Figure 5. Lateral island trapezius flap receives its primary blood supply from the transverse cervical artery.

7. The donor site is undermined and the flap is swung forward to cover the defect.

8. Muscle and skin are sutured into place in the defect.

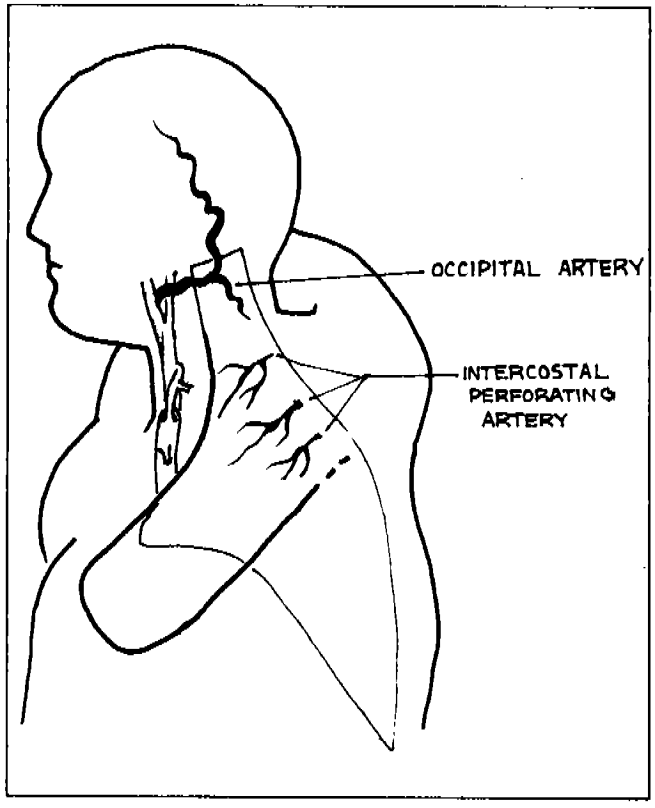
9. Donor site is closed by silk 3-0 primarily. With large defects, it may be necessary to cover the site with a split-thickness skin graft.

The superior trapezius myocutaneous flap, an axial myocutaneous flap, is the most dependable due to its nonvariable blood supply (Fig. 6). Because of its bulky base, the major disadvantage is its limited arc of rotation beyond 110°. It is excellent for reconstructing the lateral neck and lower facial skin.

1. Preoperative maneuvers and positioning are similar to the lateral island trapezius flap.

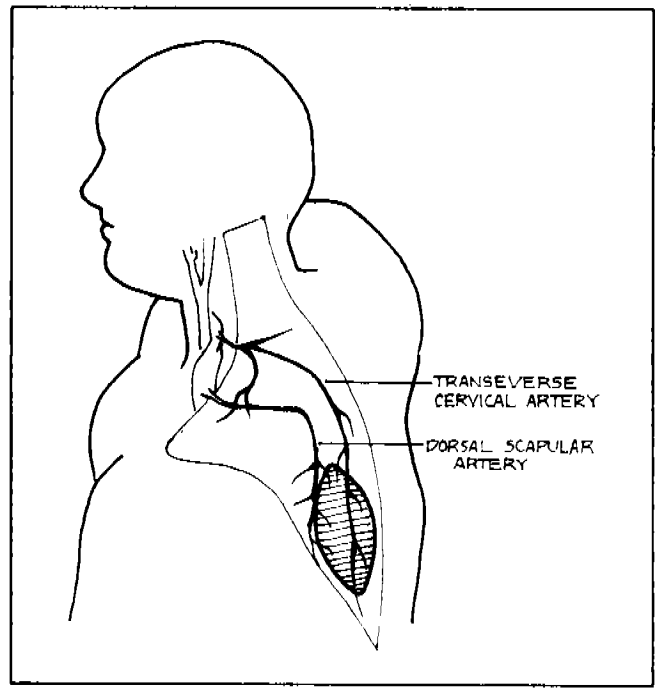
2. The anterior incision is at the anterior border of the trapezius muscle.

3. The posterior incision runs parallel to the anterior incision. This incision can be extended across the midline to increase the mobility of the flap and to recruit contralateral midline vascular contributions.



SUPERIOR TMF

Figure 6. Superior trapezius flap receives its primary blood supply from the perforating branches of the posterior intercostal ateries, with minor supplement from the occipital artery.



EXTENDED ISLAND TMF

Figure 7. Extended island (Posterior) flap receives its primary blood supply from the descending branch of the transverse cervical artery. Supplemental blood supply is provided by the dorsal scapular artery but may be used to provide major blood supply to this flap.

4. The tip of the flap is elevated in a plane beneath the deltoid fascia. A random extension may reach up to 10 cm beyond the boundary of the trapezius muscle.

5. The trapezius muscle is severed from its bony attachment. The transverse cervical artery and the ascending branch of the dorsal scapular artery are ligated and divided unless the needed arc of rotation is not hindered by their attachments.

6. The flap is rotated and sutured to cover the cutaneous defect.

7. The donor site is closed. With large defects, it may be necessary to cover the site with a split thickness skin graft.

The extended island (posterior) flap is based on the descending branch of the transverse cervical artery (Fig. 7). Although this flap has a variable blood supply, compensation is provided by its wide arc of rotation due to its long pedicle. It has a broad range of application. It is used to reconstruct defects on the scalp, face, and on either side of the lower part of the face.

CASE REPORT

Case I

A.B., a 71-year-old male with a diagnosis of squamous cell carcinoma, well differentiated, stage IV ($T_4N_2M_0$), on the right buccal mucosa presented with the following: a 5 x 5 cm fungating mass at the right buccal mucosa; a 3 x 3 cm fungating mass at the right cheek area; and a 4 x 4 cm firm, movable lymph node at the submandibular area (Fig. 8). The patient underwent elective tracheostomy, wide resection of the cheek mass with a 2 cm margin, partial maxillectomy, marginal resection of the mandible, radical neck dissection with preservation of the accessory nerve on the right, and suprahyoid dissection on the left. Primary reconstruction was done using the lateral island trapezius flap. The flap was "bivalved", with the proximal segment of the flap providing a cover for the buccal area. Primary closure was partially done at the donor site and the remainder of the defect covered with a split-thickness skin graft. Postoperatively, the patient developed dehiscence on the donor site due to infection and probable tension at the suture line. The patient received 6,000 rads 3 weeks later. Patient had good follow-up only to

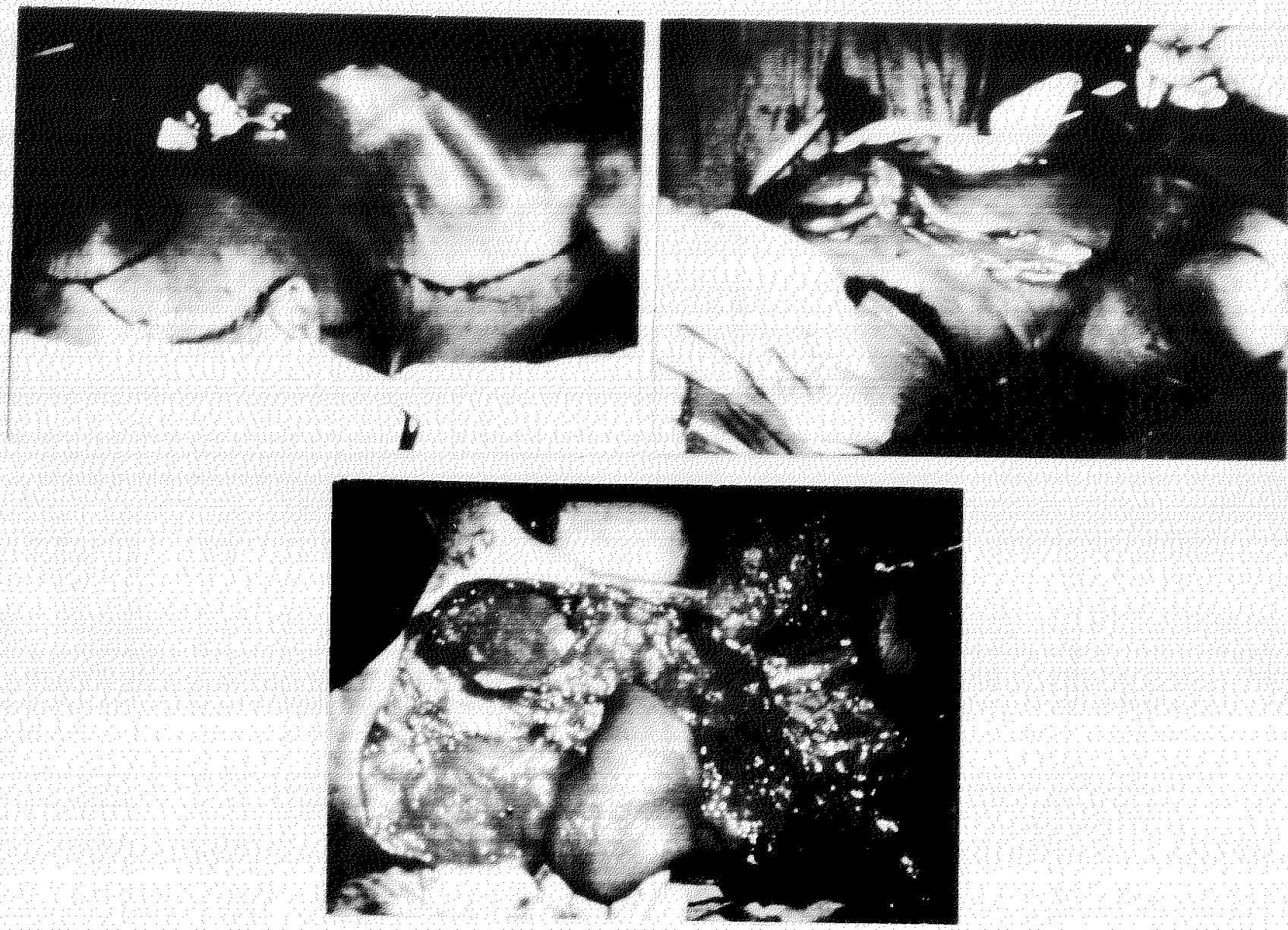


Figure 8. Case I underwent wide excision of the right cheek mass, partial maxillectomy, marginal resection of the mandible and radical neck dissection on the right. Top left, preoperative position of the patient. Top right, face and neck incision connected to the flap. Bottom right, face lateral island trapezius flap is swung towards the defect.

succumb to cardiac arrest 6 months after the operation.

Case II

S.V., a 74-year-old female with a diagnosis of squamous cell carcinoma, well differentiated, stage IV ($T_4N_2M_0$) on the right cheek presented with a 5 x 5 cm fungating mass at the right cheek area, a 2 x 2 cm erythematous induration at the buccal mucosa of the right cheek, and a 1 x 1cm movable lymph node at the submandibular area (Fig. 9). Patient underwent wide resection of the mass with a 2 cm margin, partial maxillectomy, hemimandibulectomy and radical neck dissection with preservation of the accessory nerve on the right. The defect was closed using the lateral island trapezius myocutaneous flap. Primary closure was partially done at the donor site with the remainder of the defect covered with split-thickness skin graft. Postoperatively, the donor site developed Proteus infection and was controlled with antibiotics and judicious conservative management. A fistula less than 2 cms developed at the right cheek area near the lip due to infection and saliva contamination. In spite of these complications, no significant necrosis of the flap developed. Patient was discharged in good condition but was lost to follow-up.

Case III

A.V., a 45-year-old female with a diagnosis of squamous cell carcinoma on the left tonsillar area, Stage IV ($T_4N_1M_0$), presented with a 6 x 4 cm exophytic mass on the left tonsillar area with extension to the adjacent soft palate, anterior tonsillar pillar, and retromolar trigone; and a 3 x 2 cm fixed lymph node on the left submandibular area (Fig. 10). The patient underwent wide excision of the mass with partial maxillectomy through a lateral mandibulotomy and radical neck dissection on the left with preservation of the spinal accessory nerve. The defect, which includes the exposed carotid artery,was reconstructed using the superior trapezius flap with a 4 cm lateral random extension. The flap was tubed to serve as a controlled fistula. Primary closure was done to repair the donor site, except at the distal 5 cm which was allowed to heal by secondary intention. Postoperatively, the patient developed Pseudomonas infection at the donor and recipient sites, healing was delayed without loss of the flap. One month post-op, the controlled fistula was closed only to partially dehisce after one week. The wound healed after 4 months by secondary intention. The patient received a total of 6,000 rads. Postoperatively, the patient has been following up regularly for 1 year without any recurrence, but with trismus of 1 fingerbreadth.

RESULTS

The trapezius myocutaneous flap was utilized in the reconstruction of head and neck defects in 3 patients at the East Avenue Medical Center, Department of Otolaryngology Head and Neck Surgery.

In Cases I and II, the lateral island trapezius flap was used to reconstruct large defects of the buccal and cheek area. In Case III, the superior trapezius flap was used to reconstruct a defect in the oropharynx. Complete resection of the tumor was done in all 3 cases with a 2 cm margin. Frozen sections revealed the margins to be negative for malignancy. Cosmetically, the flap provided a good color match and sufficient bulk, especially for the cheek defect. In Case I, the patient was able to tolerate solid foods on the 7th post-op day and was discharged after 3 weeks. In Case II, the patient had a delay in oral food intake due to orocutaneous fistula but was discharged after 4 weeks. In Case III, there was delay in oral food intake due to infection of the recipient site and the patient was discharged after 5 weeks.

Cases I and II developed dehiscence at the donor site due to infection and tension at the suture line. The second case developed orocutaneous fistula due to infection and salivary contamination. In Case III, no dehiscence of any significance occurred at the donor site. However, the patient developed a minor dehiscence in the neck, at the site of the closed controlled fistula due to persistent salivary contamination and infection. In all cases, the flap remained viable. All patients experienced minimal shoulder dysfunction because of the loss of the supportive musculature of the scapula. In Cases I and II, post-op irradiation with 6,000 rads had no significant effect on the viability of the flap.

DISCUSSION

Historically, the surgical treatment of cancers of the head and neck has improved with the advances in reconstructive techniques. The applications of the myocutaneous flap was first described by Owens in 1955, who used the sternocleidomastoid muscle and its overlying skin to correct facial deformity. Recently, additional musculocutaneous tissue transfers in head and neck reconstruction have been described including pectoralis, trapezius and latissimus dorsi flaps. Although the other alternatives flaps were versatile, in selected cases (eg. in female patients) the trapezius myocutaneous flap is more suitable to use because

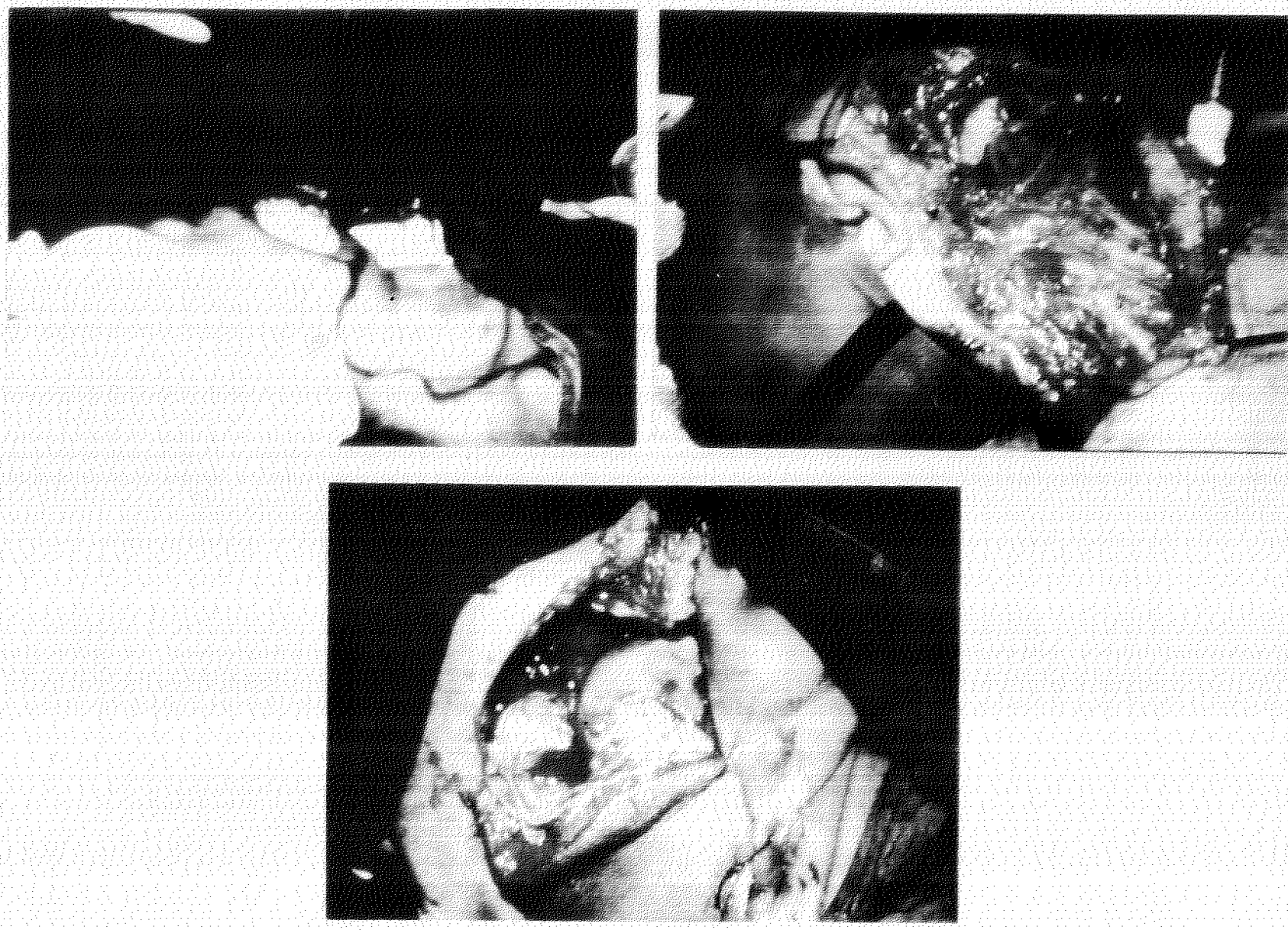


Figure 9. Case Ii undewent wide excision of the right cheek mass, partial maxillectomy, hemimandibulectomy and radical neck dissection on the right. Top left, preoperative position of the patient. Top right, appearance after complection of the extended cheek resection and radical neck dissection. Bottom right, lateral island trapezius flap is sutured to the cheek defect.

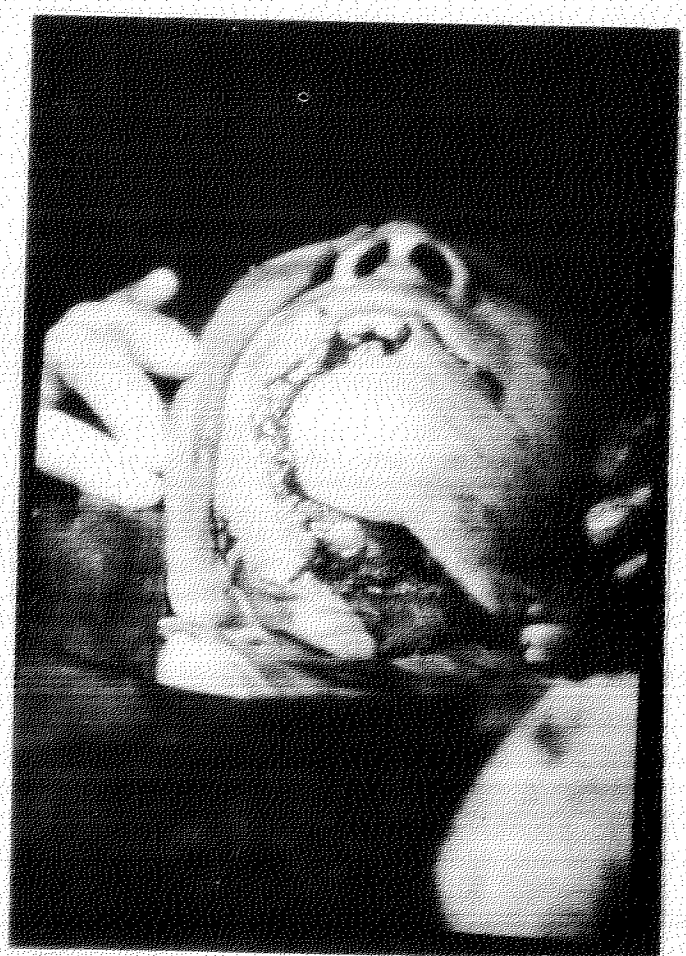


Figure 10. Case III underwent wide excision of the left tonsillar mass, partial maxillectomy, and radical neck dissection on the left. Top left, outline of the Superior TMCF. Right, appearance of the lip splitting incision. Bottom left, postoperative appearance of the patient.

breast distortion is avoided. This, together with its other important advantages promote its increasing popularity. The trapezius myocutaneous flap was described by **Dermegasso and Piazza** in 1979 as a lateral island flap based on the superficial transverse cervical vessels leaving the paraspinous attachments of the trapezius intact to form a bi-pedicled flap. **Panje** popularized the trapezius flap by describing the vascular anatomy and further applications in greater detail, thus stimulating a broader acceptance of this technique. Detailed descriptions of this procedure and their modifications have been reported by **Bertotti** (1980), **Baek** (1980), **Guillamondequi** (1981), **Shapiro** (1981), **Goodwin** (1982), **Rosen** (1985), and many others.

The trapezius flap consists of an island of skin of considerable dimensions adherent to a good portion of the trapezius muscle. Overall review of foreign journals shows that the trapezius myocutaneous flap offers several advantages making it the flap of choice for reconstruction of certain head and neck defects. These advantages are as follows:

1. It is a permanently pedicled axial flap.
2. The length of the flap is adequate to reach well beyond the midline.
3. It can provide adequate protection for the carotid system and bulk for the neck after radical neck dissection.
4. The flap can include bone as well as skin and muscle.
5. It is utilized as a one stage reconstructive technique.
6. Flap donor site is in the same operative field.
7. Its enormous arc of rotation allows it to reliably reconstruct massive defects of the upper face with the orbit at the center of the defect.
8. Integrity of the vascular pedicle can be established early in the operative procedure. If by the time the primary surgery is completed and the flap has insufficient blood supply, it wil be noticed and this permits the surgeon to use an alternative flap.

Several authors have cited the different uses of the trapezius myocutaneous flap. These are:

1. for reconstruction of large defects in the tongue, cheek, face, mandible and esophagus;
2. for single reconstruction of defects beyond the orbital rim extending across the midline following craniofacial resection;
3. for provision of additional muscle coverage for the carotid vessels protected by the sternocleidomastoid muscle which is most beneficial in heavily irradiated patients.

The advantages of the TMCF as compared with the pectoralis major myocutaneous flap and others are the following:

1. Patients undergoing ablative surgery including resection of the spinal accessory nerve rely on the lateral island trapezius musculocutaneous flap instead of the pectoralis major myocutaneous flap since this provides the added disability to the shoulder function that is encountered with the loss of both muscles.
2. Due to its thin and supple anatomy, it is more readily tubed than other myocutaneous flaps making it an excellent candidate for reconstruction of circumferential pharyngeal defects secondary to total laryngopharyngectomy.
3. It does not disturb the anterior aspect of the chest (a major advantage in women).
4. There are fewer hair follicles on the trapezius area than on the anterior chest wall.

In contrast, the disadvantages of the TMCF given by various authors are the following:

1. There is a large amount of tension on the donor site which can separate and delay healing.
2. It causes impairment of shoulder motion.
3. It may require a skin graft over the donor site.
4. There is a relatively short pedicle available in some patients. Unlike in the pectoralis major MCF, the vessels are not protected by a layer of myofacial tissue that might help to guard against kinking or thrombosis.
5. There is tedious dissection involved in isolating the transverse cervical artery and vein as they course across the base of the neck.

The complications noted by foreign journals are:

1. Donor site seroma
2. Total loss of flap
3. Necrosis
4. Wound dehiscence
5. Infection
6. Fistula

Panje, in a study of trapezius flaps has cited some limitations. And these are the following:

1. variable vascular anatomy,
2. the presence of lymph node metastasis in the neck contraindicates its use,
3. previous surgical ipsilateral neck dissection may compromise the the transverse cervical artery and prevent the use of the trapezius island flap,
4. difficulty in the positioning of the patient specifically in the extended trapezius MCF,
5. the tendency to dog ear at the base, and
6. the potential loss of CN XI.

A review of local journals reveals no studies done on the trapezius myocutaneous flap. To the authors' knowledge, this is the first locally reported study on the trapezius myocutaneous flap.

Based on the authors' experience, the advantages of utilizing this flap are:

1. It is a one stage procedure.
2. The flap can easily cover large skin and mucosal defects due to its enormous arc of rotation.
3. There is a good color match.
4. Breast distortion is avoided.
5. It provides adequate bulk for facial defects.

The disadvantages noted are:

1. Function: Minimal impairment of shoulder motion, and
2. Technical Difficulty: Repositioning of patient during surgery and difficulty in closure of donor site.

SUMMARY

This is the experience of East Avenue Medical Center with the trapezius myocutaneous island flap as an alternative technique in the reconstruction of major head and neck defects. Its advantages, disadvantages and limitations have been fully described. In selected cases, the trapezius myocutaneous island flap has been proven to be superior to other myocutaneous flaps.

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THE VALUE OF ANTHROPOMETRIC DATA IN AIRWAY MANAGEMENT AMONG FILIPINO INFANTS AND CHILDREN*

RAMON BAUTISTA, MD**

ABSTRACT

Endotracheal intubation is a life-saving procedure. This study aims to set standards for the determination of endotracheal tube size and length among Filipino infants and children with the use of anthropometric data. After studying eighty-four randomly selected Filipino pediatric patients, the following were concluded: 1) the average mouth to carina distance were 15.02 cm +/- 3.0 for males and 14.97 cm +/- 2.87 for females; 2) there are significant correlations between tube size and mouth to carina distance with age, height, weight, nares to xiphoid distance, midmaxilla to mandible distance, mandible to xiphoid distance and length of the third finger; 3) the optimal tube length can be predicted as follows: a) the sum of the distances from the midmaxilla to mandible and from the mandible to the xiphoid divided by 2, b) three times the length of the third finger minus one cm; 4) the internal diameter of the tube in millimeters is equal to the length of the third finger in centimeters; 5) the flexible fiberoptic nasopharyngoscope is a valuable aid in determining the mouth to carina distance.

INTRODUCTION

One of the most dreaded conditions occurring in the pediatric population is that of a compromised airway. Infants and children are uniquely susceptible to this condition as a consequence of several anatomic and physiologic factors. With the proper management of the airway based not only on the knowledge of the disease process but of the technique in securing the airway, morbidity and mortality in this age group can be minimized.

Endotracheal intubation is a commonly performed procedure that has become well established in treating respiratory failure in infants and children. Indeed, it is a life-saving procedure and remains the method of choice in airway management. However, such procedure if not properly done can lead to life threatening complications.

Successful intubation of a pediatric patient demands among other things, the ability to select an endotracheal tube of optimal diameter as well as placement of the endotracheal tube to an appropriate length. This is very critical in the pediatric age group as the margin for error is very small.

Determining the proper endotracheal tube size and length among infants and children continue to be a controversy. Even among the experts, doubts exists as to the choice of tube size and length for a particular patient.

Previous studies have documented several foreign investigations on tracheal measurements in human, cadavers or x-rays, but no direct measurement of optimum tube size and depth in living infant and children has ever been reported. This study therefore aims to set a standard among Filipino infants and children by direct measurement of the actual mouth to carina distance with the use of flexible fiberoptic nasopharyngoscope and to correlate the results of various anthropometric measurements for predicting optimal tube size and length.

OBJECTIVES

1. A. To establish a normative data for mouth to carina distance among Filipino infants and children.
   B. To evaluate the validity and applicability of the following anthropometric measurements in the assessment of optimal endotracheal tube size and tube length among Filipino infants and children.

   1. Age
   2. Height
   3. Weight
   4. Length of the third finger
   5. Base of nares to Xiphoid tip distance
   6. Distance from Midmaxilla alveolar ridge to Angle of the mandible
   7. Distance from Angel of the mandible to tip of Xiphoid process

* Presented at the 10th Boeringer-Ingelhiem Research Contest held at Hyatt Hotel on Sept. 21, 1990.

C. To assess which of the above parameters are least variable and thus more suitable.

2. A. To derive a formula based on the above anthropometric data for predicting optimal tube size and tube length.

B. To compare the values derived from the above anthropometric measurements as compared to values obtained from formulas derived from Caucasians.

3. To assess the value of flexible fiberoptic nasopharyngoscope as an aid in determining actual mouth to carina distance in Filipino infants and children.

MATERIALS AND METHODS

SUBJECTS: The data for this study were obtained from one hundred randomly selected patients from 1 day to 14 years age scheduled for non-thoracic surgery under general orotracheal anesthesia at the Santo Tomas University Hospital - Clinical Division, from November 1989 to March 15, 1990. Of the 100 pediatric patients, only 84 were included in this study. Of the sixteen excluded, 4 had cardiac disease, 9 had pulmonary disease, 2 had airway distortion (Cystic Hygroma - 1 and Ludwig's angina - 1) and 1 was a burn patient who had the second and third fingers of both hands amputated. Prior to surgery, the protocol was thoroughly explained to the patients or guardian and written consent was obtained.

PROCEDURE: General data included were Age (A), Sex (S), Height (H) in cm. and Weight (W) in kg. Premedication was given thirty minutes prior to surgery. Before intubation, the following anthropometric measurements were determined: Height (H), Nares to Xiphoid distance (BX), Midmaxilla to Angle of mandible distance (MA), Angle of the mandible to Xiphoid process distance (AX) and Third or Middle finger length (MF). All measurements were made with patient lying supine on the operating table with head in neutral position (nose is aligned with the xiphoid process and the mandible fixed at 90° to the operating table). All measurements were determined to the nearest 0.5 cm. using a fiberglass coated tape measure.

Verification of the height and weight was done. Height was measured from the crown to heel.

BX is the line measured from the base of the nares perpendicular to a line drawn from the tip of the xiphoid process. (Fig. 1)

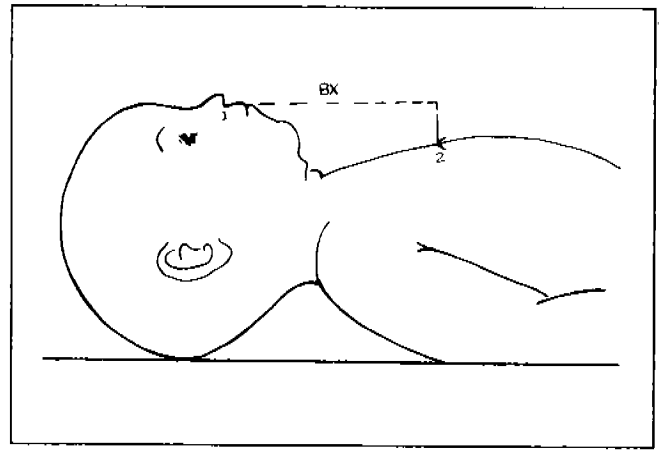

Figure 1. Schematic drawing of nares - Xiphoid Distance (BX). This is the line measured from the base of the nares (1) perpendicular to a line drawn from the tip of the xyphoid process (2).

MA is the distance from the midmaxilla alveolar ridge to the angle of the mandible. AX is the distance from the angle of the mandible to a perpendicular line drawn from tip of the xiphoid process. (Fig. 2) The sum of these two distances was noted.

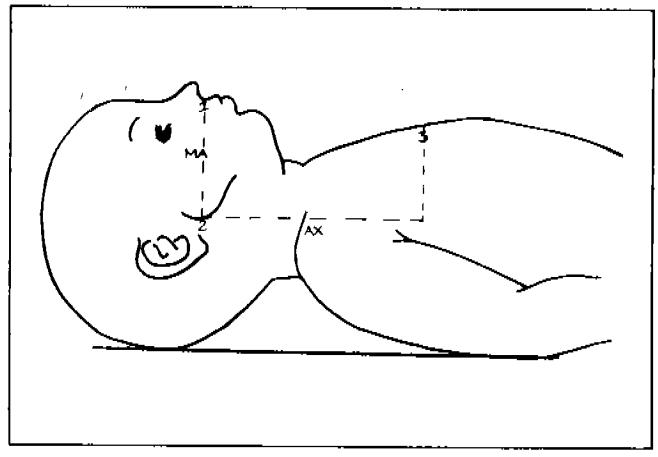

Figure 2. Schematic drawing of: A. Midmaxilla - Mandible distance (MA) which is measured from the Midmaxilla Alveolar Ridge (1) to the angle of the mandible (2); b. Mandible - Xiphoid Distance (AX) which is measured from the angle of the Mandibxble (2) to a vertical line drawn from the tip of the Xiphoid Process (3).

Third finger length was measured on the palmar surface of the hand from the metacarpophalangeal joint crease to the finger tip. (Fig. 3)

With the head in neutral position, the tube was advanced into the mainstem bronchus and after endobronchial placement was established the tube was

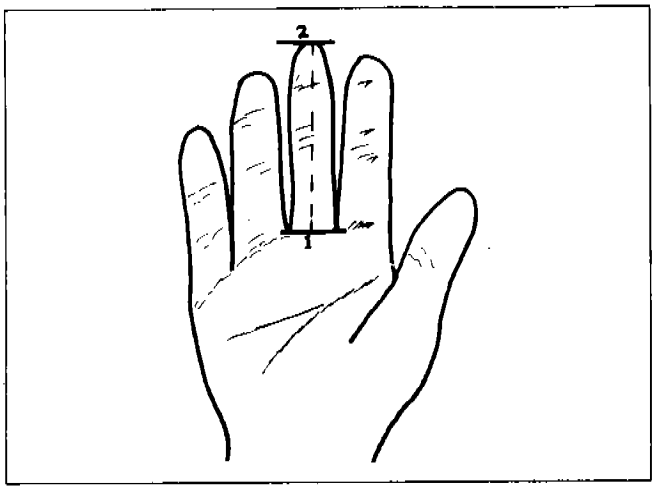

Figure 3. Schematic drawing of measurement of the third finger length from the metacarpophalangeal joint crease (1) to the Finger Tip (2)

withdrawn until it was determined to have just re-entered the trachea i.e. presence of breath sounds bilaterally on auscultation. At this point, the tip or the tube was presumed to be at the carina, and the measurement on the tube at the upper incisor or gum margin was noted, (Fig. 4) and this measurement was considered to be the distance between the carina and the upper incisor or gum margin (MTC). The mouth

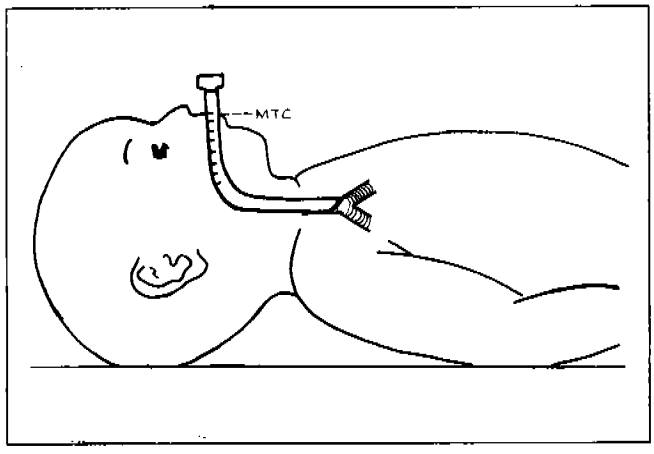

Figure 4. Schematic drawing of mouth to carina distance with the tube in Situ.

to carina distance was verified further by the use of flexible fiberoptic nasopharyngoscope. (Fig. 5) The flexible fiberoptic nasopharyngoscope was inserted through the endotracheal tube until the tip reaches the carina. The distance from mouth to carina was compared with various anthropometric measurements obtained, i.e. age, height, weight, third finger length.

DATA ANALYSIS: Data were collected and analyzed for statistical significance using the Pearson

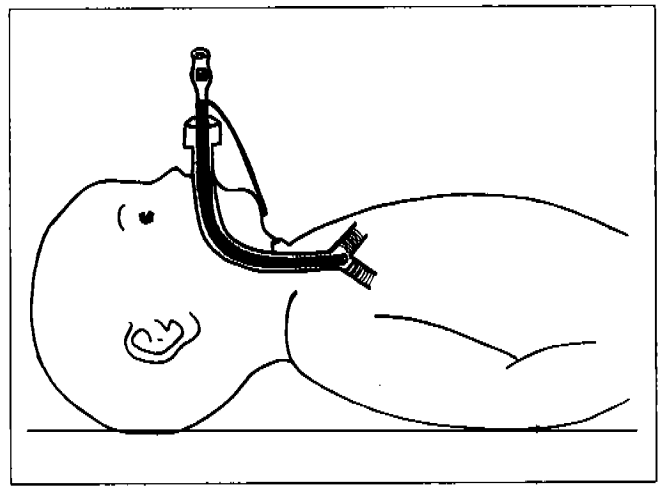

Figure 5. Schematic drawing of mouth to carima distance using flexible fiberoptic nasopharyngoscope.

product moment correlation coefficient matrices. A matrix was computed for the entire population: ages were grouped into three 0-3, 4-9, 10-14 and sex as males and females respectively. Regression lines were derived using the least square method.

To determine what effect age might have on the observed differences between the distance from: nares to xiphoid, midmaxilla to mandible, mandible to xiphoid and third finger length and the mouth to carina distance, data for subjects aged 0-3 were compared with those of the 4-9 and 10-14 age groups. Same was done for sex. Students T-test was used.

For all statistical analysis a p value less than 0.01 was considered significant.

From the anthropometric data obtained, a formula to predict optimal tube length was derived using Linear regression analysis.

RESULTS

Figure 6 depicts the number of subjects by gender and age group. A total of 84 pediatric patients with ages 1 day to 14 years and mean of 5.9 years, SD +/ -4.4 years were included in this study. There were 48 males (57.14%) and 36 females (42.86%). (Fig. 7) A summary of the anthropometric and derived data from 84 Filipino pediatric patients categorized according to sex are presented on Tables I and II.

The mean optimal tube size for all subjects was 5.19 mm I.D. SD +/- 1.22 mm and the overall mean mouth to carina distance was 15.0 cm SD +/- 2.93 cm. When categorized according to sex, mean optimal tube size was 5.16 mm I.D. SD =/- 1.22 mm for males and 5.23 mm I.D. SD +/- 1.33 mm for females: while mouth to carina distance was 15.02 cm SD +/- 3.0 for males

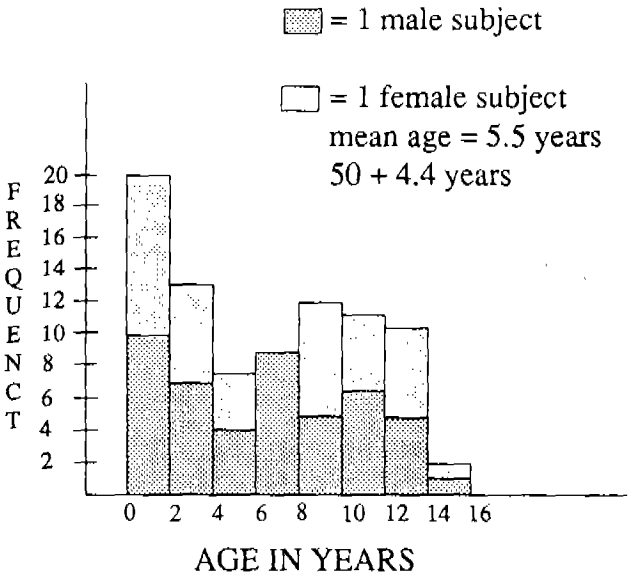

Figure 6. Number of pediatric patients included in the study by gender and age group

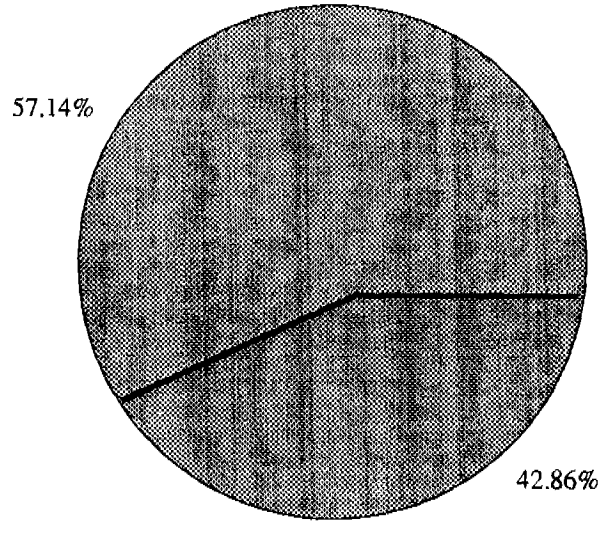

Figure 7. Proportion of male & female patients in the study population

and 14.97 cm SD +/-2.87 cm for females. Student's T-test showed no significant difference between the means obtained for both groups.

Correlative and Predictive Factors of Optimal Endotracheal Tube size and Mouth to Carina Distance

ANTHROPOMETRIC DATA

AGE Age has highly significant positive correlation with both tube size (r=0.93466, p < 0.01) and mouth to carina distance (r = 0.91520, p <0.01) **Table** *III.* According to age group, the highest correlation was found in the 0-3 age group, the highest correlation was found in the 0-3 age group (r = 0.83854 and r = 0.85198 for tube size and mouth to carina distance respectively, p < 0.01) and the 4-9 age group (r= 0.83361 and r = 0.74958 for tube size and mouth to carina distance respectively, p < 0.01). In the 10 -1 4 age group, is still significant although the correlation is equivocal (r = 0.46418, p < .05). **Table IV, V, VI**

SEX There is apparently no correlation between sex and either tube size and mouth to carina distance among infants and children in all age groups. However, female subjects in the 10-14 age group tend to have shorter mouth to carina distance than their male counterparts.

HEIGHT The mean height for males was 98.32 cm SD +/- 29.36 cm, and for females 98.98 SD +/- 30.09 cm. **Fig. 8** Student's T-test showed no significant difference between both groups. A significant correlation was found when height was compared with optimal tube size (r=0.93619, p <0.01). According to sex, height correlated with tube size better in males (r=0.92765). **Table VII**

WEIGHT The mean weight for males was 17.2 kg. SD +/- 9.9 kg and for females 17.04 kg SD +/- 9.7 kg. Student's T test showed no significant difference between the groups. **Fig. 9** A significant correlation was obtained when weight was compared with optimal tube size (r=0.86017, p <0.01) and mouth to carina distance (r=0.86759, p <0.01). According to sex, there was a more significant correlation for females than for males.

THIRD FINGER LENGTH There was significant correlation between the optimal tube size (r= 0.91111, p < 0.01) as well as with mouth to carina distance (r = 0.93197). The length of the third finger in centimeter was found to be equal to the internal diameter of the endotracheal tube in millimeters.

NARES TO XIPHOID DISTANCE The overall mean distance was 18.51 cm SD +/- 4.62 cm. The mean distance was 18.59 cm SD +/- 4.65 cm for males

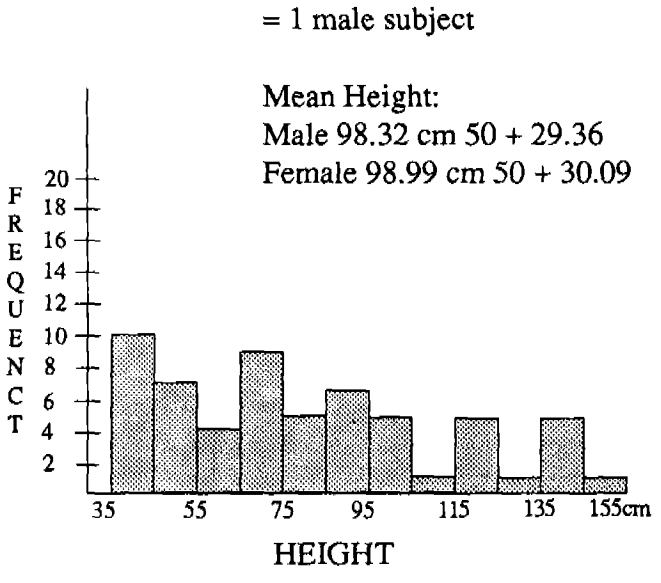

Figure 8. Number of Pediatric Patients included in the study by height.

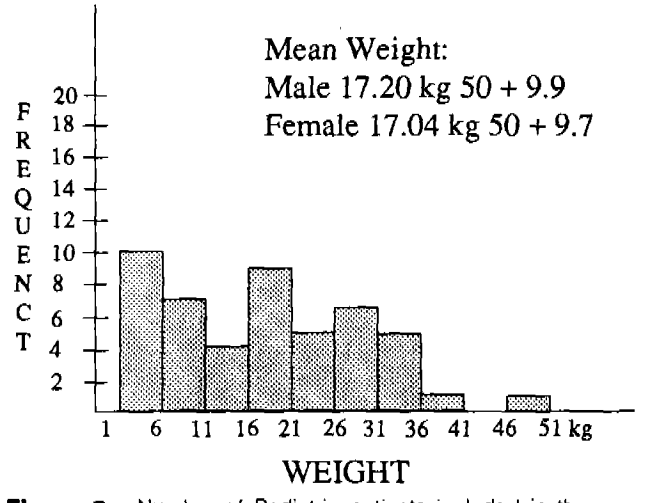

Figure 9. Number of Pediatric patients included in the study by weight

and 18.40 cm SD +/- 4.64 cm for females. No significant difference was noted between the groups.

MIDMAXILLA TO MANDIBLE DISTANCE The overall mean distance from the midmaxilla alveolar ridge to angle of mandible was 9.93 cm SD +/- 1.46 cm. It measured 9.96 cm SD +/- 1.55 for males and 9.90 cm SD +/- 1.36 cm for females. No significant difference was noted between the groups.

MANDIBLE TO XIPHOID DISTANCE The overall mean distance was 17.7 cm SD +/- 4.75 cm. The mean distance was 17.9 cm SD +/- 4.8 cm for males and 17.5 cm SD +/- 4.74 cm for females. No significant difference was noted between both groups.

DERIVED DATA Table VIII

THREE TIMES THE LENGTH OF THE THIRD FINGER This correlated well with the optimal tube size ($r = 0.91125$, $p < 0.01$) and mouth to the carina distance ($r=0.93182$, $p< 0.01$). Three times the length of the middle finger in centimeters was found to be greater than the actual mouth to carina distance. The mean difference was 0.4 cm in males and 0.6 cm in females.

Fig. 10 plots the mouth to carina versus three times the middle finger length for each subjects. The regression line for the entire population ($n= 84$) was expressed by the equation $y = 0.67x + 4.5$. Regression lines were plotted separately for male subjects $y = 0.71x + 3.98$ and females $y = 0.62x + 5.25$.

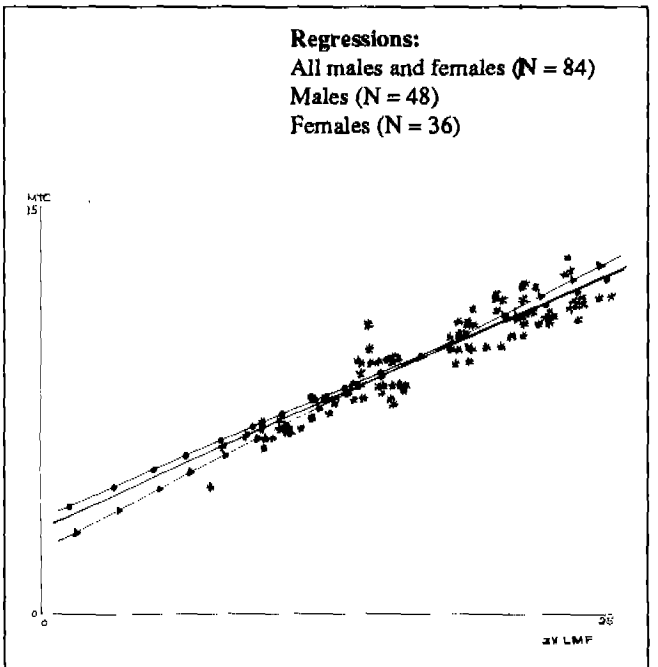

Figure 10. Correlations and Regressions of mouth to carina distance with three times the length of the third finger.

THE SUM OF MIDMAXILLA TO MANDIBLE AND MANDIBLE TO XIPHOID DISTANCE DIVIDED BY 2 This derived data correlated well with the tube size ($r=0.91970$, $p<0.01$). This derived data was found to be less than the actual mouth to carina distance. The mean difference being 1.1 cm in males

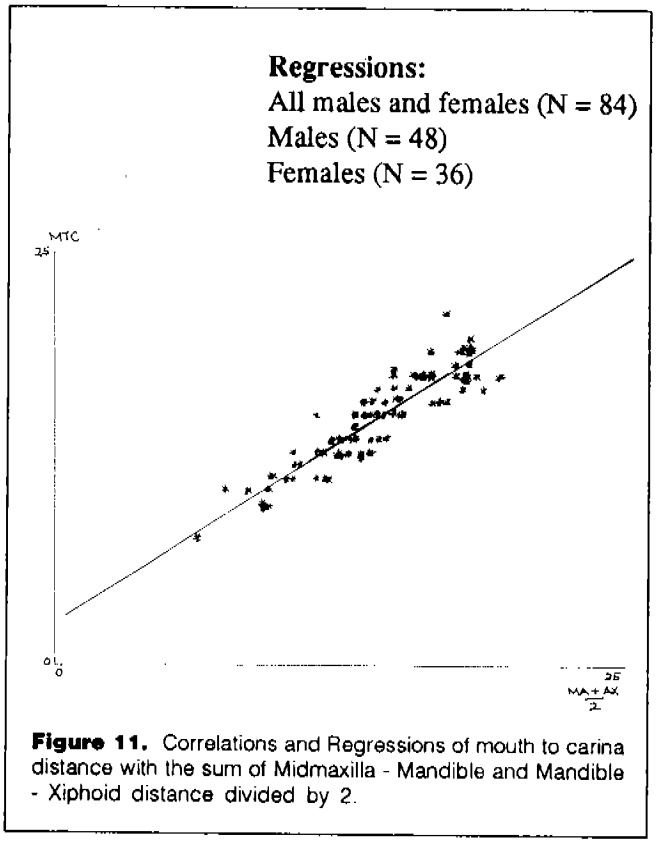

Figure 11. Correlations and Regressions of mouth to carina distance with the sum of Midmaxilla - Mandible and Mandible - Xiphoid distance divided by 2.

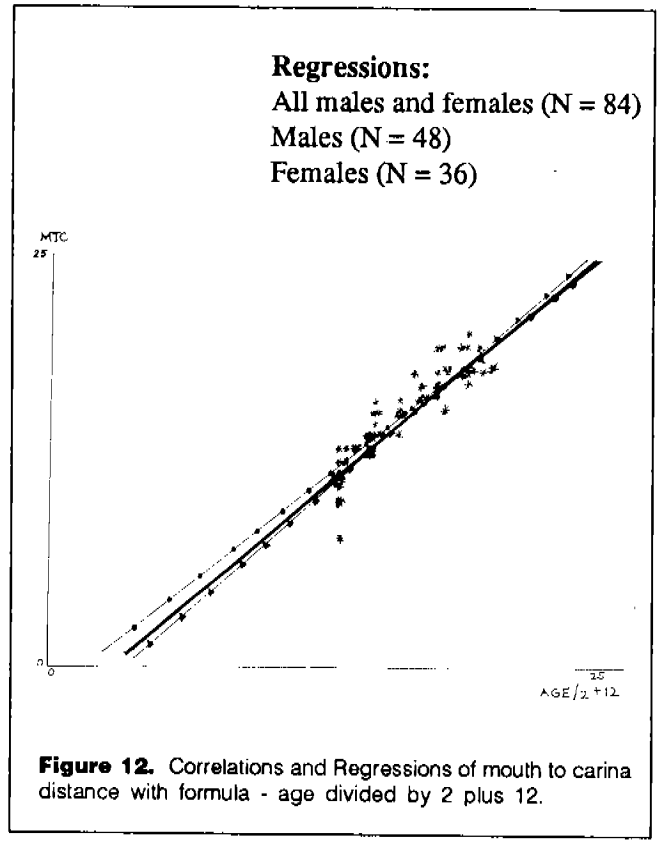

Figure 12. Correlations and Regressions of mouth to carina distance with formula - age divided by 2 plus 12.

and 1.3 cm in females. **Fig. 11** illustrates the mouth to carina distance versus the sum of midmaxilla to mandible and mandible to xiphoid distance divided by 2 for each subject. The regression line for the entire population (N = 84) was expressed by the equation $y=0.89x + 2.72$. Regression lines were plotted separately each for males $y = 0.88x + 2.69$ and females $y = 0.89x + 2.70$.

AGE DIVIDED BY 2 PLUS 12 The value obtained from the above formula likewise correlated significantly with tube size ($r=0.93508$, $p < 0.01$) and the mouth to carina distance ($r= 0.91659$, $p< 0.01$). According to sex, it was noted that correlation with tube size was more significant in females while correlation with mouth to carina distance was more significant in males. The value derived from this formula was found to be less than the mouth to carina distance. The mean difference was 0.02 cm for males and 0.03 cm for females. **Fig. 12**

BLOCH'S FORMULA: HEIGHT X 0.1 + 6.1 The value derived from the above formula likewise correlated well with tube size ($r= 0.91641$, $p< 0.01$) and mouth to carina distance ($r = 0.93571$, $p < 0.01$). According to sex, correlation with mouth to carina distance was more significant for females than their male counterparts. The value derived from this formula was actually greater than the actual mouth to carina distance. The mean difference was 0.9 cm in males and 1.01 cm in females. **Fig. 13**

DISCUSSION

Airway obstruction occurs in infants and children either with previously unsuspected airway problems and in those with known conditions. It can be an insidious process until a rapid catastrophic consequence occurs. Thus, all symptoms of airway obstruction can be considered fatal, demanding eternal vigilance. The management due to the time-honored conventional technique of endotracheal intubation.

Endotracheal intubation is a commonly performed and safe procedure in airway management. However, in the urgency of the situation and in the hands of the inexperienced, it is not entirely free from complications. The potential complications include accidental dislodgement, laryngeal mucosal ulceration, granuloma formation, subglottic stenosis, and obstruction of the tube with thick secretions or blood. The most common and most dreaded complication of endotracheal intubation is improper placement of the tube as in endobronchial intubation. Failure to check

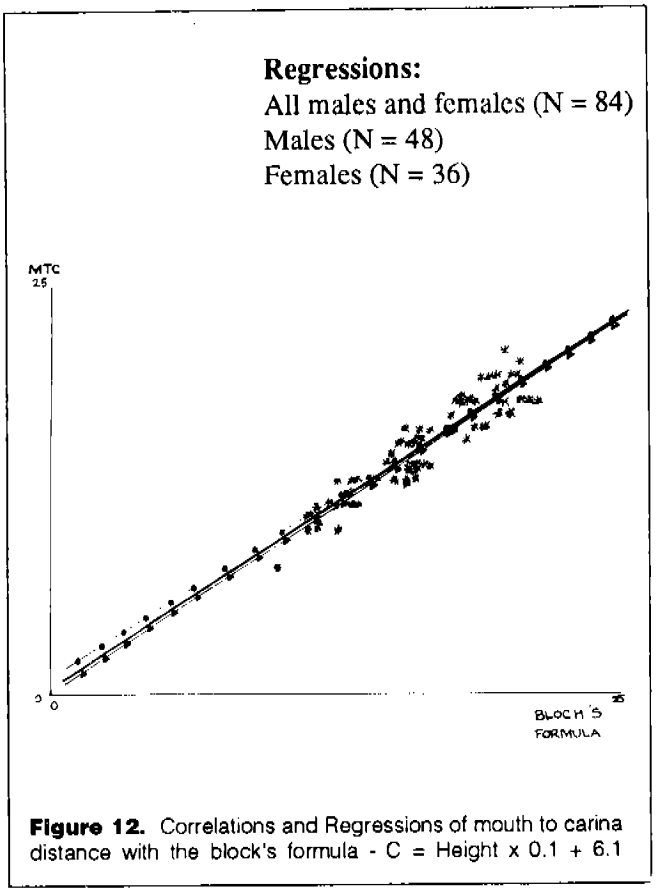

Figure 12. Correlations and Regressions of mouth to carina distance with the block's formula - C = Height x 0.1 + 6.1

for correct endotracheal tube placement, frequent suctioning of an improperly anchored tube or changes in head position all lead to endobronchial intubation. Conversely, failure to place the tube several centimeters beyond the vocal cords may result in inadvertent extubation with subsequent disastrous consequences.

In 1979, **Brown** and **Fisch** reported that the right bronchial angle averaged 30 degrees and the left 47 degrees in living children. Because of this more direct continuity with the trachea they observed that endobronchial intubation was common in the right. In a study made by **Kuhn** on living children, the carina was seen radiographically to move 0.5 to 2.0 cm. in relation to the tip of the endotracheal tube during respiration. Moreover, movement of the head with the endotracheal tube in place altered the position of the tip of the tube. During flexion of the neck, the tip of the tube advanced caudad a maximum of 0.5 cm and when the head was turned to the side, the tip was pulled upward a maximum of 1.2 cm as compared to the neutral position. Therefore, the ideal position for the tube tip would be one that would allow a 1.2 cm upward excursion by the tube with head turning, a 0.5 cm. descent of the tube with head flexion, and up to 2 cm above the carina to allow for its movement during respiration.

There are two aspects in airway management: the selection of the correct size of endotracheal tube and the proper tube placement to an appropriate depth.

Three methods are currently used to confirm proper tube placement namely: a) chest auscultation for equality of breath sounds in all areas of both lungs following intubation. However, some authors have questioned the reliability of this method. Auscultation is said to be deceptive in positioning or the endotracheal tube[1]: When the tube is in the bronchus, some ventilation of the side opposite the tube tip may occur by air escaping around the endotracheal tube so that breath sounds may be heard over the lung of the unobstructed bronchus. The lung opposite the endotracheal tube may, however become atelectatic because of hypoventilation or acccumulation of secretions; b) Chest X-ray although confirmatory, is expensive,, inconvenient and may not be readily available; c) the optimal position as well as the patency of the tube can be checked quickly and safely by the use of a flexible fiberoptic nasopharyngoscope. This obviates the necessity for a chest x-ray, for which the patient may have to be moved, increasing the risk of disconnection and accidental extubation, and also eliminated exposure to radiation. This study confirms the usefullness of this instrument in measuring actual mouth to carina distance in Filipino infants and children.

It was **Galileo Galilei** who said "Measure all that can be measured." Man since the earliest time has used his own body as basis for measurement.[6] From then on, the concept of anatomic correlation and anthropometric measurements have evolved and the distance between the mouth and carina in infants and children is no exception.

As early as 1907, **Chavalier Jackson** stated that the straigth distance from the upper anterior teeth to the carina measured bronchoscopically was 27 cm in men and 23 cm in women. On the other hand, **Gillespie** suggested that the tube length is related to the distance from the cricoid to the sternal angle of **Louis**, leaving a margin of error 9 cm. **Kuhn** in 1971 showed that measurement of the distance from the lips to 2 cm above the carina radiographically indicate a tube length of 9 cm in term neonates, - 2 cm for very small premature infants and + 2 cm for 1 year old infants. **Loew** and **Thibeault** in 1974 found a high correlation between orotracheal tube length and the distance of the midmaxilla alveolar ridge to the angle of the mandible and from the angle of the mandible to the tip of the xiphoid process. Analytically, the authors failed to take into consideration the possibility that half of the sum of these two distances could have a correlation with optimal tube length among infants and children. Until now, no literature has yet been published

Table I. Summary of Anthropometric data for Filipino infants and children (N = 84)

	Males (n= 48)		Females (n = 36)	
	Mean	SD	Mean	SD
Age (years)	5.98	+ 4.26	5.83	+ 4.65
Height (cm)	98.32	+ 29.36	98.98	+ 30.10
Weight (kg)	17.21	+9.89	17.04	+ 9.69
Length of third finger (cm)	5.15	+ 1.32	5.20	+ 1.42
Base of the nares to xiphoid tip distnace (cm)	18.59	+ 4.65	18.40	+ 4.64
Midmaxillla alveclar ridge to angle of mandiable distance (cm)	9.96	+ 1.55	9.90	+ 1.36
Angle of mandible to xiphoid tip (cm)	17.89	+ 4.81	17.54	+ 4.74
Mouth to Carina distance (cm)	15.02	+ 3.00	14.97	+ 2.88
Tube size (in mm ID)	5.17	+ 1.23	5.24	+ 1.34

Table II. Summary of Derived data for Filipino inftants and children (N = 84)

	Males (n= 48)		Females (n = 36)	
	Mean	SD	Mean	SD
Length of third finger X 3	15.47	+ 3.97	15.61	+ 4.27
Sum of Midmaxilla Alvedlar	13.94	+ 3.13	13.64	+ 2.94
Ridge to angle of mandible + angle of mandible to Xiphoid tip divided by 2 age divided by 2 plus 12	14.99	+ 2.13	14.94	+ 2.30
(K x 0.1) + 6.1 block's	15.91	+ 2.96	15.99	+ 3.01
Mouth to carina distance	15.02	+ 3.00	14.97	+ 2.88
Tube size (in mm ID)	5.17	+ 1.23	5.24	+ 1.34

Legend: Measurements are expressed in centimeters except tube size

Table III. Correlation Matrix of the different Anthropometric measurements in all pediatric patients included in the study.

	Age	**Height**	**Weight**	**BX**	**MA**	**AX**	**MTC**
Height	0.94221						
Weight	0.89733	0.93647					
LMF	0.91231	0.94279	0.88759				
BX	0.89700	0.92778	0.87250				
MA	0.78853	0.83153	0.81998	0.80429			
RX	0.91232	0.93520	0.89338	0.99109	0.83207		
MTC	0.91520	0.93619	0.86759	0.89939	0.80922	0.91416	
T	0.93466	0.91665	0.86017	0.91111	0.83759	0.89195	0.91871

Critical Value 2 Tail, D.05 = + / - 0.21444 N = 84
BX = Nares to Xiphoid distance AX = Mandible to Xiphoid distance
MTC = Mouth to Carina Distance
MR = Midmaxilla to Mandible Distance T = Tube size

Table IV. Correlation Matrix of considered factors included in the study among Pediatric patients aged 1 - 3 years old

	Age	Height	Weight	8X	MA	AX	MTC
Height	.91511						
Weight	.88584	.90427					
Tube Size	.83854	.83449	.78120				
LMF	.88205	.94377	.92863				
3XLMF	.88221	.94628	.92886				
8X	.86896	.87711	.85841	.85357			
MA	.53681	.65137	.65538	.73054	.65261		
AX	.85125	.85605	.85892	.84614	.98879	.68004	
MA + AX/2	.81550	.85718	.85045	.87431	.95085	.82900	.96771
Age/2+12	.96702	.88197	.88065	.87791	.85859	.53879	.85782
Block's	.91452	.99724	.90578	.94910	.87769	.65185	.85505
MTC	.85198	.88570	.90750	.92177	.84487	.77406	.84243

Table V. Correlation Matrix of considered factors included in the study among Pediatric patients age 4 - 9 years old

	Age	Height	Weight	3XLMF	8X	MA	AX
Height	.82128						
Weight	.76022	.83588					
LMF	.80680	.87533	.87428				
3XLMF	.80680	.87533	.87428				
BX	.76848	.73416	.77355	.71161			
MA	.52207	.45358	.61487	.60134	.42592		
AX	.80380	.71852	.75643	.73526	.96615	.48967	
MA + AX/2	.78232	70919	.78397	.75762	.92858	.63660	.96614
MTC	.74958	.80493	.72095	.74758	.71319	.27891	.72569
Tube size	.83361	.74180	.80970	.83607	.75319	.69147	.77509

Table VI. Correlation Matrix of considered factors included in the study among Pediatric patients age 10 - 14 years old

	Age	Height	Weight	3XLMF	8X	MA	AX
Height	.68735						
Weight	.58744	.87906					
LMF	.23666	.38380	.40099				
3XLMF	.23666	.38380	.40099				
8X	.36660	.63283	.46603	.63318			
MA	.61370	.72642	.77836	.60274	.60013		
AX	.42506	.71837	.61375	.64397	.95873	.70974	
MA + AX/2	.51751	.76568	.69247	.66904	.91711	.82773	.97980
Age/2+12	1.0000	.68735	.58744	.23666	.36660	.61370	.42506
Block's	.68892	.99978	.87809	.37751	.63227	.72776	.71689
MTC	.05747	.37750	.31698	.40014	.30306	.23297	.38650
Tube Size	.46418	.31635	.29643	.92341	.11037	.25348	.16781

Table VII. Correlation of considered factors with tube size and mouth to carina distance in Filipino Pediatric Patients N = 84

	Males (48)		Females (36)	
	MTC	Tube Size	MTC	Tube Size
Age	.91249	.92633	.92302	.94615
Height	.92765	.91802	.94955	.91622
Weight	.82822	.84177	.92402	.88735
LMFing.	.94220	.91437	.92274	90744
3XLMFing.	.94204	.91463	92274	.90744
8X	.91472	.88737	.87848	.85930
MA	.80752	.85733	.81384	.82386
AX	.92007	.89973	.90673	.88906
MA + AX/2	.92237	.91719	.91723	.89556
Age/2 + 12	.91389	.92586	.92392	.94735
Block's	.92725	.91813	.94890	.91571

Table VIII. Correlation Matrix of the different derived data in all Pediatric Patients included in the study

	A	H	W	3xLMF	MA+AX	A+12	Block's	MTC
Height	.94221							
Weight	.89773	.93647						
3 X LMF	.91248	.94306	.88773					
MA + AX/2	.91281	.94051	.90236	.91745				
Age/2 + 12	.99885	.94202	.89809	.93643	.91538			
Block's	.94161	.99963	.93611	.94304	.94005	.94161		
MTC	.91520	.93619	.86759	.93181	.91970	.91659	.93571	
T	.93466	.91665	.86017	.91125	.90284	.93508	.91641	.91871

Critical Value 2 Tail, 9.05 = + / - 0.21444 N = 84
MTC = Mouth to Carina Distance T = Tube size
AX = Mandiable to Xiphoid MA = Midmaxilla To Mandible
LMF = Length of Middle Finger

concerning this hypothesis. **Calimag** in 1986 found that the length of the middle finger correlated well with the tube size and tube length among adults.[6] Recently, **Ossey** and Bloch described a new method **by means of deliberated endobronchial** intubation eventually deriving a formula relating depth with height.[7] Age has been generally used as the basis to predict tube length in Filipino infants and children.[13,14,15] In this study among Filipino infants and children, age has a high correlation with the optimal tube size and mouth to carina distance: As age increases, the tube size and mouth to carina distance increases. However, when the different age categories are taken into consideration, the correlation becomes less after the first decade of life. This may stem from the fact that as children grow older they approximate the size of an adult. This observation supports the fact that the normal child has definite rate and pattern of growth and development within which is predictable for all normal children. The greatest rate of growth are from birth to 2 years of age and from prepubescence to 15-16 years of age. The results of this study further confirm the findings previously obtained from Filipino adults.

In the local setting , the formula Age in years divided by 2 plus 12[13] is equally used to estimate the tube depth. Findings from this local study showed that this formula is more significantly correlated with tube size in females while the mouth to carina distance is more significantly correlated in males. The value derived from this formula is usually less than the actual mouth to carina distance.

Among neonates, **Tochen** derived a formula "rule of 7 - 8 - 9" based on birth weight. In this study, weight among female subjects was more significantly correlated with optimal tube size and mouth to carina

distance than their male counterparts. Furthermore, it was found that weight was more significantly correlated with tube size and mouth to carina distance in pediatrics than in adults. This may be attributed to the varied dietary habits of adults. The quality and quantity of dietary intake together with the interplay of both heredity and environment influence growth development.

According to sex, height was more significantly correlated with tube size in males than in females. However, it is the mouth to carina distance which was more significantly correlated in females than in males. Unlike weight, height is usually easier to measure even in the most seriously ill. The results of this study support the general observation that linear growth does not cease until maturity is reached, at about 17 years of age in females and 21 in males.

Bloch et al. derived a formula relating tube length with height. In this study, the predicted value using the formula C = height x 0.1 + 6.1 was greater than the actual mouth to carina distance. This is very important since the probability of accidental endobronchial intubation is quite high.

The sum of the midmaxilla to mandible and mandible to xiphoid distance divided by 2 correlated well with both the tube size and mouth to carina distance. This derived data was usually less than the actual mouth to carina distance in Filipino infants and children, by 1.1 cm in males and 1.3 cm in females. From this data, the optimal tube length among the pediatric age group could be derived.

Endotracheal intubation is usually performed during emergency situations wherein there is little or no time at all to calculate the length of the tube which must be inserted. Therefore, the use of height, weight or various body measurements may be limited. It is during this critical situation where the practicality of using the length of the third finger is realized. The findings of this study show that the length of the middle finger in centimeters is equal to the internal diameter of the tube size in millimeters. The value obtained from three times the length of the middle finger corresponds to the mouth to carina distance among the pediatric age group which is consistent with the findings from previous study conducted among Filipino adults.[6]

SUMMARY AND CONCLUSIONS

Significant statistical correlations were obtained from mouth to carina distance, endotracheal tube size and the following anthropometric mesurements: age, height, midmaxilla to mandible distance, mandible to xiphoid distance and the length fo third finger; thus, making them good predictors of endotracheal tube size and length among Filipino infants and children.

In summary:

1. The average mouth to carina distance among Filipino infants and children was 15 cm SD +/- 1.22. According to sex, the average mouth to carina distance was 15.02 cm SD +/- 3.0 for males and 14.97 cm SD +/- 2.87 for females.

2. The optimal endotracheal tube length for Filipino infants and children can be derived using the following formulas:
   a. Midmaxilla to mandible distance + mandible to xiphoid distance divided by 2 (in centimeters) b. Length of the middle finger x 3 - 1 cm.
3. The length of the third finger in centimeters corresponds to the internal diameter of endotracheal tube in millimeters.
4. The formulas derived from this local study are simpler, and the results represents the optimum tube size and tube length for Filipino infants and children. Values obtained from the formulas derived from Caucasians do not provide the optimum tube size and tube length for Filipino infants and childeren.
5. The flexible fiberoptic nasopharyngoscope is a valuable aid in assessing actual mouth to carina distance in infants and children.

The complications of endotracheal intubation can not be ignored. One of the important aspects of the procedure is the determination of the appropriate tube size and tube length. The formulas derived from the anthropometric measurements can serve as useful guide and valuable tool in order to provide the pediatric patient with an optimum airway management and achieved a sense of fulfillment to be able to save a life.

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Chronic Otitis Media Surgery in the Philippines: Its Current Status

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ABSTRACT

A local study was conducted to determine the most preferred surgical technique in the management of chronic otitis media. Questionaires were sent to 70 board certified otolaryngologists and yielded a 40% response. All are currently active in otologic surgery. At the same time, a review of 50 patients with chronic otitis media operated on by UST ENT residents between January 5, 1989 and June 6, 1989 was done.

This study shows that 56.84% prefer open cavity procedures for cases with or without cholesteatoma. However, at 95% level of significance, there is no significant difference between surgical preference on open cavity and non-cholesteatoma cases. The actual surgeries performed by ENT residents for the last 5 months were in conformity with the preferences of otolaryngologists for non-cholesteatoma cases. However, cholesteatoma cases cannot be compared since no intact canal wall procedure was done in UST during this 5 months.

For reconstructive procedures, 77.78% prefer tympanoplasty according to classification by Wullstein and 22.22% tympanoplasty with ossiculoplasty for cholesteatoma while 80.95% prefer Wullstein classification and 19.05% tympanoplasty with ossiculoplasty for non-cholesteatoma cases.

Based on ENT resident surgeries, 76.92% utilize tympanoplasty under Wullstein classification and 23.07% tympanoplasty with ossiculoplasty for cholesteatoma while 82.61% did tympanoplasty following classification by Wullstein and 17.39% tympanoplasty with ossiculoplasty for non-cholesteatoma cases. The most preferred tympanic membrane graft and ossiculoplasty materials are the temporalis fascia and bone chips respectively. When compared with actual surgeries of the residents, same materials were used for both cholesteatoma and non-cholesteatoma cases.

INTRODUCTION

Cholesteatoma is pathological entity characterized by bone-eroding skin lined cavity filled with concentric layers of desquamated epithelium.[1] There is no medical treatment for this condition. The aim of mastoidectomy is to arrest bone erosion and potential threat to life by removing the debris and cyst wall.

Chronic otitis media with or without cholesteatoma has been a formidable adversary to the otologic surgeon. Classical otologic surgery can be divided into three chronologic stages of development. The first began with von Trottsch, Korner, Schwaetze and Kuster between 1878 and 1889 and saw the establishment of basic principles of radical tympanomastoidectomy which were perfected by Zaufel, Stackel and Jansen in 1890. This surgery was devoted solely to elimination of otologic infection, with no regard being given to the functional characteristics of the ear.

Bondy in 1910, marked the second phase and aimed not only to eradicate infection of the middle ear and mastoid but to respect healthy middle ear structures for the benefit of auditory function. In the early 20th century, with the introduction of new instruments like the monocular microscope by Nylen in 1931, binocular microscope by Holmgreen in 1932 and electric drill by Boetcher in 1940, existing surgical techniques improved. Finally in 1952, Wullstein and Zollner introduced tympanoplasty with mastoidectomy. They summarized the possibilities of repair to the sound conduction mechanism of the middle ear by establishing universally accepted classification methods based on the principle of sound protection of the round window.[2] In the early 1960s, many began to use intact canal wall technique but the high recurrence of cholesteatoma led to the development of obliteration procedures in 1962 and 1963. The various techniques utilized to treat chronically discharging ear only confirms that there is no universally accepted operation to control this disease. The paucity of our local literature regarding chronic ear surgery led the author to investigate how local otolaryngologists deal with this problem.

The objectives of this study are the following:

1. To determine the most frequently preferred surgical techniques among otolaryngologists in the treatment of chronic otitis media:
   a) with cholesteatoma
   b) without cholesteatoma

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2. To determine the most utilized surgical techniques in the treatment of chronic otitis media based on surgical procedures performed by UST ENT residents.

3. To compare the preferred surgical techniques of otolaryngologists and actual surgical techniques done by a group of ENT residents in management of chronic otitis media.

4. To determine the type of middle ear reconstruction frequently used by ENT specialists as well as residents.

MATERIALS AND METHODS

A survey was conducted to determine the commonly used surgical techniques and reconstructive procedures for chronic otitis media. Respondents were board certified otolaryngologist from all over the country. Statistical analysis was done using frequency distribution, taking one surgical procedure at a time. Statistical significance was determined using Chi-square test for significance.

To compare the preferred surgical procedure by otolaryngologists with the ENT residents at UST, 50 charts of patients with chronic otitis media operated on from January 5 to June 6, 1989 were reviewed retrospectively and similarly analyzed.

RESULTS

Results show that for cases of otitis media, with and without cholesteatoma, majority (56.84%) prefer the open cavity procedure. Table 1 shows the surgical preference for both cholesteatoma and non-cholesteatoma cases.

Table 1. Surgical Preference by Otolaryngologists for both Cholesteatoma and Non-cholesteatoma cases

Type of surgery	Cholesteatoma		Non-Cholesteatoma		TOTAL	
	N	%	N	%	N	%
Open Cavity	28	59.57	26	54.17	54	56.84
Intact Canal Wall	19	40.43	22	45.83	41	43.16
Total	47	100.00	48	100.00	95	100.00
Chi-Sq. computed		1.72		0.33		1.78
Chi-Sq./Yates		1.74		0.35		1.78
Chi-Sq..95		3.84				

Although many prefer the open cavity type of surgery at 95% level of significance, there is no significant difference between expected and observed frequency on preference for open cavity and intact canal wall for both cholesteatoma and non-cholesteatoma cases.

In the open cavity procedures, the modified radical approach is preferred for non-cholesteatoma cases and radical mastoidectomy for cholesteatoma cases. Table II exhibits details on open cavity procedures preferred by responding otolaryngologists.

Table II. Surgical Preference According To Open Cavity Procedures

Open Cavity Procedures	Cholesteatoma		Non-Cholesteatoma		Total	
	N	%	N	%	N	%
Modified Rad.	10	35.71	24	92.31	34	62.96
Radical	18	64.29	2	7.69	20	37.04
Total	28	100.00	26	100.00	54	100.00
Chi-Sq.computed		2.29		18.62		3.63
Chi-Sq./Yates		1.75		16.96		3.12
Chi-sq.tabulated	(95%)	3.84	(99.5%)	7.88	(90%)	2.71

The difference between modified radical and radical mastoidectomies on cholesteatoma cases is 28.57% (18-10/28) but applying the chi-square test with or without Yates correction factor, shows that there is no difference between observed and expected frequency at 95% level of significance. If survey result on this item shows at most 8 points for one and at least 20 for the other, then it may pass the 95% level of significance. (2.7100 chi-sq..90,1).

For non-cholesteatoma cases, there is a significant difference proving that the modified approach is the more preferred procedure. (7.88 chi-sq..95,1).

For combined cholesteatoma and non-cholesteatoma cases, the difference is significant at 90% but inconclusive.

In the intact canal wall procedures, the complete and combined approach are equal in distribution for the non-cholesteatoma cases while the combined approach is preferred for cholesteatoma cases. Table III shows the preference points for intact canal wall procedures and Chi-Sq. test indicates no significant difference between complete and combined approach of all cases.

Table III. Surgical Preference For Intact Canal Wall Procedures

INTACT CANAL WALL	CHOLESTEATOMA		NON-CHOLES		TOTAL	
	N	%	N	%	N	%
Complete	7	36.84	11	50	18	43.90
Comb.-approch	12	63.16	11	50	23	56.10
Total	19	100.00	22	100.00	41	100.00
Chi-Sq.computed		1.32		0.00		0.61
Chi-Sq./Yates		0.84		0.04		0.39
Chi-Sq..95,1		3.84				

The combined-approach tympanomastoidectomy is preferred as shown in the frequency distribution. Table IV shows the chi-sq. test results indicating no significant difference between observed and expected frequencies.

Table IV. Surgical Preference On Combined-Approach Tympanomastoidectomy Procedure Applied

	CHOLESTEATOMA		NON-CHOLESTEATOMA		TOTAL	
	N	%	N	%	N	%
Facial Recess	6	28.57	5	25.00	11	26.83
One-Stage	9	42.86	10	50.00	19	6.34
Two Stage		628.57	5	25.00	11	26.83
Total	21	100.00	20	100.00	41	100.00
Chi-Sq.computed		0.86		2.50		3.12
Chi-Sq..95		5.99				

Table V shows that for non-cholesteatoma cases, tympanoplasty following **Wullstein** classification is highly preferred over tympanoplasty with ossiculoplasty (99% level of significance). For cholesteatoma cases, statistical analysis revealed no sigificant difference between the 2 preferred reconstructive procedures.

Table V. Reconstruction Procedures Applied For Cholesteatoma And Non-cholesteatoma Cases

PROCEDURE following	CHOLESTEATOMA		NON-CHOLESTEATOMA		TOTAL	
	N	%	N	N	%	
	0	0	0	0	0	0
Wullstein Classification	7	77.78	17	80.95	24	80.00
W/ Ossiculoplasty	2	22.22	4	19.05	6	20.00
Total	9	100.00	21	100.00	30	100.00
Chi-Sq.computed		2.27		8.05		10.08
Chi-Sq./Yates		1.78		6.86		9.63
Chi-Sq.tabulated	(90%)	2.71	(99%)	6.63	(99.5%)	7.85

Table VI. Tympanic Membrane Grafting Technique Applied For Cholesteatoma And Non-cholesteatoma Cases

PROCEDURE	CHOLESTEATOMA		NON-CHOLESTEATOMA		TOTAL	
	Count	%	Count	%	Count	%
Lateral Graft	5	55.56	13	61.90	18	60.00
Medial Graft	4	44.44	8	38.10	12.	40.00
Total	9	100.00	21	100.00	30	100.00
Chi-Sq.computed		0.11		1.19		1.20
Chi-Sq./Yates		0		0.76		0.83
Chi-Sq..95		3.84		3.84		3.84

For tympanic membrane grafting techniques, there is no desired preference between the lateral and medial graft for both cholesteatoma annd non-cholesteatoma cases (95% level of significance).

In choosing the tympanic graft annd ossiculoplasty material, Table VII and VIII show that temporalis fascia and bone chips are the most frequently used.

Table VII. Tympanic Graft Materials Used For Cholesteatoma and Non-cholesteatoma Cases

TM GRAFT TOTALMATERIALS	CHOLESTEATOMA		NON-CHOLESTEATOMA		TOTAL	
	Count	%	Count	%	Count	%
Temporalis Fascia	9	75	21	72.41	30	73.17
Skin	2	16.67	4	13.79	6	14.63
Vein	1	8.33	0		1	2.44
Perichondrium	0		4	13.79	4	9.76
Total	12	100.00	29	100.00	41	100.00
Chi-Sq.computed		8.34		18.12		46.49
Chi-Sq.tabulated	(95%)	7.81	(99.5%)	12.8	(99.5%)	12.8

Table VIII. Ossiculoplasty Materials Used For Cholesteatoma And Non-cholesteatoma Cases

Ossiculopasty Materials	Cholasteatoma		Non-Cholesteatoma		Total	
	Count	%	Count	%	Count	%
Plastic	1	7.69	4	14.29	5	12.20
Wire	2	15.38	4	14.29	6	14.63
Bone chips	5	38.47	10	35.72	15	3.58
Fitted pros	0		2	7.14	2	4.88
Cartilage	4	30.77	3	10.71	7	17.07
Silastic	0		3	10.71	3	7.32
Ceramics	1	7.69	2	7.14	3	7.32
Total	13	100.00	28	100.00	41	100.00
Chi-Sq.computed		12.31		11.50		21.05
Chi-Sq.tabulated	(95%)	12.6	(99%)	16.8	(99.5%)	18.5

The 50 cases drawn from UST Hospital showed that the open cavity procedure was used in all cases of cholesteatoma while 57.89% of 19 non-cholesteatoma used intact canal wall technique. Table A summarizes the surgical procedures applied for cholesteatoma and non-cholesteatoma cases. For non-cholesteatoma cases, both the open cavity and intact canal wall technique were utilized.

TABLE A. Surgery Applied for Cholesteatoma and Non-cholesteatoma Cases

	CHOLESTEATOMA		NON-CHOLESTEATOMA		TOTAL	
	Count	%	Count	%	Count	%
Open Cavity	31	100.00	8	42	39	78.00
Intact Canal Wall	0	0.00	11	57.89	11	22.00
Total	31	100.00	19	100.00	50	100.00
Chi-Sq.computed		31.00		47		23.01
Chi-Sq./Yates		29.03		21		19.76
Chi-sq..95,1		3.84				

Comparing Table A with preferences classified in Table 1, the technique used by UST residents in non-cholesteatoma cases conforms with the technique preferred by otolaryngologists nationwide.

For reconstruction procedures, (Table B), ENT residents utilized tympanoplasty following Wullstein classification in 76.92% of 31 cholesteatoma cases and 82.61% of the 19 non-cholesteatoma cases. Only 23.08% of cholesteatoma cases and 17.39% of the non-cholesteatoma cases underwent tympanoplasty with ossiculoplasty.

Table B. Tympanoplasty Done by UST ENT Residents for Cholesteatoma And Non-cholesteatoma Cases from January 5, 1989 until June 6, 1989

TYMPANOPLASTY Classification	CHOLESTEATOMA		NON-CHOLESTEATOMA		TOTAL
	Count	%	Count	%	Count
Wullstein Classification	20	76.92	19	82.61	39
Tympanoplasty with ossiculoplasty	6	23.08	4	17.39	10
Total	26	100.00	23	100.00	49
Chi-Sq.computed		7.54		9.78	
Chi-Sq.tabulated	(95%)	3.84	(99.5%)	7.88	

The Wullstein classification is preferred by a majority of otolaryngologists and utilized most frequently by ENT residents in their cholesteatoma and non-cholesteatoma cases (Table B and VII).

Table C shows that the lateral graft is utilized more frequently than the medial graft by ENT residents for both cholesteatoma and non-cholesteatoma cases.

Table C. Tympanic Membrane Grafting Technique Done For Cholesteatoma And Non-cholesteatoma Cases

PROCEDURES	Cholesteatoma		Non Cholesteatoma		TOTAL
	Count	%	Count	%	Count
Lateral Graft	18	90.00	14	73.68	32
Medial Graft	2	10.00	5	26.32	7
Total	20	100.00	19	100.00	39
Chi-Sq.computed		12.8		4.26	
Chi-Sq.tabulated	(99.5%)	7.88	(99%)	3.84	

Both otolaryngologists and UST residents prefer and utilize lateral tympanic membrane grafting technique in majority of their chronic otitis media surgeries (Table VI and C).

DISCUSSION

In the management of chronic otitis media, eradication of cholesteatoma takes priority over hearing restoration. Taking this principle in consideration, many local otologists prefer open cavity procedures for cases with or without cholesteatoma.

However, the study shows there is no significant difference on preferences for an open cavity and intact canal wall procedures.

Both can either be used on cholesteatoma or non-cholesteatoma cases by any otolaryngologist. This could be attributed to individual intraoperative assessment of the surgeon regarding the extent of the cholesteatoma as well as the anatomic configuration of the patient's mastoid. **Parishier et al.**[1] in his study of surgical therapy of chronic mastoiditis with cholesteatoma noted that selection of an operative procedure ("canal wall up" or "canal wall down") was dictated by the extent of pathologic indications in relation to the size of the patient's mastoid.

Kinney[2] (1988) in a long term study about intact canal wall tympanoplasty with mastoidectomy for cholesteatoma did not clearly show that there is one correct surgical approach to cholesteatoma.

Between the two types of open cavity procedures, modified radical mastoidectomy was preferred by the otolaryngologist for non-cholesteatoma cases.

For the intact canal wall procedures, preferences are equally distributed for cholesteatoma and non-cholesteatoma cases among the local otolaryngologists. **Ragheb, et al.**[3] reporting the Iowa experience with surgery for cholesteatoma noted that although the intact canal wall mastoidectomy has been shown to result in a high cholesteatoma recurence rate, surgeons still feel encouraged to use it whenever anatomically feasible on the assumption that it provides a better hearing result than open cavity procedure and it avoids creation of mastoid bowl with its lifelong care obligations.

The results of this study show that under combined approach tympanomastoidectomy. preferences for opening the facial recess, undergoing a one-stage or two-stage procedure are fairly distributed for cholesteatoma cases. Thus, an otolaryngologist's choice would depend upon his discretion and no specific procedure is highly recommended over the other. However, the choice of techniques would depend on many factors. **Mangabeira-Albernaz**[4] (1982) in his writings about preoperative evaluation for tympanoplasty, noted that in patients with good socio-economic standing many advocate intact canal wall technique maintaining intact posterior canal wall. Corollary to this, **Ragheb**[3], et al. (1987) noted that intact canal wall procedure was preferred for persons who are willing to undergo series of operative procedures. Patients predicted to undergo intact canal wall technique have a higher incidence of recurrence and the possibility of another major operative procedure.

Based on the study, the two-stage procedure is equally recommended as one-stage procedure. **James Sheehy**[5] (1973) in a study of tympanoplasty staging stated that the decision to perform 2-stage procedure is made at the time of surgery. Elimination of disease and aeration of the middle ear cleft are the objects of the first stage. Reestablishment of sound pressure transfer mechanism and reinspection of the ear from residual cholesteatoma 6 months to 18 months later are the objectives of the second stage.

However, **Mangabeira-Albernaz**[4] (1982) claimed that among patients whose geographic and socio-economic conditions do not favor repeated surgical procedure, the one stage procedure is preferred. Furthermore, open cavity procedures was recommended.

For the reconstructive procedures, majority of the otolaryngologists favor tympanoplasty under **Wullstein** classification over ossiculoplasty for both cholesteatoma and non-cholesteatoma cases. **Jacob Sade et al.** [6] (1989) in a study of tripod ossiculoplasty in incudal lesions of 30 ears said that cholesteatoma ears are very often unsuitable for ossiculoplasty, whereas ears with simple chronic otitis media or atelectasis are often suitable. This would be the same reason why local otolaryangologists do not advocate ossiculoplasty for cholesteatoma cases.

The most preferred tympanic graft and ossiculoplasty materials are the temporalis fascia and bone chips respectively. **Tato Jr.**[7] (1982) noted that temporalis fascia and tragal perichondrium are the best materials for tympanic membrane grafting for they are fibrous tissue in origin and easy to obtain intraoperatively.

Comparing the actual surgeries of a group of ENT residents done for 5 consecutive months, the technique used by the residents conform with the major preference of otolaryangologists. But in their cholesteatoma case, no intact canal wall procedure were recorded. **Moss & Lucente**[8] (1987) recommended that open cavity technique should be strongly urged in resident cases when dealing with cholesteatoma considering the shorter follow-up time.

In the past years, there has been so much enthusiasm regarding the intact canal wall technique and it was the operation being advocated by most ear surgeons. However, long term result showing a high incidence of residual and recurrent cholesteatoma have influenced a majority of otologists to revert back to the more reliable and time tested way of handling the cholesteatoma with the open cavity method.

Open cavity method is evidently the operation of choice for the resident in training and the beginning otologist. Until such time that one has acquired the mastery and has achieved good results can one then attempt to perform intact canal wall technique in cases where there are definite indications. For those indigent patients coming from rural areas, it is more practical to advise the open cavity method to lessen the financial burden it entails when considering a second look.

Whatever be the surgical approach contemplated, there is a high demand of technical excellence for its success. **Jackson**[14] said that canal wall down procedures can be wrought with so many serious complications as their more controversial combined approach tympanoplasty procedures counterpart is alleged to propagate and that such problem cavities most commonly result from poor execution of basic techniques.

Review of literature regarding causes of failures in cholesteatoma surgery includes the following: incomplete eradication of disease, residual or recurrent cholesteatoma, high facial ridge, overhanging anterior and posterior buttress, inadequate meatoplasty, incomplete exanteration of air cells, failure to seal middle ear cavity and eustachian tube problems.

Knowing the basic principles and common error seen in mastoid surgery, it is imperative that a number of vital steps be followed to ensure success regardless of the surgical approach.

1. Postauricular incision - from the superior attachment of the auricle down post-auricularly along the hairline to the natural crease of the neck.

Rationale - allows wide cortical exposure
- avoids wound being directly over the cavity which runs the risk of delayed wound healing or occurence of permanent fistula.
- results in an inconspicious scar because it is covered by hair.

2. Canalplasty - bony external auditory canal is enlarged with cutting and diamond burrs until the tympanic annulus is completely visualized with just one position of the microscope.

Rationale - guarantee proper placement of the tympanic membrane graft
- allows easy inspection and cleaning post-op; provide better aeration
- prevents accumulation of debris.

3. Complete eradication of disease - all matrix and the underlying bone is removed similar to excising a tumor mass with a sizeable margin. Total removal of the facial ridge to the level of the fallopian

canal is a must in order to eliminate any bony barrier between the floor of the meatus and the mastoid cavity. The final cavity should have an external diameter which is twice the medial diameter. Removal of the facial ridge has an added advantage of having better access to the sinus tympani where the cholesteatoma matrix are missed.

Rationale - guarantee total removal of disease, therefore a safe, and dry ear, and free from complications.

4. Exenteration of all mastoid and epitympanic air spaces - all air cells in the retrosinal, retrofacial, retrolabyrinthine areas are drilled.

Rationale - facilitates reepithelialization and prevents the formation of cell debris and granulations.

5. Use of silastic or gelfilm when available

Rationale - to create an aerated middle ear space to provide a phase differential be tween the two windows of the inner ear
- prevent adhesions from forming between the promontory and the tympanic membrane allowing the mucosa to revert back to normal
- provide stability to the graft and allow reconstruction of the columella at a later procedure.

6. Maintain the fibrous annulus and canal skin at the anterior angle.

Rationale - delimits the boundary between the external and middle ear thus prevents blunting of the anterior angle
- excellent vascular bed
- assumed role in the embryogenesis of the lamina propia of the drum
- acts as a shelf to prevent retractions of the edges of the graft to the cavum minor and eustachian tube

7. Reconstruction of the middle ear conductive mechanism - best performed 1 year after construction of an aerated middle ear cavity.

Rationale - ensure ideal position and stability of the sound conducting mechanism
- stabilization of the drum
- regrowth of the mucosal lining of the middle ear
- evaluation of the ventilating efficiency of the eustachian tube

8. Meatoconchoplasty - direction of the incision must coincide with the large axis of the cavity to allow maximum aeration and easy inspection postoperatively. It should be adequately anchored to adjoining tissues to stent the meatoplasty without relying on the use of packing.

Rationale - exteriorize the cavity; promote ventilation; decrease the post-op incidence of external otitis;
- adequate visualization of the new eardrum
- initiate epidermization

Analysis of the reconstructive procedures done by the residents conform to the procedures preferred by the otolaryngologists.

CONCLUSION

This study, therefore, shows that local otolaryngologists prefer either an open cavity or intact canal wall procedures for their cholesteatoma and non-cholesteatoma cases. No specific procedure is preferred over the other. The actual surgeries performed by a group of ENT residents for the last 5 months were in conformity with the preferences of the Otolaryngologists for non-cholesteatoma cases. However, for cholesteatoma cases, residents did not utilize intact canal wall procedure instead open cavity techniques.

Tympanoplasty according to Wullstein classification is highly preferred by the otolaryngologists and ENT residents over ossiculoplasty in their reconstructive procedures of the middle ear.

The most preferred and utilized tympanic membrane graft and ossiculoplasty materials by otolaryngologists and residents were temporalis fascia and bone chips, respectively.

The fact that articles continue to be written about the different ways to treat cholesteatoma confirms the belief that there is no correct operation to control aural cholesteatoma. However, the Otolaryngologists should be guided by the basic principles and common errors seen in mastoid surgery to ensure the favorable outcomes of such procedures.

In any surgical endeavor, the first attempt is always the best. It is a common experience in revision surgery that abundant fibrosis and scarification makes the operation doubly difficult, pose problems in identifying normal anatomic landmarks and obtain results that are less satisfactory compared to primary surgery.

Farrior[15] clearly dictated a message, ""In tympanomastoid surgery, each failure and each revision jeopardizes the future of Otology."

CAUSES OF FAILURE IN MASTOID SURGERIES

	OHRR 1957	LEE 1970	BRANDOW 1974	FARIOR 1974	CHEESEMAN 1978
Inc. Eradication of Dis., residual or recurrent cholesteatoma	x	x	x	x	x
High facial ridge overhanging ant. & post. buttress	x		x	x	x
Inadequate meatoplasty	x		x	x	x
Inc. exenteration of air cells	x		x	x	x
Failure to seal ME cavity		x	x	x	
ET problems			x		

CAUSES OF FAILURE IN MASTOID SURGERIES

	FISCH 1980	CODY 1984	NADOL 1985	JACKSON 1985	KINNEY 1988
Inc. Eradication of Dis., residual or recurrent cholesteatoma		x	x	x	
High facial ridge overhanging ant. & post. buttress			x	x	x
Inadequate meatoplasty			x	x	x
Inc. exenteration of air cells			x	x	
Failure to seal ME cavity		x		x	
ET problems					x

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EPIDEMIOLOGY OF EAR WAX IN GRADE SIX PUBLIC SCHOOLS STUDENT OF DAGUPAN CITY (A Preliminary Study)

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INTRODUCTION

Ear wax is both a protector and a bane to humans. The cerumen in the ears help in conditioning the canal skin as well as offering some protection from foreign bodies. Unfortunately, excessive formation or failure in regular cleaning can lead to a pathologic condition since the accumulated cerumen can cause impaired hearing.

Is there a problem of excessive cerumen among the public school students in Dagupan City? Are there other ear diseases which are present in these children? These are the questions which interested the authors to investigate the epidemiology of ear wax among our Grade six public school students in Dagupan City. This endeavor also provided the authors to do some community work for the students.

MATERIALS AND METHODS

The project covered the period from January 30, 1991 to May 12, 1991. Seven Central Public Schools were visited. Only Grade 6 students were examined due to time and resources constraints. Furthermore, these graduating students were more responsible and cooperative than younger students. There were 775 students examined; 343 were males and 412 were females.

Children with no gross ear pathology were labelled N (Normal), children with ear pathology were labelled: BR (Ear wax, right ear), BL (Ear wax, left ear), BRL (Ear wax both ears), AR (Ear disease other than ear wax, right ear), AL (Ear disease other than ear wax, left ear), ARL (Ear disease other than ear wax, both ears). Those with ear wax were given free medicine (glycerine) to lyze their cerumen. These eventually were followed-up in the clinics of the authors for manual extraction of the cerumen. Those with other ear diseases were advised to seek further consultation. The project scope does not aim to treat more complicated ear cases. The authors hoped that the children with ear diseases other than cerumen would be treated by the specialists consulted.

RESULTS

There were 1117 Grade Six students enrolled in all seven central schools (TABLE 1-VIII). Of these, 775 were examined which represented 67.5% of the enrolled students. This data will need further investigation.

Seven hundred fifty five students were examined; 343 were males and 412 were females. This represented 1510 ears examined (TABLE IX). There were 603 students with normal ears; 9 with otitis media on the right ear; 10 with otitis media on the left ear; 3 with bilateral otitis media; 40 with cerumen on the right ear; 43 with cerumen on the left ear; 48 with cerumen on both ears. As previously mentioned, the only ear disease other than ear wax was otitis media. There were also a lot of tinea flava cases but this was not within the scope of this project.

There were 48 in BRL and 3 in ARL classification. In these two groups of students, more impaired hearing due to the bilateral involvement of the ears was expected.

DISCUSSION

The results obtained by the authors did not vary greatly from the studies of other researchers regarding hearing impairment in children in public schools. It was refreshing to note that 79.9% of students have normal ears, only 3% with otitis media, and 17.4% with ear wax (GRAPH 1). The fact that only 66.5% of the total Grade six students were examined raised questions on the results of this preliminary study. Were the students who absented "normal" or were avoiding the medical team because they have "shameful" ear disease? This question will be resolved during further data collection by the group.

The authors centered on the BRL and ARL classifications because of the fact that it should be these two groups who should exhibit more severe

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hearing impairement due to involvement of both ears. The BRL represented 6.4% and that of ARL 0.4% which totalled 6.8% (51 of the 755 students), GRAPH II. This value was way below the 10% that we expected.

Some of those with AR, AL and ARL have consulted with the authors in their clinics for removal of the softened cerumen.

ACKNOWLEDGEMENT AND LIMITATIONS

This project was conceived by the senior author in cooperation with the Rotary Club of Dagupan, DOH, and DECS. The project was named: Operation L.T. (Linis Tainga). The project was spearheaded by the senior author who is a member of the Rotary Club in Dagupan. He sought the help of **Dr. Bernardo Mendoza** of the Pangasinan Provincial Hospital. The DECS under **City Schools Supt. Nicanor M. Salazar, Jr.** thru **Mrs. Nora Siapno** coordinated the completion of this year's crop of students. **Dr. Josephine Rodriguez, Mrs. Angelina Alvarez,** and **Mrs. Colete C. Viray** joined the team of health workers.

The authors would like to admit their limitations. This project has no funding; thus, the resources were voluntary or were partly subsidized by the local DECS unit/school and the Rotary Club of Dagupan. An audiometer would have been very beneficial. Our frustration is not being able to treat directly the otitis media cases as part of the project should be understood in the light of our limited resources. The authors may have to resort to cheaper medicines as substitute for our ceruminolytic agent (coconut oil or baby oil for glycerine). The involvement of other health workers for the other disease for evaluation and treatment would be welcome (eye evaluation, skin evaluation, etc.)

The authors would continue with this project as long as the DECS and DOH and other civic clubs like the Rotary Club of Dagupan are lending their helping hand. We wish to thank them by aggressively working for the sake of the students, the future of our motherland.

OPERATION LINIS TAINGA (LT)
ROTARY CLUB OF DAGUPAN
DECS PPH

GRADE 6 PUBLIC SCHOOL STUDENTS

TABLE I
JANUARY 30, 1991
WEST CENTRAL 1

S	n	ST	n	EX	T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
A	18	17	11	17	28	8	12							1	2	1		1	3	20	0	8	71.4	0.0	28.6	14.3	0.0
B	19	20	18	20	38	15	15							1	1	1	1	1	3	30	0	8	78.9	0.0	21.1	10.5	0.0
C	17	18	13	16	29	12	11			1					1		2		2	23	1	5	79.3	3.4	17.2	6.9	0.0
D	20	20	16	14	30	13	12								1	1		2	1	25	0	5	83.3	0.0	16.7	10.0	0.0
E	15	18	12	15	27	6	12							1		3	2	2	1	18	0	9	66.7	0.0	33.3	11.1	0.0
F	18	15	9	7	16	7	4			1			1		1	1	1		1	11	2	3	68.8	12.5	18.8	0.0	6.3
G	15	18		10	15	25	8	12			1	1		2			2			20	2	4	80.0	8.0	16.0	0.0	0.3
	122	126	89	104	193	69	78	0	0	3	1	0	1	5	6	7	8	6	10	147	5	42	76.2	2.6	21.8	8.3	0.5

TABLE II
WEST CENTRAL II

S	n	ST	n	EX	T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
A	24	16	15	11	26	13	7						1	1	1	1	1		1	20	1	5	76.9	3.8	19.2	3.8	3.8
B	19	20	19	16	35	16	12							2		1	1	3		28		7	80.0	0.0	20.0	8.6	0.0
	43	36	34	27	61	29	19	0	0	0	0	0	1	3	1	2	2	3	1	48	1	12	78.7	1.6	19.7	6.6	1.6

TABLE III
MARCH 6, 1991
EAST CENTRAL SCHOOL

S	n	ST	n	EX	T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
A	14	18	13	18	31	12	14				1				3			1		26	1	4	83.9	3.2	12.9	3.2	0.0
B	13	19	11	19	30	11	15		1								2		1	26	1	3	86.7	3.3	10.0	3.3	0.0
C	12	20	11	19	30	7	14		1						3	3	1	1	1	21	1	9	70.0	3.3	30.0	6.7	0.0
E	11	18	4	15	19	4	14		1						18		1			94.7		5.3	0.0	0.0	0.0		
F	11	17	4	13		17	3	10	1		1	1	1				13	3	1		76.5		17.6	5.9	0.0	5.9	
G	21	5	3	4		7	2	1					2	1	1		3		4		42.9		0.0	57.1	0.0	0.0	
	99	110	61	99	160	50	77	1	3	0	2	0	10	10	5	5	5	2	127	7	27		79.4	4.4	16.9	4.4	0.6

TABLE IV
MARCH 7, 1991
PANTAL ELEM. SCHOOL

S	n	ST	n	EX	T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
1	13	25	11	25	36	10	23			1	1				1					33	2	1	91.7	5.6	2.8	0.0	0.0
2	15	25	11	19	30	9	16		1							1	2	1		25	1	4	83.3	3.3	13.3	3.3	0.0
3	23	16	13	6	19	12	5											1	1	1	17	2	89.5	0.0	10.5	10.5	0.0
4	27	16	10	10	20	9	8								1			1	1	17		3	85.0	0.0	15.0	10.0	0.0
	78	82	45	60	105	40	52	0	1	1	1	0	0	0	2	1	2	3	2	92	3	10	87.6	2.9	9.5	4.8	0.0

TABLE V
MARCH 8, 1991
NORTH CENTRAL ELEM. SCHOOL

S	n	ST	n	EX	T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
1	13	17	6	14	20	5	12		1								1	1		17	1	2	85.0	5.0	10.0	5.0	0.0
2	13	19	6	11	17	6	8								1				2	14		3	82.4	0.0	17.6	11.8	0.0
3	16	16	1	3	4	1	3													4			100.0	0.0	0.0	0.0	0.0
4	16	15	0	2	2		1								1					1		1	50.0	0.0	50.0	0.0	0.0
	58	67	13	30	43	12	24	0	1	0	0	0	0	0	2	0	1	1	2	36	1	6	83.7	2.3	14.0	7.0	0.0

TABLE VI
GENERAL G. DEL PILAR ELEM. SCHOOL

S	n	ST	n	EX	T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
A	14	18	8	13	21	6	9			1					1		1	1	2	15	1	5	71.4	4.8	23.8	14.3	0.0
B	16	15	9	7	16	8	4								1	1		1		12	1	3	75.0	6.3	18.8	6.3	0.0
C	19	12	3	12	15	1	10										1	2	1	11	0	4	73.3	0.0	26.7	20.0	0.0
D	19	12	8	4	12	7	4								1					11		1	91.7	0.0	8.3	0.0	0.0
	68	57	28	36	64	22	27	0	0	1	0	0	0	0	3	1	2	4	3	49	2	13	76.6	3.1	20.3	10.9	0.0

TABLE VII
MARCH 12, 1991
BONUAN BOQUIG ELEM. SCHOOL

S	n ST		n EX		T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
A	13	23	10	18	28	8	16							1	1		1	1		24		4	85.0	5.0	10.0	5.0	0.0
B	20		16	19	13	32	17	7							3	1	2	1	1	24		8	75.0	0.0	25.0	6.3	0.0
C	23		11	15	8	23	12	6				1		1		1	1	1		18	1	4	78.3	4.3	17.4	4.3	0.0
D	21		8	17	5	22	15	4						1			1	1		19		3	86.4	0.0	13.6	4.5	0.0
	77	58	61	44	105	52	33	0	0	0	1	0	0	3	4	2	5	4	1	85	1	19	81.0	1.0	18.1	4.8	0.0

TABLE VIII
MARCH 13, 1991
WEST CENTRAL EXT. ELEM. SCHOOL

S	n ST		n EX		T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
1	18	18	12	12	24	9	10	2	1					1					1	19	3	2	79.2	12.5	8.3	4.2	0.0

TABLE IX
SUMMARY OF ALL SCHOOLS

S	n ST		n EX		T	N		AR		AL		ARL		BR		BL		BRL		N	A	B	N%	A%	B%	BRL%	ARL%
	M	F	M	F		M	F	M	F	M	F	M	F	M	F	M	F	M	F								
	563	554	343	412	755	283	320	3	6	5	5	0	3	12	28	18	25	26	22	603	23	131	79.9	3.0	17.4	6.4	0.4

LEGENDS:

S = Section
n ST = no. of students
n EX = studetns examined
T = Total examined
M = male
F = female

N = normal
AR = ear disease, right ear
AL = ear disease, left ear
ARL = ear disease, both ears
BR = cerumen, right ear
BL = cerumen, left ear

N% = % normal/Total
A% = % A/Total
B% = % B/Total
BRL% = % BRL/Total M+F
BRL = cerumen, both ears
ARL% = % ARL/Total M+F

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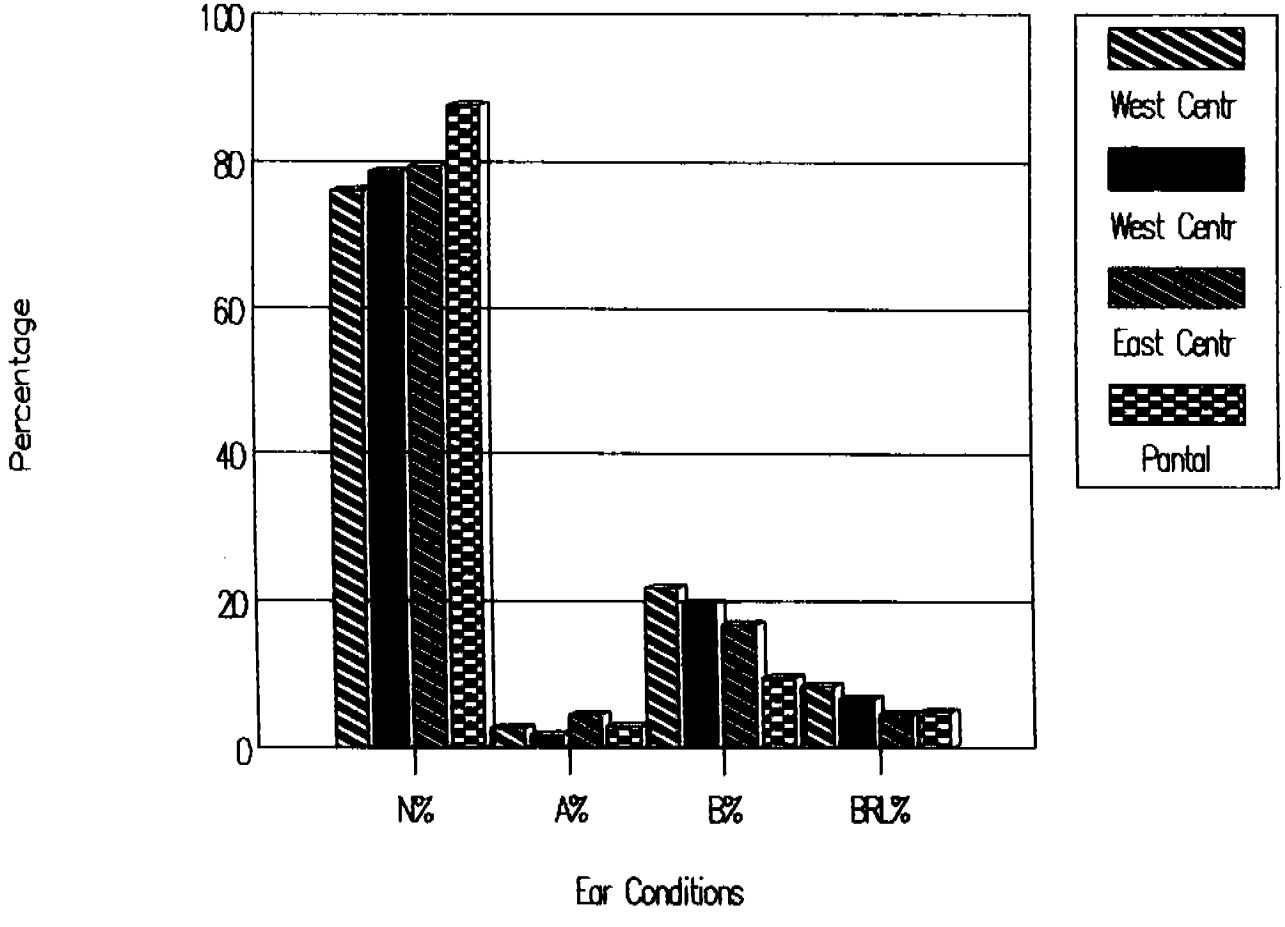
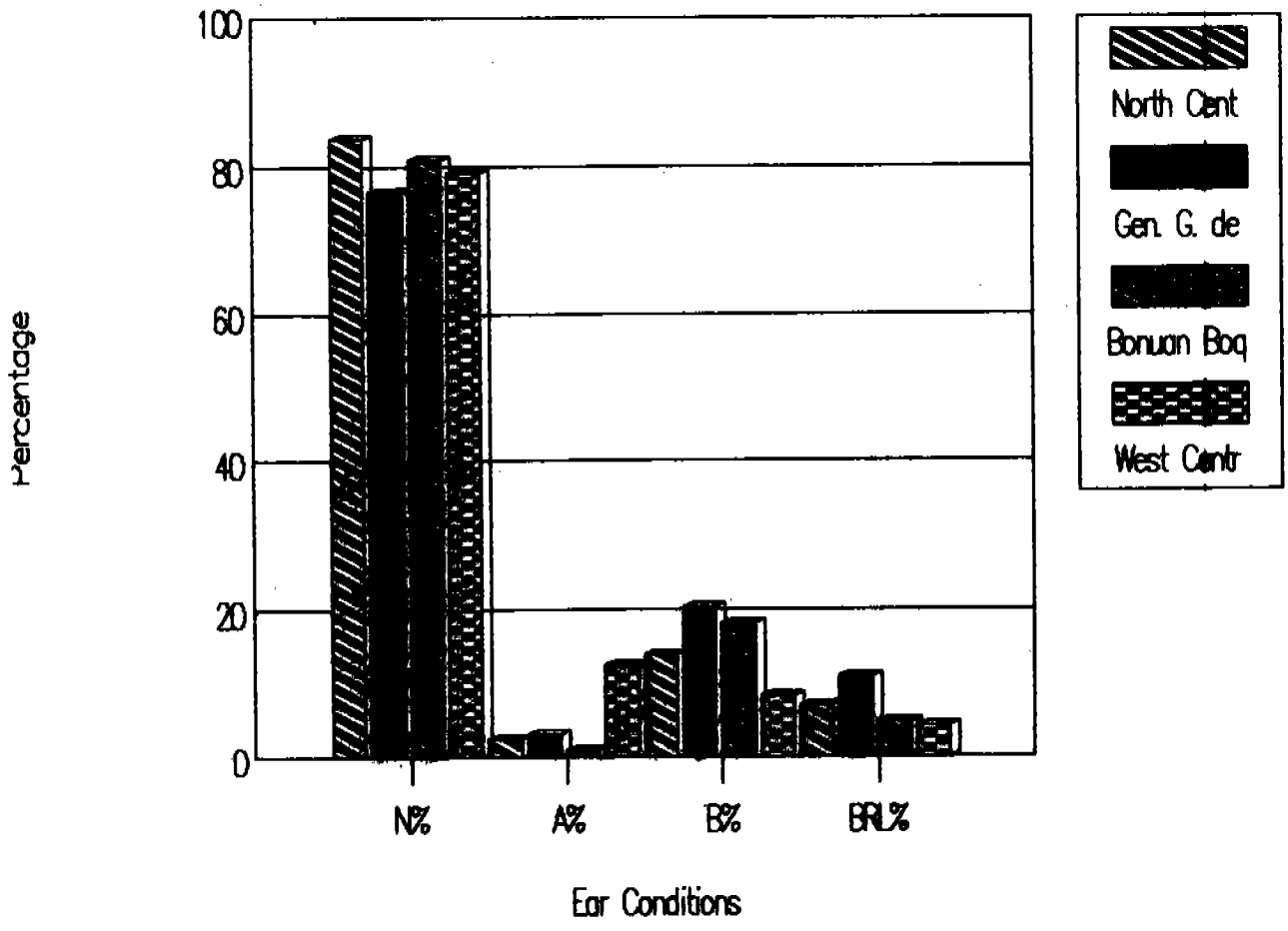
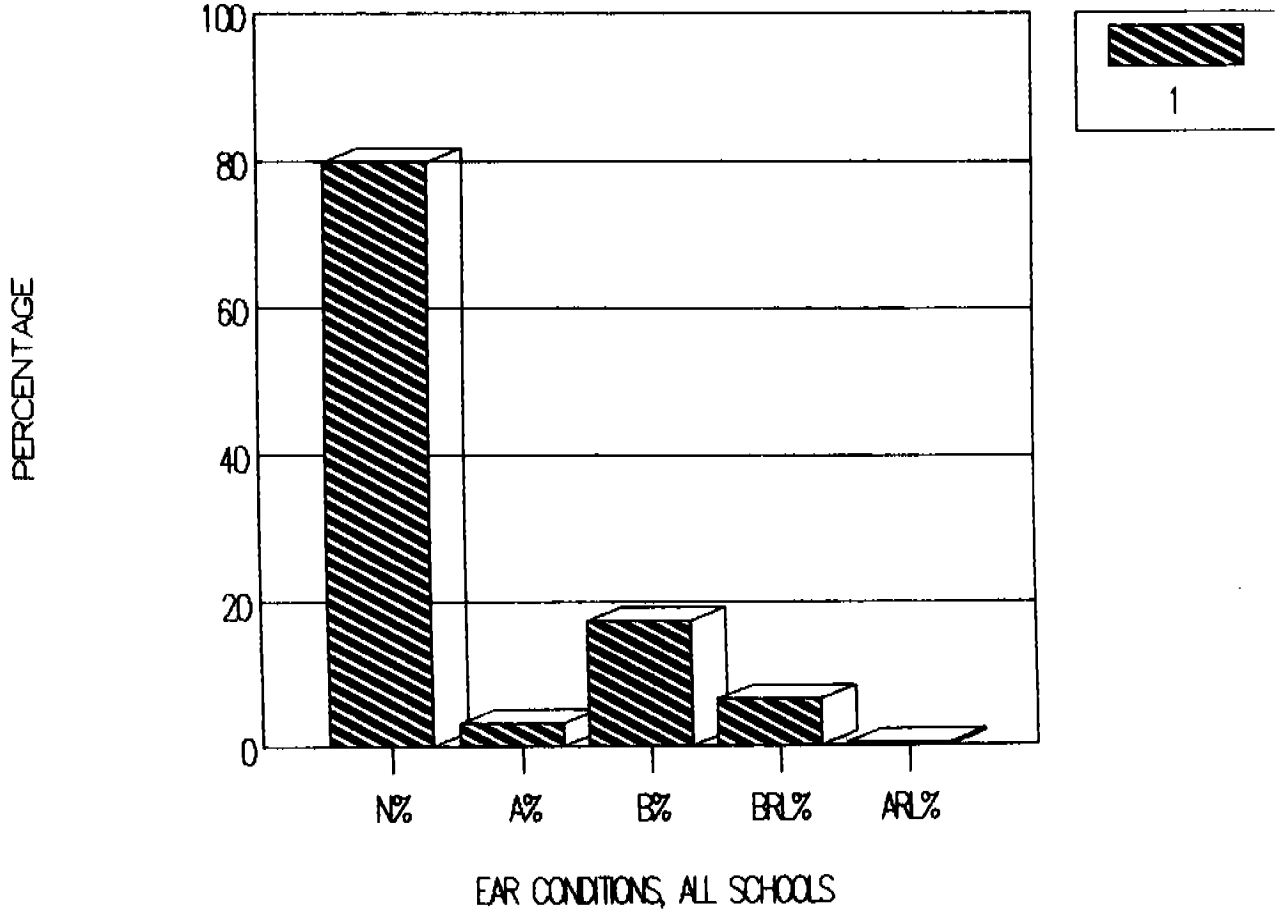
Incidence of Cerumen Among Grade Six Students of Dagupan City



Incidence of Cerumen Among Grade Six Students of Dagupan City



Ear Conditions of Grade Six Public School Students, Dagupan City



THE RINNE TUNING FORK TEST REVISITED

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ABSTRACT

Six hundred ninety-four pure-tone audiograms done at the Department of Otorhinolaryngology, Philippine General Hospital from January-December, 1988 were retrieved and compared to the Rinne tuning fork test. Results showed that if there is an air-bone gap of 20 db or more, 50% of these cases will have a negative Rinne test. This predictability is raised to 75% if the air bone gap is 45 db or more.

INTRODUCTION

Tuning fork tests are routinely used in otologic practice in screening for hearing loss. Perhaps the best known among them is the Rinne test which was first described by Adolf Rinne in 1856. In this test, the ability of the patient to hear by bone conduction (BC) is compared with that by air conduction (AC). A positive Rinne is one where AC is greater than BC; on the other hand, a negative Rinne means that the BC is greater than AC. A positive Rinne occurs in normal ears, sensorineural hearing loss or a mild conductive hearing loss. A negative Rinne is seen in moderate or severe conductive hearing loss.

Lately with the advent of new techniques in audiology, the tuning fork tests have been relegated to the background. There is a tendency to rely on audiometric results in evaluation of hearing loss. But this should not be so.

This study was done to compare the results of the Rinne test and the audiometric findings and thus determine the air-bone gap at which the Rinne test will become negative. Findings from the study will be helpful to the otologist in the absence of audiometric studies; when these are on hand, it will make the evaluation more comprehensive.

METHODOLOGY

The records of Pure Tone Audiometry done from January to December, 1988 at the Department of Otorhinolaryngology, Philippine General Hospital were reviewed. The air-bone gap at 500 hz were measured and compared with results of the Rinne Test. In this clinic the Rinne Test was performed without the use of masking.

Table 1. Relationship of the Rinne Tuning fork test to air-bone gap at 500 hz.

AIR-BONE GAP (db)	n	% RINNE AC>BC	AC=BC	AC<BC
5	384	92	1	7
10	139	84	1	14
15	71	87	0	13
20	77	77	5	18
25	66	55	1	44
30	73	62	0	38
35	64	48	0	52
40	56	50	0	50
45	46	33	0	67
50	52	19	8	73
55	15	33	0	67
60	19	11	0	89

RESULTS

A total of 694 audiograms were reviewed with ages ranging from 5-90 years; normal audiograms were recorded separately and not included in the analysis. A total of 1062 ears were recorded with their corresponding Rinne tuning fork test. Table 1 shows the breakdown of the results. As the air-bone (A-B) gap increases the percentage of negative Rinne increases; that is from 7% at 0-5 db to 89% at 56-60 db A-B gap. Using this data, the sensitivity and specificity were calculated (Table 2). With an A-B gap of at least 20 db, 54.7% of these cases will be picked up by the Rinne test, that is BC will be greater than AC. If the A-B gap is >45 db, 75.6% will give a negative Rinne. On the other hand, looking at the specificity, if the A-B gap is less than or equal to 20 db, 89.7% will have a positive Rinne. Note that there is an inverse relationship between the A-B gap and the specificity.

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* Presented, 11th Boehringer Ingelheim Clinical Research Contest, held at Silahis Hotel, Manila, October 11, 1991.
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Table 2. Sensitivity and specificity at various air-bone gaps.

(db)	Sensitivity	AB gap Specificity
20	54.7	89.7
25	56.9	86.7
30	62.3	84.4
35	66.0	81.8
40	72.3	79.9
45	75.6	77.7
50	79.4	75.1

DISCUSSION

The Rinne test is probably the most commonly performed tuning fork test. Various investigators have studied its validity and reliability. **Wilson** and **Woods** found that the Rinne test has a high degree of accuracy in children with a 40 db or greater A-B gap. They felt that the test was only meaningful if a negative result was obtained. **Crowley** and **Kauffman** examined 153 ears in adults with conductive hearing loss of a least 20 db using 4 different frequency tuning forks. Masking was not used since it is not a standard procedure in the clinics. Air bone gaps of <15 db give a positive Rinne test, while A-B gaps >30 db almost always show a negative Rinne. Comparable results were obtained in all four tuning forks. They concluded that the Rinne test is a good screening test and may help as a check of the audiogram.

An anecdotal report by **Sheehy** noted that conductive hearing loss of 15 db at 512 hz will reverse the tuning fork test from positive to negative.

Data from this study shows that for patients with normal hearing and sensorineural hearing loss, the results of the Rinne were positive except in 2.8% and 12.7%, respectively (Table 3).

Table 3. Results of the Rinne tuning fork test and type of hearing loss.

Type of hearing loss	n	% Rinne AC>BC	AC=BC	AC<BC
Conductive	181	45.3	1.7	53.0
Sensorineural	503	85.1	2.2	12.7
Mixed	240	43.8	0.8	55.4
Normal ears*	81	97.5	0.0	2.8

However, for patients with a conductive component in the hearing loss regardless of severity, there is an almost 50% chance that the Rinne may be positive or negative.

A closer look at the data in Table 1 shows that there is a 7% chance of commiting an error that BC>AC when there is a 0-5 db A-B gap. This is comparable to that reported by **Wilson** and **Woods** at 2%. This figure probably represents the false-negative Rinne which occurs in unilateral severe sensorineural hearing loss.

Table 4. Size of air-bone gap which would be correctly identified by the Rinne test on various % of occassion.

	Confidence Limits 50%	75%	90+%
Crowley & Kauffman, 1966	25	30	
Wilson & Woods, 1975			40
Gelfand, 1977		40	
Golabek & Stephens, 1979	9		
GRI Clinic, 1984	20		45
PGH, 1989	20		45

In determining the clinical value of the Rinne test, the data should be analyzed as to the proportion of patients who will give a positive or negative Rinne test for a given A-B gap. **Browning** compared these results as investigated by various authors and is shown in Table 4. Data shows that with an A-B gap of 40-45 db, there is at least a 75% chance that this will be picked up by the Rinne test. The present study shows that the Rinne test will be negative on 50% of occasion with at leat 20 db A-B gap. This is increased to 75% if the A-B gap is at least 45 db. The Rinne tuning fork test becomes more sensitive as the A-B gap increases.

SUMMARY

A retrospective study of 1062 ears was done and the Rinne test was compared with the corresponding A-B gap at 500 hz. Results showed that if there is an A-B gap of 20 db or more, 50% of these cases will have a negative Rinne. This predictability is raised to 75% if the A-B gap is 45 db or more. If a positive result is obtained, it may mean a normal hearing, sensorineural hearing or mild conductive hearing loss with an A-B gap or 30 db. However, one should bear in mind that the Rinne test can not stand alone. It is always best interpreted along with the history, otoscopic findings and other tuning fork tests.

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HISTIOCYTOSIS X:
A Pathologist's Challenge*

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Norberto V. Martinez, MD***

INTRODUCTION

Histiocytosis-X denotes a group of diseases characterized by infiltration or proliferation of histiocytes in various body tissues.The clinical presentation is varied but similarities exist for microscopic examination. The head and neck are frequent sites of involvement in the more benign forms, or may be the site of initial involvement for the more serious varieties. The temporal bone and adjacent areas are the frequent sites of Histiocytosis-X. In American literature, 25 to 30% of patients with various forms of this disease have temporal bone destruction, and recent series have found nearly 50% involvement in the remainder of the head and neck. These consist mostly of isolated lesions of the mandible and skull, but lymph node dissemination and oral mucosal lesions can also be seen manifesting as infiltration with the characteristic pathologic histiocytic infiltrates. The frequency of head and neck manifestations, as well as possible confusion with other diseases in the head and neck make an understanding of the disease and its pecularities important for the otolaryngologist.[1]

Among the reticuloendothelial system disorders, Histiocytosis-X, according to Smith, J.H., et al, is one of the rare disorders. Indeed, in a survey done at Santo Tomas University Hospital from 1980-1990, only 4 cases of Histiocytosis-X were reported. Three presented as **Letterer-Siwe** Disease, but these were not clinically documented. The remaining one, this case report, presented as **Hand-Schuller-Christian Disease** and the only documented case. Likewise, at the Hospital of Infant Jesus, from 1986-1990, only one case was reported, classified under eosinophilic granuloma. The diagnostic limitations of this disease entity lie in immunochemistry and electron microscopy.

CASE REPORT

M.L. is a 2 year and 9 month old child from Occidental Mindoro admitted because of a right temporal mass and aural discharge from the right ear. At 2 weeks of age, greasy scales were noted over the scalp, followed later by erythematous papules and pustules for which hexachlorophene was prescribed. The lesions dried up leaving areas of crusting, which recurred almost monthly. The patient developed right yellowish purulent, foul smelling aural discharge 9 months PTA. Aural hygiene with hydrogen peroxide was used which afforded no relief.

Six months PTA a 2 x 2 cm, non-tender, non-movable, non-erythematous, doughy mass was noted on the right temporal area.

Two months later, erythematous, non-pruritic papules were noted over the bridge of the nose and both cheeks. The right temporal mass gradually increased in size accompanied by vague tolerable pain. Further consultations and medications, however, were to no avail.

On admission, physical examination showed a hyposthenic child with 2-3 mm follicular pustules, areas of crusting and scaling over the scalp and bridge of the nose. Multiple pustules were noted on the distal nailfold with concomitant onycholysis and subungal hyperkeratosis of the fingernails and both big toes. Over the right temporal area was a doughy, non-tender, non-movable, non-erythematous mass measuring 5 x 4 cm. Otoscopy showed polyps with yellowish purulent, foul discharge, AD. The left ear was normal.The neck showed palpable non-tender lymph nodes over the posterior cervical triangle. The oral cavity had multiple dental caries.

An impression of right temporal mass, R/O rhabdomyosarcoma, R/O histiocytosis-x was given. Work-up consisting of CBC,platelet count, peripheral smear , ESR, prothrombin time, partial thromboplastin time, electrolytes and urinalysis were within normal limits. Culture of the wound discharge on the right ear showed no growth. Gram stain of the lesion revealed gram (+) cocci with a few polymorphonuclears and leucocytes 0-5/hpf.

The chest x-ray showed nodular densities in the hilar and retrocardiac area representing enlarged lymph

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nodes, and was read as probable Koch's infection, correlate clinically. Skull x-ray was negative. Mastoid x-ray revealed Mastoiditis, right.

Play audiometry revealed severe hearing loss, AD; normal hearing, AS.

Patient was referred to Pediatrics with the same impression. Mantoux test done yielded a negative result. Because of the x-ray finding, he was started with anti-Koch's medications. Dermatologic consultation gave an impression of seborrheic dermatitis, follicular acrodermatitis, R/O tinea ungium for which KOH 1:20,000 dilution, and Betnovate ointment was prescribed.

A skin biopsy of the left frontal area showed intracellular edema and spongiosis of the epidermis; inflammatory infiltrate composed of histiocytes, lymphocytes and neutrophils surrounding dilated capillaries, with some of the infiltrates extending up to the epidermis; and occasional histiocytosis with irregularly-shaped nuclei. The pathologic diagnosis given was diffuse dermatitis.

Several biopsies were done on the right temporal mass. FNAB showed clustered and solitary histiocytes most of which bear pigment, probably hemosiderin. Some multinucleated giant cells were also seen. These were admixed with numerous neutrophils, some lymphocytes and plasma cells. Incision biopsy done showed granulation tissue. Diagnosis was still inconclusive. Another biopsy done showed an abscess on the temporal area. Microsection, however, disclosed fragments of tissue showing liquefaction necrosis and sheets of neutrophils and occasional lymphoblastic cells. There was no evidence of malignancy.

On the 20th hospital day, debulking of the right temporal mass was done. This revealed a 5 x 5 cm mass, rubbery in consistency that extended to the right external auditory canal invading the cranium. The right external auditory canal had granulation tissue, and intact tympanic membrane. On section, the mass revealed yellowish adipose-like tissue with multiple pockets of pus. Culture of pus revealed negative results. The residual mass inside the skull which was pulsatile was left untouched. The wound healed by primary intention. Histopath showed chronic inflammation with abscess formation and foreign body reaction. Microsection disclosed fibrocollagenous tissue and dense aggragates of PMN cells with abscess formation. Numerous giant cells of foreign body type was noted.

Antibiotics were discontinued on the 14th postoperative day. The remaining hospital days were unremarkable.

With an inconclusive diagnosis, cell blocks were sent to Georgetown University Hospital, Washington, D.C. for official reading. Histopath revealed Histiocytosis-X compatible with eosinophilic granuloma. If bone lesion and exophthalmos are present, consider **Hand-Schuller-Christian** disease. Correlate clinically. This was read by **Dr. Ernest Lack**, Director of Surgical Pathology.

DISCUSSION

The dilemma in arriving at the definitive diagnosis and the extreme rarity of this disease entity prompted this presentation. Several biopsies were done but yielded inconclusive diagnosis. Likewise, many of the clinical features mimic the most common disease in the Philippines which is tuberculosis. Clinically, the patient manifested the features of histiocytosis-x but a definite diagnosis cannot be established by biopsy.

Histiocytosis-X is a non-neoplastic proliferative disorder of histiocytes, with multiple clinical manifestations, mirroring the widespread distribution of histiocytes in the body.[2] The "X" refers to the fact that the etiology is still unknown. Recent studies suggest that the disease has an immunological basis. Loss of H_2 surface receptors was found on circulating T cells indicating a deficiency of suppressor T cells. In addition, lymphocytes cytotoxic to culture, producing antibody to autologous erythrocytes were observed. Moreover, administration of calf thymus extract produced clinical remission and correction of 3 immunological abnormalities. **Lackey, et al**, in a study conducted in 1985 were able to demonstrate elevations in serum immunoglobin in children with histiocytosis-x. Elevation of IgM concentrations were the most frequently found. IgG and IgA were also elevated. Although males are involved twice as often as females, there seems to be no genetic predisposition. Viral, bacterial and metabolic etiology remain unproven. Clinically, it is characterized by remissions and exacerbations.

Histiocytosis-X is a general class of diseases with 3 less distinctive and overlapping states, namely:[4]

1. **Leterrer-Siwe** disease - an acute rapidly progressive illness, usually in an infant or young child manifested by an exfoliative dermatitis, hepatosplenomegaly, anemia and thrombocytopenia.[4]

2. **Hand-Schuller-Christian** diseae - a syndrome characterized by (a) osteolytic lesions, (b) exophthalmos, (c) diabetes insipidus. However, only 30% present with this triad.

It is a chronic disseminated disease usually initially discovered in young children, but also occuring in adults, with signs and symptoms of focal osseous and/or visceral lesions which may produce intractable otitis media; osseous defects especially in the skull, lymphadenopathy, hepatosplenomegaly, exophthalmos, eczematoid skin lesions, chronic gingival or palatal ulcers.[5]

3. **Eosinophilic granuloma** - unifocal; presenting as a lytic lesion in the bone, or as a single infiltrative lesion in the viscera. High incidence is seen among children and in adults below 21 years old and it frequently affects the skull bone. This particular case presented at its onset with seborrheic lesions in the scalp which progressed to involve the nasal bridge and frontal area. Initially, the skin lesion was attributed to poor hygiene and an immunodeficient state. However, review of the skin biopsy revealed that the skin manifestations were actually part of Histiocytosis-X. The skin is the most frequently involved tissue. The lesions are initially present in 40% of patients, and ultimately in 80 to 100% of patients with disseminated Histiocytosis-X. These are most commonly found in the scalp and hair line areas and vary from resistant dandruff to weeping dermatitis.[4] Scalp lesions are often misdiagnosed as eczema and may be an early sign of dissemination. Smith and Evans noted that 77% of patients suffering from Histiocytosis-X related deaths demonstrated generalized eczema. In severe cases, the skin becomes scaly, yellowish and greasy, with purpuric or hemorrhagic rashes resembling scald burns. Because the skin is invariably involved, the prognostic value of skin involvement at presentation is minimal.[4]

At the children's hospital of Pittsburg, 18 of 62 children diagnosed with Histiocytosis-X between 1970-1986 demonstrated ear and temporal bone involvement. In six, otologic disease was their sole presenting manifestation. Common signs and symptoms included aural discharge (unresponsive to medical therapy), post-aural swelling, aural polyps and conductive hearing loss. The otologic findings in these children, if not investigated properly, could easily be attributed to acute or chronic infectious ear disease. In differentiating Histiocytosis-X from otitis media complicating cholesteatoma, **Coutte, et al**, found that an elevated ESR in the absence of acute infection was suggestive of histiocytosis-x in children less than 3 years old. The laboratory evaluation is principally used to assess any systemic disease. The patient had a normal ESR, therefore, he was negative for systemic disease.[5] This child was admitted because of a right temporal mass and aural discharge and he was later proved to have a bony defect. The tympanic membrane was intact, accompanied by granulation tissue at the external auditory canal. Review of the skull x-ray was done because of the above finding. Upon re-evaluation of the skull x-ray, there was a lytic lesion in the right temporal mass. This bony defect is usually characterized as a punched out area in the temporal bone, or a cyst-like lesion in the skull, giving rise to the lesion "Geographic Skull". In a study done by **Jones, et al**, (1984), the middle ear and tympanic membrane are usually normal, as shown in this case. This characteristic offers an important differentiation between the lesion of Histiocytosis-x and acute mastoiditis, since acute mastoiditis is almost always associated with middle ear disease. When Histiocytosis-x involves the middle ear, serous otitis media may develop, thus exposing the facial nerve. Interestingly, there have been only 14 reported cases of facial nerve paralysis with histiocytosis in the world literature.

Lymphadenopathy is a frequent finding in disseminated Histiocytosis-x. In 5% of patients, lymph node enlargement is the first manifestation, although 50% will eventually develop lymphadenopathy. Most commonly, it manifests as regional node involvement, with accompanying lytic bone lesions or cutaneous manifestations. There is a slight predilection for the anterior cervical chain, although any group of lymph nodes may be affected. The patient with intermittent lymphadenopathy is asymptomatic between episodes but develop systemic symptoms of fever, malaise, and night sweats with the lymphadenopathy. With isolated lymphadenopathy, a simple excision of the involved nodes is curative, but the patient must be examined periodically for recurrence or progression.

Lymphadenopathy in the presented case is in the posterior cervical triangle, and in the retrocardiac and hilar areas. It could be part of Koch's infection, otitis externa or dental caries. However, mantoux test was negative and ESR was within normal. This yields a high index of suspicion for Histiocytosis-X. However, false negative results can be obtained from a mantoux test as in wrong technique, immunocompromised patients, or in advanced tuberculosis. Thus a normal value points to clinical diagnosis of Histiocytosis-X. Lymph node enlargement is considered to be the result of local histiocytic proliferation rather than a reflection of drainage of extranodal foci of disease.

Since Histiocytosis-X is a rare disease entity, a secure diagnosis is imperative. Although clinical findings suggest its diagnosis, biopsy of suspect lesions is mandatory. Comprehensive evaluation is, therefore, necessary to determine all active sites of the disease.[1] Initial studies include hematologic, immunologic, clotting and liver function tests. If diabetes insipidus is suspected, the initial work-ups should include serum electrolytes. A chest radiograph, skeletal survey and urinalysis should also be performed. If lung involvement is suspected, arterial blood gas and pulmonary function tests are indicated.[5] Skin lesions should be biopsied. A bone marrow study is warranted in the presence of abnormal CBC. All the laboratory work-ups done in this particular case were within normal limits.

Histiocytosis-X is confirmed only by immunocytochemistry studies and electron microscopy. Histopathologically, the surgical material from patients with solitary lesions is identical to that from patients with disseminated diagnosis. It is characterized by sheets of polygonal histiocytes containing an abundant eosinophilic cytoplasm and a poorly defined cell membrane. The cells may be vacuolated and may accumulate cholesterols.[7] It is only when they proliferate in abnormal fashion that a diagnosis of Histiocytosis-X is justified. Multinucleated giant cell fibrosis and areas of necrosis may be present within the lesion. The appearance of lipid in **Letterer-Siwe** and **Hand-Schuller-Christian** disease is reported only in the late stages. Histologic variation can be found at different sites of involvement as well as during the course of the disease.

Histopathology showed an inconclusive diagnosis. Histiocytosis-X was not considered because it showed a non-specific histiocytic reaction in the form of histiocytic proliferation associated with lymphocyte plasma cells, eosinophils, neovascularization, and some neutrophils which could all be present in any inflammatory reaction. The granuloma appreciated was not characteristic of tuberculosis because the histiocytes did not form epithelioid cells nor giant cells, with or without necrosis. The skin biopsy was likewise reviewed. The lesion in the temporal area showed histiocytic proliferation like that of the skin with a focal distribution of epidermis and hair follicles.

Cytoplasmic inclusion bodies (X) granules or Berbeck granules may be additional histiologic features common to lesions of Histiocytosis-X detected by electron microscopy. Rod-shaped inclusion bodies are bordered by 2 double membranes with a dense core showing periodic cross striations. These are usually found in the peripheral cytoplasm and are clearly related to vesicles of endoplasmic reticulum and cell membrane. It has been suggested that a histiocyte with inclusion bodies are characteristic, if not pathognomic, of Histiocytosis-X.[8]

The unifying feature in Histiocytosis-X is the pathologic lesion. In an attempt to correlate the pathologic appearance with the clinical course of Histiocytosis-X, two separate subtypes of the lesion have been described.

Table 1. TYPES OF HISTIOCYTOSIS-X (9)

	TYPE 1	TYPE 2
Distribution of lesions	diffuse reticuloendothelial system and other organs	solitary or multicentric
Histology	histiocytes	histiocytes eosinophils fibrosis necrosis
Age	before 3 years	any age
Course	acute, short	protracted
Therapy	cytotoxic drugs irradiation	surgical excision and irradiation
prognosis	poor	good

This patient belongs to Type 2 and thus has a good prognosis.

It has been stated that the extent of the disease is an important factor in determining the prognosis. Significant visceral involvement portends an unfavorable outcome. In an effort to illustrate these important relationships in a more tangible fashion, a system of scoring was devised and the resultant values then correlated. A score of 1 was given for the evidence of involvement of each of the following organs: skeleton, skin, lung, liver, spleen, hematopoeitic, ear and lymph node. The number of organs involved is directly related to mortality. The following table shows that the organ involvement in this patient gives him a mortality rate of 14%.

Table 2

# of organs involved	Mortality
1-2	5%
3-4	14%
5-6	75%
7-9	100%

In 1975, **Dr. M. Eugene Lagey** introduced the concept of "organ dysfunction" as a means of prognostication in Histiocytosis-X . He decided to scrutinize only the life-threatening organ dysfunctions,

i.e., those involving the liver, lung and hematopoeitic system.[6]

Hepatic:	protein	less than 5.5 g/dl
	albumin	less than 2.5 g/dl
	total bilirubin	greater than 2.5 mg/dl
	edema	
	ascites	
Hematopoeitic:	hemoglobin	less than 10 g/dl
	leukocytes	less than 4000/mm3
	neutrophils	less than 1500/mm3
	platelets	less than 100,000/mm3
Pulmonary:	tachypnea	
	cyanosis	
	pleural effusion	
	pneumothorax	

Fortunately, this patient has no abnormality in any of the aforementioned organs.

Age also plays an important factor in the prognosis of patient. The patient's age puts him under the category of "good risk" according to table 3.

Table 3

	AGE	ORGAN DYSFUNCTION
good risk	2 years	without organ dysfunction
intermediate risk	2 years	with organ dysfunction
poor risk	any age	with organ dysfunction

Since Histiocytosis-X is a heterogenous entity, the treatment must be appropriate for the extent and severity of the disease. Singular bony lesions are initially treated with surgical curettage or with localized radiation of 600 to 1,000 rads. When multifocal disease is present or there is recurrent disease, chemotherapy and steroids are generally indicated. Systemic steroids are indicated when radiation fails and multiple sites demand treatment. Use of cytotoxic agents especially Vinblastine, is generally reserved for aggressive and refractory disease. The seborrheic eruption is responsive to tar bath. Even with the combination of radiation and chemotherapy, eroded bone lesions have been noted to regenerate.

It must be emphasized that management should be individualized according to the patient's particular disease.

Following apparent resolution of the disease, patients with Histiocytosis-X should be followed on a monthly basis for at least 1 year. Physical examination should be accompanied by appropriate skull films and long bone films when indicated, at 3 month intervals, during the first year. After the first year, the interval between x-rays can be lengthened if the patient remains disease free.[3]

While some patients treated with aforementioned modalities will no doubt be left with sequelae such as diabetes insipidus, dwarfism, ptosis, pulmonary fibrosis, mental retardation, blindness, or deafness, experience indicates that more than 1/2 of survivors leave apparently recovered completely.[4]

Age	>5 years	<5 years	<3 years	2 yrs. 9mos.
Bone involvement	+	+	-	+
Other organ involvement	-	+	-	+
Course	probable spontaneous remission	longer than 1-2 years	fatal in 1-2 years	

SUMMARY

This is a case of **Hand-Schuller-Christian** disease as shown in Table 5. Clinically, organ involvement, namely (a) skin, (b) lymph node, (c) ear, and histologically documented osteolytic lesions are present in this patient. The official reading from Georgetown University Hospital solved the dilemma in establishing the diagnosis. Referral was done to a Pediatric oncologist, and steroids and low dose radiation therapy was advised. Tar bath would be appropriate for the skin lesions. Chemotherapy is not yet indicated in this particular patient because he does not manifest any organ dysfunction.

CONCLUSION:

Histiocytosis-X is a rare systemic disease. The diagnosis must be histologically confirmed and the extent of the disease defined prior to the initiation of therapy. It is uncommon but relevant to the Otorhinolaryngologist because the patient presents or ultimately develops head and neck manifestations. Therefore, the otorhinolaryngologists assumes a fundamental role in the diagnosis and treatment of this disorder.

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PRESIDENT'S PAGE

Dear Colleagues:

First, let me congratulate and commend our Editor-in-Chief, Dr. Joselito Jamir for a job well done. He had worked silently but did his job well for the past years. Unfortunately whenever I stand before an audience in our previous meetings, I always forget to mention and commend him. To Dr. Jamir, congrats.

Our Society has managed to stay strong and united though ocassioally we get some pressures from elsewhere. We should continue to be vigilant and hone further our skills so that we remain the respected leaders in the medical profession especially in those areas where there is some overlap e.g. head and neck, plastic surgery.

In the last Asean Otolaryngology - Head and Neck Surgery Congress held in Jakarta we were very well represented both in numbers and quality. Our Filipino otolaryngologists who participated in the different symposia or contributed scientific papers fared very well and further enhanced the image of the Filipino ENT - H & N surgeon who though lacking in some modern hi-tech instrumentation can still manage to keep abreast with our neighbors and give adequate and competent care to our people. Congratulations and we should prepare for the next Asean Congress to be held in Thailand.

The organizing committee for our coming 36th Annual Convention headed by Drs. Alfie Pontejos and Manny Tuazon is putting the finishing touches for the success of the affair. All the Committees are busy preparing for the event which has been getting bigger and better every year. All the members are enjoined to support this endeavor and be reminded that to remain a member of good standing in our Society, he should at least attend the annual convention.

MABUHAY!

VICENTE T. CHIONG, MD

THE COMPLEATE PHYSICIAN

Every opening of the academic year, we see a lot of greenhorns and dreamers troop the line and enrol in the different medical colleges in the country. Thousands try to attempt to make the grade in this most exacting of all professions. But, as the saying goes, only a few are chosen. And fewer still are the ones capable enough to become certified specialists in the different fields of medicine.

However, in the desire to make the grade, a lot of medical students, teachers and colleges have placed emphasis in the pursuit of knowledge, in the acquisition of wisdom, in obtaining high grades that certain aspects in training and outlook have been neglected. There has been a complete stress on the professional, academic, and financial requirements that the moral side of medical practice have been set aside or conveniently forgotten.

Now what is a compleat physician? A medical professional should not only confine himself to the medical needs of his patient. He has a lot more responsibility than just finding and looking for solutions to the medical problems of the patient. He must strive to educate his patients for only in doing so will he be able to help solve what might be a recurring medical problem. A simple education on the patient's part can help prevent cases of otitis externa caused by excessive manipulation. The doctor must also engage in research activities so that new knowledge can be gained that will benefit not only the medical practicioner but also the patients as well. How many of our colleagues are doing research work? Or for that matter are interested in medical writing? Is it because of the lack of capability? Or glamor? Is it because there is no money in this endeavor? I dare say that the reason is none of the above. The plain truth is that a lot of physicians do not want to find the time for it. But, there is always a time for everything if one would just find the motivation to do it. Physicians are simply too engrossed with their practice that they are simply lazy to write things down. How many times has each one of us read in journals, cases, procedures and innovations that we have been doing for quite sometime and yet find it worthy of publication by others? It has been said that fora person to leave his mark in this world, one simply has to father a son, plant a tree, or write a book? A lot of doctors are contented with simply doing one of these three alternatives. But doctors are a chosen lot. The opportunity is there for us to accomplish all three. We, in the journal would be more than glad to publish your written works.

Included in this issue is an article by Dr. Zenaides Wi, an ENT specialist in Pangasinan who has found the time to engage in humanitarian work and, at the same time, conduct research, write down his findings, teach at a medical school. All these despite the demands of his busy medical practice. In a much earlier issue, an article by Dr. Edwin Cosalan, our colleague from Baguio was featured. These are just some examples fo what we perceive should be the activities of what we might call a compleat physician. Not only do they have the knowledge and the expertise but also the desire and the heart to do things for their brethren and to uplift education towards the common good. To them our congratulations and may you blaze the trail that others might find worthy of emulation. May your tribe increase! How about a look next time?

Joselito C. Jamir, MD
Editor-in-Chief