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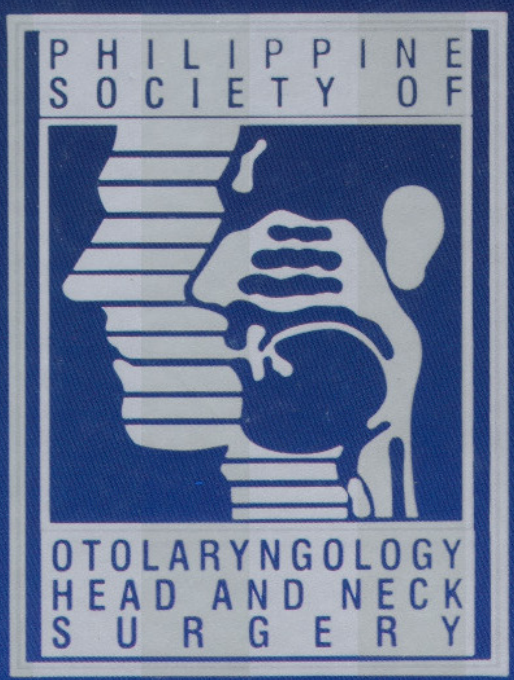

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A COMPARATIVE STUDY ON THE EFFICACY OF SILICA GEL VERSUS CLOTRIMAZOLE IN OTOMYCOSIS*

MARIEL B. CONANAN, M.D. **
VICTOR DINO ALARVA III, M.D, **
OTHELLO RAYMOND S. DAVE III, M. D.**

ABSTRACT

Objectives:

1. To compare the efficacy of silica gel versus clotrimazole in the alleviation of the signs and symptoms of otomycosis or otitis externa of fungal etiology.
2. To determine the duration in the alleviation of signs and symptoms of otomycosis using clotrimazole.
3. To determine the duration in the alleviation of signs and symptoms of otomycosis using silica gel.
4. To determine if there is a significant statistical difference between the duration of signs and symptoms of otomycosis using silica gel versus clotrimazole

Design: Random clinical trial

Setting: Tertiary hospital

Patients: 33 patients diagnosed to have otomycosis from October 1999 to April 2000

Conclusion:

The efficacy of silica gel versus clotrimazole in the alleviation of the signs and symptoms of otomycosis was established by determining the duration after initiation of the respective treatment regimens. Statistical analysis was made using the two-tailed test of independence or T-test.

Symptoms of otomycosis, namely: pruritus, otalgia, fullness, hearing loss and tinnitus, in patients treated with silica gel exhibited a statistically significant shorter period of duration in comparison to those treated with clotrimazole.

Likewise, signs of otomycosis, namely: mycelial elements on otoscopy, erythema of external auditory canal, edema, watery or serous discharge, and hyphae seen on KOH mount, in patients treated with silica gel exhibited a statistically significant shorter period of duration in comparison to those treated with clotrimazole.

The efficacy of silica gel in alleviating the signs and symptoms of otomycosis is greatly attributed to its dessiccating property.

Despite the above-mentioned conclusions, the present study cannot conclude if silica gel is superior than clotrimazole in treating otomycosis. The present study, however, strongly suggests that keeping the ear dry and free from cellular debris is still the best way to prevent otomycosis.

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*Presented, PSOHNS Analytical Research Contest, November 30, 2000, Punta Baluarte, Calatagan, Batangas

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INTRODUCTION

The human external auditory canal is an epithelium-lined cavity composed of outer cartilaginous portion and inner bony portion. There are marked differences in the skin morphology as one progresses from lateral to medial in the external auditory canal. The skin of the bony canal is very thin with few hair and sebaceous glands, as compared to the skin of cartilaginous canal which is much thicker containing numerous hair as well as sebaceous and ceruminous glands. [1]

The external auditory canal provides ideal conditions for growth of microorganisms because of its warmth, darkness, moisture, and presence of debris and nutrients. [2] The normal flora of the external auditory canal is remarkably stable, however, there are certain factors that contribute to the development and growth of microorganisms particularly the fungi. Disruption of the acidic wax layer overlying the epithelium of the ear canal that occurs during scratching and vigorous cleaning using cotton buds removes the natural barrier to fungal and bacterial infections. [3] Fungal infection is also common among patients who underwent mastoidectomy, and those who wear hearing aids with occlusive ear mold. [4]

Fungi are ubiquitous making us all exposed to their infectious elements. They become pathogenic under certain conditions such as immunosuppression, overuse of topical steroids, or antibiotic otic drops. The fungus is initially implanted on the most superficial layer of the skin (stratum corneum). Consequently, they proliferate and grow into the superficial layer of the epidermis and produce symptoms after a dormant phase of several days to weeks.

Various cures for otomycosis have been mentioned. Jain used: (1) oils derived from plants such as coconut, peanut and mustard; (2) organic volatile substances such as benzene, carbon dioxide, and methanol; (3) antiseptics such as merthiolate and gentian violet; and (4) topical antifungals. Studies revealed that topical antifungals and antiseptics are consistent in their inhibitory activity against the different fungi causing otomycosis. [5]

Because fungi grow well in dark, warm, and humid areas such as the external auditory canal, this study was conceptualized to remove one factor that favor its growth that is moisture.

Silica gel is an odorless, tasteless, inert, and opaque substance obtained when a solution of silicate is mixed with concentrated sulfuric acid yielding a gelatinous material. When the gel is dehydrated, it forms a solid with extensive internal surface useful for absorbing gases and moisture. Silica gel is available commercially in the form of pellets packed in porous bags. It is commonly incorporated in storage boxes of equipment containing lenses such as telescopes and microscopes to prevent the growth of molds. [6]

On the other hand, silica gel is known to cause irritation to skin, eyes, and respiratory tract. This irritation is secondary to its desiccant properties. It is stable under ordinary conditions of use and storage and has no known or anticipated carcinogenic properties. When released into the soil and water, silica gel is not expected to biodegrade, hence is not expected to be toxic to aquatic life. No LD50/LC50 information is found relating to normal routes of occupational exposure. [7]

Figure 1
Silica Gel Packed in Various Sizes

Other physical and chemical properties is shown in Appendix A.

OBJECTIVES OF THE STUDY

GENERAL OBJECTIVE

To compare the efficacy of silica gel versus clotrimazole in the alleviation of the signs and symptoms of otomycosis or otitis externa of fungal etiology.

SPECIFIC OBJECTIVES

1. To determine the duration in the alleviation of signs and symptoms of Otomycosis using clotrimazole.
2. To determine the duration in the alleviation of signs and symptoms of otomycosis using silica gel.

3. To determine if there is a statistically significant difference between the duration in the alleviation of signs and symptoms of otomycosis using silica gel versus clotrimazole.

PATIENTS AND METHODS

A. SUBJECT SELECTION

This study includes patients seen in the Out-Patient Department of Ospital ng Maynila Medical Center diagnosed to have otomycosis from October 1999 to April 2000. The diagnosis of otomycosis was based on the symptomatology and physical examination consistent with otomycosis such as the presence of the fungal elements in the external auditory canal.

Patients with perforated tympanic membrane, purulent otorrhea, severe otalgia,. cellulitis of the external auditory canal, patients who underwent mastoid surgery, and immunocompromised patients were excluded in the study.

B. EXPERIMENTAL INTERVENTION

Prior to initiation of treatment, an informed consent was secured from the subjects, who then were asked to fill up an information sheet regarding their demographic data (name, age, sex, and occupation). Medical history of diabetes, use of topical otic drops, and intake of immunosuppressive drugs were elicited. Symptomatology such as otalgia, pruritus, ear fullness, and hearing loss were obtained. Initial otoscopic findings as well as presence of other cutaneous and systemic infections were also noted. Treatment proper began with thorough cleansing of the ear canal of its accumulated infected debris either by manual extraction, suctioning, or irrigation with normal saline solution After cleansing, patients were randomly assigned into two groups: Group A (Control-Clotrimazole Solution), and Group B (Experimental-Silica Gel Pellets).

Group A subjects were instilled with three drops of 1% Clotrimazole solution to their affected ear. The solution was allowed to stay for three minutes. They were instructed to repeat the procedure three times daily and to follow-up every three days until they become asymptomatic. Subjective and objective findings as well as microscopic examination of mycelial elements were obtained and noted.

Group B patients had three silica gel pellets inserted into their affected ears. These pellets were sandwiched between thin pieces of cotton and inserted into the ear canal as far as the lateral two-thirds from the opening. These were subsequently repiaced on a daily basis by the patients themselves and were asked to return for follow-up every three days.

Scrapings from the external auditory canal were obtained with sterile cotton pledgets mounted on potassium hydroxide and examined under the microscope to determine the presence of mycelial elements prior to initiation of treatment, and during subsequent follow-up.

RESULTS

Thirty seven patients were initially included in this study, however, 4 were subsequently dropped, all of whom were diagnosed to have diabetes during the duration of the treatment. There was a high index of suspicion for diabetes when the condition of the patient's ear worsened despite treatment. The diagnosis was confirmed with fasting blood sugar determination.

All the patients diagnosed with otomycosis or fungal otitis externa were noted to be in its mild inflammatory stage. Bojrab et al classified the inflammatory stage of the otitis externa as mild, moderate, or severe. Increased itching and pain, in contrast to the pre-inflammatory state characterize the mild acute inflammatory stage. Mild erythema and edema are present on examination, and the external auditory canal is patent. Exfoliation of skin along with a minimal amount of clear or serous secretions may also be seen. [8]

Of the 33 patients, fifteen patients were treated with clotrimazole, and eighteen patients with silica gel. For patients treated with clotrimazole, majority were female (66.67%), while for patients treated with silica gel, majority were male (72.22%). The average age of patients treated with silica gel was found to be slightly older than patients treated with clotrimazole (35.61 years and 30.53 years, respectively). Patients were mostly vendor, drivers, and laborers, whose nature of work exposes them to dust-containing fungal spores predisposing them for otomycosis.

Duration of symptoms for both silica gel and clotrimazole were compared using a two-tailed test of independence or T-test. This is synonymous with clinical cure, which is the number of days when the patient became asymptomatic from the start of the corresponding treatment regimens. The period of treatment for silica gel was found to be significantly shorter (10.05 +/- 4.22 days) as compared to that for clotrimazole (16.60 +/- 3.11 days) with a p value of 0.000. (Table 1)

Closer scrutiny of the specific symptoms (pruritus, otalgia, ear fullness, hearing loss and tinnitus) of otomycosis reveal that, on the average, patients treated with silica gel have shorter duration of symptoms compared to patients treated with clotrimazole. (Figure 2)

Also, results of the individual t-test on the average duration (in days) of specific symptoms exhibited by the patients reveal that, all patients treated with silica gel exhibit a statistically significant shorter period of duration compared to patients treated with clotrimazole. (Table 2)

Similarly, data on the signs of otomycosis (mycelial elements on otoscopy, erythema of canal, edema, serous ear discharge, and hyphal elements on KOH) of the patients reveal that, on the average, patients treated with silica gel, were present for a shorter period of time compared to patients treated with clotrimazole. (Figure 3)

Results of the individual t-test on the number of days the specific signs of otomycosis persisted reveal that, patients treated with silica gel have a statistically significant shorter period of time compared to patients treated with clotrimazole. (Table 3)

DISCUSSION

Fungi are ubiquitous, and consequently we are constantly exposed to their infectious elements. In the present study, the majority of the patients were vendors, drivers, and laborers, all of whom are exposed to dust. This is similar to the study made by Tan et al where majority of their patients was housewives who were continuously exposed to housedust. [10] All fungi have three basic growth requirements: moisture, warmth, and darkness. Altering any of these factors, like moisture, will eventually discourage fungal growth. The external canal being a moist warm cavity coupled with its epithelial debris serves as an ideal area for fungal proliferation, especially *Candida albicans* and *Aspergillus sp.* [11] (Figure4)

Otomycosis or otitis externa of fungal etiology is a chronic or subacute infection of the pinna, the external auditory meatus, and the ear canal. It is a rare clinical process but a relatively characteristics concerning its etiology and presentation depending on the geographic area, that, being a common condition in the tropics due to high humidity. [8]

Senturia et al described several contributory factors to this pathogenesis namely heat, humidity and trauma. Heat and humidity increases the aqueous content of the stratum corneum producing intracellular edema of the external auditory canal. [12] The patient perceives this condition as obstruction or uncomfortable sense of fullness leading to the sense of itching. Because the usual response to itching is to scratch, and the act of scratching disrupts the surface epithelium, thereby allowing contamination of the epidermis and the dermis. This sets the stage for further edema allowing extravasation of fluids manifested as watery ear discharge, and slight

Table 1. Two-tailed test of Independence on Overall Duration of Treatment of Patients

Overall Duration	Clotrimazole (n=15)		Silica Gel (n=18)		P-Value
	Average (Mean)	Standard Deviation (CL=0.05)	Average (Mean)	Standard Deviation (CL=0.05)	
Duration in Days	16.6	3.1122	10.0556	4.2214	.000

tenderness or pain. As edema progresses, the pain and tenderness increases, and the discharge becomes purulent. The accumulation of the fungal and epithelial debris in the inflamed and narrowed canal produces hearing loss. [3]

Many agents have been recommended for treating otomycosis. A variety of treatment regimens have been used ranging from antifungal otic drops, antibiotics, steroids, oils, garlic extracts, to volatile substances. In a study made by Pavlenko, he examined 238 patients aged 15 to 80 years with persistent otitis and inflammatory pathologies of the ears. Nitrofungin and Clotrimazolein combination with 1% Decamine ointment were effectively used in the treatment. [15] Another antifungal lotion, 1% Bifonazole lotion was advocated by Piantoni. It was

Figure2
Average duration of symptoms of otomycosis in patients undergoing clotrimazole versus silica gel treatments.
(Clotrimazole n=15, Silica gel n=18)

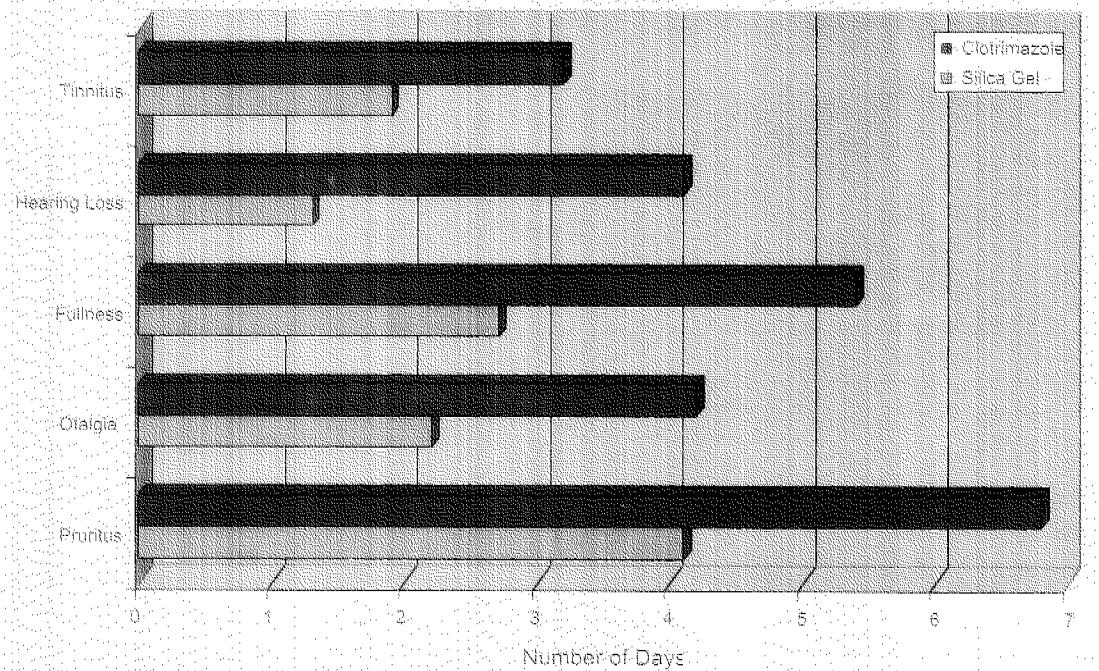


Table 2. Comparison of the average duration and standard deviation (in days) of symptoms of otomycosis in patients undergoing clotrimazole versus silica gel treatments using two-tailed test for independence (t-test).

Symptoms	Clotrimazole treatment (n=15, CL 0.05)	Silica Gel treatment (n=18, CL 0.05)	P-value
Tinnitus	3.13 +/-3.2264	1.94 +/-1.6260	0.004
Hearing Loss	4.13 +/-3.5630	1.33 +/-1.2834	0.000
Fullness	5.47 +/-2.9244	2.72 +/-2.0524	0.017
Otalgia	4.20 +/-2.2104	2.17 +/-1.0981	0.006
Pruritus	6.80 +/-3.489	4.06 +/-1.6618	0.007

Figure 3
Average duration of signs of otomycosis in patients undergoing clotrimazole versus silica gel treatments.
(Clotrimazole n=15, Silica gel n=18)

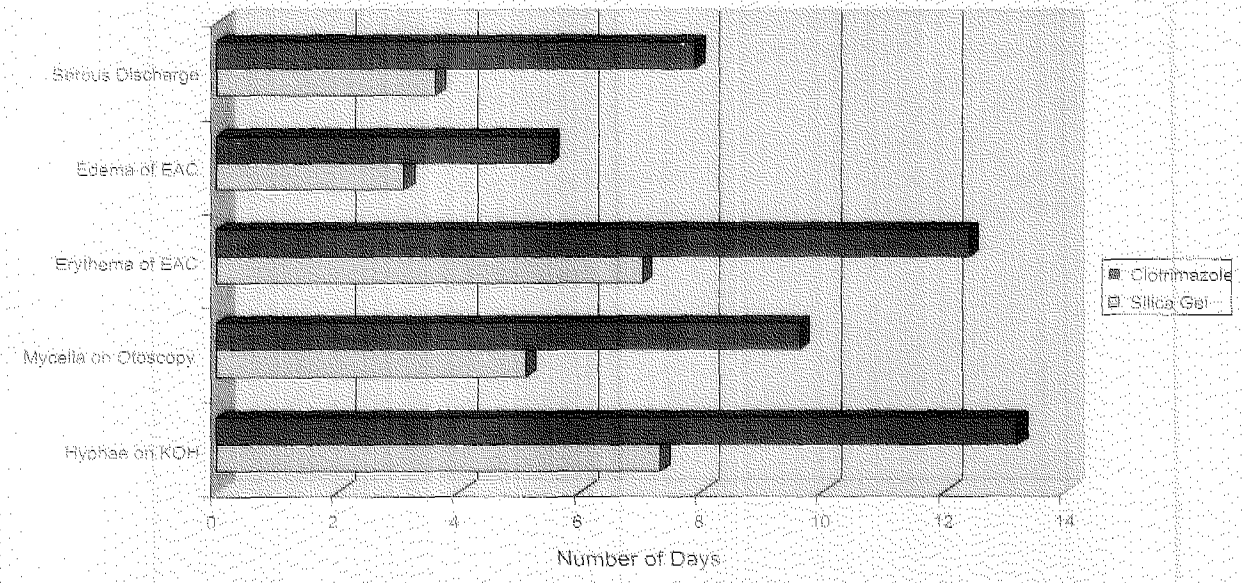
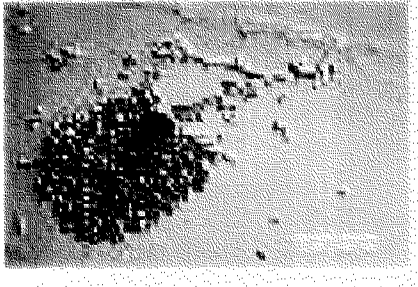


Table 3. Comparison of the average duration and standard deviation (in days) of signs of otomycosis in patients undergoing clotrimazole versus silica gel treatments using two-tailed test for independence (t-test).

Sign	Clotrimazole treatment (n=15, CL 0.05)	Silica Gel treatment (n=18, CL 0.05)	P-value (>or=0.05)
Serous Discharge	7.87 +/-2.5317	3.61 +/-2.5699	0.000
Edema of EAC	5.47 +/-3.3352	3.06 +/-2.5546	0.030
Erythema of EAC	12.40 +/-3.7378	7.00 +/-3.5645	0.000
Mycelia on Otoscopy	9.60 +/-2.0284	5.11 +/-3.0849	0.000
Hyphae on KOH	13.20 +/-2.7308	7.33 +/-3.7417	0.000

Figure 4.
Microscopic appearances of Candida (a) and Aspergillus (b).

Candida



Aspergillus

noted to be highly effective with complete resolution of the clinical picture for all patients for a period of 4 to 15 days. [14]

Jain et al evaluated the use of some oils against fungi-causing otomycosis. These oils from mustard, groundnut, coconut, and amla showed sporostatic effects. [5] Two years later, he made further studies, this time using volatile substances such as ammonia, carbon disulfide, petroleum benzene, carbon dioxide, methanol, glacial acetic acid, and hydrogen peroxide. These substances were found to inhibit mycelial growth and sporulation or budding. [15]

Senturia et al determined the usual pH of the external auditory canal as mildly acidic at pH 4 to 5. In the presence of infection, the acidic pH gears toward alkalinity, allowing the growth of pathogenic microorganisms. Using acetic acid solution, boric acid, or Burrow's solution specially in the early stage of infection, is sufficient enough to control the disease. [12]

A local study done by Tan et al, compared two treatment regimens for otomycosis, that is, clotrimazole solution and guava leaf extract, of which clotrimazole proved to be more effective. While clotrimazole continues to be the gold standard for otomycosis treatment, the guava leaf extract was recognized as an alternative mode of therapy. The Kirby-Bauer disc diffusion method was used to document the antifungal properties of the treatment regimens. [10]

Clotrimazole's mode of action is to alter the cell membrane of the fungus so that the amino acid transport is changed, thus impairing subsequent protein synthesis. It comes in different commerciallly-available preparations such as cream, solutions, and powder. [16] In the present study, we opted to use the solution because of its availability. Kwok and Hawke reported a successful treatment of otomycosis using the powder preparation and offered reasons for its preference over the solution: (1) better coating of all the canal surfaces; (2) no increase in canal humidity; (3) avoidance of a carrier solution with possible canal irritation; (4) ability to deliver higher drug concentration, and (5) treatment is done by the physician himself avoiding the possible compliance problems of patients. [17] The property of dryness or being able to keep the ear canal dry makes it superior to the solution preparation.

Some studies point to the possible irritating effect of otic solutions when applied to the ear canal. While some patients complain of burning sensation, others complain of pain upon instillation. Such complaints lead to doubts on the patient's compliance to treatment, which may predispose to longer treatment duration.

Other drying agents such as merthiolate, boric acid, and gentian violet have been discussed in several literatures over and over again putting emphasis on its ability to keep the ear canal dry, aside from its antimicrobial properties. The in vitro studies done by Stern et al compared the effectiveness of 13 different agents for treatment of otomycosis, one of which merthiolate which showed effectivity against all the organism tested. This again could point out its drying capability that prevents the growth of the fungi. [18]

It cannot be overemphasized that the key to successful treatment of fungal otitis externa is gentle efficient cleaning of the ear canal carefully removing its accumulated debris, followed by thorough drying, because retained humidity promotes further fungal growth. [8]

CONCLUSION

The efficacy of silica gel versus clotrimazole in the alleviation of the signs and symptoms of otomycosis was established by determining the duration after initiation of the respective treatment regimens. Statistical analysis was made using the two-tailed test of independence or T-test.

Symptoms of otomycosis, namely: pruritus, otalgia, fullness, hearing loss and tinnitus, in patients treated with silica gel exhibited a statistically significant shorter period of duration in comparison to those treated with clotrimazole.

Likewise, signs of otomycosis, namely: mycelial elements on otoscopy, erythema of external auditory canal, edema, watery or serous discharge, and hyphae seen on KOH mount, in patients treated with silica gel exhibited a statistically significant shorter period of duration in comparison to those treated with clotrimazole.

The efficacy of silica gel in alleviating the signs and symptoms of otomycosis is greatly attributed to its desiccating property.

Despite the above-mentioned conclusions, the present study cannot conclude if silica gel is superior than clotrimazole in treating otomycosis.

The present study, however, strongly suggests that keeping the ear dry and free from cellular debris is still the best way to prevent otomycosis.

RECOMMENDATION

In our search for cheaper alternatives for currently used treatment regimens, we have started to give a second glance on materials not medically used but theoretically sound. This is true in the case of our present study wherein we propose the possibility of using silica gel, a commercially available desiccant, as an alternative treatment for otomycosis.

However, further studies are recommended to ascertain if the compound will have any role in the management of otomycosis:

(1) Similar studies can be made on a larger sample population to check the reproducibility of the results herein.
(2) Silica gel can be compared to other desiccants such as boric acid, merthiolate, and gentian violet.
(3) Know the effectivity of silica gel in controlling other fungal pathogens.
(4) Determine the cost-effectivity of silica gel in comparison to other treatment regimens against otomycosis.

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ASPS of the head and neck were found mostly in the orbit and tongue (STS, 1992). A case of ASPS in the larynx was reported in 1997 in California, U.S.A. (De Sautel et al 1997). Of the 143 cases of ASPS listed by the Armed Forces Institute of Pathology (AFIP) in the U.S., 27.3% were located in the head and neck, 11.2% in the trunk, 17.4% in the upper extremity and 44.1% in the lower extremity (Fig.6).

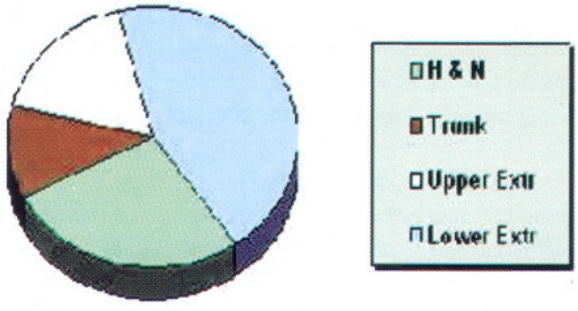

Figure 6. Primary location of ASPS *(AFIP)*

Initial behavior of this tumor is relatively indolent as shown by several cases reported. Over time, however, a sizeable number of these tumors recur locally and develop metastases and, as such, are best regarded as true malignant neoplasms. (Hunter, 1998)

Due to its infrequent occurrence, variations in presentation and frequent overlap of histopathological features, accurate diagnosis of ASPS remains to be a constant challenge. In many cases, a definite diagnosis can be reached with confidence by histopathology alone but, in some soft tissue tumors, even the application of the full armamentarium of available diagnostic methods leaves a degree of uncertainty about the exact nature of this neoplasm.

DISCUSSION

An indolent mass presenting in a young patient which changes in character after manipulation should mandate an immediate histologic diagnosis.

Initially, the mass was slow-growing, non-tender, nonpulsatile, nonerythematous and movable with the skin. After the first surgical manipulation, mass was noted to be fixed and has a faster rate of growth. Intraoperative findings during the section biopsy depicted a locally invasive tumor with some areas of necrosis suggesting a malignancy at this point. Only further histopathologic studies can differentiate the specific origin of the tumor.

Specimen were routinely stained in hematoxylin and eosin dyes. Results showed a lobular configuration of cells with surrounding septations and marked vascularity (Fig. 7a, b). PAS staining exhibited the characteristic intracellular , rhomboid or rodlike crystalline material (Fig. 8). Brownish to golden intracellular deposits were also evident in S100 staining (Fig. 9). Vimentin antibodies stained round or oval small cells located in the interalveolar septa (Fig. 10). Actin staining failed to show positive results (Fig. 11).

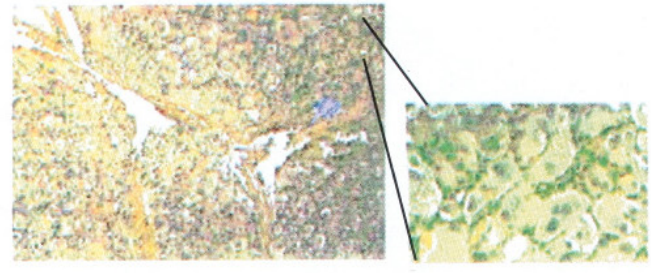

Figure 7. H & E staining showing lobular configuration with septation.

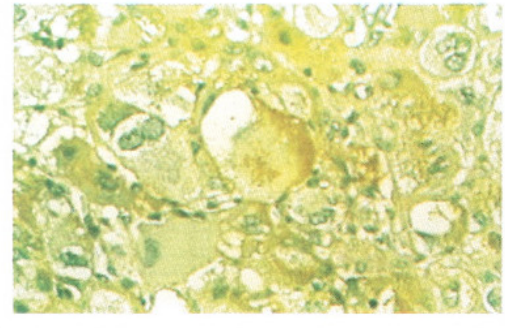

Figure 8. PAS stain, showing characteristic Intracellular crystals

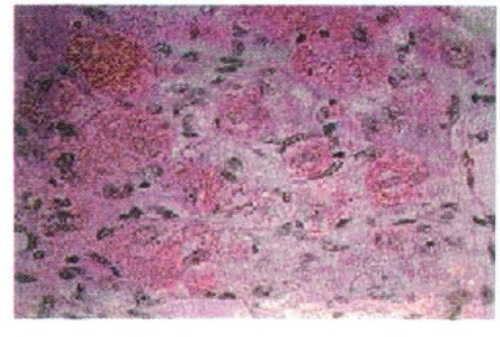

Figure 9. S-100 staining showing golden cytoplasmic inclusions

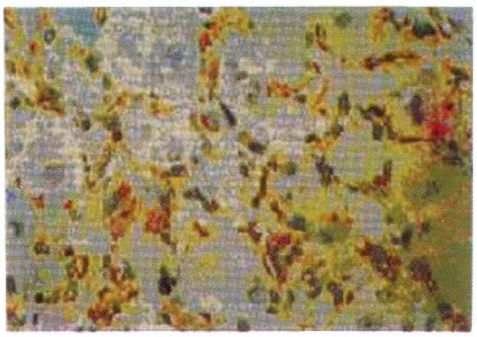

Figure 10. Vimentin antibody staining of interalveolar septa cells

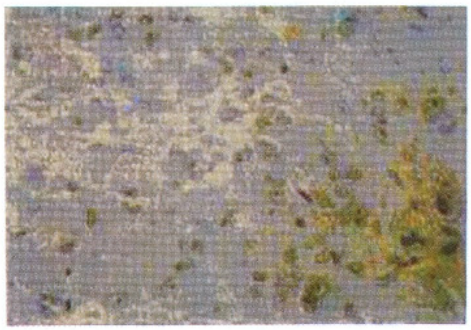

Figure 11. Negative Actin stain

PAS staining is the most important stain in the diagnosis of ASPS as it is pathognomonic for this tumor. It contains intracellular glycogen which is characteristically PAS-positive, diastase resistant crystalline material (STS, 1992). This has never been demonstrated in any other neoplasms but present in 80% of ASPS cases. Masson-Trichome staining may also be positive for ASPS and depicts the characteristic crystalline material.

Earlier reports on ASPS indicate negative staining for S-100, myelin proteins, and neuron specific enolase (STS, 1992) but recent review of related literatures showed nonuniform immunoreactivity to muscle specific Actin, S-100 proteins and Vimentin (Jong, 1998; Flieden et al 1997). The patient's tumor stained positively for S-100 and Vimentin. Renal Cell CA, as well as paraganglioma and malignant granular cell tumor fail to exhibit the unique PAS positive crystalline material. Paraganglioma contains intracellular glycogen but in scanty amounts. The mentioned tumors usually affects older patients (>40y.o.) and are rare in patients less than 25 years old. Alveolar Rhabdomyosarcoma is oftentimes confused with ASPS but more because of terminologies rather than the histopathologic picture. Primary bone tumors are less entertained due to the initial history of a movable mass over the malar area, not fixed to the underlying zygomatic bone.

Surgical excision remains the mainstay of therapy for circumscribed cases of ASPS and its metastases, if present (Hunter, 1996). Tumor resectability was determined to be the main predictor of survivability because studies on the effect of chemotherapy failed to produce significant tumor responses (Pappo,1996) (STS, 1992). In the review of Lieberman et al from 1923 to 1986 showed no survival advantage could be demonstrated for patients who received chemotherapy and/or radiotherapy.

Two years after the patient was diagnosed, the patient remained tumor free without any signs of metastases elsewhere. Wide excision proved to be the adequate management for this patient.

Prognosis, according to studies available, remained poor despite the indolent course of the tumor. Two-year, 5-year and 10- year survival rates were reported to be 82%, 59%, 47% respectively. Median survival of patients with typical ASPS was determined to be 79 months from time of diagnosis (Evans, 1985).There are limited studies regarding survival of such patients 20 years after diagnosis. . The presence of metastases (common to lung, bone and brain) further decreases the chances of remission and cure (Pappo, 1996) (Hunter et al 1998). Short term survival (4-years), however, was shown to have no correlation to clinical presentation, adjuvant treatment, tumor size, histological grade, vascular invasion by tumor, proliferative index or p53 protein accumulation (Jong, 1998)

SUMMARY

The case presented with a lesion which was assessed initially as benign and was treated as such. The more aggressive recurrent tumor was diagnosed as Alveolar Soft-Part Sarcoma after special staining and immunohistochemical studies. Microscopically, there was note of an intracellular crystalline material which was PAS, S100 and Vimentin positive. Wide excision entailed resection of the malar bone containing the lesion and overlying soft tissues. The patient was tumor and metastases-free two years later. The authors agree with literature that surgery with wide resection is presently the best treatment modality available for Alveolar Soft Part Sarcoma (ASPS).

CONCLUSION

Head and neck masses occuring in the young adult and especially children is almost always a source of anxiety for patients and caregivers alike.

A COMPARATIVE STUDY

APPENDICES

APPENDIX A

Silica Gel: Physical and Chemical Properties

Appearance:	White amorphous powder
Odor:	Odorless
Solubility: Neglible:	(<0.1%)
Specific Gravity:	2.1
PH:	3-8 (in 5% slurry)
% Volatiles by Volume @ 21C (70F):	0
Boiling Point:	2230 C (4046F)
Melting Point:	1610C (2390F)
Vapor Density (Air=1):	No information found
Evaporation Rate (BuAc=1):	No information found

APPENDIX B

Independent Samples Test
Symptoms of Otomycosis

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95%Confidence Interval of the Mean	
							Lower	Upper
DISCHARGE	Equal variances assumed	4.768	31	.000	4.2556	.8924	2.4354	6.0757
	Equal variances assumed	4.775	30.093	.000	4.2556	.8912	2.4357	6.0754
EDEMA	Equal variances assumed	2.351	31	.025	2.4111	1.0254	.3198	4.5024
	Equal variances assumed	2.295	25.931	.030	2.4111	1.0508	.2509	4.5713
ERYTHEMA	Equal variances assumed	4.239	31	.000	5.4000	1.2739	2.8019	7.9981
	Equal variances assumed	4.220	29.369	.000	5.4000	1.2796	2.7844	8.0156
FULLNESS	Equal variances assumed	3.160	31	.004	2.7444	.8686	.9730	4.5159
	Equal variances assumed	3.060	24.458	.005	2.7444	.8968	.8955	4.5934

APPENDIX C

Independent Samples Test
Signs of Otomycosis

		t-test for Equality of Means						
		t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95%Confidence Interval of the Mean	
							Lower	Upper
HEARLOSS	Equal variances assumed	3.109	31	.004	2.8000	.9006	.9632	4.6368
	Equal variances assumed	2.891	17.027	.010	2.8000	.9684	.7570	4.8430
KOH	Equal variances assumed	5.049	31	.000	5.8667	1.1619	3.4970	8.2363
	Equal variances assumed	5.196	30.531	.000	5.8667	1.1291	3.5624	8.1710
MYCELIAL	Equal variances assumed	4.827	31	.000	4.4889	.9300	2.5921	6.3857
	Equal variances assumed	5.009	29.555	.000	4.4889	.8961	2.6577	6.3201
OTALGIA	Equal variances assumed	3.434	31	.002	2.0333	.5920	.8259	3.2408
	Equal variances assumed	3.245	19.666	.004	2.0333	.6267	.7247	3.3420
PRURITUS	Equal variances assumed	2.965	31	.006	2.7444	.9257	.8565	4.6324
	Equal variances assumed	2.794	19.228	.011	2.7444	.9823	.6902	4.7987
TINNITUS	Equal variances assumed	1.371	31	.180	1.1889	.8671	-.5795	2.9572
	Equal variances assumed	1.297	19.822	.210	1.1889	.9170	-.7250	3.1028

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ALTERNATIVE METHOD IN IDENTIFICATION OF RECURRENTLARYNGEAL NERVE

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ABSTRACT

Objective:
To find an alternative and safe method in the identification of the recurrent laryngeal nerve.

Design:
Experimental studies were done using periodic acid schiff as stain for the identification of the recurrent laryngeal nerve in cadavers.

Setting:
The study was done in the laboratory and morgue of a tertiary government hospital (Rizal Memorial Medical Center).

Subjects:
Frogs, cats and fresh cadavers were used in the study.

Results:
The study revealed that the use of periodic acid schiff as a means of identifying the recurrent laryngeal nerve showed no changed in the function; also, there was no alteration in the histology noted.

Conclusion:
The use of periodic acid schiff as a means of identification of the recurrent laryngeal nerve is safe and accurate and could definitely be used as an alternative method in the identification of the recurrent laryngeal nerve.

INTRODUCTION

Surgical therapy continues to be the primary therapeutic modality for treating many thyroid disorders, and is one of the more common surgical procedures done in our local setting. The technique varies and the procedure is tedious and difficult to do. It has many inherent problems and what is more challenging is the identification of the recurrent laryngeal nerve. In our institution, it has been the practice of our residents in training to identify the recurrent laryngeal nerve in all thyroid surgeries and failure of identification had resulted in injuries to the above mentioned nerve in 1% to 10% of the patients operated on. Injury to the recurrent laryngeal nerve results in permanent change of voice or even worse, it may lead to respiratory distress.

The only way of identifying the recurrent laryngeal nerve is thru its anatomic location and its relation with the other structures in the cervical area. This method however is not easy for many reasons such as: a) its size and color, b) the several anatomic variations and c) even the distortion of the structure as caused by the disease process or from previous thyroid operation.

Failure in identifying the recurrent laryngeal nerve can cause so much anxiety on the surgeon and lead to permanent morbidity on the part of the patient.

In this study, the authors chose to use the stain Periodic Acid Schiff (PAS) as a means of

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identifying the recurrent laryngeal nerve. The said stain is cheap, readily available and is safe as evidenced in the study.

OBJECTIVE

The experimental study was designed to find an easy, fast, safe and reliable method of identifying the recurrent laryngeal nerve intraoperatively. This could help in making the operation easy, limit detailed cervical exploration, shorten the operating time and decrease the morbidity in thyroid surgery.

MATERIALS AND METHODOLOGY

This is a three-part study. The first part is the frog experiment in which the sciatic nerve of the frog was exposed and stained with periodic acid schiff. The second part of the experiment used a cat to note the function of the recurrent laryngeal nerve after staining with periodic acid schiff. The final part of the experiment involved fresh cadavers. The recurrent laryngeal nerve was exposed and stained with periodic acid schiff and the stained nerve was sent to histopathology for documentation.

I. Staining Procedure

The first part of the experiment was done to test whether PAS can really stain nerve tissues grossly.

A. Frog Experiment:
The frog is one of the most common experimental animals used in medical schools. We utilized the frog for its sciatic nerve. First we dissected the sciatic nerve of both hindlegs, after which we applied PAS over the exposed area. After one minute, we then rinsed the area with sterile water and noted the result.

B. Cat Experiment
After the very encouraging results we got from the frog experiment, we applied the same method on the cat but now we exposed the laryngeal nerve. After anesthesia with ether gas, we did a vertical incision on the neck and with the help of a zoologist, we were able to identify and expose the laryngeal nerve. The chemical stain was applied to the identified structure and after 1 minute, the area was rinsed with water. The results were then noted.

C. Postmortem Experiment
To try to simulate the effects of PAS on live patients, we did the same staining procedure on fresh cadavers. The interval between the time of death and the time of dissection was less than 24 hours. After consent for autopsy, we exposed the right recurrent laryngeal nerve of the cadaver using the same surgical procedure done on live patients. Upon exposure of the thyroid gland, we lateralized it to expose the tracheoesophageal groove after which we were able to expose the recurrent laryngeal structure. PAS was applied to the structure and we then noted for the results after rinsing it with distilled water. The dye was also applied to the blood vessels and fibrous tissues in the operative site.

II. Test for function of the stained nerve

The second part of the experiment is to prove that the stain (PAS) when applied to the nerve is non-injurious and will not affect its functions.

Frog Experiment – measurement of nerve impulses before and after staining of the sciatic nerve.

One of the more important function of nerve fibers is conduction of impulse. Electrical potentials exist across the membrane of nerve cells, and are "excitable" – nerve cells are capable of self-generation of electrochemical impulses are used at their membranes and these impulses to transmit the signals along the nerve fiber.

By measuring this membrane potential generated in the nerve, we could compare the function before and after staining the nerve and test if PAS has affected the conducting capacity of the nerve. To measure the conducting capacity of the nerve, we filled a small pipette with a very strong electrolyte (KCL) that was imparted through the cell membrane then to the interior of the fiber. Another electrode called the "indifferent electrode" was placed in the interstitial fluid

and the potential difference between the inside and the outside of the fiber was measured using a voltmeter. For recording rapid changes in the membrane potential during the transmission of nerve impulses, the microelectrode was connected to an oscilloscope. Nerve impulses were then measured by voltmeter and oscilloscope during nerve stimulation and were recorded before and after staining and compared. (Fig. 1)

Cat Experiment – In the cat experiment, we tried to compare the amplitude and frequency modulation of the cry of the cat (we dissected on two cats) before and after staining the laryngeal nerve. The frequency and amplitude of the cat's cry was measured using an ordinary graphic synthesizer found in a component and the results were graphed and recorded. On the first cat, the frequency and amplitude of the cry was recorded before and after staining the laryngeal nerve. On the second cat, the frequency and amplitude of the cry was measured and recorded before and after cutting the laryngeal nerve. Results were then recorded and compared.

III. *Identification of the stained nerve by histopathology*

The third part of the experiment was done to prove that all the structures stained in the animal and the postmortem cadaver studies were really nerve structures. We had to also prove that the chemical stain did not change the histologic features of the nerve. To prove this, all stained structures such as the sciatic nerves of the frog, the laryngeal nerve of the cat and the recurrent laryngeal nerve of the human cadaver were subjected to histopathological studies.

RESULTS

In the first part of the experiment, the chemical stain (PAS) was able to stain the nerve grossly giving it a reddish-purple color while failing to stain all other structures such as fibrous tissues and vessels (Table 1).

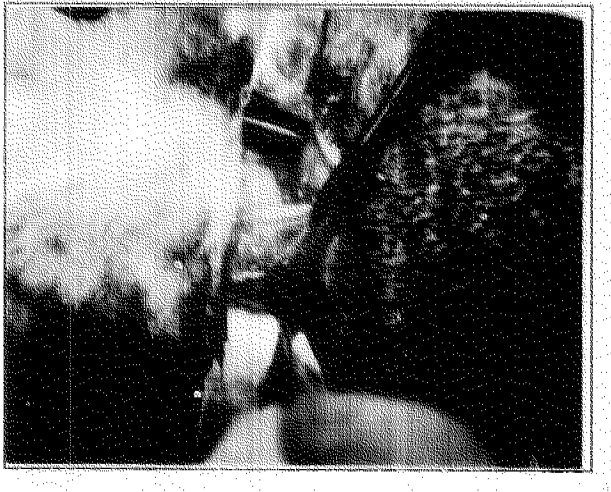
In the second part of the experiment, we were able to prove that PAS was not injurious to the nerves. This was proven when no change in the measurement of nerve impulse was observed before and after staining of the frog's sciatic nerve (Table 2).

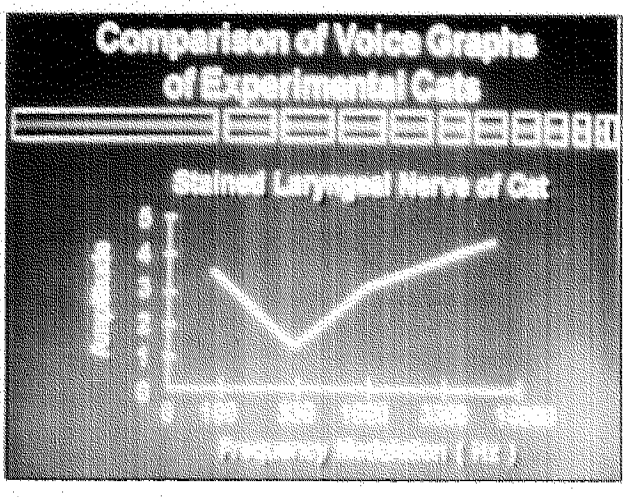
There was likewise no change in the amplitude and frequency modulation of the cat's cry in the unstained and stained laryngeal nerve but there was a noted marked decrease in amplitude and frequency modulation were noted in severed laryngeal nerve as compared to an intact laryngeal nerve (Figures 1-4).

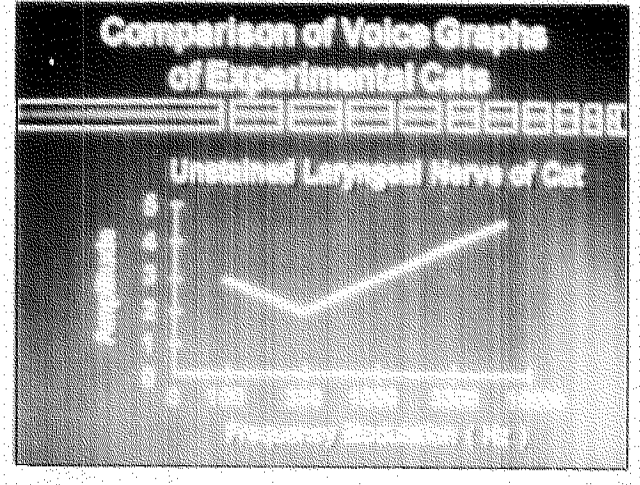
Table 1. Comparison of Nerve/Other Structure Before and After PAS.

SPECIMEN	COLOR BEFORE STAINING	COLOR AFTER STAINING AND RINSING WITH DISTILLED WATER
Sciatic nerve of the frog	Shiny white	Reddish purple
Laryngeal nerve of the cat	Shiny white	Reddish purple
Recurrent laryngeal nerve of postmortem human cadaver	white	Reddish purple
Blood vessels and fibrous tissues of postmortem	Grayish	Gray

Table 2. Comparison of Nerve Impulse in Unstained and Stained Sciatic Nerve.	
SPECIMEN	MEASUREMENT OF NERVE IMPULSE BY VOLTMETER AND OSCILLOSCOPE
Unstained sciatic nerve	+50 mv.
Stained sciatic nerve	+50mv.







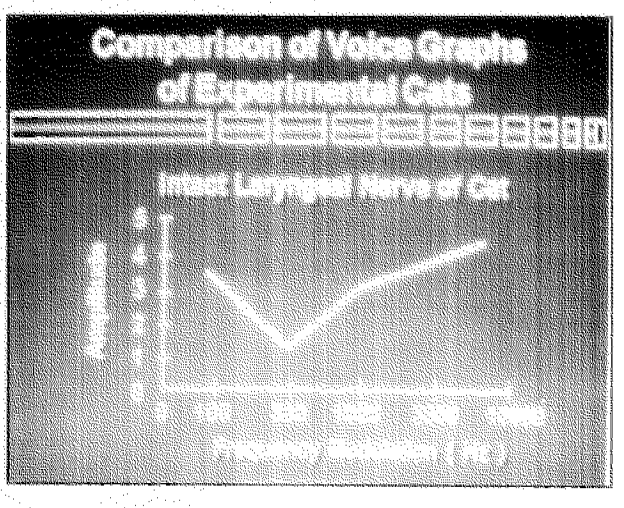


Table 3. Tabulation of Histologic Changes After PAS

SPECIMEN	HISTOLOGIC READING	CHANGES IN HISTOLOGIC FEATURES AFTER PAS
Sciatic nerve stained with PAS (frog)	Consistent with nerve	(-)
Laryngeal nerve stained with PAS (cat)	Consistent with nerve	(-)
Recurrent laryngeal nerve of postmortem human cadaver stained with PAS	Consistent with nerve	(-)

In the third part of the experiment, histological exams of the stained specimens were all consistent with nerve structures. There were no structural changes seen microscopically when the said nerves were stained with PAS (Table 3).

DISCUSSION

One of the characteristics of peripheral nerve tissues that make it different from other structural tissues is the presence of glycolipids, unsaturated lipids and phospholipids. These are abundantly present practically in all parts of the peripheral nerve tissues such as the perineural fat, medullary sheath and the connective tissue surrounding the nerve fiber (perineurium, epineurium and endoneurium).

The commonly used PAS (Periodic Acid Schiff) stain has a long history in histochemistry. It's staining property depends on the oxidation of 1,2 glycol group (CHOH-CHOH) by periodic acid. The resultant dialdehyde reacts with Schiff's reagent (Fuschin sulfurous acid) to produce a reddish-purple stain.

A number of compounds found in peripheral nerve tissues such as glycolipids, unsaturated lipids and phospholipids are stained with this reaction. When the stain reacts on the structural component of the nerve, the reaction that ensues is negligible, the functional unit and the conductive capacity of the nerve are left intact.

Injury to the recurrent laryngeal nerve is best avoided by careful dissection and identification of the nerve. A good knowledge of its surgical anatomy is imperative. This however is easier said than done. The identification may be extremely difficult because of the many anatomic variations brought about by the disease entity and from previous thyroid surgeries. Extensive surgical dissection in the attempt to look for the *true* recurrent laryngeal nerve may cause injury or edema of the nerve resulting in temporary to permanent vocal cord paresis. Because of these problems, the study was designed to find an alternative way so that we can identify the nerve safely and accurately.

PAS was the chemical stain of choice used. It is cheap and readily available. Its reliability and sensitivity were proven in the experiment. It stained the sciatic nerve of the frog, the laryngeal nerve of the cat and the recurrent laryngeal nerve of the postmortem human cadaver reddish purple thus making their identification easy and obvious. This was confirmed by histologic examination of the said structures. The experimental study has proven the safety of PAS in the identification of the laryngeal nerve. Series of experiments on our frogs and cats have shown no changes in the functional activities of the nerve after staining likewise the histologic findings showed no structural changes in the nerve after staining with PAS.

CONCLUSION

We can therefore conclude that an easy and alternative way of identifying the recurrent laryngeal nerve is by staining it with PAS. With this method, we can avoid the nerve during dissection. This method would also prevent extensive cervical dissection thus shortening the operative time and ultimately avoiding possible morbidity in thyroid surgery.

RECOMMENDATIONS

We recommend to do further studies on PAS not only on doing more cadaver and animal studies and eventually we can do this in live patients.

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ULTRASTRUCTURAL CHANGES IN NASAL POLYPS WITH EXPOSURE TO MOMETASONE FUROATE MONOHYDRATE AQUEOUS NASAL SPRAY*

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ABSTRACT

OBJECTIVES:

1. To describe the ultrastructural changes in the nasal polyp of patients treated with Mometasone Furoate Monohydrate aqueous nasal spray through the aid of electron microscopy
2. To describe through the use of transmission electron microscopy the ultrastructural appearance of the nasal polyp
3. To describe the ultrastructural changes in the nasal polyp of patients while undergoing Treatment with Mometasone Furoate Monohydrate aqueous nasal spray after 4 and 8 weeks of exposure.

DESIGN: Descriptive Study

SETTING: Tertiary hospital

PATIENTS: 4 patients, ages 22 to 70,diagnosed to have nasal polyposis

CONCLUSION:

The ultrastructural changes seen in polyps are 1) the variability in the thickness of the surface epithelium and cellular composition, 2) Extensive edema of the epithelial layer as evidenced by there widened and distended intercellular spaces, and loosened junctional complexes. , 3) Presence of cells, which possessed large membrane bound vacuoles containing flocculent material 4) Irregularities in the surface cilia such as the presence of thickened ciliary membranes, disintegration and dissolution of ciliary components 5) The vacuolation of the mitochondria and destruction of intraorganelle crystals, 6) The basement membrane was thick and widened with the cell free zone beneath it replaced by bands of edematous area containing loose collagen fibers and amorphous materials of low electron density, 7) The mast cells showed extensive degranulation, also occurring twice as much with a highly variable morphology, 8) The granules were very small, very electron dense and amorphous with a crystalline matrix and it lacked the outer lamellar content 9) The endoplasmic reticulum was distended and contained flocculent materials of low electron density 10) The blood vessels seen had its endothelial cells arranged in such a fashion that the junctions in between provided spaces for the leakage of fluid, 11) The glands contained mucous elements and the regular tall columnar lining was shifted to a flattened epithelium.

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*Presented, PSOHNS Descriptive Research Contest, November 29, 2000, Punta Baluarte, Calatagan, Batangas
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At four weeks of treatment the area beneath the basement membrane showed areas of less edema. Mast cells were less degranulated and the granules showed the central core and the scroll pattern was already identified with the presence of crystalline inclusion bodies. The dilated cistern of the endoplasmic reticulum was less prominent with a more uniform arrangement. Mitochondria had less vacuolation with reappearance of some intraorganelle crystals. Other findings were 1) narrowing of the open endothelial junctions in the capillaries 2) portions of the stroma demonstrated areas of necrosis 3) at the epithelium, the junctional complexes showed thinning.

At eight weeks of treatment, there was marked reduction in the edema at the epithelial layer wherein the junctional complexes were clearly delineated from one cell to another. Ciliary organization was more uniform. Mitochondria activity was more prominent. There was narrowing of the basement membrane where collagen fibers were dense. Mast cells and the granules were less dense and amorphous.

The polyps were devoid of sensory, vasomotor and secretomotor innervation.

INTRODUCTION

Lesions of the sinonasal region may have similar or overlapping morphology, and pose a challenge not just to the Otolaryngologist but also to the Pathologist. With the advent of modern technology in this present day and age, modern pathologic techniques including immunohistochemistry and electron microscopy, have been employed and are commonly utilized in giving us an accurate diagnosis and better understanding of such lesions. Standard pathologic criteria for architecture, nuclear configuration and mitotic rate remain the essential morphologic features for diagnosis.

Immunohistochemistry is a powerful tool for pathologic diagnosis and is proved effective in the classification of the undifferentiated and/or small lesions of the sinonasal tract. Briefly stated, immunohistochemistry is the application of immunologic principles and techniques to the study of cells and tissues.[1]

The main applications of electron microscopy to diagnostic pathology are in the fields of tumor pathology and renal pathology. In tumor pathology, ultrastructural examinations have proved to be very useful in determining the histiogenesis of various tumors but unfortunately have not shown consistent differences between reactive conditions, benign tumors and malignant tumors of the same type.[1] At present, the role of diagnostic electron microscopy has diminished as a result of the advances in immunohistochemistry. However, it remains a powerful diagnostic tool used selectively and intelligently, with full knowledge of its potential contributions and limitations.

Nasal Polyposis is a disease known to man for over 5000 years. Nasal polyps are not true neoplasms. They appear to be inflammatory swellings of the nasal mucosa especially in the middle meatus and anterior ethmoidal air cells rather than a true neoplastic growth. Many are still of obscure etiology. Many hypotheses regarding its pathogenesis have been proposed and debated upon, but there is still no clear-cut evidence for its cause. The pathologic mechanism of polyp formation is still under investigation and current theories favor a connective tissue dysfunction due to immunoglobulin E (IgE)-mediated response in the lamina propria, which results in fluid retention below the epithelial surface. Grossly, nasal polyposis appears as soft polypoid translucent

masses up to several centimeters in diameter.

Histologically, the surface mucosa is typically intact and covered by respiratory epithelium with increased goblet cells and/or areas of squamous metaplasia. The basement membrane is frequently thickened and eosinophilic. The stroma is edematous and myxomatous with scattered fibroblasts and variable vascularity.

There have been extensive histological and biochemical studies of nasal polyps and a few studies were made with the aid of electron microscopy.[3,4,5,6,7,8,9,10] Electron microscopy has revealed that tissues of polyps are devoid of sensory, vasomotor and secretomotor innervation. Eosinophils and neutrophils are increased in number in all layers. Plasma cells exhibit activity in the endoplasmic reticulum and Golgi zone and that mast cells are depleted of their granules. The venules of polyps reveal open endothelial junctions, which signify vascular leakage.[3]

The increasing popularity of topical corticosteroids has led to several studies on its clinical, biochemical and histological effects on nasal polyps. Studies showed that the number of eosinophils in nasal smears, concentrations of albumin, IgG and IgE, number of goblet cells, degree of tissue edema and symptomatology in nasal polyps decrease significantly with the use of topical corticosteroids.[7,9,16,17] Mometasone furoate aqueous nasal spray in the treatment of perennial rhinitis led to an improved appearance of the epithelium and reduced extent of inflammatory cell infiltrate, especially eosinophils and mast cells.[11]

The effects of corticosteroids are widespread and numerous. They not only influence carbohydrate, lipid and protein metabolism but also water and electrolyte balance. Its actions are often complexly related to the functions of other hormones. Like any other steroid hormones, they act by controlling the rate of synthesis of proteins. It reacts with receptor proteins in the cytoplasm of many sensitive cells to form a steroid receptor complex. The complex undergoes sedimentation then moves into the nucleus and regulates transcription although most of the time it is enhanced as manifested by many mRNA. It then releases a protein, which plays a major part in the receptor complex then proceeds to the nucleus where it interacts with the DNA.

Glucocorticoids act by preventing or suppressing the development of the manifestations of inflammation. Although the effects may be palliative, the suppression of inflammation and its consequences have made them of great clinical value. Corticosteroids do not only inhibit the phenomena of the inflammatory process but also the later manifestations such as proliferation of fibroblasts and capillaries and deposition of collagen. It also inhibits the recruitment of leukocytes, monocytes-macrophage into affected areas. It also exerts actions on the various elements of the circulatory system, including the capillaries and arterioles. In the absence of corticosteroids, there is increased capillary permeability, inadequate vasomotor response of the small vessels to catecholamines.

No literature was encountered on the ultrastructural changes of nasal polyps that are being treated with topical corticosteroids. Thus, with the aid of electron microscopy, this study aims to give a description of the nasal mucosa in the subcellular level in patients with nasal polyps being treated with mometasone furoate aqueous nasal spray.

The management of nasal polyposis, both medical and surgical presents as a challenge in the field of Otorhinolaryngology. Its therapy is one of the

major challenges for both medical and surgical approaches including endoscopic sinus surgery. Polyps tend to recur as long as the underlying disease is not eradicated.

REVIEW OF LITERATURE:

It was in 1972 when Cauna et al. published their research, "Fine structure of nasal polyps". They presented intimate details and descriptions of the various structures seen in nasal polyps. The tissues of the polyps were noted to be devoid of sensory, vasomotor and secretomotor innervation. Eosinophils and neutrophils were found to be increased in number in all layers. Plasma cells exhibit activity in the endoplasmic reticulum and Golgi zones, and mast cells are depleted of their granules. The venules of polyps reveal open endothelial junctions, which signify vascular leakage. It was suggested that the loss of innervation combined with allergic reactions, infection or inflammation is responsible for polyp formation.

Mygind et al. followed this in 1974 when they published their findings regarding their studies in nasal polyps thru scanning electron microscopy. The following year, Mygind described the human nasal mucosa also thru scanning electron microscopy. He concluded that allergic reactions have only a slight direct influence on the ultrastructure of the mucous membranes and that the nasal mucosa is characteristically altered in atrophic rhinitis.

Before 1975 ended, Lenz published his study, "The surface of nasal polyps in the scanning electron microscope", which revealed a domination of kinocilia-free epithelium. There was evidence of transitional forms of epithelium, from a cylindrical to more cube-like and finally to squamous epithelium. The covered surface showed bundle-like, long and mostly parallel kinociliae together with short and thin kinociliae in small bundles. All kinociliae had coordinated direction and a morphologically evident function phase. There was also a network of kinociliae without any function phase or coordinated direction. Thru their morphological findings, it was concluded that there is an extensive decrease in function of the mucociliary system in cases of polyposis, and as a result of this, an infectious origin is favored.

With the increasing popularity of topical corticosteroids, Sorensen et al. studied the effect of Beclomethasone dipropionate on nasal polyps in 1976. The study showed a decreasing trend in the number of eosinophils in nasal smears and falls in the increased concentrations of albumin, IgG and IgE in nasal secretions. No signs of adverse effects were noted and with this, they regarded that Beclomethasone dipropionate as a valuable drug in the treatment of nasal polyps. The same conclusion was reached in 1978 by Mygind et al. and added that the degree of tissue edema, number of infiltrating eosinophils, number of goblet cells decreased significantly and that the use of the drug for a period of few years will not cause atrophic rhinitis.

However, in 1980, Baumgarte et al. in their study of "Histopathological examination of nasal polyps of different etiology", claimed that it is impossible to give a safe differentiation between an allergic and non-allergic polyp, whether it be studied under light or electron microscopy. They noted, however, some indications, which might lead to an allergic or non-allergic origin. Eosinophils and round cell infiltrations are present in all types of polyps. An index of eosinophils to plasma cells below 5 is indicative of an allergic origin while an index of above 5 corresponds to an infectious etiology. An increased number of glands and collagen fibers, especially under the epithelium indicate the age of the polyp.

ULTRASTRUCTURAL CHANGES

Drake-Lee made a series of descriptive and analytical studies about mast cell ultrastructure. On his preliminary report in 1987, he described mast cells from normal nasal mucosa, nasal polyps, inferior turbinates and adenoid tissues. It was concluded that almost all mast cells from nasal polyps showed extensive degranulation, with occasional electron-dense granules and vacuoles and that the process of degranulation may extend throughout the rest of the nose. Normal mast cells have electron-dense amorphous granules organized like a scroll or a less dense crystalline matrix with a single nucleus and less degranulation. On his final paper in 1997 the degree of degranulation was evaluated. It confirmed that mast cells are degranulated within the stroma of nasal polyps and that the changes there are more than those are found in the inferior turbinates. The study also suggests that the degranulation in polyps imply a co-existing inflammation occurring throughout the nose.

Matthias and Merker (1997) investigated the morphology of the mucosa of the human paranasal sinus by electron microscopy. The mucosa represented a highly prismatic epithelium consisting of kinocilia-carrying and mucus producing (goblet) cells. Other cell types, such as those occurring in the respiratory epithelium of other areas could not be demonstrated. Electron microscopic and immunomorphological investigations revealed collagen type VII beneath the lamina densa of the basal lamina, and only a small number of basophils and eosinophils in the area. Pronounced acute reactions of the mucosa in this area cannot be expected, which is in contrast to that of the nasal mucosa.

The response to steroid nasal sprays was shown in the experiments of Holmberg et al. in 1997 where they used fluticasone aqueous nasal spray (FPANS) in the treatment of nasal polyposis. It was shown that the administration of fluticasone propionate and Beclomethasone dipropionate are effective in the treatment of nasal polyps, with some evidence that fluticasone propionate has a faster onset of action and is tolerated as well as Beclomethasone at the same dose.

Lund in 1998 discussed the effectivity of fluticasone spray in severe polyposis. The drug was found to be effective in treating the symptoms of severe polyposis. Evidence showed that the group treated with FPANS responded more quickly and efficiently than in the group receiving Beclomethasone.

Also in 1998, Minshall, et al. made a study on the "Assessment by nasal biopsy of long-term use of mometasone furoate aqueous nasal spray (MFNS) in the treatment of perennial rhinitis". In a study of 69 patients with allergic rhinitis treated with mometasone furoate, they concluded that long-term use of MFNS appeared to improve the appearance of the epithelium and reduced the extent of the inflammatory cell infiltrate, particularly eosinophils and mast cells. It had no untoward side effects on the nasal mucosa, and there was complete absence of atrophic changes. By virtue of its effect on the nasal mucosa, they recommended MFNS as an effective treatment for perennial rhinitis.

OBJECTIVES

A. GENERAL OBJECTIVE:

To describe the ultrastructural changes in the nasal polyp of patients treated with mometasone furoate monohydrate aqueous nasal spray through electron microscopy.

B. SPECIFIC OBJECTIVES:

To describe through the use of transmission electron microscopy the ultrastructural appearance of the nasal polyp.

To describe the ultrastructural changes in the nasal polyp of patients while undergoing treatment with mometasone furoate monohydrate aqueous nasal spray (Nasonex) after four weeks and eight weeks.

SUBJECTS:

A. INCLUSION CRITERIA

Patients 20 years up to 70 years of age

Patients belonging to both sexes

Patients with clinically-diagnosed Grade II and Grade III nasal polyps

Patients who have not undergone any treatment prior to initial biopsy

B. EXCLUSION CRITERIA

Patients who underwent functional endoscopic sinus surgery

Patients who received steroids in the last twelve months

Patients with known allergy to any of the components of the topical corticosteroid used in this study

Pregnant women

Lactating / breastfeeding women

Patients undergoing chemotherapy

MATERIALS AND METHODOLOGY

A. PATIENT SELECTION:

Four adults diagnosed with nasal polyposis from our out patient department were selected for this study. Ages range from twenty-two to seventy years. A complete history and physical examination was done on all patients with emphasis on anterior rhinoscopic findings. Voluntary consent to participate in the study was obtained. Specimens were obtained thru punch biopsy. Patients were then subjected to mometasone furoate monohydrate aqueous nasal spray at two nasal puffs per nostril twice a day at approximately 200 ug per day.

Repeat biopsy was done every three to four weeks, noting changes on the gross appearance of the polyp. Patients were advised to note of any adverse effects while continuously using mometasone furoate monohydrate nasal spray (Nasonex).

B. STUDY DESIGN:

A descriptive study.

C. TISSUE PREPARATION:

Nasal polyps were obtained in the standard manner using Takahashi forceps from the right and left nasal cavity of each subject. The nose had previously been prepared with Oxymetazoline hydrochloride (Drixine 0.05% nasal spray) and was subsequently anesthetized with lidocaine hydrochloride (Xylocaine) 10% nasal spray. Nasal biopsy specimens measuring 1-1.5 mm were immediately fixed in 2.5%-3.0% gluteraldehyde in 0.2M Sorenson's sodium phosphate buffer. Biopsy specimens were stored in the refrigerator at 4-5 degrees Celsius. Specimens were later washed, blocked and post-fixed in 1-% osmium tetroxide. Processing of specimen was done automatically using 1-% uranyl acetate solution and ethyl alcohol before being placed in epoxy resin. Embedding of 1-mm specimen was done in BEEM capsules. Biopsy specimens were sliced 0.5-1 um thick and stained with 2% toluidine blue then examined under a light microscope, to determine the areas of special interest. Thin sectioning was done and collected in trough. Thin sections were examined using stereoscope binoculars to observe the "colors" of the section. The sections were ascertained to be thin enough for adequate beam

penetration to achieve good resolution. A high quality thin section will have no chatter, knife lines, cracks, folds or contamination. Manual grid staining was done with 35% methanol, 4% uranyl acetate in methanol and lead citrate.[14] The specimens were observed under the transmission electron microscope. The results were recorded and interpreted.

OBSERVATIONS

A. CLINICAL FINDINGS

There were four adult patients involved in this study. Two males and two females, with age range from 22 to 70 years of age (mean of 41.5 years). All of these patients had histories of mild to moderate rhinosinusitis. Their symptomatology included nasal obstruction, nasal stuffiness, difficulty in nasal breathing, watery rhinorrhea, and headache. The duration of symptoms ranged from 5 months to 4 years. There was no history of epistaxis elicited.

On anterior rhinoscopy, all patients had bilateral polyp formation. Conventional paranasal sinus radiographs were done on these patients. The overall clinical impression of these lesions was nasal polyposis grades II to III, with no distinct features, which might be suggestive of unusual or malignant changes.

B. PATHOLOGIC FINDINGS

On evaluation through anterior rhinoscopy, the polyps grossly appeared as smooth, soft, polypoid, translucent, masses, sometimes pinkish in color, rubbery and glistening masses. Focal hemorrhages and ulceration were observed in some areas.

After obtaining the specimens through punch biopsy, the specimens were fixed in their proper media and processed under the required manner for this study. The initial specimens served as the baseline with no exposure yet to mometasone furoate aqueous nasal spray. These specimens were labeled as EMRIA1, EMRIB1, EMRIC1, and EMRID1. After which, the prepared specimens were examined under the light microscope.

Under light microscopy, polyps exhibited a ciliated respiratory epithelium. The submucosa was composed of different degrees of loose myxomatous or edematous stroma with varying numbers of mucous glands. Interspersed within the stroma are numerous infiltrates of inflammatory cells such as eosinophils, lymphocytes, plasma cells, mast cells and neutrophils. The basement membrane generally appeared to be intact. Cellular cytoplasm varied in amount. The glands, which were mostly distended, lost its usual lining from a columnar respiratory epithelium to a flattened epithelium.

C. ELECTRON MICROSCOPIC FINDINGS

The succeeding specimens labeled as EMRIIA, EMRIIB, EMRIIC, EMRIID, EMRIIIA, EMRIIIB, EMRIIIC, and EMRIIID were the ones that were exposed to Mometasone Furoate aqueous nasal spray. All three groups were examined under the electron microscope.

GROUP I- PRETREATMENT GROUP

A. EPITHELIUM: All reviewed specimens showed varying thickness of its surface epithelium and cellular composition. Numerous inflammatory infiltrates were identified (eosinophils, neutrophils, lymphocytes and mast cells). The epithelium showed extensive areas of edema characterized by the widened or distended intercellular spaces. The cytoplasm contained vacuoles with some lightly staining flocculent

material. There were accumulations of numerous amorphous granules (Plates 1 & 2). The cells in this layer were distinctly separated from one another as evidenced by their loosened tight junctions (zonula occludens) or terminal bars. The macula adherens or desmosomes identified also had widened gaps (Plate 3). There were no signs of cellular atrophy observed. The mitochondria were observed to have areas of vacuolation and destruction of the intraorganelle crystals suggestive of hypoxic changes. One particular specimen showed a basket cell seen entering in between two adjacent cells. Amorphous granules were seen interspersed among the other cellular components. No microvilli, bacterial or viral particles were encountered within this layer. No nerve endings were observed.

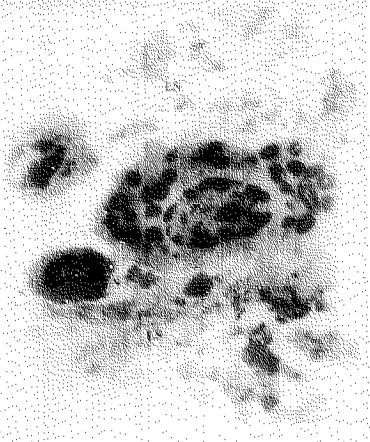

Plate 1
Loose stroma (LS); Eosinophil (EOS); Neutrophil (NEU)

Plate 2
Mast cell (MC); Amorphous Granules (AG)

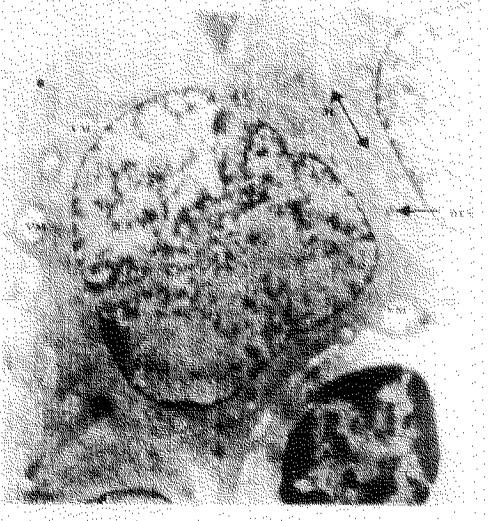

Plate 3
Vacuolated mitochondria (VM); junctional complex (JC); desmosomes (DES); Mast cell (MC)

The surface cilia were identified to have a 9+2 pattern, with the direction of most cilia oriented in one direction. However, some areas showed patterns with no definite orientation or were arranged haphazardly. Fused or mega cilia were noted infrequently. Some cilia which had thickened ciliary membranes showed disintegration or dissolution of some of its components in the longitudinal sections. Other noted findings were the infrequent appearance of fused cilia, or mega cilia (Plate 4 & 5).

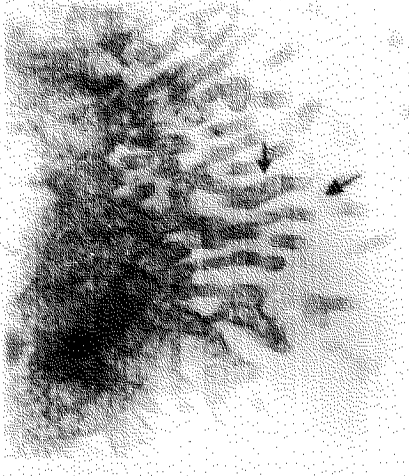

Plate 4
Abnormalities in ciliary structure showing fused cilia (FC); black arrows pointing to dissolution of intraciliary components.

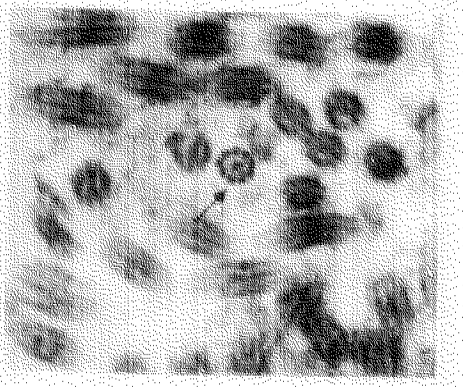

Plate 5
Arrow points to across-sectional cut of a cilia showing 9+2 pattern; the rest are cilia shown on longitudinal cuts

B. STROMA: The different tissue elements of the stroma were separated from the epithelium by a widened and thickened basement membrane. The area beneath the basement membrane showed very thick edematous areas which contained very loose collagen fibers with varying number of cells and amorphous materials characterized to have low electron density. Some red blood cells were stack or rouleaux formation suggestive of focal hemorrhage (Plate 6). Some cells appeared to lose its regular configuration, were distorted, others elongated, while

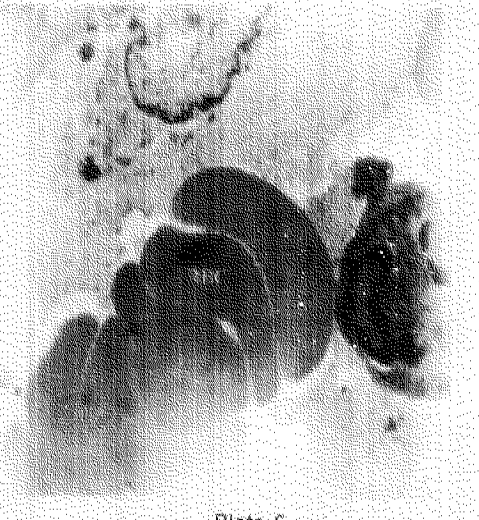

Plate 6
Red blood cells in rouleaux formation (RBC).

others exhibited areas of convolutions or infoldings. Such irregularities may be due to the compression of the other cellular components secondary to the surrounding edema. Darkly-staining coarse granules were identified in areas with numerous glands (Plate 7). The stroma contained numerous wandering cells like neutrophils, eosinophils, plasma, and mast cells. The plasma cells appeared either as clusters or singly,

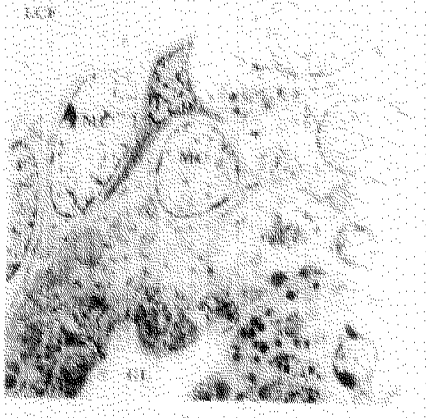

Plate 7
Area beneath the basement membrane showing loose collagen fibers (LCF), coarse granules (CG) surrounding the gland. A basket cell (BC) is seen in between two adjacent mast cells (MC).

containing vacuolation and was infrequently surrounded by areas of the basement membrane. The mast cells, which showed extensive degranulation, occurred twice as much in the polyps compared to the normal nasal mucosa. They were occassionally observed to occur at the surface epithelium. The overall morphology was highly variable, some were deformed, some had round while others had oval shapes. Most of the granules were small, very amorphous and electrons dense, such that further details to describe it at this point were quite difficult. They either have a greatly reduced or lacking outer lamellar element. In the normal respiratory mucosa, the granules consist of a central core and a peripheral lamellar substance arranged into a typical scroll pattern. Also noted were honeycombed crystalline structures within some mast cells. Membrane bound crystalline inclusion bodies

were also observed.

Granular endoplasmic reticulum were identified within the proximity of the degranulated mast cells. The cisterns of this endoplasmic reticulum were distended by flocculent materials of low electron density.

Mitochondriae were present in all cells, although their position were not constant in relation with any intracellular feature. They were found to occur within the cell, at the periphery of the cell, while some were scattered. Again vacuolation and destruction of the crystals within were observed. The Golgi apparatus was not observed. No nerve fibers were seen to occur at this layer.

C. BLOOD VESSELS: Majority of the vessels encountered in these subjects were the capillaries which were lined by endothelial cells and exhibited fenestration. They were found to appear near the epithelial surface and within the vicinity of the gland. Openings or gaps in between the endothelial cells were observed. It is possible that these openings or gaps contribute to the leakage of substances within the stroma and epithelium leading to edema formation (Plate 8). No large arteries or veins were demonstrated. No subendothelial cushions were seen, nor was there any presence of AV anastomoses. No nerve endings were found.

D. GLANDS: The glands were mostly of mucous-secreting elements. The lumen was distended by secretory material and the regular tall columnar lining was shifted to a flattened epithelium especially when filled with mucous.

GROUP II: AT FOUR WEEKS OF TREATMENT

A. EPITHELIUM: After four weeks of treatment with mometasone, the surface epithelium still demonstrated areas of thickness and edema. There were still numerous inflammatory infiltrates. The intercellular spaces were persistently widened. The cells were still separated from one another by their loose tight junctions. The cytoplasm of some cells still contained large membrane bound vacuoles with the same lightly flocculent material as previously mentioned in the pretreatment group (Plate 9 & 10).

Plate 8
Fenestrated capillary lined by endothelial cells (EC); arrow points to open junctions; lininng

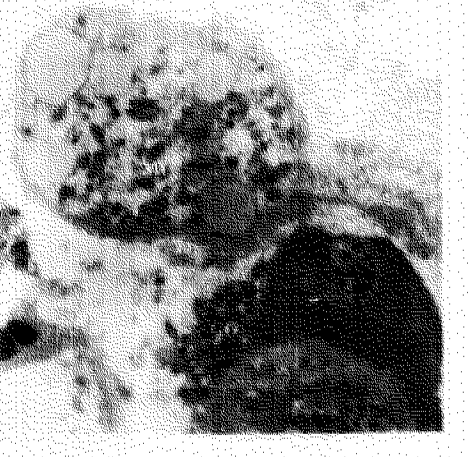

Plate 9
Mast cell (MC) cytoplasm showing large membrane-bound vacuoles (VF) with lightly flocculent material; glycogen granules (GG) are also seen.

ULTRASTRUCTURAL CHANGES

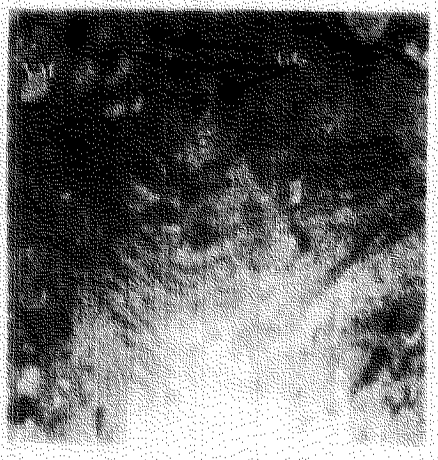

Plate 10
Presence of vacuolated mitochondria, glycogen granules (GG), and fibrous strands within the epithelial layer.

Accumulations of glycogen granules and bundles of fine fibrin resembling tonofilaments of the epidermal keratinocytes were encountered in some epithelial cells. Although not frequently encountered, there were areas identified that showed improvement. This is supported by the thinning of the junctional complex (Plate 11). These junctional complexes were highly irregular prior to treatment. After four weeks of topical corticosteroid use, there was thinning of these junctional complexes or signs of conformity to the adjacent cells.

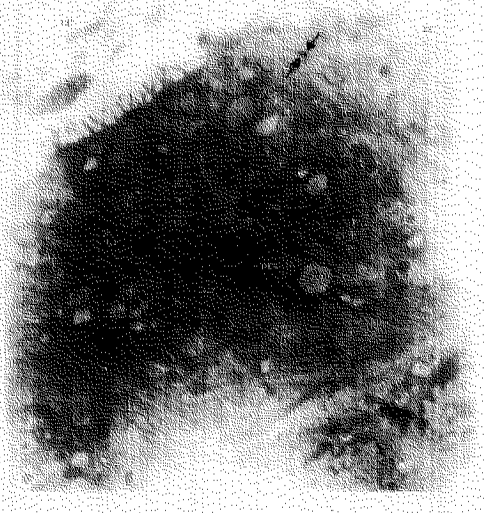

Plate 11
Section of the epithelium showing gap junctions (GJ) interrupted by desmosomes (DES). Signs of recovery evident at this area. One cell area can be delineated from another. Periphery shows areas of loose collagen (LS). Vacuoles (VF) still present.

There was no change in the surface cilia with regards to its structure, but a more definite organization with regards to its orientation was noted. The previously mentioned haphazard arrangement found in the pretreatment group was no longer observed. The pattern identified was still 9+2. The thickened membranes of some cilia in the pretreatment group with dissolution or disintegration of some of its component were still evident which might be suggestive of persistent abnormal function (Plate 16).

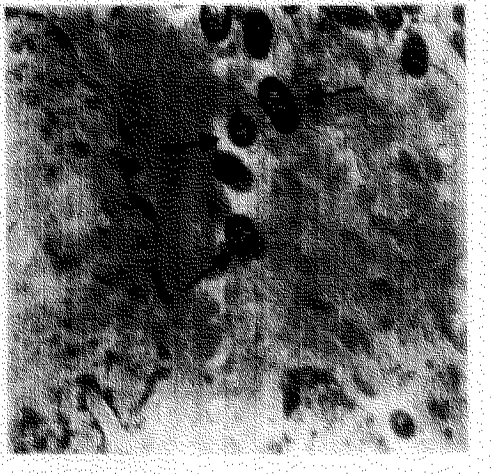

Plate 16
Cross-sectional cut of the cilia showing thickened ciliary membrane and dissolved ciliary components.

Mitochondria showed areas of vacuolation. This could suggest that the hypoxic change occurring within this layer is still present. Amorphous granules were still interspersed among the cells.

B. STROMA: The basement membrane still showed areas of thickness (Plate 12). However, the cell free zone beneath the basement membrane started to show a reduction in thickness, showing areas of dense collagen fibers and amorphous materials of low density (Plate 15).

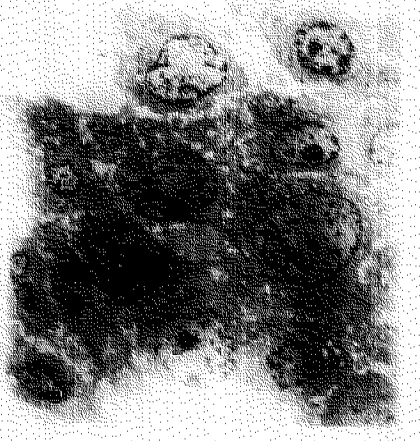

Plate 12
Portion of the stroma showing areas of less edema, with areas of dense collagen fibers and amorphous materials of low density.

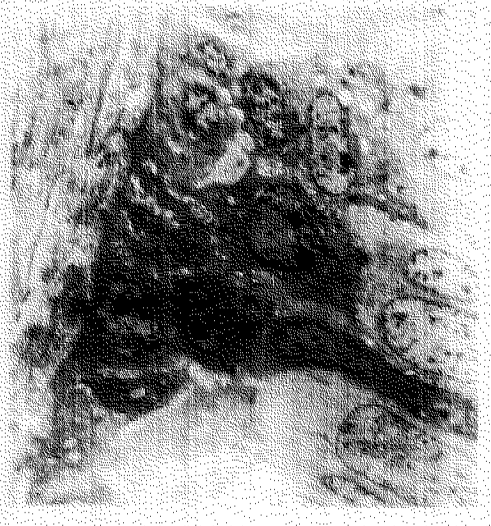

Plate 15
The area of the stroma showing the basement membrane (BM) composing areas of dense collagen fibers, and amorphous materials of low-density. (CFZ) indicates cell free zone beneath the basement membrane (BM).

The predominant cells found in the area were the polymorphonuclear neutrophils and mast cells. The mast cells showed areas of less degranulation but the morphology was still variable. The granules however, showed an increase in size (Plate 13). Although amorphous and electron dense, some granules showed the central core and scroll patterns There was still the presence of crystalline inclusion bodies.

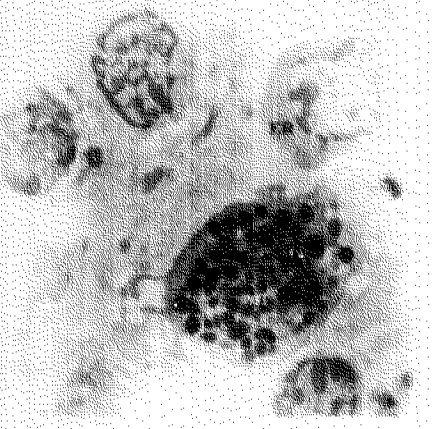

Plate 13
Shows a mast cell (MC) with variable morphology, a surface projection (SP), granules (G) of different sizes which are amorphous and electron dense. An endoplasmic reticulum is seen.

The granular endoplasmic reticulum was still within the proximity of the mast cells, however, the dilated cistern was less prominent and the arrangement more uniform (Plate 14).

The mitochondria started to show less vacuolation at this level in contrast with those at the epithelial layer wherein the hypoxic changes were still evident. Some of the crystalline structures started to appear which may indicate that repair or regeneration is already taking place. Portions of this layer showed areas of necrosis as observed on all specimens in

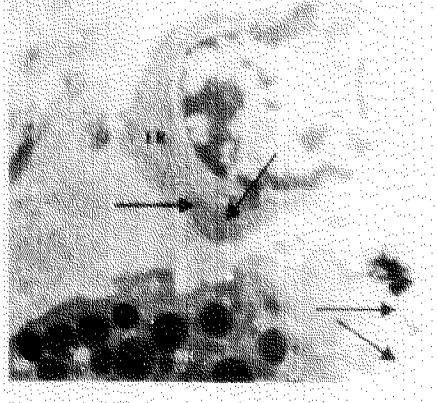

Plate 14
Shows an enlarged view of the endoplasmic reticulum and arrows at the periphery point to vacuolated milochondria without its crystals. Black arows within the mast cell point to vacuoles

this group.

C. BLOOD VESSELS: The gaps or openings that separated each endothelial cells have narrowed. There was also an increase in the number of endothelial cells lining the capillaries.

D. GLANDS: No significant changes were seen in the glands.

GROUP III: AT EIGHT WEEKS OF TREATMENT:

A. EPITHELIUM: During this period, much of the surface epithelium manifested significant signs of recovery. The areas of thickness and edema were markedly reduced. Perhaps, the most significant manifestation of recovery would be the presence of clearly defined junctional complexes. The intercellular spaces have decreased and a cell can be distinctly identified from its adjacent cell. These junctional complexes showed regularity (Plate 17).

Plate 17
Junctional complex at 8 weeks of treatment

Even the surface cilia showed changes that were not as evident during the fourth week of treatment. There was a tendency for normalization of the ciliary structure in most specimens (Plate 21). Ciliary organization was also more uniform. The presence of the thickened ciliary membranes and dissolution of some of the ciliary components were still present. Some mitochondria showed signs of activity, although there were still areas where vacuoles were found.

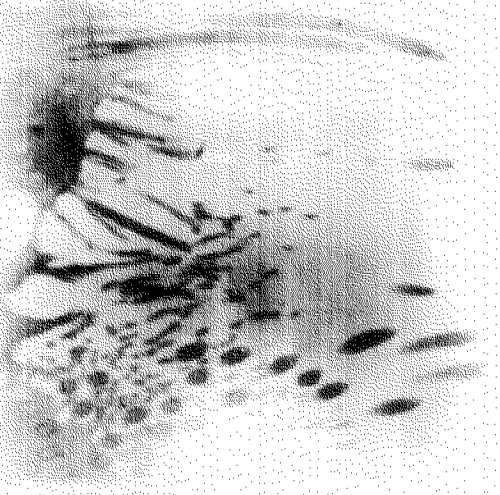

Plate 21
Cilia at 8 weeks of treatment

B. STROMA: The mast cells were less degranulated and less dense. Although the morphology of these mast cells is still variable, the granules were electron dense and amorphous (Plate 18 & 19). With improvement, the details of the central core exhibiting the scroll pattern and the honeycombed crystalline structures can normally be found. The mitochondria continue to have lesser vacuolation (Plate 20). The basement membrane and the cell free zone beneath showed areas of lesser edema with narrowing of the lining of the basement membrane. Collagen fibers were denser. Fibrin formation was observed but was not

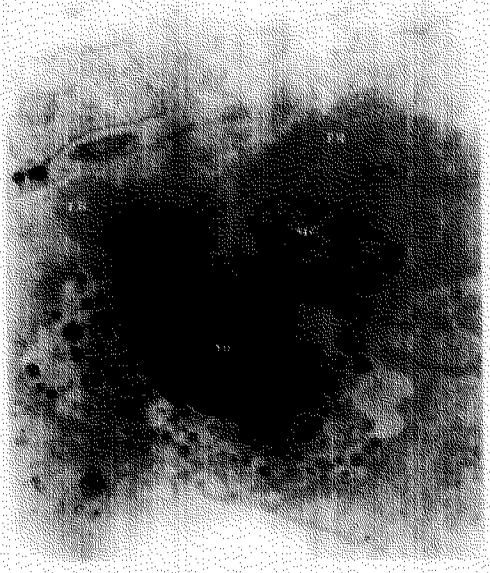

Plate 18
Mast cell (MC) and endoplasmic reticulum (ER) at 8 weeks of treatment

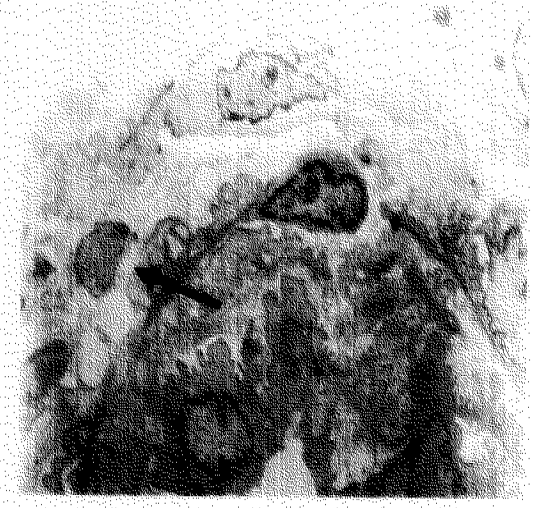

Plate 20
Arrow points to a mitochondria in the stroma without any vacuolations; cristae are present.

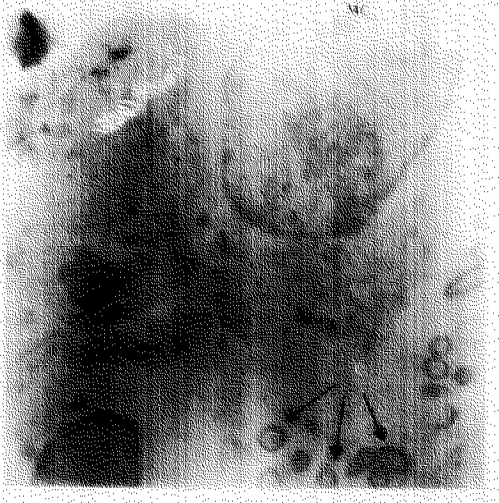

Plate 19
Mast cell (MC) and cilia (C) at 8 weeks of treatment; nucleus (NU)

consistent in all areas.

DISCUSSION

Nasal diseases form a considerable part of ENT practice. Nasal polyps are by far one of the more frequent disease entities encountered by the Otolaryngologist. As a disease, man has known its existence since antiquity. These polypoid changes are by far the most frequent pathologic manifestations in the mucous membranes that line the nasal cavity and paranasal sinuses. Polyposis of the nose and sinuses are the most frequent indications for surgical intervention in this area.[13] Individuals afflicted with such a disease will often seek consult for symptoms of nasal obstruction, nasal stuffiness, intranasal mass and anosmia. All these symptoms are variable depending on the severity of the disease. Grossly, they all look the same. A befitting common description would be its resemblance to a "peeled grape". Histologically, it is remarkably consistent in over 90% and gives a good over-all idea of cell composition and distribution. Biochemically, it has been extensively studied, and there have been numerous theories and

The fenestrated capillaries observed in this study showed the presence of open endothelial cells, which could probably be responsible for the vascular leakage leading to edema aside from the reactions occurring in mast cells causing the release of histamine. In nasal polyposis, the permeability of capillaries is very high. The granules of these mast cells are partly depleted, which may be an indication that agents including histamine are being released from cells. This process is probably responsible for the vascular leakage as manifested by the open endothelial junctions found around the capillaries. The reaction that happens thereby causes the surface membrane to alter causing the entry of calcium into the cells. This then initiates the formation of CAMP from ATP. The initial response then is to release the preformed elements within the granules. Histamine is then dissolved from the protein/heparin complex, which can be seen as an electron dense matrix and is either amorphous or organized as scrolls or crystals within the granules. The granule swells and then becomes less electron dense, the end-results is formation of vacuoles.[4] Aside from the fenestrated type of capillary, there is also the continuous type and the discontinuous type. The layers of the basement membrane may appear around this capillaries where projections from these endothelial cells project into the interstitium. A well-developed basement membrane prevents vascular leakage of large molecules.[19]

Polyps seem to develop in areas where the lining of the nasal cavity joins the sinuses. These areas may be mechanically more predisposed to edema formation.

CONCLUSIONS

The ultrastructural changes seen in polyps are variable in relation to the thickness of the surface epithelium and its cellular composition. There was extensive edema of the epithelial layer as evidenced by the widened intercellular spaces and loosened junctional complexes. Presence of cells which possessed large membrane bound vacuoles containing flocculent material was noted. Irregularities in the surface cilia were observed, such as the presence of thickened ciliary membranes, disintegration and dissolution of ciliary components. The vacuolation of the mitochondria and destruction of intraorganelle crystals. The basement membrane was thick and widened with the cell free zone beneath it replaced by bands of edematous area containing loose collagen fibers and amorphous materials of low electron density. The mast cells showed a highly variable morphology with extensive degranulation, occurring twice as much of that in normal mucosa. The granules were very small, very electron dense and amorphous with a crystalline matrix and with its outer lamellar content lacking. The endoplasmic reticulum was distended and contained flocculent materials of low electron density. The blood vessels had its endothelial cells arranged in such a fashion that their junctions in between provided spaces for the leakage of fluid. The glands contained mucous elements and the regular tall columnar lining was shifted to a flattened epithelium.

At four weeks of treatment the area beneath the basement membrane showed areas of less edema. Mast cells were less degranulated and the granules showed the central core and scroll pattern together with the presence of crystalline inclusion bodies. The dilated cistern of the endoplasmic reticu-

lum was less prominent and had a more uniform arrangement. Mitochondria had less vacuolation with reappearance of some intraorganelle crystals. There was narrowing of the open endothelial junctions in the capillaries. Portions of the stroma demonstrated areas of necrosis. At the epithelium, there was thinning of the junctional complexes.

At eight weeks of treatment, there was marked reduction in the edema at the epithelial layer with the junctional complexes being clearly delineated from one cell to another. Ciliary organization was more uniform and mitochondrial activity was more prominent. There was narrowing of the basement membrane where collagen fibers were dense. Mast cells and its granules were less dense and amorphous.

The polyps were devoid of sensory, vasomotor and secretomotor innervation.

RECOMMENDATIONS

This study was done to investigate the ultrastructural changes at the subcellular level of nasal polyps after there is exposure to a topical corticosteroid. Being a pilot study in this particular area, the authors may have overlooked some details, which to the reader of this paper might need further improvement. In this regard, the following are recommended:

1. A longer period of time frame is suggested to further evaluate and validate the ultrastructural changes in nasal polyps once it is exposed to topical corticosteroids.

2. An increase in the number of patients to point out a more definite association as to its probable etiology.

3. To study the possible effects of other topical corticosteroids versus anti-histamines and its effects at the subcellular level and to note of other possible changes that might occur.

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THE COMPOSITE TRAPEZIUS-SCAPULAR SPINE FLAP: AN ALTERNATIVE IN THE RECONSTRUCTION OF OROMANDIBULAR DEFECTS*

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JOSEPH AMADO C. GALVEZ, M D**
ARMANDO M. CHIONG JR., MD, DPBO ***

ABSTRACT

OBJECTIVES To present a new technique for mandibular reconstruction using pedicled spine of the scapula

DESIGN Case Report

SETTING Tertiary hospital

PATIENT 1 patient who underwent segmental mandibulectomy for ameloblastoma

CONCLUSION The trapezius-spine flap of the scapula offers a potential pedicled flap for immediate reconstruction of relatively large oro-mandibular defect resulting from tumor ablation. Because of its reliable blood supply, it offers the following advantages: lesser chance of extrusion, non-union and bone resorption, rapid integration to recipient tissue, and high resistance to infection. Because of this advantages, early recovery, lesser morbidity, and good cosmetic results are expected, and functional disability minimized.

INTRODUCTION

Mandibular defects resulting from post-oncologic surgery, avulsive trauma, and inflammatory conditions pose a big problem for head and neck surgeons. Loss of a portion of the mandible will result to a spectrum of aesthetic deformity and functional disability depending on the size and location of the defect. Loss of a portion of the posterior body of the mandible or ramus causes slight malocclusion due to shifting of the remaining mandible to the affected side, but rarely will result to cosmetic or functional disturbance. On the other hand, extensive defects involving significant portions of the anterior mandible or body can result to severe functional disability. Due to the loss of structural support for the tongue and laryngeal apparatus, masticatory and deglutition problems are also anticipated. In extreme cases, large anterior mandibular defects may cause airway compromise secondary to posterior displacement of the tongue necessitating tracheostomy. Clearly, these types of defects must be reconstructed to avoid functional disability.

The primary goal of oromandibular reconstruction is to reliably, safely, and promptly restore lower facial contour, occlusal relationship, functional

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CASE REPORT

A 27-year-old female was admitted because of a slowly growing left mandibular mass of 2 years duration. Upon examination, the mass which measured approximately 7 by 5 cms. was located on the body of the left mandible, and was noted to be hard, fixed, and non-tender. Examination of the oral cavity revealed the presence of a fungating mass on the area of left mandibular body and an expansion of the lingual aspect of the mandibular cortex .

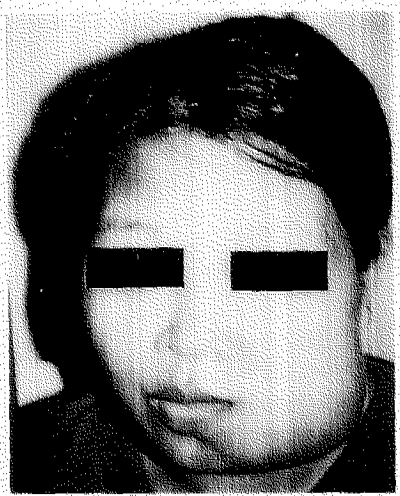

Figure1
The patient presenting with left mandibular mass

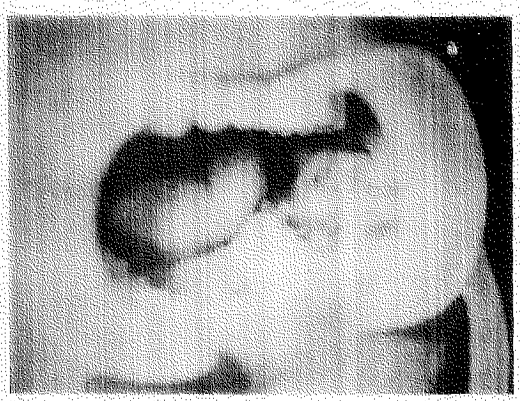

Figure2
The oral cavity extension of the mass

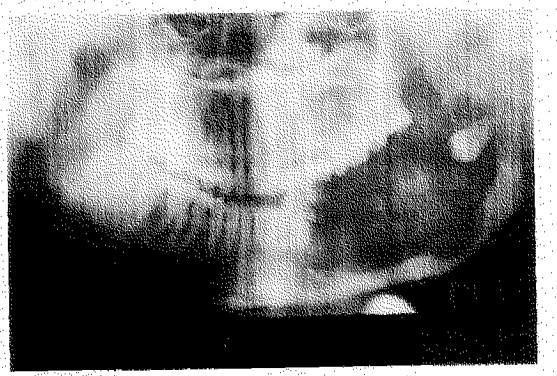

Figure2
Panoramic x-ray of the patient's mandible showing unilocular lesion involving the body, angle, and portion of the ascending ramus

Findings of the orthonomopantomogram of the mandible (Fig.3) were consistent with ameloblastoma. The diagnosis was confirmed by punch biopsy of the mandibular mass. Patient subsequently underwent segmental mandibulectomy with a single-stage mandibular reconstruction using pedicled trapezius osteomyofascial flap containing the spine of the scapula to repair the bony defect. Neck incisions and the donor site were closed primarily. Mandibulomaxillary fixation was achieved using Ivy loops. Patient was discharged 2 1/2 weeks post operatively.

Upon follow up, mandibulomaxillary fixation was removed after the 6th postoperative week. It was noted that proper dental occlusion and lower facial contour were maintained. Rehabilitation of the temporomandibular joint was initiated without delay. The patient was able to open her mouth maximally and tolerated solid foods at 7th postoperative week.

lower dentition, deglutition and mastication. Immediate reconstruction as opposed to a staged-procedure will avoid major problems in secondary settings, which is related to the drifting of the remaining mandibular segments and soft tissue contracture.[1] Several reconstructive techniques for mandibular defects have been described in literature. It commonly involves the use of different reconstruction materials such as autogenous and allogenic bone grafts, prosthetic devices, metallic plates and mesh. [2]

Ivy[3] reported the first attempt at mandibular reconstruction with autogenous bone using femur and tibia. World War I and WWII paved the way for major advances in grafting techniques for mandibular reconstruction due to the significant increase in the number of patients with traumatic mandibular defects.[4] The recent introduction of myocutaneous flaps has kindled the enthusiasm in including bone in the flap to reconstruct defects of the floor of the mouth and mandible. During the 1970's and early 1980's, attention was focused on the transfer of vascularized bone to the oral cavity as a composite flap. McKee[5] was the first to use vascularized bone containing free flap to reconstruct the mandible followed by Demergosso[2,6] in 1976. In 1978, the first large series of mandibular reconstruction using vascularized bone-containing free flap was published.[5] Since then, several refinements of surgical techniques have evolved with improved understanding of the vascular and skeletal anatomy.

Reconstruction of defects of the mandible and floor of the mouth remain to be one of the most challenging tasks in head and neck surgery.[7] At present, several options have been proposed for its reconstruction. Bone-containing free flaps are popular not only for oromandibular reconstruction but also for craniomaxillofacial surgery. Utilization of bone containing free flaps for oromandibular reconstruction, however suffer the disadvantages of requiring prolonged operating time, large number of operating room personnel and adequate microvascular skill for surgery. Investigators found out that exposure to large salivary fistula and oral flora contamination decreases the anastomotic patency rate of free flaps.[5]

Resistance to infection and extrusion make the bone-containing pedicled flap suitable for oromandibular reconstruction. The medial and lateral sides of the scapula were among the common donor sites. In 1976, Demergaso[6, 8] described the incorporation of the scapular spine to a trapezius flap. However, it was only in 1980 when the trapezius osteomyocutaneous flap appeared in American literature. The purpose of this paper is to present a relatively new technique in reconstructing mandibular defects with a pedicled trapezius osteomyofascial flap with the spine of the scapula.

Repeat radiographic films showed healing of previous osteotomy sites. Absence of any signs of bone resorption on repeat radiologic studies on the 11th postoperative week was also noted.

SURGICAL ANATOMY

The trapezius muscle is a flat triangular muscle covering the back of the neck and the shoulder. Muscle fibers originate from the occiput, superior nuchal line, external occipital protuberance, ligamentum nuchae, spine of the 7th cervical vertebrae, and spinous process of all the thoracic vertebra.[9] The fibers of the upper part of the muscle runs obliquely downward and laterally attached to the lateral 3rd of the clavicle. The middle part courses transversely and inserts to the medial edge of the acromion and upper border of the spine of the scapula. Fibers of the inferior portion of the muscle run obliquely upward and laterally insert to the tubercle at the medial end of the spine of the scapula.

The blood supply to the trapezius muscle is variable but it is derived primarily from the transverse cervical artery through its superficial (descending) branch.[10] Branches from the occipital artery, the most consistent among the vessels supplying the muscle, along with the posterior intercostal perforating artery and the dorsal scapular artery provide additional vascular supply. Venous drainage is even more variable but usually compose of superficial veins in the sub-dermal plexus and deeper venae commitantes that accompany perforating arteries. These vessels eventually drain into the transverse cervical vein. Motor innervation is via the spinal accessory nerve and sensory innervation is through the upper cervical nerves C3 and C4.

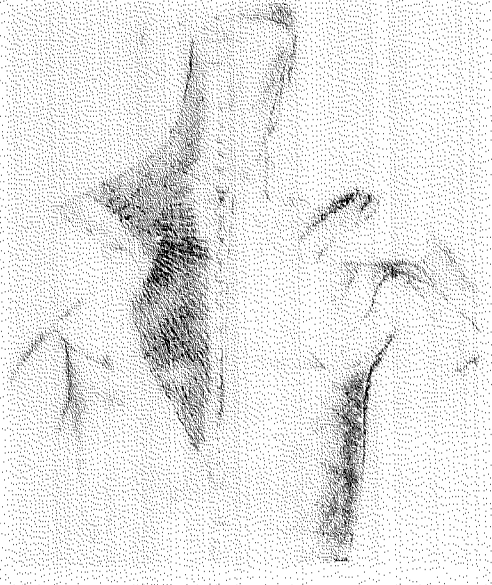

Figure 4
The Anatomy of Trapezius Muscle
A- spine of the scapula; B- 7th Cervical vertebrae; C-thoracic vertebra; D. Ext. occipital protuberance

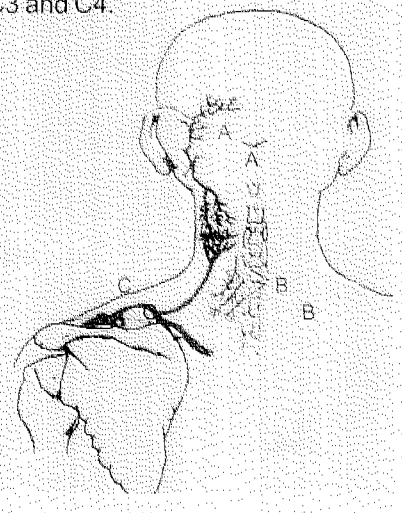

Figure5
The tripartite blood supply of the upper trapezius muscle (A – occipital artery; B- paraspinous perforators; C- transverse cervical artery)

that all the failures occurred in patients who had a composite spine flap that contain a segment of scapular spine greater than 6 cms. in length. Some investigators were able to use even longer portion of the spine and yet did not report the same experience with that of Panje's.

On our patient's 12th post operative week follow up, she was able to tolerate solid foods without feeling any discomfort. The bulge of the trapezius muscle flap on her neck significantly decreased in size. Repeat radiographic examination revealed good flap incorporation to the recipient bone without signs of bone resorption.

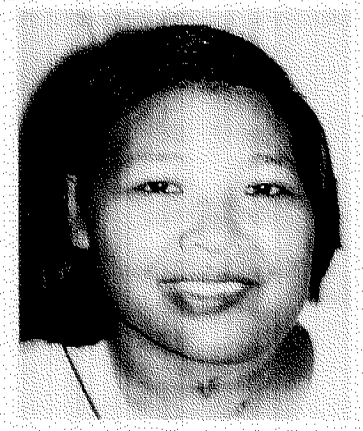

Figure 15
The Patient 12 weeks post operative
(note the acceptable cosmetic result)

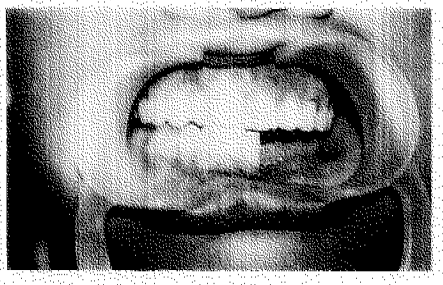

Figure 16
Post operative occlusion

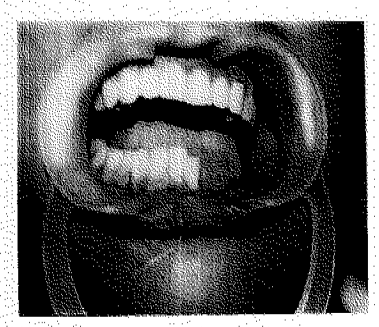

Figure 17
Patient upon opening the mouth
(note take note of the intact of gingivo-buccalgutterand absence of trismus)

Figure 18
Repeat AP projection of the mandible at 12 weeks post operative

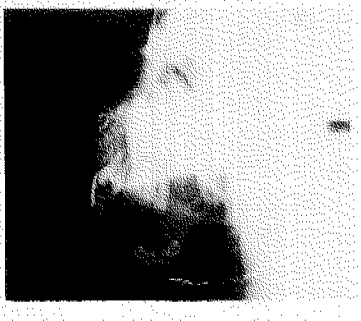

Figure 19
Repeat Lateral Oblique Projection of the mandible at 12 weeks post operative

The scapula, a flat bone located at the supero lateral portion of the back, serves as an attachment for different back muscles including the trapezius and the rhomboids. It is supplied primarily by dorsal scapular artery. The scapula, being a flat bone receives relatively more blood supply from the periosteum.[11] Its nutrition is dependent on periosteal perforating vessels found at the edges of adjacent ossification centers. The horizontally oriented scapular spine projects from the dorsal aspect of the body of the scapula. The spine divides the scapula into supra-scapular and infra-scapular areas. The spine serves as an attachment for the fibers coming from the middle portion of the trapezius muscle. The lateral portion of the scapular spine is continuous with the acromion process.

SURGICAL TECHNIQUE

After removal of the tumor, the defect was measured to determine the dimension of the bone flap that will be harvested (Fig.6). In this case, the defect measured 7 cms. The patient was placed on lateral decubitus position with the arm pulled anteriorly and abducted to allow the scapula to be rotated away from the vertebral body. A vertical incision from the anterior border of the trapezius extending inferiorly to the tip of the scapula was carried out (Fig.7). Lateral and medial skin flaps were developed and retracted. Lateral borders of the trapezius muscle as well as the spine of the scapula were palpated and identified (Fig.8).

Figure 6
Surgical specimen. The defect was measured to determine the size of the graft to be harvested

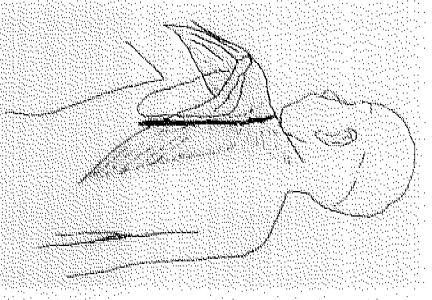

Figure 7
Back Incision

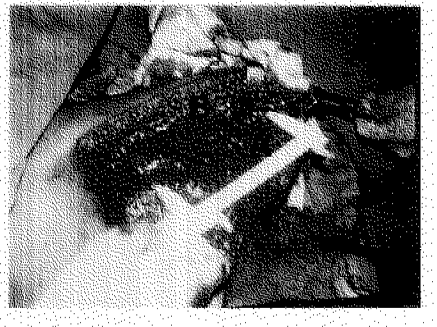

Figure 8
Identification of lateral border of the trapezius (B) and scapular spine (A)

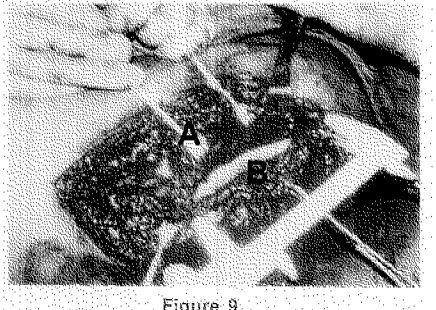

Figure 9
Incision at the inferior border of the spine detaching the infraspinatus muscle from the bone (A- infraspinatus muscle; B-scapular spine)

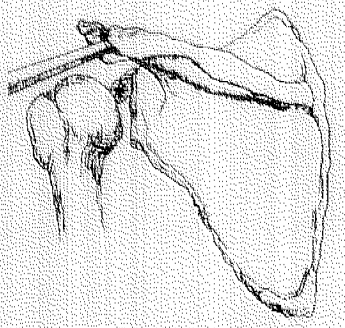

Figure 10
Spine of the scapula was detached from the body using circular saw and chisel (red line indicates the bone cut)

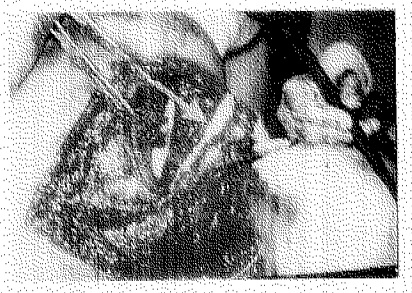

Figure 11
Complete separation of the spine of the scapula. The rest of the flap was dissected in a manner similar to the procedure used in the development of the trapezius myocutaneous flap (Yellow arrow–spine of the scapula)

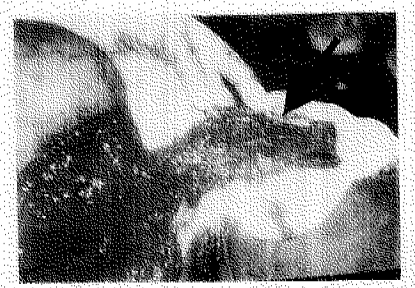

Figure 12
The completd trapezius osteomyofascial flap. (Blue arrow – scapular spine)

Figure 13
Fixation of the scapular spine flap to the mandibular defect using titanium plates and screws

The initial step in the formation of the trapezius osteomyofascial flap is the harvesting of the composite flap based on the transverse cervical artery and vein. According to literature, the transverse cervical artery is variable in its origin. Based on Filipino cadaver dissection performed by Gallardo, Alarva, and Chiong, the transverse cervical artery and vein is located at the junction of medial 3/5 and lateral 2/5 along the line drawn between the acromioclavicular joint and the spine of the 7th cervical vertebra.[10]

After identifying the vascular bundle, the scapular spine was exposed. An incision inferior to the spine was made to detach the infraspinatus muscle from the bone. The inferior side of the spine was bluntly dissected free of any muscle attachment (Fig 9). The dissection was then brought laterally along the inferior border of the spine until a fossa deep to the acromion portion of the spine was identified. The arch covering the fossa was preserved.

The spine of the scapula used in the reconstruction of the mandibular defect was detached from the body of the scapula using circular saw and chisel, in a lateral to medial fashion (Fig.10). After complete separation of the spine from the body of the scapula, the rest of the flap was dissected in a manner similar to the procedure used in the development of the trapezius myocutaneous flap(Fig.11). Meticulous dissection was performed to preserve the periosteal

attachment of the spine to the trapezius muscle. Using blunt dissection, a skin tunnel was developed into the neck and the flap was delivered through the tunnel to reach the mandibular defect(Fig 13). Multiple osteotomies were made on both cortices of the spine to facilitate contouring. The proximal portion of the spine was attached to the condylar remnant using 2.4 mm angled titanium mandibular plate and secured using 2 titanium screws on each side. The distal segment of the spine was attached to the parasymphysis of the right hemi-mandible using 2.4-mm straight titanium mandibular plate and secured using 2 titanium screws on each side(Fig.13). After determining the proper occlusion, mandibulo-maxillary fixation was achieved using Ivy loops. The trapezius muscle flap was secured on soft tissues of the neck using chromic 3-0 suture to prevent traction to the spine. The incision and the donor sites were closed primarily. After adequate hemostasis, separate suction drains were placed on the neck and back. Mandibulo-maxillary fixation was maintained for six weeks, after the removal of which, regular diet was resumed.

DISCUSSION

The pedicled trapezius osteomyofascial composite flap using the scapular spine is a relatively new technique for mandibular reconstruction. This is the only pedicled flap that is able to transfer vascularized corticocancellous bone for mandibular reconstruction. It does not only provide structural integrity necessary to bridge the defect, but also viable and immunocompatible osteoblastic cells, and pleuripotential mesenchymal cells that can differentiate into osteoblasts in the presence of morphogenic proteins.[9] Owing to its vascular nature, this composite flap demonstrates increased rate of healing and graft incorporation. Among the composite flaps, the trapezius spine flap has the highest resistance to infection, making it a better choice for oromandibular reconstruction.

After separation from the body of the scapula, accessory nutrient arteries coming from the trapezius muscle will nourish the scapular spine.[2] These arteries penetrate the scapular spine at the fascial attachment of trapezius muscle to the spine. If the transverse cervical artery and vein is interrupted, such as in irradiation and previous neck dissection, the flap can still survive based on paraspinous perforators, with or without further blood supply coming from the occipital artery(Fig.5). This event is well documented by intravenous fluorescein perfusion studies. Vascularization of the pedicled trapezius spine flap is also clearly demonstrated by extensive antibiotic incorporation by tetracycline labeling.

In elevating the pedicled trapezius-spine flap, Panje advocates the inclusion of at least three to four

paraspinous perforators within the flap muscle to ensure adequate vascular perforation of the spine.[11] In order to preserve the paraspinous perforators, he extended the caudal incision of the muscle across the midline at the level of C5 or C6 before cutting in the cephalic direction. In Conley's original description of the pedicled composite trapezius flap, the muscular incision does not cross the midline (Fig. 14) and is placed lateral to Panje's incision.[12]

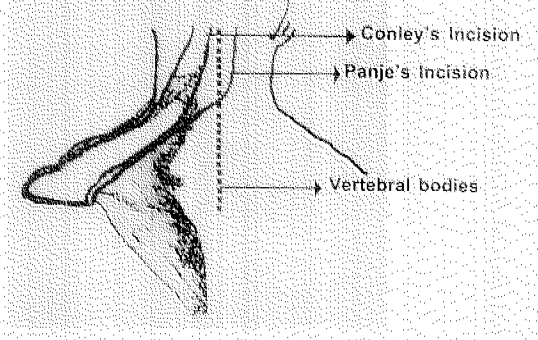

Figure 14
Incision proposed by Panje to allow inclusion of paraspinous vasculature with pedicled trapezius composite flap

When compared to traditional sources of material for mandibular reconstruction, the scapular spine is considered a better choice. Unlike iliac and other long bones, the pedicled trapezius spine flap can provide a maximum of 12 cms x 2.5 cms of corticocancellous bone [3] without producing severe functional disability and minimal donor site morbidity.

Because the donor site is located at the back, the cosmetic result is excellent. Aside from bone and muscle, large amount of fat, and skin can be incorporated to the flap to repair soft tissue defects resulting from cancer surgery on the temporal region, face, floor of mouth, tongue, retromolar trigone, and scalp.[2,13] Kenyeres reported successful application of the flap for reconstruction of the lateral orbital wall and malar complex.[7] Since the trapezius spine flap is independent of the recipient bed for vascularization, it can also be used for previously irradiated patients.[11]

The trapezius spine flap however, also has its share of disadvantages. Some surgeons tend to maximize the bone included in the flap by including the acromion process, similar to what Demergasso described in his paper in 1976.[3] Disarticulation of the acromioclavicular joint will result to shoulder discomfort secondary to loss of function and torque to the shoulder.[14] Loss of shoulder muscle function due to spinal accessory nerve injury was also reported in some patients. Moreover, some surgeons do not favor the awkward positioning of the patient during surgery. Tang reported the formation of pseudocyst at the donor site after dissection of the trapezius muscle.[15]

Nevertheless, the over all success rate with the use of pedicled trapezius spine flap is 87%.[11] According to some authors, success rates of up to 90 % have been reported even when used in irradiated fields.[2] In Panje's series of mandibular reconstruction using the composite flap, he noted

CONCLUSION

The pedicled scapular spine flap offers an alternative viable source of autologous tissue for immediate reconstruction of mandibular defects resulting from post ablative tumor surgery, particularly those involving the anterior portion and the body of the mandible. Because of the bulk of trapezius muscle that can be included in the flap, it can also be used to repair large soft tissue defects in the head and neck and cover the great vessels in region without compromising the survival of the scapular spine flap. As long as the periosteal attachment of the spine to the muscle is preserved, the survival of the composite flap is assured. Therefore, because of its independent and reliable vasculature, the trapezius spine flap is an excellent choice for reconstructing mandibular and oral soft tissue defects.

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the patient. Commercially available stock trays for taking the impression of the maxillary arch are not used for infants because of the differences in the palatal defects and size of the palate. Customized trays (Fig. 1) were fashioned from hard autopolymerizing acrylic resin

Figure 1. Customized trays of different sizes, depending on the approximate size of the patient's palate. This approximation is made using the middle and index finger as guide. An impression of the patient's maxillary arch is taken using a thermoplastic impression material (Fig. 2).

Figure 2. Thermoplastic impression material.

The thermoplastic impression material is heated for around ten minutes in boiling water until soft and then placed on top of the tray. The tray is introduced into the patient's mouth while the patient is in an upright position. This is held for around one minute or until the thermoplastic material hardens. The tray is removed and immersed in cold water. From this negative impression of the palate and the defect (Fig. 3), a stone model is made. An obturator is constructed on

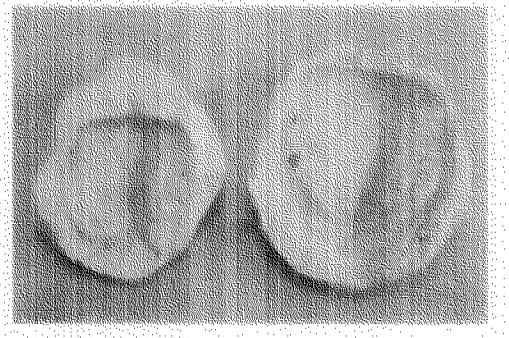

Figure 3. Impression taken of the palate and defect.

the stone model by sprinkling a soft autopolymerizing acrylic resin on the palatal cleft and then a hard autopolymerizing acrylic resin over the entire palate extending into the mucobuccal fold area. The obturator is then trimmed (Fig. 4) and polished (Fig. 5). The obturator is fitted on the patient.

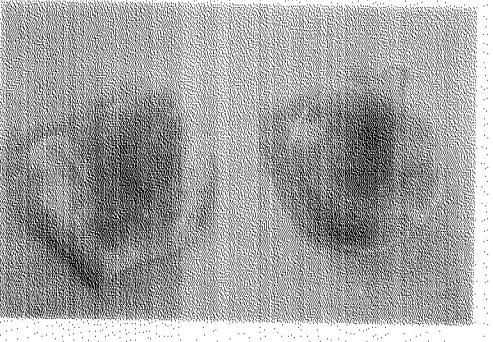

Figure 4. Unpolished obturators.

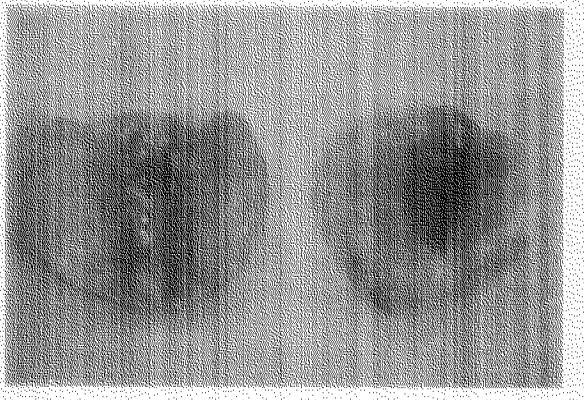

Figure 5. Polished obturators.

A denture adhesive cream is applied on the obturator for better retention (Fig. 6). Instructions on obturator care and further follow-up is then given to the patient's parents.

Figure 6. Denture adhesive cream.

RESULTS

A total of 97 patients were seen at the Prosthesis Section of a Department of ORL from January 1999 to October 15, 2000. Forty (40) patients consulted in 1999 and 57 patients consulted from January to October 15, 2000.

The age of first consultation were mostly in the 5 to 9 months age group in 1999 while it was in the newborn to 1 month age group in year 2000. (Table 1)

A total of 13 out of 40 (32.5%) patients had multiple follow-ups up to the time of surgery in 1999 and 17 out of 54 (31.5%) in year 2000.

TABLE 1: Age of First Consult

	1999	2000
Newborn-1 month	6	24
2-4 months	9	23
5-9 months	12	2
10 months-1 year	2	4
> 1 year	3	4
None specified	8	0
Total	40	57

DISCUSSION

There has been a growing awareness of the need for feeding obturators for patients with cleft lip and palate as can be seen in the increase in the number of patients consulting in the prosthesis section. But there is need for further education as to the timing of the use of the obturators. The feeding obturator should be applied as early as possible starting immediately after birth until surgical closure of the palate (9),(6). We can see from the results that most patients are seen at the 5 – 9 months age group in 1999. There was a change noted the following year since most patients were seen at the newborn to 1 month age group but still a number of patients consulted at a later

time. This delay in the fitting of the feeding obturator can lead to poor nourishment of the infant due to difficulty in feeding and subsequent developmental delay (3). This can also lead to delay in surgical repair of the palatal defect due to the nutritional deficiency. There should be more information dissemination as to the timing of the application of the obturator especially to the pediatricians who see the patients first even before the ENT specialist. They should be informed that prostheses can be safely used even by newborns and would be a benefit to their growth and development.

There was also poor follow-up of the patients noted (32.5 % in 1999 and 31.5 % in 2000). In order not to interfere with the growth of the dental arch, the border of the obturator must be trimmed regularly (9). The appliance is adjusted monthly to allow for maxillary growth (6). There could be a lot of factors for the poor follow-up of the patients. One factor could be satisfaction of the parents in the obturator in terms of decrease in nasal regurgitation and increase in appetite of the infant, retention of the prosthesis, care for the prosthesis and added aesthetic appearance of the child. The parents would be more disposed to bringing back their child for re-fitting if they see that there is an increase in the amount of milk the child is taking in and a gain in the patient's weight. The added time needed for the care and use of the feeding obturator can be a hindrance for some parents. Also if the obturator do not seem to improve the appearance of their infant then some parents might not opt to come back. But first and foremost in the hindrance to patient's follow-up is the economic factor. The cost of the appliance if changed monthly would be a big financial burden for most of the patients seen at our institution. Considering also that most of them come from outlying provinces, then there would be the added cost of transportation to and from the hospital. If for the parents, the added benefits of the obturator do not outweigh the disadvantages then they will not return for re-fitting.

CONCLUSION AND RECOMMENDATION

A process of fabricating the passive orthodontic feeding obturator was presented. There are numerous ways of preparing feeding obturators. Some use silicone as opposed to acrylic (9). Others use the Hotz plate (10). Alpine et al advocated combined obturator and palatal lift prosthesis (11). McKinstry suggested pin and screw for added retention of the palatal prosthesis especially for large defects (12). This method of constructing the appliance was developed due to the accessibility of the materials, ease in fabricating the appliance, good results noted as to retention,

block in the milestones of normal development. Severe nutritional deficiencies further complicate surgical closure at the right time (3). A feeding obturator is an intra-oral appliance which serves to separate the oral cavity from the nasal cavity thus promoting better deglutition and mastication in a cleft palate patient. Feeding obturators improve feeding thereby contributing to weight gain and thriving state of health, an important prerequisite for surgical repair of the palatal defect (1).

A second problem in cleft lip and palate patients is the protrusive and rotated premaxilla especially in bilateral cleft lip patients which is challenging for the reconstructive team (4). Other deformities in cleft palate patients include malalignment of the alveolar arches which are often underdeveloped and are frequently collapsed in an upward and inward direction (2). Feeding obturators position the maxillary segments more ideally and then maintain their position while allowing growth to occur (5). It encourages passive orthopedic guidance of maxillary growth causing narrowing of the cleft and flattening of the steepness of the palatal slope (6). Furthermore, prosthetic intervention to reposition segments before surgical correction may improve the bony base for tissue molding and avoid excessive tension at the surgical site (7). The aesthetic benefits can also be instrumental in the psychological and social acceptance of the cleft palate patient (8).

OBJECTIVES

The objectives of this paper are as follows:

1. To describe the construction and maintenance of feeding obturators as practiced in a Prosthesis Section of a Department of Otorhinolaryngology (ORL).
2. To determine the age of first consult and follow-up behavior of the caregivers of patients seen at a Prosthesis Section.
3. To identify the advantages and disadvantages of feeding obturators.

METHODOLOGY

The list of patients was based on a Prosthesis Section of a Department of ORL logbook entries from Jan 1999 to October 15, 2000 and was compiled as to number of patients seen per year, age of first consult and number of patients with multiple follow-ups.

The following steps were used in making the feeding obturator per patient irrespective of the age of

decrease in nasal regurgitation and ease in care of the prosthesis. Further studies are in process to determine the above factors.

A limitation of the study is the deficiency of the data from the records of the Prosthesis Section logbooks. There could have been more patients seen but not recorded. Some patients were logged in but lacked in data such as age on consult. Dental stone records were also noted to be incomplete since some of them were damaged, destroyed or discarded during the process of obturator fabrication.

This is a preliminary study. As the census of the section increases, further studies can be made using the patients and data from this section. Accurate and complete record keeping should be implemented in order to maximize the information gathered from the patients.

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AN ENDOSCOPIC ADAPTOR FOR DIRECT LARYNGOSCOPY WITH MICROLARYNGEAL SURGERY*

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FERDINAND G. PAMINTUAN, MD***

ABSTRACT

Direct laryngoscopy remains the mainstay in the visualization of the larynx as well as performing other surgical procedures on the larynx. Often when microlaryngeal surgery or biopsy needs to be done, a rigid laryngoscope together with an operating microscope is necessary. An alternative to this set-up is endoscopic microlaryngeal surgery. However, the cost to put up this current set-up is overwhelmingly high. The nasal endoscope adaptor provides a stable and yet economical alternative in doing endoscopic microlaryngeal surgery without hindering the surgeon's maneuverability. Through the use of this adaptor, the need for an operating microscope is obviated.

INTRODUCTION

With the ever-growing advances in technology in the field of Medicine and Surgery, it is not surprising that the costs of surgical instruments and equipment continue to soar. These instruments and equipment are used in the different operative procedures. Microlaryngeal surgery is one of the most common procedures done by an otolaryngologist[1]. The surgeon however occasionally encounters difficulties especially when an operating microscope is unavailable whether the reason is technical or financial.

The objective of this instrument design is to provide a cheaper yet stable alternative to the use of the operating microscope without sacrificing the full use of the surgeon's hands and at the same time providing a means of teaching students.

MATERIALS AND METHODS

The basic instruments used for Microlaryngeal surgery are the following (Fig. 1):

Rigid Karl Storz Adult Laryngoscope

Rigid laryngoscopes come in different sizes for both adults and children. These scopes provide an excellent view of the larynx even in difficult conditions such as small oral opening and short, thick and stiff necks[1].

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*3rd Place, PSOHNS Poster Session on Surgical Instrumentation, November 30, 2000 Punta Baluarte, Calatagan, Batangas

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Suspension bar and laryngoscope holder

These support devices provide stability to the laryngoscope. The chest support can be placed directly over the thorax without affecting respiration.

0 degree Nasal endoscope with protective sheath

The nasal endoscope provides a magnified view of the structures to be visualized. These come in different degrees or angulations as to provide varied views. Common ones are the 0, 30, 70, 90 and 120 degrees. The protective metal sheath comes with the nasal endoscope.

Light source and cable

The light cable and light source provide illumination.

Microlaryngeal instruments

These different instruments are necessary for precision surgery of the larynx particularly when operating on the vocal folds of the larynx.

Nasal Endoscope Clip (Fig. 2)

This simple adaptor was made from a metal sheet. It is designed to be clipped-on to the handle of the laryngoscope with the long end inserted through the scope. The long end has three holders for carrying the protective sheath of the nasal endoscope. The clip for the handle of the rigid laryngoscope was fashioned from a hard stainless steel 0.05 mm plate. The carrier was made from a flat stainless steel 0.039 mm plate. These were then riveted together using two flat spring stainless steel pegs.

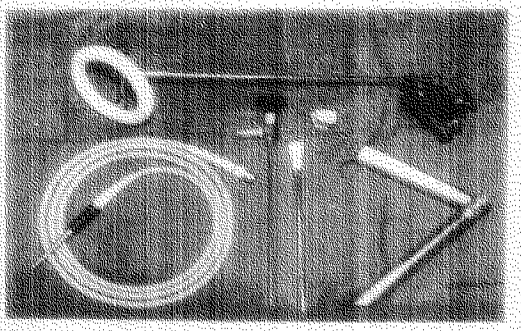
Endocscopic Camera System (optional)

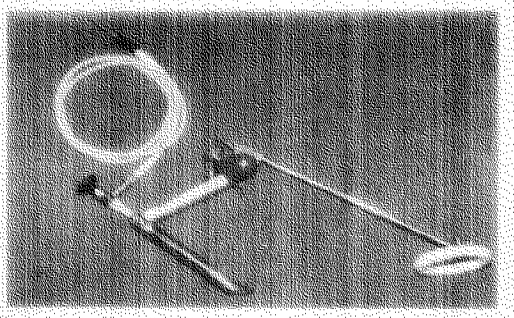
This system is hooked-up to the nasal endoscope so that the surgeon can view the image through a television or monitor.

The device was tested on two patients, one with a vocal cord nodule (Fig. 3) and another one with laryngeal squamous papillomatosis (Fig. 4). The first patient was given general anesthesia via orotracheal intubation and the second one via tracheostomy. The rigid laryngoscope was then inserted until the laryngeal inlet was visualized. The laryngoscope was then suspended. Ordinarily, an operating microscope with a 400 mm lens would be used at this point for a more detailed anatomy of the larynx. In this operation however, the procedure was done endoscopically. The adaptor was clipped to the handle of the laryngoscope together with the protective sheath (Fig. 1 and B). A 0 degree nasal endoscope was then inserted in the sheath. Microlaryngeal surgery then proceeded as usual with no complications post-operatively. The views and

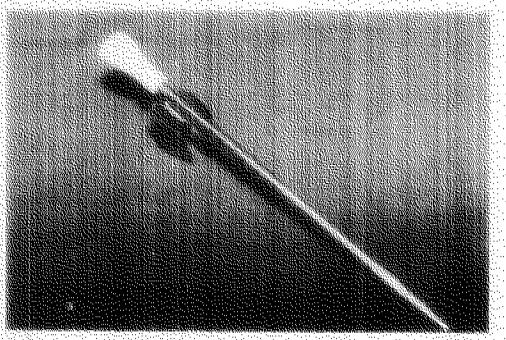
maneuverability of the surgeon using the endoscope and the microscope were likewise compared (Fig. 7 and 8)

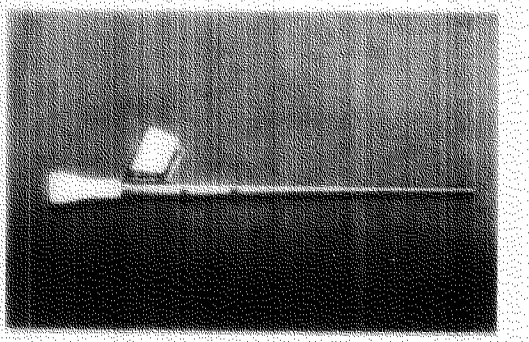
Figure 1
Instruments used for Direct Laryngoscopy





A. Protective Sheath Attached to Nasal Scope Adaptor





B. Laryngoscope Fitted with Nasal Endoscope

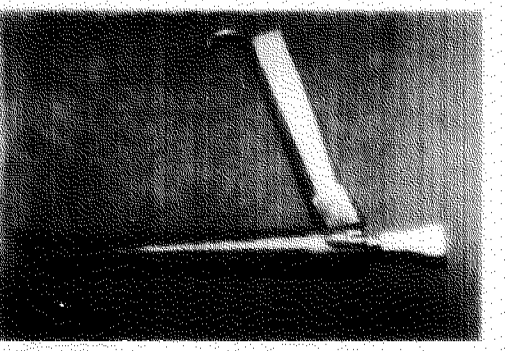
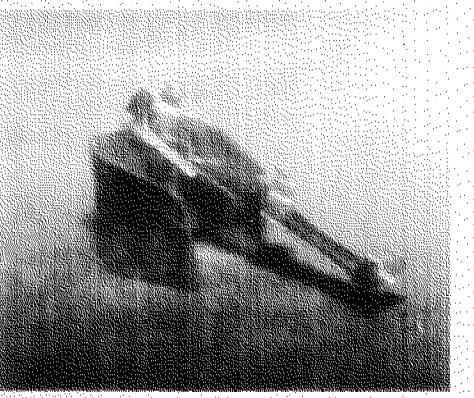


Figure 2
Nasal Scope Adaptor



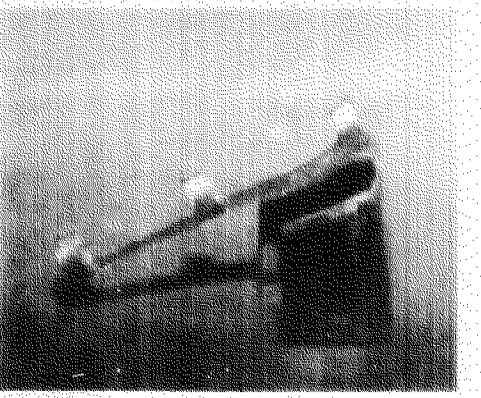


Figure 3

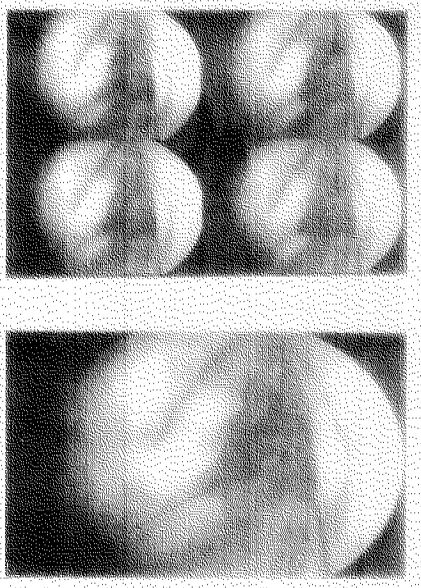


Figure 4

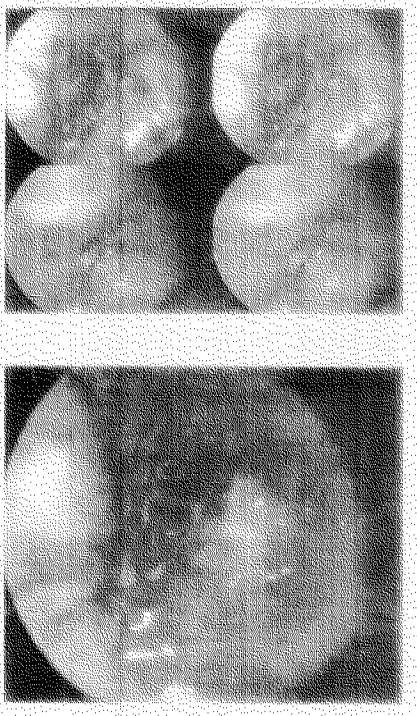
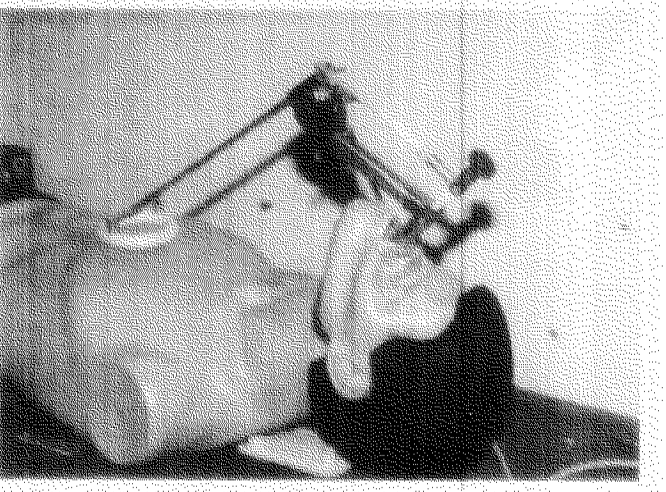
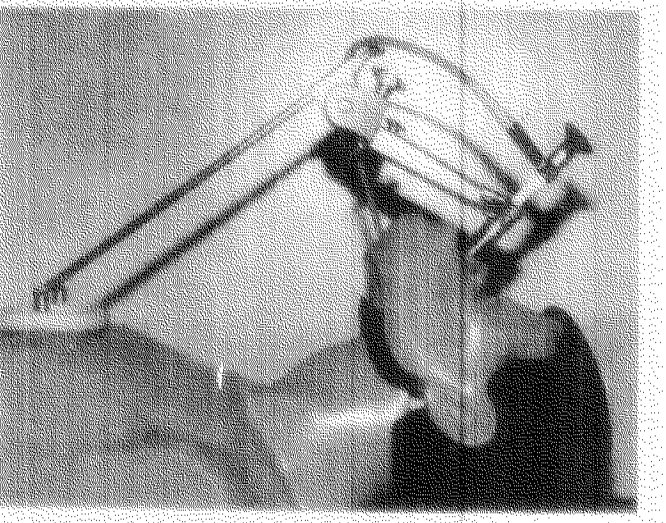


Figure 5
Operative Set





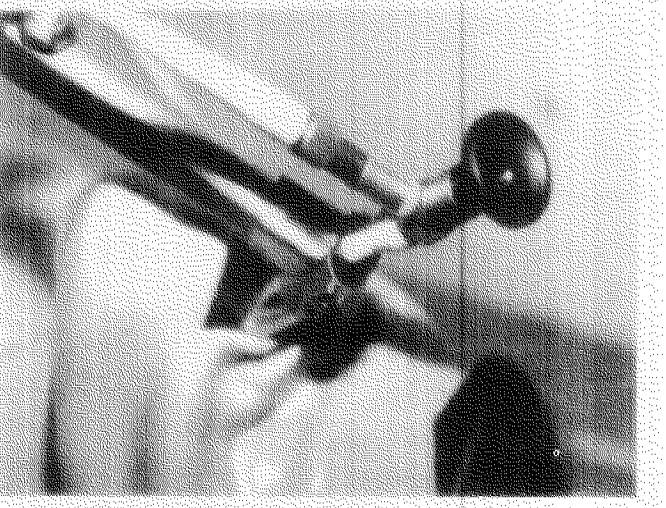


Figure 6
Different Views Obtained From Different Nasal Endoscopes

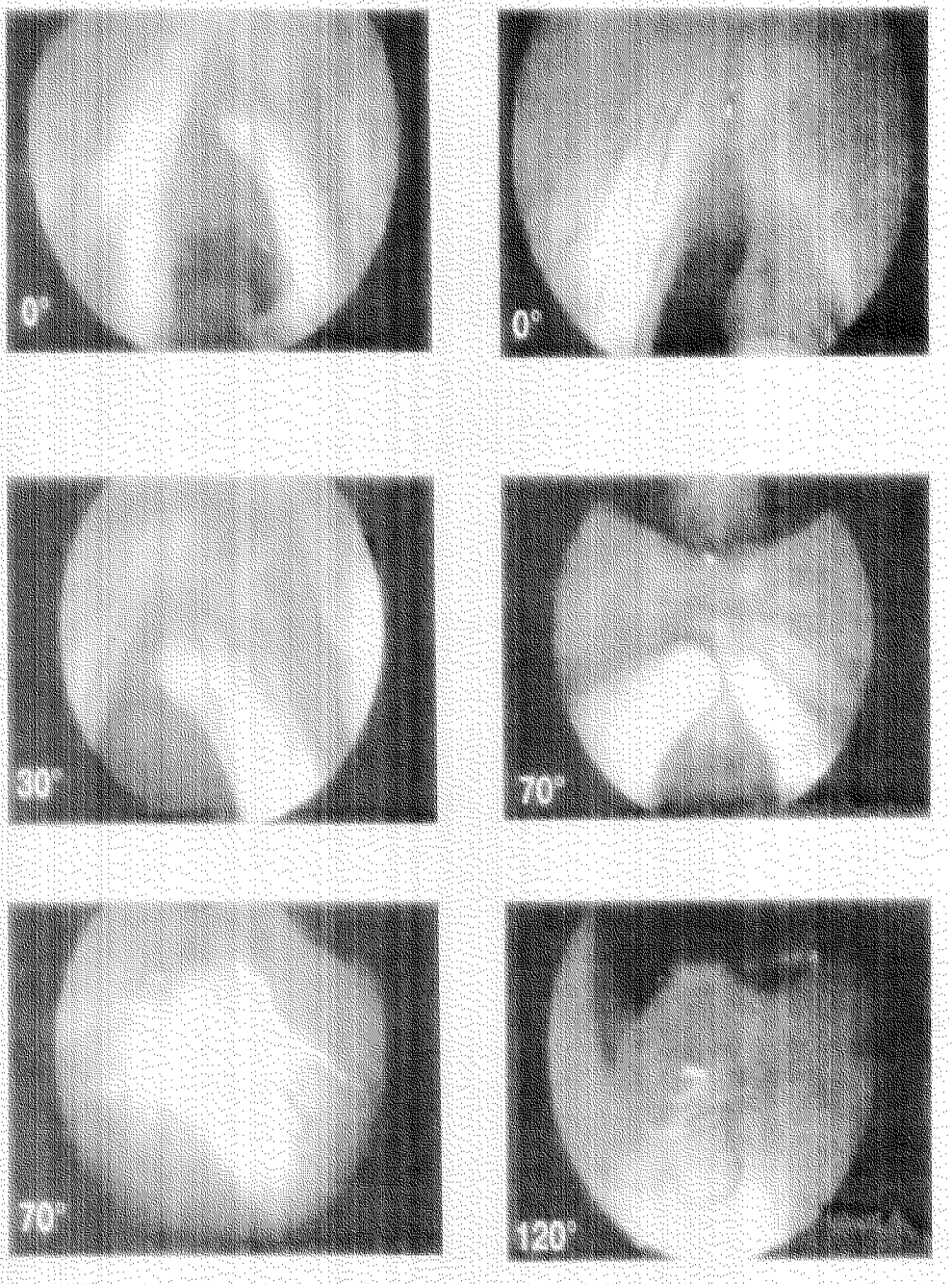


Figure 7
Standard Microlaryngeal Surgery Using The Operating Microscope

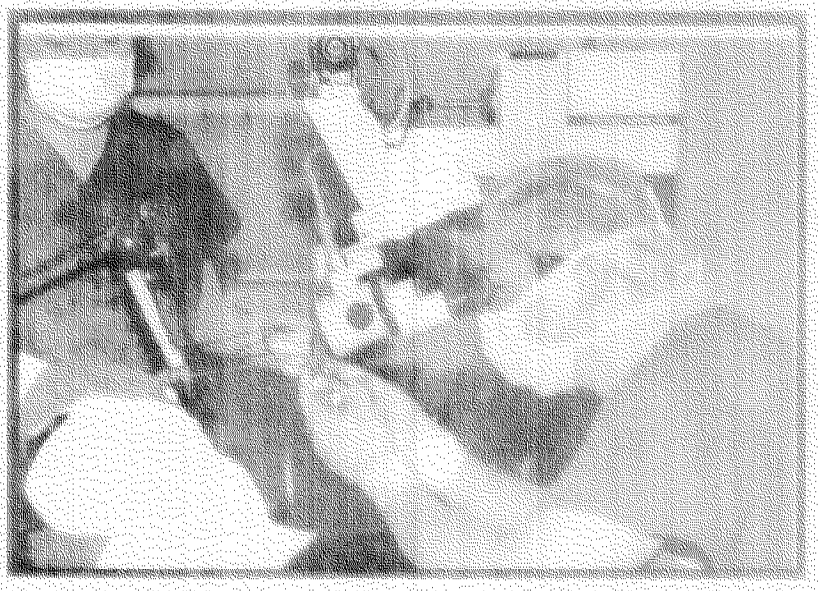
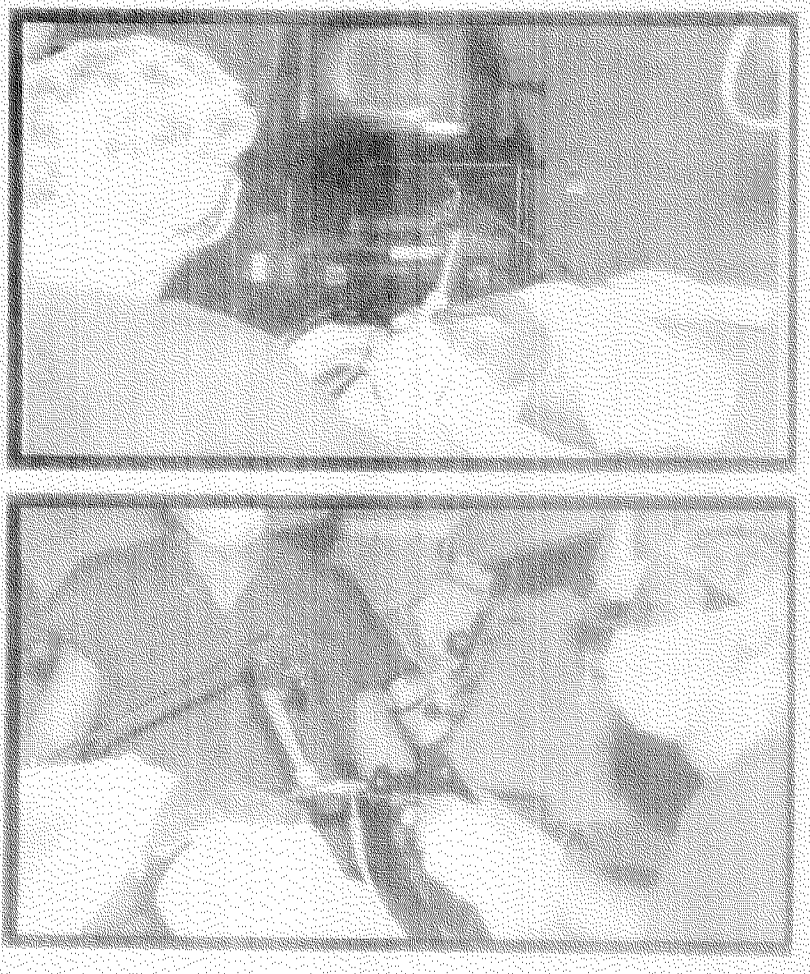


Figure 8
Video Assisted Microlaryngeal Surgery Using The Adaptor



RESULTS AND DISCUSSION

Endoscopic microlaryngeal surgery proved relatively comparable to microlaryngeal surgery with the use of an operating microscope. Endoscopic surgery provides great depth of field and good visualization of the anterior glottis[2]. It also offers high quality imaging that is traditionally difficult to explore such as the inferior surface and free border of the vocal cord, the anterior commissure, the ventricle and the subglottis[3] (Fig. 6). There are however a few disadvantages, the most prominent one being inadequate distance of the surgeon's eye on the viewing lens of the endoscope and the aperture of the rigid laryngoscope. Ordinarily, the working distance is around a foot or more. With the use of the endoscope however the distance was reduced to more than half (Fig. 5). Manipulation of the instruments proved difficult. Also the depth of perception is not the same as when one uses a microscope. This is because endoscopic procedures allow only for the observation of the larynx along a vertical axis. The advantages however outweigh the disadvantages. First of all, when an operating microscope is unavailable whether the reason is financial or technical, endoscopic surgery is an alternative. Operative charges to these instruments and equipment are lised in Table 1. The production cost of the adaptor is a mere P400. The adaptor is easily available as well as easily reproducible. It is also stable enough to hold both the nasal endoscope together with the light cable and a video-camera system. Another advantage is that for training institutions, microlaryngeal surgery via endoscopy provides a means for teaching students and doctors without giving undue financial burden to their patients and without causing delay in the surgical procedure[2].

TABLE 1
SANTO TOMAS UNIVERSITY HOSPITAL-CLINIC DIVISION OPERATIVE CHARGES

Leica Microscope with 400mm lens	P1800
Endovision Camera System	P1200
	P3000
Nasal Endoscope*	P 300
Light Cable and Light Source*	P 400
	P 700

*not charged if personally provided

CONCLUSION

The adaptor clip provides a cheap alternative in the use of a nasal endoscope in microlaryngeal surgery. It also provides excellent stability with minimal compromise to the surgeon's working field and capacity as compared to the use of an operating microscope. It also offers a good means of teaching students.

RECOMMENDATION

It is recommended that a more sturdy and aesthetically pleasing model of the adaptor be made. Also, modifications may be done so that the adaptor is

made adjustable to the different sizes of rigid laryngoscopes. A longer scope such as a cystoscope may also be used instead of a nasal endoscope so that the working space of the surgeon is not minimized.

ACKNOWLEGEMENT

The author wishes to thank the advising consultant for his generous time and his support in the making of this paper. Likewise, to the residency staff most especially to the author's junior colleagues.

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ALVEOLAR SOFT PART SARCOMA IN THE MALAR AREA: A CASE REPORT*

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ABSTRACT

A case of a 23 year old male with a slow-growing left malar mass is presented. Excision without biopsy resulted in recurrence of tumor with more aggressive features. Repeated biopsies and H & E staining were inconclusive. Definite histopathology of Alveolar Soft- Part Sarcoma was made after PAS and immuno-staining. Wide excision of the malar bone was performed with reconstruction using synthetic bone implants (Medpor). Follow-up after two years showed no signs of recurrence.

INTRODUCTION

Alveolar-Soft Part Sarcoma (ASPS) is a very rare tumor which is a true malignancy but may initially be mistaken for a benign lesion because of a protracted indolent phase. It is easily overlooked in routine H & E slides, and requires special staining for definite diagnosis. An error in diagnosis may result in undertreatment, and inevitable recurrences will require more extensive repeat surgeries and unnecessary expenses. The paucity of cases in the reports reviewed and the variety in the manner of presentation only serve to underline the difficulty in identifying similar cases on clinical grounds. By presenting this experience and those of others, an increase in the physician's awareness of these tumors and their clinical behavior may hopefully reduce the incidence of misdiagnosis and provide a basis for the development of proper treatment protocols.

CASE REPORT

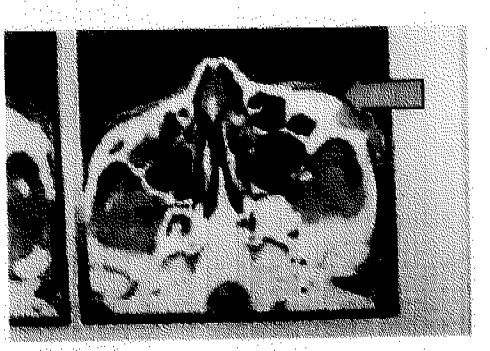
A 23 year-old male presented at our institution with a mass at the left malar area of five years duration. It was initially noted to be firm, adherent to the skin but not the underlying tissues. The mass was excised by a physician the previous year but it recurred in the same area and was since fixed to the underlying bone. A section biopsy was subsequently performed and interpreted as Liposarcoma. The patient was referred to our institution for chemotherapy.

The lesion increased in size to 3 x 3 cm and was fixed to the left malar area. Concomitant bilateral polypoid masses were seen in both nasal cavities and there was an active chronic right tympanomastoiditis. No facial paralysis nor ophthalmoplegia was present.

A repeat section biopsy yielded dark brown friable tissue with necrotic portions and admixed bony fragments. A 1.5 x 1.5 cm bony defect was noted on the left zygoma. The H&E slides were interpreted as Embryonal Rhabdomyosarcoma (RB) versus Malignant Fibrous Histiocytoma (MFH). PAS and Masson-Trichome stain were positive.

Computed tomography revealed a nodule on the left malar area with bony erosion of the zygomatic prominence. Chest X-ray and other blood work-ups were normal.

Figure 1. Axial CT scan showing malar mass



HISTOPATHOLOGY

Due to the uncertainty in the histologic diagnosis, immunohistochemical studies were requested revealing positive results for S-100 and Vimentin. Staining for Actin yielded negative results however. Review of slides after immunostaining later confirmed the diagnosis of Alveolar Soft Part Sarcoma (ASPS).

PAS histochemical staining under high magnification showed strong cytoplasmic positivity of the tumor cells with varying amounts of intracellular PAS positive crystalline and granular bodies. S100 immunohistochemical studies showed similar strong cytoplasmic staining within the tumor cells. Outlining the sinusoidal space were Vimentin-positive cells that divide the tumor cells into irregular groups and nests,

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evident in both low and high-power magnification.

Figure 2. Flap design

MANAGEMENT

The mass was excised with wide tissue margins by performing a complete zygomectomy. An oblong-shaped incision overlying the malar area provided access to the zygoma(Fig.2) The malar bone was then separated from attachments to the zygomatic arch, the temporo-zygomatic and zygomatico-maxillary processes(Fig. 3 and inset). The tumor was delivered en bloc with the detached malar bone and overlying skin and soft tissue.

Figure 3. En bloc excision with overlying skin paddle

The defect was reconstructed using porous biomaterial (Medpor) implants. A pre-formed inferior orbital rim implant was combined with a flat sheet and was moulded to conform to the anterior maxillary sinus wall. These were secured to the bony margins of the defect using titanium screws (Fig. 4).

Figure 4. Reconstruction of malar defect with *Medpor* implants

An inferiorly based flap of temporalis fascia was swung down to provide soft-tissue cover for the implants. The skin defect was closed primarily by widely undermining the temporal skin (Fig. 5).

Figure 5. Flap closure

Weekly postoperative follow-up for the first month was uneventful and patient remained recurrence-free 2 years later.

REVIEW OF RELATED LITERATURE

Alveolar Soft Part Sarcoma (ASPS) is a very rare malignant soft tissue tumor whose histogenesis, up to the present, has not been established. Studies on the derivation of this tumor showed possible muscle or neuroendocrine origin but evidence accumulated so far remains inconclusive (Hunter, 1998).

ASPS was first reported in 1952 by Christopherson et al. It comprises an estimated 0.4-1.0% of all soft tissue sarcomas (STS,1992) and usually affects adolescents and young adults (age 15-35 years old). To date, no case of ASPS had been reported in the Philippines.

Previous reports on ASPS described the location of the tumors mainly in the lower extremities in young adults and in the head and neck in children.

Though these masses are more commonly benign, a suspicion of a malignancy is based on clinical behaviour which is usually confirmed by microscopic examination of a biopsy specimen. Most common of the malignant tumors comprise the rhabdomyosarcoma group followed by fibrosarcoma, liposarcoma, malignant fibrous histiocytoma, hemangiopericytoma and malignant neurofibrosarcoma.

Alveolar Soft-Part Sarcoma has been diagnosed in a very small percentage of cases of soft tissue tumors, and is rarely considered in the differential diagnosis. It is a true malignancy with the capacity to invade surrounding tissues and to metastasize. However, it usually presents as an indolent lesion with little or no involvement of its surroundings and is prone to be mistaken as benign lesion. Improper surgical manipulation may result not only in change of aggressiveness of the lesion but also disruption of the tissue planes and possible seeding. Delay in adequate treatment may also ensue. Most important is the failure to advise the patient on the severity of the disease, as the survival rates have been dismal in the few cases reported, regardless of clinical behavior.

Special stains are required to demonstrate the characteristic intracellular glycogen. Variable immunoreactivity to S-100, muscle specific Actin and Vimentin has been described in the literature. Histopathologic findings save for PAS-staining intracellular glycogen are not unique to ASPS alone and must be correlated with clinical evidence.

With the few cases of ASPS reported so far, it is difficult to pinpoint identifying characteristics in the clinical history and physical findings. Surgery still appears to be the treatment modality of choice in the literature and the case presented has remained tumor free after two years with minimal cosmetic or functional derangements. Resectability was the best prognosticating factor in the literature. Increased awareness of ASPS will hopefully allow more cases to be properly identified, and as experience with these malignancies expands, a proper diagnostic and treatment protocol may be arrived at.

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A FLOOR OF THE MOUTH YOLK SAC TUMOR IN AICARDI SYNDROME: A CASE REPORT*

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ABSTRACT

Objectives:
To present a rare case of yolk sac tumor in the oral cavity of an infant diagnosed of the extremely rare congenital disorder of Aicardi Syndrome.
To review the differential diagnoses of sublingual masses in the infant.
To present options in the management of extragonadal yolk sac tumors.

Design: Case Report

Setting: Tertiary Hospital

Patients: One year old patient with sublingual mass

Results:
A floor-of-the-mouth endodermal sinus (yolk sac) tumor (EST-YST) in a previously diagnosed case of Aicardi syndrome is reported. The patient is a one-year-old girl exhibiting a rapidly growing tumor in the sublingual and floor of the mouth regions.

The lesion showed the typical microscopic features of YST including Schiller-Duval bodies. Alpha fetoprotein immunoreactivity was expressed by the representative specimen slides. There was no clinical or ultrasonographic evidence of the presence of this tumor elsewhere in the body.

Conclusion:
The association of YST and genetic or environmental factors is little known except for its increased risk in Klinefelter and Swyer Syndrome. To date, no local or international literature has been published on the association or coexistence of a yolk sac tumor in Aicardi sydrome. This may be the first reported case of a yolk sac Tumor in Aicardi syndrome worldwide.

Hemangiomas, ranula and dermoid cysts are the more common childhod tumors in the oral cavity, however a physician should not discount a potential malignancy especially in cases where a coexisting congenital disorder is present.

Experts of pediatric oncology recommend total excision of primary tumor whenever possible and chemotherapy is highly recommended. This case is however compounded by an existing congenital disorder that magnifies the risks involved with the standard management. Supportive therapy maybe the most humane management option.

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INTRODUCTION

Yolk sac tumors are malignant tumors that occur in the gonads of children and young adults and at extragonadal sites in young children. Extragonadal lesions in the head and neck apart from the CNS are however rare.

This is the first reported case of a Yolk Sac Tumor in Aicardi Syndrome patient based on Medline search.

CASE REPORT

General Data

This is the case of V. P., a one-year-old female from Balsigan, Baguio City admitted for the second time in our medical center on February 8, 2000 due to a left sublingual mass.

History of Present Illness

Five days prior to admission, the patient had manifestations of fair oral intake, fever by palpation and a watery nasal discharge. Three days prior to admission, there was onset of stridor along with a notable pinkish, glistening mass on the left sublingual area. A consult was made with the ENT-OPD, which prompted subsequent admission.

Perinatal History

She was born to a 46-year-old mother with an OB score of G12P9 (9-0-3-8) and who had no previous history of viral infection, drug intake or exposure to radiations. The patient was hospital- borne, by normal spontaneous delivery, term, with a good Apgar score.

Developmental History

The smile was spontaneous at age one-month. She was fully capable of moving her head from side to side and follows moving objects at 2 months. At 3 months she had a good head control, however, no further sociopsychomotor development was observed from this time onwards.

Feeding History

She was breastfed from birth on a per demand basis up to three months when formula feeding was introduced with good acceptance.

Past Medical History

Nine months prior to admission, she manifested upward rolling of eyeballs and hyperextension of both upper and lower extremities. This lead to her first admission to the medical center. After thorough physical examinations and a battery of diagnostic procedures, it was revealed that she was suffering from microphthalmia, anisocoria and chorioretinal coloboma all on the left eye; agenesis of the Corpus Callosum, hemi vertebrae and dextroscoliosis; and a general seizure disorder noted by EEG. After thorough evaluation, she was diagnosed with Aicardi Syndrome by certified pediatricians.

Family History

Both parents were 46 years old during patient's conception; healthy, unrelated by consanguinity. The patient is the youngest among eight siblings of four boys and four girls. Two of the male siblings had cleft palate. The first male sibling died of severe pneumonia. No history of malignancy was extracted from the lineage and there was no known blood relatives with similar signs and symptoms presented by the patient.

Physical Examination

On admission, the patient was awake, active, in moderate respiratory distress with the following vital signs: cardiac rate of 106/min, respiratory rate of 32/min, body temperature of 37 deg. C., weight of 8.2kg (p25-50), length of 61 cms (-3sd), head circumference 43 cms (p25), and chest circumference of 44 cms. (P10). She was normocephalic with closed fontanels, still with sparse hair, grossly normal right eye, left microphthalmia with anisocoria. There was an intact extraocular muscle movement on the right while the left was inferomedially deviated. External ears were grossly normal with patent auditory canals; tympanic membranes were intact with no discharge. The oral cavity showed elevation of the left antero-lateral area of the tongue due to an underlying bright pink glistening mass that extended to the floor of the mouth. The mass approximated a size of 1.7 cms x 2cms x 3cms. There were no other palpable masses noted at the oral cavity and neck regions.

Chest examination showed suprasternal retraction, symmetrical chest expansion with harsh breath sounds. Heart findings revealed the point of maximal impulse at the left 4th intercostal space with distinct heart sounds of regular rhythm and normal rate. The abdomen was soft, with no palpable mass or organomegaly. There was a grossly female genitalia. No deformities of the extremities were seen and she had good muscle bulk, full pulses and acyanotic nail beds.

Pertinent neurological examination revealed the right pupil to be 2-3mm reactive to light; the left pupil was 3-4 mm and non-reactive to light. Extraocular movement was full on the right with inferomedial deviation on the left. There was shallowing of the left nasolabial fold on crying. All extremities had a motor grading of 5/5. No nystagmus was appreciated; swallowing and gag

reflexes were intact.

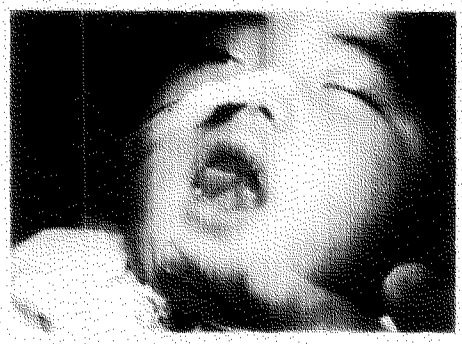

Figure 1. Sublingual mass in a 1 year old

Course in the ward

Upon admission, chest and soft tissue x-rays of the neck were taken. CBC and urinalysis were likewise requested. Blood gas analysis was not available that time but oxygen saturation was recorded at a range of 70-80 %. Chest x-ray revealed pulmonary infiltrates with no interruption of the upper air column. She was referred to the Department of Pediatrics for co-management and was then started on penicillin sodium and chloramphenicol intravenous medications, nebulization and continuance of her anticonvulsive therapy. Emergency tracheostomy was done and postoperative oxygen saturation markedly improved to 98-99%. She was then started on chest physiotherapy the following day. After one week of treatment, follow-up chest x-ray examination showed only partial clearing of the pulmonary infiltrates. There was no evident change in the character of the sublingual mass. Antibiotics were shifted to a third generation cephalosporin and a fine needle aspiration biopsy was done on the mass. Histopathologic findings turned out positive for malignant cells. She was then scheduled for excision of the sublingual mass. Intraoperatively, the mass had no delineable margins with extension into the floor of the mouth. Only debulking procedure was done on all accessible grossly abnormal appearing tissues. The specimen sent for histopathologic evaluation was signed out as an embryonal yolk sac tumor. The parents requested the patient's discharge pending the confirmatory immunohistochemical test. The representative slides turned out positive for alphafeto protein stain.

By request of the parents, no further diagnostic work-ups were done to the patient including serum alphafeto protein.

No consult was made for three weeks after discharge or six weeks after surgery. Regrowth of the sublingual mass with extension into the left anterior one third of the tongue and the left buccal area was noted after this period. There were no feeding or breathing difficulties encountered. She was readmitted for a contemplated chemotherapy but due to financial constraints and risks involved the plan was not pursued. Cobalt therapy was another option but no trial of such treatment has yet been done locally, on a patient her age at such location with an existing co-morbid condition. With no assurance of a complete remission, potentially deadly complications and coexisting congenital anomaly of guarded prognosis, the parents decided to bring the patient home. Three months after the histopathologic diagnosis of YST was released, an OPD consult was made due to poor oral intake from an obstructed oral cavity, the oral mass had reached a size of 5 cms X 4 cms with protrusion into the orifice. The base was firmly attached to the left lateral tongue surface. The mass on the floor of the mouth had markedly increased with multiple nodal involvements on the submental, ipsilateral infra and post auricular regions. An orogastric tube was then inserted to facilitate feeding, but the parents requested no admission. The patient expired a week later.

DISCUSSION

Confronted with a one-year-old patient presenting with a growth in the sublingual area, one is more likely to consider benign lesions as ranula, a hemangioma or a dermoid cyst. A malignant condition is unlikely but not to be totally ruled out. Ranula was ruled out due to the absence of a mucoid aspirate. Hemangioma as well was discounted owing to a negative blood tap on aspiration, a firm consistency and a non-blanching character while a dermoid cyst is a histopathologic diagnosis.

YST is a malignant germ cell tumor that usually arises in the gonads. Extragonadal germ cell tumors of the head and neck region apart from the CNS is rare accounting for only 5% of all benign and malignant germ cell tumors. Published literature site the orbit, maxillofacial, retroauricular, oropharyngeal, and nasopharyngeal and the floor-of-the mouth as the areas affected in the head and neck area.

YST is a malignancy diagnosed only by histopathologic techniques and is marked by elevated level of tissue and serum Alpha-fetoprotein. The latter being a helpful indicator of chemotherapy responsiveness. It was unfortunate though that such determination was not performed on the patient due to parent's request.

Very little is known about the probable genetic or environmental factors associated with childhood extracranial germ cell tumors. However, patients with Klinefelter's syndrome, [3-5] appear to be at increased risk of having mediastinal germ cell tumors, while patients with Swyer's syndrome appear at increased risk for gonadoblastomas and germinomas.[6,7]

Aicardi syndrome is a rare genetic disorder discovered by a French neurologist Dr. Jean Aicardi in 1965. This syndrome presents with the clinical tetrad of agenesis of corpus callosum, infantile spasms, chorioretinal lacunae and mental retardation. All of which were present in our patient. The number of identified cases of girls is approximately 300-500 worldwide, females mostly affected with lethality in hemizygous males. The treatment is primarily supportive and prognosis varies. It affects ages from birth to mid-20s.

A variety of uncommon benign and malignant tumors have been associated with Aicardi syndrome. These are Choroid plexus papilloma with gastric hyperplasic polyps described by Trifeletti et al. (1995), scalp lipoma with cavernous hemangioma of the leg reported by Tsao et al. (1993) and the only oral cavity tumor was that of Kiristioglu et al. (1999) who reported of a palatal hemangioma in a one day old female. No report of an YST in Aicardi Syndrome has yet been made from the available English medical literature reviewed to date.

A treatment protocol released by both the Pediatric Oncology Group and the Children's cancer group on Yolk Sac Tumors recommends a complete excision of the primary tumor whenever possible. Debulking procedures only may be appropriate with planned secondary procedure for delayed excision following chemotherapy.

The outcome of children with malignant extracranial germ cell tumors was poor before the advent of effective chemotherapy. Although children with testicular tumors did well with surgical resection [8,9] for most patients 3-year survival rates were 15% to 20% with surgery and/or radiation therapy [10-12] Chemotherapy has dramatically improved the outcome for these patients, with 5-year survival rates increasing to 60% to 90%. [9,13,14] The standard chemotherapy regimen for both adults and children with malignant nonseminomatous germ cell tumors includes cisplatin, etoposide, and bleomycin (PEB) at one cycle per month for four cycles [15-19] .The combination of carboplatin, etoposide, and bleomycin is also used for pediatric patients [20-21].

The decision of patients or parents to refuse tumor extirpation in the oral cavity is largely on account of the inevitable sacrifice of essential functions of normal swallowing and speech not to mention the deformities it leaves behind. On the other hand, the adverse effects of chemotherapy remain a prime stumbling block in its use among infant patients. Non-conformation to the standard treatment protocol may prove a wiser decision, keeping guard and addressing symptoms as they come has been the best choice in this case.

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