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# ANATOMIC DIMENSIONS OF THE MEDIAL BORDER OF THE SCAPULA AMONG FILIPINOS*

JULIE G. CEBRIAN, MD**
ANTHONY CHARLES F. DALMACIO, MD**
RENE G. CRUZ, MD**
ARMANDO M. CHIONG, JR., MD, FPSO-HNS***

## ABSTRACT

GENERAL OBJECTIVE: This study aims to measure the dimensions of the medial border of the scapula in Filipino cadavers.
SPECIFIC OBJECTIVE: To measure the length of the medial border of the scapula from the inferior angle to the level of the spine of the scapula and from the level of the spine of the scapula to the superior angle and to measure the thickness of the medial border at the midportion.
DESIGN: Descriptive Study (Anatomic Dissection)
SETTING: Laboratory of Human Anatomy of Private Medical Schools
SUBJECTS: Twenty-five adult cadavers (15 males and 10 females)
RESULTS: Fifty scapulas were dissected and measured consisting of thirty male and twenty female scapulas. The mean length of the medial border of the scapula from the inferior angle to the level of the spine of the scapula was 10.1 cm and from the level of the spine of the scapula to the superior angle was 4.3 cm. The average thickness of the medial border was 3.8 mm.
CONCLUSION: The dimensions of the medial border of the scapula in Filipinos as measured by cadaver dissection are as follows: length of 10.1 cm from the inferior angle to the level of the spine of the scapula; length of 4.3 cm from the level of the spine of the scapula to the superior angle; and thickness of 3.8 mm at the midportion.

## INTRODUCTION

Surgical defects resulting from cancer surgery in the head and neck represent a formidable challenge for the head and neck surgeon. Significant progress has been made since it was first realized that massive resections of soft tissues and /or bone in the head and neck must be followed by immediate repair. Both cosmetic and functional objectives prompt this reparative procedure. With a thorough understanding of the anatomy of flaps and their clinical application, a surgeon can be more aggressive in removing cancer and still offer the opportunity for successful rehabilitation to the patient by immediate reconstruction.

A variety of flaps and reconstruction techniques have been described in literature during the past three decades. Some of the more common flaps used for large defects are the myocutaneous flaps, which include the pectoralis major, trapezius, and latissimus dorsi flaps. Osteomyocutaneous flaps which include bone from the scapula, sternum, ribs, or iliac crest have been used for large bony defects such as those secondary to mandibulectomy. Other alternatives for mandibular reconstruction are plating techniques and microvascular free flaps.

Despite these achievements, massive soft tissue deformities of the upper medial face remain as difficult reconstructive problems. The lack of reliable, well-vascularized flaps that can resurface this area make tumor resection and reconstruction difficult. The trapezius musculocutaneous flap has been used by in head and neck reconstruction of the lower face [1-3] and in lateral defects only of the upper face and scalp[4]. Since it was first used by Demergasso and Piazza in 1979 [2], various refinements and modifications have been made including the use of the scapular

*Submitted, PSO-HNS Descriptive Researh Paper Contest, 47th PSO-HNS Annual Convention November 30, 2003 , Westin Phil. Plaza Hotel, Manila
**Resident, Department of Otolaryngology-Head and Neck Surgery, Ospital ng Maynila Medical Center
***Consultant, Head - Head and Neck Section, Department of Otolaryngology-Head and Neck Surgery, Ospital ng Maynila Medical Center

spine for reconstruction of mandibular defects [5]. Another variation of the trapezius myocutaneous flaps is the rhombotrapezius myocutaneous and osteomyocutaneous flap which include the trapezius and rhomboid muscles and the medial border of the scapula as an osteomyocutaneous flap. This flap provides bulk for augmentation of facial defects and offers a longer pedicle with a greater arc of rotation [6]. Since there is no reliable technique of assessing the size of the medial border of the scapula preoperatively, the reconstructive surgeon needs to be better able to plan and anticipate the bony transfer. This study was conceptualized to determine the size of available bone that can be used from the medial border of the scapula. Since Filipinos are anthropometrically smaller than Caucasian subjects described in western literature, it is of necessity that local studies be done to guide local head and neck surgeons.

The scapula is a triangular bone that lies obliquely over the second to the seventh ribs in the back and in the posterior wall of the axilla. It has three borders namely the superior, lateral and medial border. The ***medial border*** forms a prominent ridge where the rhomboid muscles are attached which ends above at the superior angle and below at the inferior angle. The ***superior angle*** can be palpated opposite the first thoracic spine and the ***inferior angle*** can be palpated opposite the seventh thoracic spine. The dorsal surface is divided obliquely into two parts by a triangular spine. The ***spine*** is continuous laterally with a shelf of bone, the acromion, which turns forward and overhangs the shoulder joint. The crest of the spine of the scapula can be palpated and traced medially to the medial border of the scapula, which it joins at the level of the third thoracic spine. (Figure 1).

## OBJECTIVES OF THE STUDY

**General Objective:**

This study aims to measure the dimensions of the medial border of the scapula in adult Filipino cadavers.

**Specific Objectives:**

1. To measure the length of the medial border of scapula from the inferior angle to the level of the scapular spine.
2. To measure the length of the medial border of the scapula from the level of the scapular spine to the superior angle.
3. To measure the thickness of the medial border of the scapula at it's midportion.

## METHODOLOGY

**Subjects**:

Twenty-five adult Filipino cadavers with no gross deformities were included in this study, fifteen males and ten females. A total of fifty scapular dissections were done.

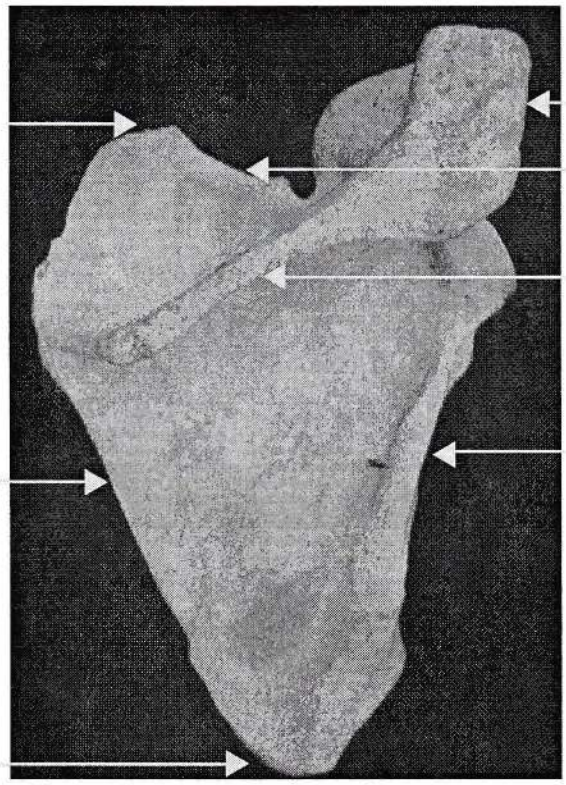


**Figure 1. Dorsal surface of the scapula**

**Method of Measurement:**

The length of the medial border of the scapula was measured from the inferior angle to the level of the scapular spine (L1). Another measurement was done from the level of the scapular spine to the superior angle using a metal caliper (L2). All measurements were in centimeters. The thickness of the medial border in millimeters was measured at the midportion (T) (Figure 2). All measurements done in the study was done by only one researcher.

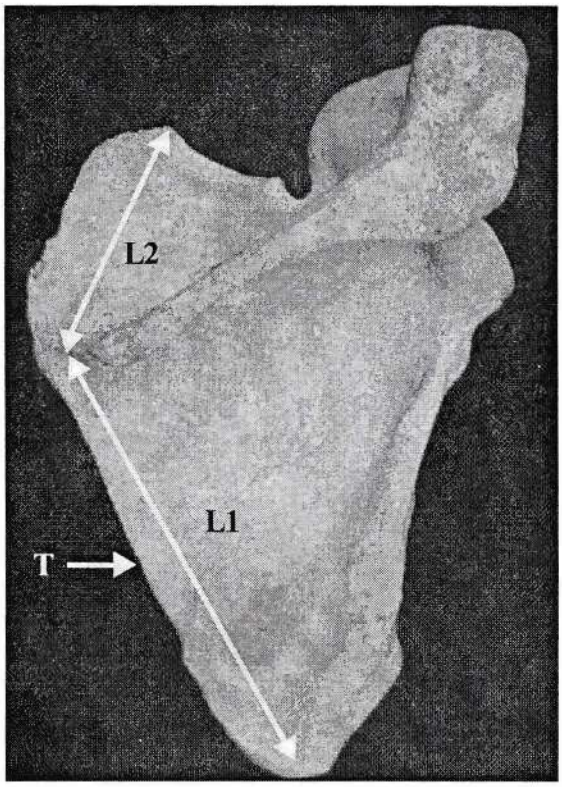


**Figure 2. Measurements of the medial border of the scapula**

## RESULTS

A total of fifty scapulas were dissected and measured. There were thirty male scapulas and twenty female scapulas. The mean length of the medial border of the scapula from the inferior angle to the level of the spine of the scapula (L1) was 10.1 cm (range: 8.7 cm – 14 cm). The mean length of the medial border from the level of the spine of the scapula to the superior angle (L2) was 4.3 cm (range: 3.3 cm – 6.1 cm). The average thickness of the medial border was 3.8 mm (range: 3mm – 5 mm) Table 1.

In males, the mean length from the inferior angle to the level of the spine of the scapula was 10.4 cm (range: 8.7 cm – 14 cm). The length from the level of the spine of the scapula to the superior angle averaged 4.5 cm (range: 3.3 cm – 6.1 cm). The average thickness of the medial border measured 3.9 mm in males with a range of 3mm- 5-mm (Table 2). The dimensions of the medial border of the scapula among females were as follows: the average length from inferior angle to the level of the spine of the scapula was 9.5 cm with a range of 9.2 cm – 10 cm; average length from level of the spine of the scapula to the superior angle was 4cm with a range of 3.3 cm – 5.1 cm; the average thickness of the medial border was 3.7 mm with a range of 3mm – 5 mm.

## DISCUSSION

The various myocutaneous flaps derived from the trapezius muscle can be classified into three distinct myocutaneous segments: the superior, the lateral and the extended lower (posterior ) island flaps. The trapezius myocutaneous flap was first described by Demergasso and Piazza [2] in 1979. This lateral island flap was based on the superficial transverse cervical vessels. The superior trapezius myocutaneous flap is an axial myocutaneous flap based on the paraspinous muscle perforators and branches of the occipital artery. It is however limited in reach and has a bulky base. The lower trapezius myocutaneous flap described by Baek et al. [7] in 1979 utilized the caudal placement of the cutaneous island to overlay the lower trapezius fibers medial to the scapula. This flap is thin with a long pedicle allowing it to be used for primary reconstruction of middle and upper facial defects [8].

Panje [5] used the scapular spine together with the trapezius muscle for mandibular reconstruction. He emphasized preservation of the acromion in order to stabilize the shoulder and thus decrease morbidity. The length of available scapular spine with the acromion is about 13.5 cm. If the spine is cut at the scapular notch, approximately 10 cm of bone is available [8]. The rhombotrapezius myocutaneous and osteomyocutaneous flaps have been described [7]. This flap has a greater pedicle length which allows it to be used for midface defects. The inclusion of the rhomboid muscles not only adds bulk but also increases the vascular supply to the distal portion of the flap by incorporation of the dorsal scapular artery. As much as 15 to 18 cm of bone grafts can be harvested from the medial border of the scapula. Krespi [6] has reported 2 cases in which bone segments of approximately 14 x 3 cm has been incorporated in the flap.

In this study, the average total length that was measured from the inferior angle to the superior angle is 14.4 cm. This value is similar to

that described by Krespi in the two cases where the medial border of the scapula was used. However, the limited number of measurements made may not justify comparison of these two populations.

## CONCLUSION

The mean dimensions of the medial border of the scapula in Filipinos as measured by cadaver dissection are as follows: length of 10.1 cm from the inferior angle to the level of the spine of the scapula; length of 4.3 cm from the level of the spine of the scapula to the superior angle; and thickness of 3.8 mm at the midportion.

## RECOMMENDATIONS

1. The measurements of the medial border of the scapula in Filipino cadavers presented in the study can serve as a guide when using the rhombotrapezius osteomyocutaneous flap for reconstruction of various midface defects.

2. To further determine the dimensions of the medial border of the scapula which are representative of the general population in Filipinos, more cadaver dissections are should be done.

3. The findings in the present study should be correlated with actual measurements of the scapula in patients undergoing surgery.

**Table 1.** Summary Measurements of the Medial Border of the Scapula

| Length (cm) Inferior Angle to Spine | Length (cm) Spine to Superior Angle | Thickness (mm) Midportion |
|---|---|---|
| 10.8 | 5.1 | 3.0 |
| 10.9 | 5.1 | 3.0 |
| 14.0 | 6.1 | 4.0 |
| 12.3 | 5.4 | 5.0 |
| 9.8 | 4.5 | 4.0 |
| 9.6 | 4.6 | 5.0 |
| 11.7 | 5.7 | 5.0 |
| 1.6 | 5.7 | 4.0 |
| 11.6 | 5.4 | 4.0 |
| 11.7 | 5.4 | 5.0 |
| 11.0 | 3.4 | 4.0 |
| 10.9 | 3.4 | 4.0 |
| 8.7 | 3.3 | 3.0 |
| 8.7 | 3.3 | 3.0 |
| 9.5 | 4.0 | 4.0 |
| 9.5 | 4.0 | 4.0 |
| 0.8 | 3.4 | 4.0 |
| 10.8 | 3.4 | 4.0 |
| 9.3 | 4.1 | 3.0 |
| 9.3 | 4.1 | 3.0 |
| 9.9 | 3.9 | 4.0 |
| 9.9 | 3.9 | 4.0 |
| 9.8 | 4.2 | 3.0 |
| 9.8 | 4.2 | 3.0 |
| 9.9 | 5.0 | 5.0 |
| 9.9 | 5.0 | 5.0 |
| 10.7 | 5.0 | 4.0 |
| 10.6 | 5.0 | 4.0 |
| 10.0 | 4.2 | 4.0 |
| 10.0 | 4.2 | 4.0 |
| 9.5 | 5.1 | 5.0 |
| 10.0 | 4.8 | 4.0 |
| 9.0 | 3.8 | 5.0 |
| 9.0 | 3.8 | 5.0 |
| 9.9 | 3.3 | 3.0 |
| 9.9 | 3.3 | 3.0 |
| 9.3 | 3.4 | 4.0 |
| 9.2 | 4.2 | 5.0 |
| 9.0 | 4.4 | 4.0 |
| 9.7 | 4.1 | 4.0 |
| 10.0 | 4.5 | 4.0 |
| 10.0 | 4.4 | 4.0 |
| 9.2 | 3.5 | 3.0 |
| 9.2 | 3.7 | 3.0 |
| 9.6 | 3.8 | 3.0 |
| 9.6 | 3.8 | 3.0 |
| 9.5 | 3.7 | 3.0 |
| 9.5 | 3.7 | 3.0 |
| 9.6 | 4.2 | 3.0 |
| 9.6 | 4.2 | 3.0 |
| **Mean: 10.1** | **4.3** | **3.8** |

**Table 2.** Summary of Measurements of the Medial Border of the Scapula in Males

| Length (cm) Inferior Angle to Spine | Length (cm) Spine to Superior Angle | Thickness (mm) Midportion |
|---|---|---|
| 10.8 | 5.1 | 3.0 |
| 10.9 | 5.1 | 3.0 |
| 14.0 | 6.1 | 4.0 |
| 12.3 | 5.4 | 5.0 |
| 9.8 | 4.5 | 4.0 |
| 9.6 | 4.6 | 5.0 |
| 11.7 | 5.7 | 5.0 |
| 11.6 | 5.7 | 4.0 |
| 11.6 | 5.4 | 4.0 |
| 11.7 | 5.4 | 5.0 |
| 11.0 | 3.4 | 4.0 |
| 10.9 | 3.4 | 4.0 |
| 8.7 | 3.3 | 3.0 |
| 8.7 | 3.3 | 3.0 |
| 9.5 | 4.0 | 4.0 |
| 9.5 | 4.0 | 4.0 |
| 10.8 | 3.4 | 4.0 |
| 10.8 | 3.4 | 4.0 |
| 9.3 | 4.1 | 3.0 |
| 9.3 | 4.1 | 3.0 |
| 9.9 | 3.9 | 4.0 |
| 9.9 | 3.9 | 4.0 |
| 9.8 | 4.2 | 3.0 |
| 9.8 | 4.2 | 3.0 |
| 9.9 | 5.0 | 5.0 |
| 9.9 | 5.0 | 5.0 |
| 10.7 | 5.0 | 4.0 |
| 10.6 | 5.0 | 4.0 |
| 10.0 | 4.2 | 4.0 |
| 10.0 | 4.2 | 4.0 |
| **Mean: 10.4** | **4.5** | **3.9** |

**Table 3**. Summary of Measurements of the Medial Border of the Scapula in Females

| Length (cm) Inferior Angle to Spine | Length (cm) Spine to Superior Angle | Thickness (mm) Midportion |
|---|---|---|
| 9.5 | 5.1 | 5.0 |
| 10.0 | 4.8 | 4.0 |
| 9.0 | 3.8 | 5.0 |
| 9.0 | 3.8 | 5.0 |
| 9.9 | 3.3 | 3.0 |
| 9.9 | 3.3 | 3.0 |
| 9.3 | 3.4 | 4.0 |
| 9.2 | 4.2 | 5.0 |
| 9.0 | 4.4 | 4.0 |
| 9.7 | 4.1 | 4.0 |
| 10.0 | 4.5 | 4.0 |
| 10.0 | 4.4 | 4.0 |
| 9.2 | 3.5 | 3.0 |
| 9.2 | 3.7 | 3.0 |
| 9.6 | 3.8 | 3.0 |
| 9.6 | 3.8 | 3.0 |
| 9.5 | 3.7 | 3.0 |
| 9.5 | 3.7 | 3.0 |
| 9.6 | 4.2 | 3.0 |
| 9.6 | 4.2 | 3.0 |
| **Mean: 9.5** | **4.0** | **3.7** |

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# ARYTENOIDECTOMY AND POSTERIOR CORDECTOMY USING COBLATION, A NEW TECHNIQUE*

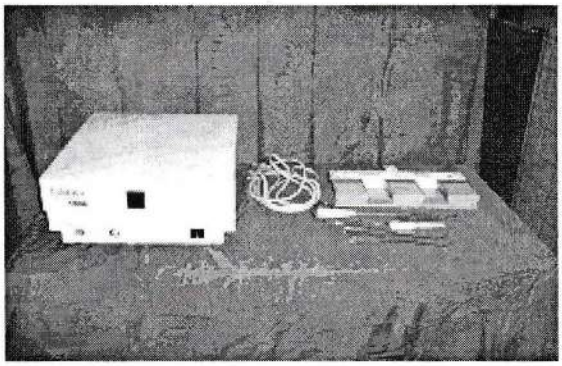
MICHAEL M. ROSANES, MD**
GIL M. VICENTE, MD, FPSO-HNS***

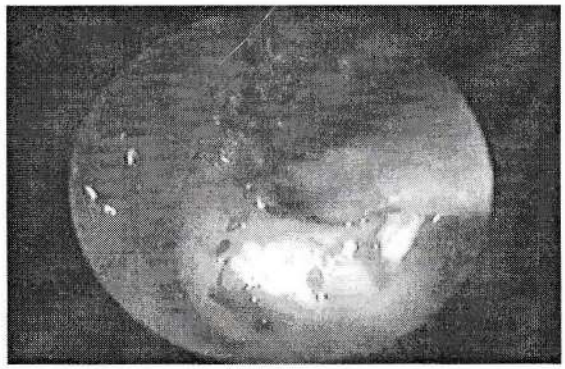
**ABSTRACT**

Many treatment modalities for bilateral vocal fold paralysis exist . Surgical management is directed at expanding the glottis for respiration while preserving closure for phonation and swallowing and preventing aspiration. Arytenoidectomy using cold knife is still being used and its disadvantages include bleeding, post-op pain and submucosal scar tissue. Most popular technique at present is endoscopic arytenoidectomy via Co2 laser. However, laryngeal web formation and posterior glottis synechiae can be complications of the procedure plus it produces severe pain, more tissue edema, more heat to produce tissue ablation and longer operating time Coblation- assisted arytenoidectomy and posterior cordectomy, which uses radiofrequency technology to achieve tissue removal with limited thermal damage to collateral tissue therefore producing less pain, less heat to produce tissue ablation, less bleeding and less operating time is presented as an alternative to $CO_2$ laser.

OBJECTIVE: To describe a novel approach in the treatment of bilateral vocal fold paralysis using Coblation.
DESIGN: Descriptive Study-Case Series
SETTING: Tertiary Government Hospital
PATIENTS: Three
MATERIALS & METHODS: Bilateral Vocal Fold Paralysis was documented by videoendoscopy and stroboscopy. All patients underwent arytenoidectomy with posterior cordectomy using an ENTEC Coblator Plasma Surgery Machine via endoscopic guidance. videoendoscopy was done every 3 days to note for any problems.
RESULTS: Three patients with bilateral vocal fold paralysis status post-thyroidectomy who underwent arytenoidectomy and posterior cordectomy via coblation had a much improved airway and no aspiration.
Conclusion: Arytenoidectomy and posterior cordectomy using coblation is a new technique in treating bilateral vocal fold paralysis. the advantages of the procedure include: less laryngeal tissue edema, less time to produce tissue ablation, simultaneous hemostasis and less operating time.

## *A New Approach in the Treatment of Bilateral Vocal Fold Paralysis





*First Place, PSO-HNS Poster Session on Surgical Innovation Contest, 47th PSO-HNS Annuual Convnetion, December 2, 2003, Westin Phil. Plaza Hotel, Manila

**Resident, Dept. of ORL-HNS, JRRMMC
***Consultant, Section Chief, Rhinology Service, Department of ORL-HNS, JRRMMC

## INTRODUCTION

Bilateral vocal fold paralysis or immobility may result from neural injury or mechanical fixation of the vocal fold itself. It can arise from injury to the recurrent laryngeal nerve anywhere from its course from the skull base into the chest or from mechanical fixation of the cricoarytenoid joint The use of the term paralysis implies a neurologic dysfunction, while the term immobiblity implies either a neurologic dysfunction or a mechanical fixation (Sinacori, 2002).

Various surgical techniques have been used for the treatment of bilateral vocal cord paralysis which include endolaryngeal arytenoidectomy, extralaryngeal arytenoidectomy, nerve-muscle transposition, external arytenoidectomy, cordectomy and vocal fold lateralization, Endoscopic cold knife and thyroplasty (Altas, 1998). Endoscopic arytenoidectomy using carbon dioxide laser, described by Ossof in 1984 and its modification of this technique by Sato in 2001 to prevent granuloma formation is currently favored over these open surgical procedures. However, laryngeal web formation and synechiae of the posterior glottis can be a problem in laser arytenoidectomy due to the high temperature it produces to irradiate laryngeal tissues such that the interarytenoid cleft of the larynx must be protected in this procedure to prevent this from happening. CO2 laser also produces more pain, more tissue edema, hematoma and longer operative time.

Coblation-assisted arytenoidectomy and posterior cordectomy is a new technique which produces tissue ablation via delivery of low frequency energy by means of a specifically adapted electrode. This energy induces ion agitation within the tissue, which increases the local temperature leading to tissue volume reduction, therefore this procedure is only slightly invasive hence, there is sparing of the overlying laryngeal mucosa, less tissue trauma and the decrease in post-operative morbidity and complications.

## MATERIALS AND METHODS

Three patients underwent arytenoidectomy with posterior cordectomy via coblation. All were females with ages of 53, 51 and 55 years old. All had thyroid surgeries prior to having vocal fold paralysis. This was documented using videoendoscopy and videostroboscopy.

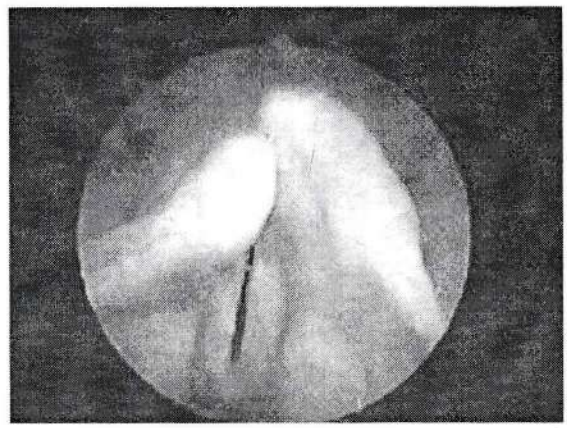
Patient 1 is FM, a 55 year old female who had a bilateral vocal fold paralysis 2 years post-thyroidectomy.

Patient 2 is AJ, a 53 year old female who also had a bilateral vocal fold paralysis 5 years post-thyroidectomy

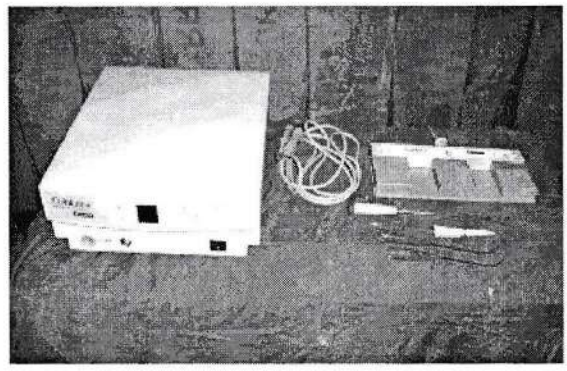
Patient 3 is FT, 51 year old female who had a bilateral vocal fold paralysis 24 years post-thyroidectomy.

**Endoscopic Findings:**

All patients had similar videoendoscopic findings of bilateral vocal fold paralysis with both vocal folds at paramedian position.



An ENTEC Coblator Plasma Surgery System Machine manufactured by Arthrocare Corporation was used in this procedure. It weighs 8.2 kilograms, Utilizes optimized bipolar radiofrequency energy and has a multifunction (ablation, dissection and coagulation) capability. Machine comes with ENT coblation plasma wands.



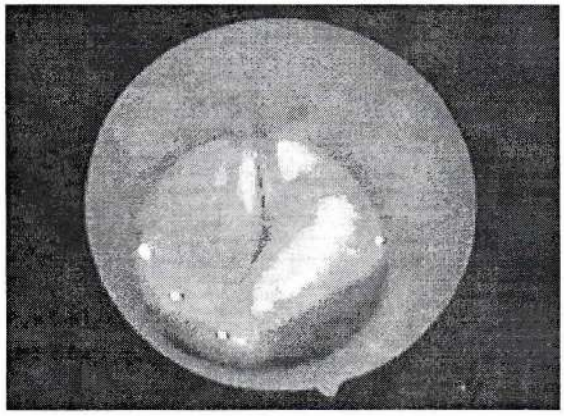
(Figure 1: ENTEC Coblator Machine)

**Surgical Procedure:**

**Step 1:**

A tracheostomy was done prior to the procedure. After which the patient was put into supine position with neck hyperextended. Induction of general anesthesia was done using tracheostomy route.A Kleinsasser Operating

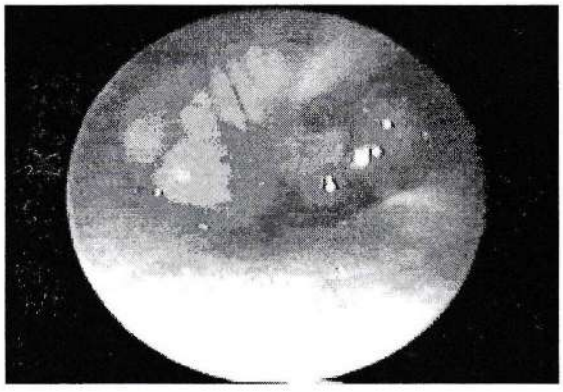
Laryngoscope 18 cm adult size was insinuated to the patient and was suspended to a chest support to expose the arytenoids of interest, the posterior portion of the ipsilateral aryepiglottic fold and the medial portion of the contralateral arytenoid vocal cords. A Hartmann 4 mm 0 degree rigid endoscope was inserted to the laryngoscope connected to a endocamera and a 150 watt eurocam cold light for better illumination and documentation of the procedure.



(Figure 2: posterior glottis)

**Step 2:**

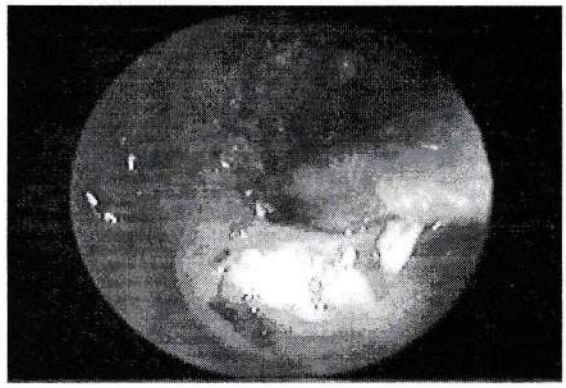
After exposing the posterior glottis, tissue ablation via coblation was started along the right aryepiglottic fold overlying the arytenoid cartilage using a coblation plasma wand, which was inserted via endoscopic guidance. Suctioning of the smoke byproducts using a suction device was done to maintain the operative field free.



(Figure 3: start of coblation)

**Step 3:**

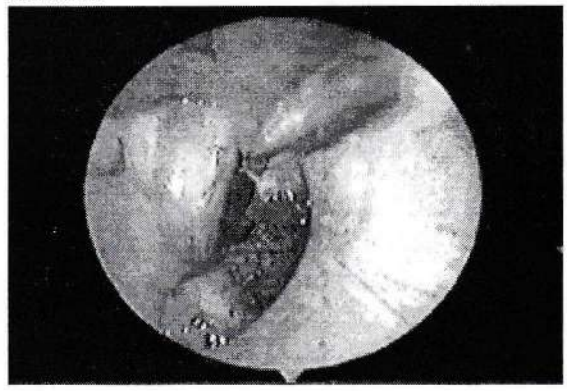
Soft tissues are then ablated to expose the the superior aspect of the right arytenoid cartilage then ablation of the entire right arytenoid cartilage was done.



(Figure 4: Coblation of Right Arytenoid Cartilage)

**Step 4:**

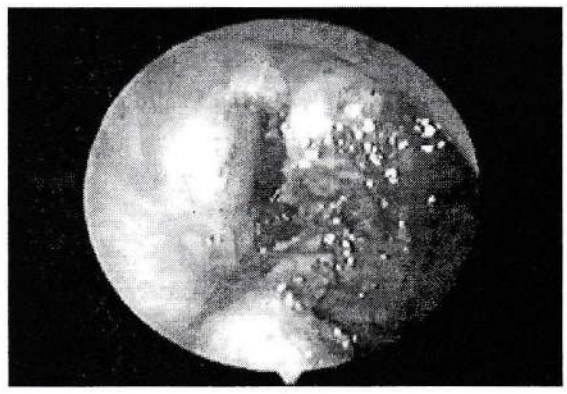
The posterior portion of the right thyroarytenoid muscle and an adjacent segment of the right membranous vocal fold was then ablated.



(Figure 5: coblation of right membranous vocal fold)

**Step 5:**

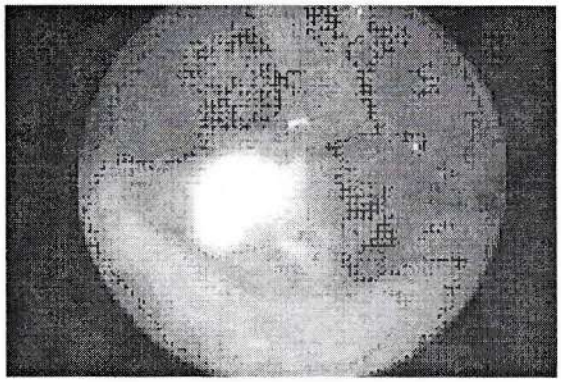
Final inspection of the posterior glottis using a microlaryngeal retractor, showing a widened posterior glottic opening. There was no bleeding noted.



(Figure 6: Final Inspection)

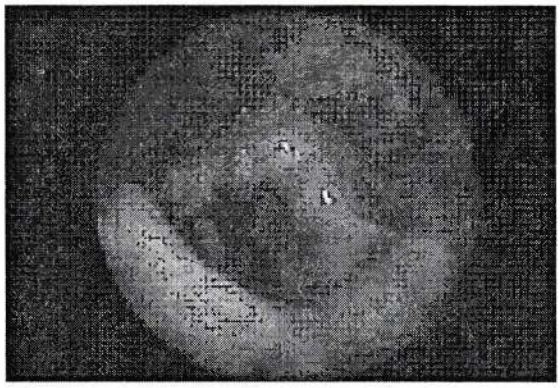
**Step 6:**

The picture shows the videoendoscopic findings of patient 1 using a 30 degree 4mm rigid endoscope 3rd day post-op wherein there is already wound healing, there was no scar tissue formation nor granulation tissue noted.



(Figure 7: 3rd day post-op)

**Results:**



(Figure 1: 7 days post-op)

Videoendoscopy of patient 1 shows the patient at 7th day post-op using a 30 degree 4 mm rigid endoscope and it reveals a widened posterior glottis. The right arytenoids and posterior vocal cord are visibly removed. There was no observable granuloma,nor scar formation nor stenosis. There was no pooling of saliva noted. Patient also had improved airway and no aspiration noted.

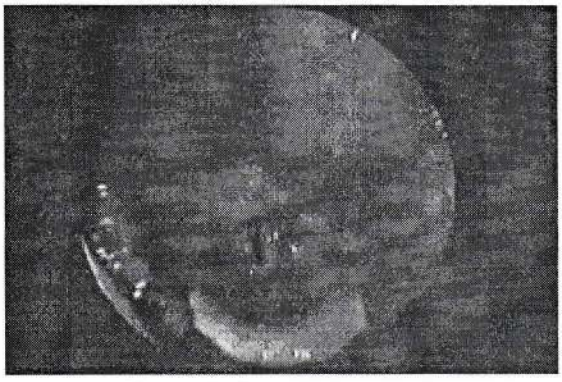


Figure 9: 2 months post-op

Videoendoscopy of patient 2 at 2nd month post-op this time using a 45 degree 4 mm rigid endoscope and findings reveal lateralized posterior vocal cord on the right with a widened posterior glottis, again no pooling of saliva. Patient had no symptoms of aspiration nor stridor.

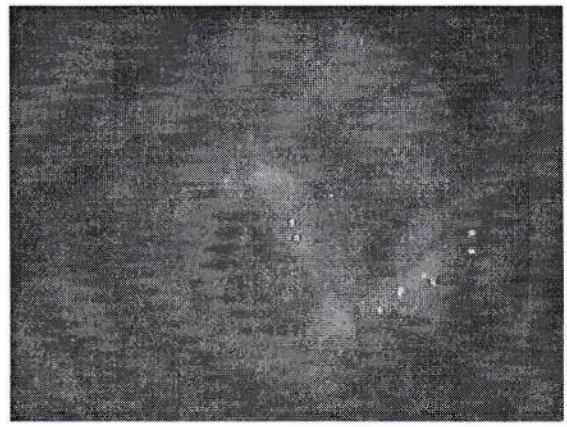


Figure 10 : 1 month post-op

Videoendoscopy of patient 3 at 1 month post-op using a 30 degree 4 mm rigid endoscope and again it shows a widened posterior glottis with no granuloma formation and a lateralized right vocal fold.

Radiofrequency ablation via coblation was performed in 3 patients, all females, with bilateral vocal fold paralysis status post thyroidectomy with ages 51, 53 and 55 respectively. All had videostroboscopy done pre-operatively to document the prescence of paralysis. Elective tracheostomy was done prior to the procedure. The procedures were uneventful and videoendoscopy was done on the patients every 3 days to assess and document wound healing and recovery and to note if there were any complications like granulation tissues or stenosis. Two patients were decannulated 1 week post-operatively and there were marked improvement in the airway with no aspiration noted. One patient was decannulated 10 days post-operatively due to productive cough.

## DISCUSSION

Radiofrequency ablation or Coblation is an emerging technology and new technique for soft tissue surgery (Bortnick, 2001). Coblation is based on electrosurgical principles which has been an effective modality for the treatment of cutaneous lesions. It is originally developed for cartilage ablation in orthopedic athroscopic surgery. Now this bipolar, multi-electrode

technology is being utilized as an alternative to C02 and erbium laser in skin resurfacing (Egger, 1998). The authors used it to perform arytenoidectomy and posterior cordectomy surgery. Most radiofrequency electrosurgical techniques use a heat driven process to ablate or cut tissue. High amounts of energy are discharged into tissue causing tissue structures to explode at high temperatures. During this process, surrounding tissue can be inadvertedly charred or burned. The Coblation process, in contrast, is a controlled, non-heat driven process. With Coblation technology, radiofrequency energy is applied to a conductive medium, causing a highly focused plasma field to form around the energized electrodes. The plasma field is comprised of highly ionized particles. These ionized particles have sufficient energy to break organic molecular bonds within tissue. The by-products of this non-heat driven process are elementary molecules and low molecular weight inert gases. Instead of exploding tissue, coblation causes a low molecular disintegration. The result is volumetric removal of target tissue with minimal damage to surrounding tissue. ( Arthrocare Corp., 2002)

Coblation is done wherein the operator uses a handpiece that deposits an electrically conductive saline solution on the target tissue. This solution is then energized by a multielectrode stylette tip that energizes the ions in the conductive fluid. These powered ions accelerate down the electrical gradient.These powered ions accelerate down the electrical gradient toward the target tissue, causing accurate and limited molecular dissociation at a cellular level. Due to the short range of travel through the conductive solution and the proximity of the active and passive return electrodes, epidermal destruction is produced at significantly lower temperature than in heat-dependent approaches, with minimal thermal injury to surrounding tissues (Olhoffer, 1999). Coblation byproducts are elementary molecules such as oxygen,nitrogen. carbon dioxide, carbon monoxide, carbon tetrahydrate and hydrogen and these byproducts are inert and are quickly flushed out during irrigation of the surgical site.

Application of Coblation technology has certain advantages over C02 laser in which the primary advantage appears to be a lower temperature cellular rupture and molecular disintegration of tissue. Similar to the CO2 lasers and unlike the erbium lasers, Coblation offers the added advantage of simultaneous resurfacing and hemostasis. The expected cascade of less erythema, less edema, less pain, and more rapid healing has also been reported by Greckin in 2000 and Mancini in 1999. In comparison to lasers, there is greater functionality via low cost and lightweight portability. There is no need for smoke evacuation or goggles. Recently, normal saline gel (Molnlycke, Ediestone, Pa.) has been used in place of normal saline solution. This gel develops a plasma layer essential for radiofrequency ablation. Additionally, it makes easier use of the radiofrequency stylettes by allowing visual tracking of the treated areas with no saline run-off. The Coblation technology is being applied by multiple surgical specialties with differing electral handpieces and stylette tips. The greatest benefit of the new technique appears to be the lower temperatures required to obtain tissue ablation, thus leading to decreased postoperative pain, erythema, and edema.

Unlike in CO2 laser irradiation wherein the interarytenoid cleft of the larynx must be protected from direct or submucosal laser irradiation to avoid posterior laryngeal web formation or synechia of the posterior glottis, Coblation avoids this risks due to the specialized plasma wands that comes with this procedure.

## SUMMARY AND CONCLUSION

In summary, the authors have presented a new technique of arytenoidectomy and posterior cordectomy for the surgical treatment bilateral vocal fold paralysis using coblation.

## RECOMMENDATIONS

The authors strongly recommend doing this surgical innovation on patients with bilateral vocal fold paralysis in order for them to have an adequate airway and in the near future, when there is already a large number of patients who have undegone this procedure, a comparative study be made between coblation and carbon dioxide laser in Arytenoidectomy and Cordectomy.

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## GLOSSARY

*Ablation:* removal of tissue

*Bipolar System:* delivers energy to target tissue via an active electrode and one or more Electrode

*Conductive Medium:* an environment that allows passage of current e.g. saline solution

*Ionization:* dissociation into ions from a neutral state

*Monopolar System:* energy is passed through target tissue via a single active electrode to a dispersive pad adhered to the patient skin.

*Plasma Layer/Field:* an electrically charged gas medium of ions

*Radiofrequency:* typically any frequency between normally audible sound and infrared light portion of the electromagnetic spectrum, lying between 10 kHz and 1,000,000 MHz, nominally. High frequency RF generators have frequency between 100 kHz-100 MHz.

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# MODIFIED MUSTARDE FLAP IN A NASAL RECONSTRUCTION*

RACHEL ZITA H. RAMOS, MD**
LUIS MENDIOLA, MD***

## ABSTRACT

OBJECTIVES: To present our technique in a nasal reconstruction using a modified Mustarde flap
DESIGN: Surgical Innovation
SETTING: Tertiary Government Hospital
PATIENT: A 66-year old male, diagnosed to have basal cell carcinoma of the nose who underwent excision and nasal reconstruction using a modified Mustarde flap last February 2003.
RESULTS: This procedure met the goals of nasal reconstruction: minimize aesthetic and physical loss. Various flaps are commonly advocated in reconstructing the alar area of the nose. The Mustarde flap is more commonly used in cheek defects. A modification of this flap using a deep-plane dissection, not only mobilized the flap, covering the more distant nasal defect, but also improved its random blood supply making it a more reliable flap.
CONCLUSION: Nasal reconstruction poses a challenging task in restoring pre-morbid appearance. Various flaps have been proposed and many studies show acceptable results. This report shows our experience in reconstructing the nose with an effective simple technique of dissection with acceptable aesthetic results and minimized complication contributing to our patient's satisfaction.

## INTRODUCTION

Nasal reconstruction poses a big challenge in both restoring the pre-morbid appearance and meeting the goals of nasal reconstruction guided by the nasal sub-unit principle proposed by Ulloa-Gonzales. Various flaps have been proposed and many studies show acceptable results. The flaps are not confined though in a strict sense, on a particular nasal sub-unit, as long as the goals are met. Designing flaps also demands creativity and technical competence.

Commonly utilized flaps in the reconstruction of the nose, specifically the lower third, are the para-median forehead flaps, naso-labial flaps and the cheek island pedicle flap. Each has its own advantages and disadvantages.

This paper presents our experience in reconstructing the lower third of the nose, specifically the alar subunit, using the modified Mustarde flap which is usually used in cheek and eyelid defects. This cervicofacial flap has the advantage of more mobilization addressing bigger and more distant defects, such as nasal defects. This deep-plane, composite dissection improves the blood supply making it a more reliable flap.

CASE HISTORY

This is a case of O.B., a 66 year old male of Diliman, Q.C. who was admitted due to a fungating mass on the right nasal ala. His problem started 2 years prior to admission when he noted a slowly growing fungating , non-tender mass measuring around 0.5 x 0.1 x 0.2 cm at the right nasal alar area. (Figure 1)

He underwent an incision biopsy but failed to follow up after. Due to the progressively enlarging mass, he consulted our OPD where a repeat biopsy revealed basal cell carcinoma of the right alar area. He is a 30 pack year smoker and occasional alcoholic beverage drinker. There were no history of previous hospitalizations. He used to be a construction worker for 5 years and a garbage collector for 30 years. He underwent excision of basal cell carcinoma with

*Second Place, PSO-HNS Poster Session on Surgical Innovation Contest, 47th PSO-HNS Annual Convention, December 2, 2003, Westin Phil. Plaza Hotel, Manila

**Resident, Department of ENT-HNS, East Avenue Medical Center
***Consultant, Plastic and Maxillofacial Service, Department of ENT-HNS, East Avenue Medical Center

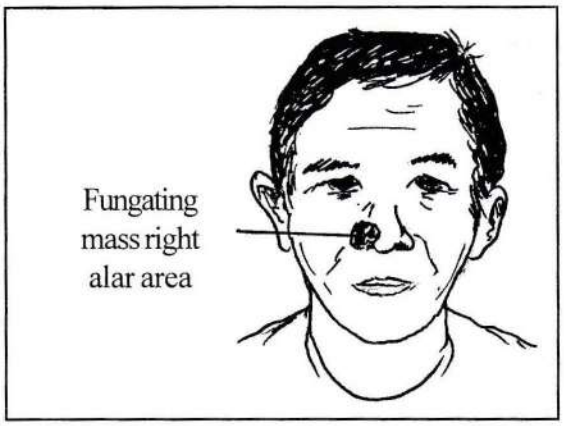


**Figure 1**

reconstruction using a modified Mustarde flap with frozen section under general anesthesia last February 2003. The procedure is described in detail as follows:

A. Excision of the mass with a 0.5 cm. margin which was sent for frozen section. With negative margins, the defect is measured at 2.5 x 3, full thickness involving the right ala. Alar perichondrium and cartilage were not involved. (Figure 2)

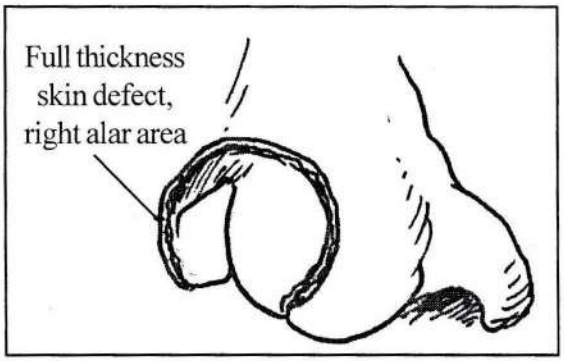


**Figure 2**

B. Deep-plane cervicofacial rotation advancement flap.

Standard cevicofacial rotation-advancement flap incision was made starting at the supero-lateral margin of the defect. Figure 3. The dissection of the flap began in the subcutaneous plane and then 2 cm. anterior to the tragus shifted to the plane just below the parotid fascia, a part of the superficial musculoaponeurotic system. The dissection over the parotid gland is relatively free of risk to the facial nerve, but once the anterior margin of gland is reached, care must be taken to avoid injuring the facial nerve, which is no longer protected by the intervening parotid tissue. (Figure 4) Blunt

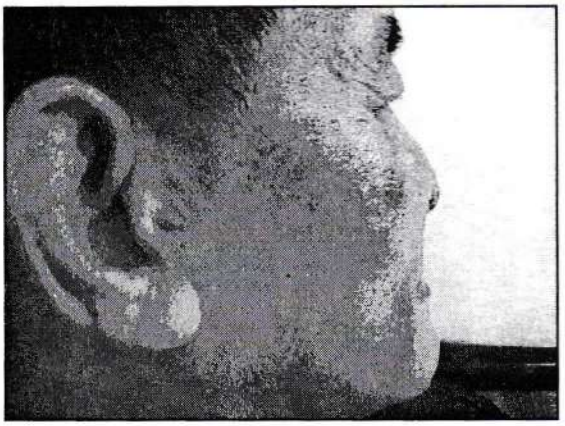

**Figure 3**

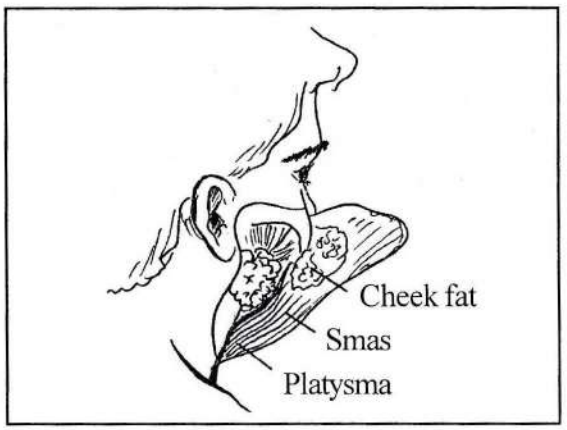


**Figure 4**

dissection with a hemostat perpendicular to the plane of the skin is safe and an effective way to perform the anterior portion of the dissection in this anterior region, and bipolar electrocautery is recommended to minimize the risk of nerve injury from stray currents. In the portion of the flap above the lower border of the mandible, the dissection is identical to a rhytidectomy face lift. It is rotated and advanced into the defect in the same fashion as the standard Mustarde flap. To prevent ectropion, the flap was anchored above the lateral canthus and by tightening the lower eyelid. Suturing at the nasofacial area was done to avoid sagging and to avoid tension.

C. Nasofacial and Alar reconstruction (Figure 5)

The reconstruction of the ala was made possible by contouring and placating the inferior edge of the flap and defatting the area where the flap is attached to the nasal tip.

Basal cell carcinoma, commonly occurring in sun-exposed areas of the face, is aggressive even with its benign character. Resulting in a disfiguring appearance, the most challenging part is the restoration of the pre-morbid appearance without compromising curative goals. An individualized approach is advocated.

**Figure 5**

Having distinct ridges and convex surfaces, Gonzales-Ulloa designated the nose as an aesthetic unit of the face.[1] It is further divided into topographic sub units.

The sub unit principle in nasal reconstruction by Burget and Menick emphasized the judicious choice and modification of recipient and donor tissue to meet the goals of minimized aesthetic and physical loss.[2]

Basic nasal reconstruction should consider the following for acceptable outcome: contrast between the nose and its surroundings, an inconspicuous border scar,
a good color and texture match with the surrounding skin and bilateral symmetry.[3]

Furthermore, Yotsunayagi, et. al. proposed nasal subunits in his experience in nasal reconstruction among Orientals.[4] Compared with Caucasian nose, the Oriental nose is low, lacks nasal muscle and has a flat glabella. A major difference is the lack of soft triangles and the addition of the glabella as an independent unit.[4]

Individual differences in nasal structure, underlying disease, and age require that the aesthetic sub units be modified as necessary.

Various flaps have been proposed for reconstructing the ala according to the nasal sub unit principle. Among them are the nasolabial flap, the cheek island flap and the glabellar flap. Each has its own advantage and disadvantage.

The naso labial flap enhances the trapdoor contraction effect and highlights the three-dimensional appearance of the nose with a large flat volume that cause minimal problems.[5]

The nasofacial area - the junction of the cheek and nasal side wall - represents a gentle transition zone that is difficult to reconstruct. This nasofacial area is thus best not violated if possible so that the thin intervening segment of the skin is preserved.[5] The modified Mustarde flap addressed the important concepts[7] in reconstructing this area.

The cheek island pedicle flap, as advocated by Fosko, has the following advantage: it maintains the normal contour of the alae, nasal tip and alar grooves as well as nasal subunit symmetry and the tissue matches the texture, color and thickness of the surrounding tissue.[6] The limitation of the flap is its random blood supply. This cheek island pedicle flap denotes complete full-thickness incision, to the level of the fat, around the entire perimeter of the flap. This procedure allows greater flap mobility by providing a pivoting motion at the flap base. Often, there is ample donor skin from the cheek resulting in a suture line that camouflages melolabial groove and nasofacial sulcus.

The cervicofacial rotation – advancement flap, advocated and described by Mustarde et al., has long been popular for reconstruction of defects of the lower eyelid and cheek. It has the same advantage as the cheek island flap and it allows easy primary closure specially for older patients with lax skin.

The flap's distal edge though has an unfortunate tendency to develop ischemic necrosis, more particularly likely when subjected to tension as with large defects, and also more likely for cigarette smokers.[7]

In the past, Skoog performed a rhytidectomy in a plane deeper than the standard subcutaneous level.[8] Hamra, on the other hand advocated a deep-plane (or composite) approach to rhytidectomy.[9] The advantages of this approach include more effective mobilization of cervicofacial tissues and improved blood supply to the flap. Although deep plane rhytidectomy requires dissection near the facial nerve branches, when properly performed, this dissection can be completed without facial nerve injury. It would therefore seem logical to apply this same approach, incorporating the deep-plane dissection with its improved blood supply.[10]

We combined the Mustarde flap with the deep-plane dissection of Hamra which is a natural extension of deep plane and composite facial rhytidectomy techniques to improve the performance of the Mustarde flap in addressing the defect which is distant and unusual for an alar reconstruction. By dissecting the deep plane, the flap (which in our technique included the SMAS, cheek fat and part of the platysma muscle) has now an axial blood supply provided by the submental branch and other perforating branches of the facial artery thus improving its performance. Barton and Zilner [11] advocated a similar flap however due to the risk of facial nerve injury, the work was not published. This risk was considerably lower owing to the wide exposure of our larger incision.

The blood supply and reliability of cervicofacial rotation advancement flap for cheek

reconstruction can be improved significantly by dissecting the flap in the deep plane, that is, below the superficial musculoaponeurotic system (SMAS) and the platysma. This modification , similar in technique to that used in composite or deep-plane face lift was used successfully in seven patients, including several heavy cigarette smokers who were unlikely to have achieved a successful outcome with a conventional cervicofacial flap.

The reconstructive surgeon may transgress aesthetic subunits by meticulous attention to details for example, when contouring the flap for a match in thickness to the adjacent area and using everting simple vertical mattress sutures. In our experience, the edge of the flap sutured to the area of the alar tip was defatted for tissue contouring.

Adjunct to our procedure is the use of nitroglycerin cream post-operatively. Information in the literature regarding the use of the paste is conflicting. Evidence for a benefit to topically applied nitroglycerin has been provided by several authors. Others have reported that it is not beneficial to the viability of skin flaps. Recently, no benefit was shown to one dose of nitroglycerin used 1 hour after surgery. Discontinuation is advocated once symptoms of dizziness or headache are noted.[5] However, we have found that nitroglycerin applied every 6 hours for a 24-48 hr. period did show some benefit.

## CONCLUSION

Nasal reconstruction is a challenging task. There are liberal approaches in utilizing the choice of flap and flap design as long as the goals are met.

We believe that elevation of the cervicofacial flap in the deep plane makes the flap more mobile and facilitates the repair of larger defects by providing a myocutaneous unit that can survive in the presence of tension that would lead to necrosis of the flap raised in the standard subcutaneous plane and improving its blood supply. Reported complications like the facial nerve injury was prevented with careful dissection. (Figure 6)

This technique is shown to be effective and easy to perform even by a novice surgeon. Aesthetic appearance is acceptable with minimal and avoidable complications.

## RECOMMENDATION

This technique can be used in more subjects. Prospective study on the use of topical nitroglycerin is also encouraged.

**Figure6**

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# EAZY WIRELESS
# WIRELESS APPLICATION IN ENT*

RICHARD JOSEPH M. VILLARDO MD**
FERDINAND G. PAMINTUAN MD, FPSO-HNS***

## ABSTRACT

***Objective:*** To develop a locally assembled alternative imaging platform with wireless capability in Otorhinolaryngology
***Design:*** Descriptive
***Setting:*** University based tertiary hospital
***Materials and Methods:*** An imaging source (Video-otoscope, DZ Cam, camera) with RCA/S-video output was acquired. The output cord was then inserted to a commercially available SONY video camera unit with USB and/or FireWire output. A USB cable was then connected between the SONY video camera unit and the desktop PC/laptop with wireless adaptor. A separate receiver (a Pentium IV-class desktop PC/laptop with wireless capability) was then assembled and configured to receive the incoming wireless signal from the SONY video camera-wireless PC/laptop unit in different locations. Output (print, file storage, videoconferencing and internet transmission) was then determined.
***Results:*** The EAZY WIRELESS Unit provided the same information a STORZ Endovision Unit will give. The imaging was adequate and there was no degradation of image quality. In addition, the unit was unencumbered by the space and distance limitation of wiring which characterizes the commercially available units. Finally, information is already stored in digital form that lends itself to a wide variety of output options.
***Conclusion:*** The EAZY WIRELESS is a cheaper, mobile, stable and flexible imaging platform in ENT.

## INTRODUCTION

The field of Otorhinolaryngology has been a prime beneficiary of the rapid technological change that have characterized medicine this last century. The advent of antibiotics enabled the control, if not the eradication of infectious diseases.[1] The endoscopic instruments (flexible or rigid), propagated by Stammberger, Storz and Jackson enabled us to have a deeper understanding of the inner workings of the upper aero-digestive tract.[2] Advanced imaging modalities such as the CT-Scan and MRI have revolutionized the diagnosis of diseases that have been previously inaccessible to the ENT surgeon.[3] The operating microscope is now also widely used with its varied applications in ear and skull base surgery as well as of the larynx and the tracheal airway.[4] Even the laser has found its way into the armamentarium of the ENT practitioner.[5]

The common denominator that have enabled much of these technological advances is the birth of the microchip which single-handedly created the information technology revolution. One way or another, whether it is in the design, the precise manufacturing, or the use of the computer's inherent mathematical capability, information technology has a great and profound impact on the continued advancement of medicine.

The latest breakthrough in IT is the wireless transmission technology. Wireless makes use of radio spectrum to transmit signal from one point to another using an exact standard-based set of protocols.

This standard – called as the IEEE 802.11 standard was developed by the Institute of

*Third Place, PSO-HNS Poster Session on Surgical Innovation Contest, 47th PSO-HNS Annual Convnetion, December 2, 2003, Westin Phil. Plaza Hotel, Manila
** UST Hospital-ENT Dept., 4th yr. resident
***UST Hospital-ENT Dept., Vice -Chief-of-Section, Facial, Plastic & Maxillo-Facial Section

Electrical and Electronics Engineers. Any machine or device operating within this standard can "talk to another", and exchange data without using wires – the so-called "wireless networking". Its latest version and the current market standard – the IEEE 802.11b, is the next generation of wireless networking and has the following features: a 11 Mbps transmission speed, offers wired equivalent protection, and can also connect to wired networks. It operates in the 2.4 GHz radio spectrum and sends its signals, or "Ethernet packets" via radio waves.[6] Any hardware device that adhere to this standard, regardless of their origin of manufacture is assured of the reliable transmission of wireless data.

## OBJECTIVE

### General Objective

The objective of this design is to develop a locally assembled alternative imaging platform with wireless capability in Otorhinolaryngology

### Specific Objectives:

1. To demonstrate the stability and reliability of wireless data transmission.
2. To demonstrate the availability of cost effective wireless technological applications relevant to Otorhinolaryngology.

## MATERIALS AND METHODS

An imaging source (Video-otoscope, DZ Cam, camera) with RCA a nd/or S-video output was acquired. The RCA/S-video cord was then inserted to a commercially available SONY video camera with USB and/or FireWire output. A USB cable was then connected between the SONY video camera and the desktop PC/laptop with wireless adaptor, rendering the unit capable of wireless transmission. A separate receiver (a Pentium IV-class desktop PC/laptop with wireless capability) was then assembled and configured to receive the incoming wireless signal from the SONY video camera-wireless PC/laptop unit within the room and afterwards, from a separate room that was within the same floor of the same building. The device was then tested. Output type (print, file storage (CD-ROM, floppy), videoconferencing and internet transmission) was detemined.

## RESULTS AND DISCUSSION

The primary use of the EAZY WIRELESS is the simplified transmission of a patient's image data (telescopic examination of the upper aero-digestive tract and the ear) and its storage to a readily changeable digital format for later retrieval, on an outpatient basis. Examining the test subjects using any imaging modality with an RCA/S-video output jack (Video-otoscope, DZ Cam, camera) greatly simplified matters for this is the type of output most prevalent in a wide variety of audio-visual equipments. It was also a prime consideration in choosing the SONY video camera as the interface for image processing. Its wide feature set (Table 1) and user-friendly capabilities ensure that the data will be organized in the preferred digital format used by the wireless enabled desktop PC/laptop connected to the SONY video camera.

The immediate relief felt by the examiner unburdened by the wires of commercially available endoscopy units was readily apparent. The wires was replaced by the RCA/S-video cord and jack. However, the shortness of the RCA cord proved to be a limiting factor; fortunately, the error was corrected by purchasing a longer cord.

The transmission capability was then tested in two ways: first, by testing the signal strength and signal quality in real time between a Television attached via RCA/S-video cord to the SONY video camera and the desktop PC/laptop wireless receiving unit.

There was no inconsistency with regards to image quality of the two. Image transmission was fast. The same procedure was then also used with the desktop PC/laptop wireless receiving unit located at an adjoining room. In this case, there was a slight degradation in image quality with noticeable slight lags in transmission strength.

The image file was then stored in the PC's hard drive for later output as a CD-ROM, floppy, VHStape, printed file, e-mail or which can be re-send again to another wireless receiver unit for Telemetry/Video-Conferencing.

Despite its potential, wireless networking has its limitations. In indoor applications, 11 Mbps transmission speed can be achieved at distances up to 150 ft., with 5.5 Mbps transmission speed from 150-250 ft. These numbers are not absolute, but more of a potential, for interference caused by physical barriers, such as walls, doors and windows and by other electronics, such as cordless phones, motors, and microwave ovens, will affect transmission speed and distance. The effect of concomitant cellular phone use on signal transmission has not been evaluated. The shorter the distance and the fewer the barriers the better the wireless network will operate.[6] For optimal performance in longer distances or environments with many physical barriers, installing a repeater

or "bridge" for the signal can be used.

The primary benefits that the field of Otorhinolaryngology can derive from wireless technology relates to the field of outpatient care and in terms of continuing medical education. In the former, one cannot doubt the great impact on the patient and their relatives when they can simultaneously evaluate the diagnostic and treatment process in real-time, whether in the outpatient clinic or in the operating room. In this way, the patient is empowered and greater empathy and understanding can be developed between the patient and the caregiver, thus, strengthening the doctor-patient relationship, which is much maligned these days. Hopefully, this much hoped for development would lead to a lesser degree of litigation. For the former, it is in the field of continuing medical education that this technology has a much greater impact. The training of medical students, residents or fellows in the field of Otorhinolaryngology, or in other allied specialties, would be enhanced by the simultaneous, real-time demonstration of a particular operating procedure, whether it be a new, pioneering technique or a difficult and rare procedure, to a much wider audience. In this way, they can benefit too and not only the assistant surgeons. In the outpatient setting, numerous monitors could be arranged in such a way that the consultants, residents, and even the patients and their relatives could monitor and be made aware of difficult cases. Thus, presentation to subspecialty consultants will be more efficient and meaningful. When the wireless network is extended properly, the simultaneous sharing can be extended to others institutions too. Interhospital/Interdepartmental Grand Rounds, Research Presentations/Contests, Roundtable Discussions, Product Presentations are just some of the possibilities. And finally, the ultimate expression of the promise of wireless networking in Otorhinolaryngology is in the use of the Internet as the medium for sharing of knowledge. With the Internet, we can reach out to a much greater audience, particularly, our fellow practitioners in the provinces with whom we can share our clinical experiences and refer patients to appropriate practitioners and/or institutions.

**TABLE 1: SONY Video Camera (Digital HandyCam-DCR PC-115) Specifications**

| |
|---|
| 1.55 megapixels CCD |
| Precision LCD Monitor |
| Dual Media: MiniDV and Memory Stick |
| Infolithium battery (7 hours battery life) |
| 1,360 x 1,020 size still picture |
| MPEG movie function |
| 530 lines horizontal resolution |
| USB and Firewire output capability |
| Small form factor |
| DC 7.2V |
| 120X Zoom capability |

**TABLE 2: Feature Set Comparison between EAZY WIRELESS and a commercially available STORZ Endovision Unit**

| | EAZY Wireless | STORZ EndoVision |
|---|---|---|
| Cost | P10,000++ | P100,000++ |
| Data management | Computer stored | VCR |
| Availability | Readily available | Imported |
| Clarity | Clear | Clear |
| Weight | Lighter | Heavier |
| Stability | Stable | Stable |
| Ease of use | User friendly | Technical |
| Electrical interference | Possible | None |
| Comfort | Light | Light |
| Installation | Plug and Play | Cable intensive |

**Recommendations:**

1.) A locally designed and assembled system can be created to replace the SONY video camera system as the "interface" that converts the RCA/S-video output to a digital form.
2.) A longer RCA/S-video cord.
3.) A longer antennae for the wireless unit to enable wireless transmission to a greater distance.
4.) A single-unit mounting rack to hold all the components together can also be developed.
5.) Lastly, error correction software for greater picture quality.

## CONCLUSION

The EAZY WIRELESS provided an affordable alternative to the commercially available STORZ Endovision Unit. It is cheaper and uses widely available off-the-shelf components. The unit needs no wires for data transmission. It's greatest strength is that the data is already converted to digital form lending it to a wide variety of output options.

## DEFINITION OF TERMS

*Wireless Adapter* – Device typically installed on computers to communicate to the access point for wireless networking. Used for connecting clients to the access point, which in turn connects clients to the network. Three basic styles are PC card for laptop computers, PCI cards for desktop/tower computers, and USB for any computer that supports USB. Flash card adapters are also available for connecting PDAs to the network wirelessly.[6]

*Bridge* - A wireless bridge is used to extend the distance of a wireless network. It communicates wirelessly with both access points and wireless adapters, and is used to connect wireless segments to wireless segments. It takes the communication from access points and rebroadcasts it to wireless adapters and vice-versa.[6]

*Universal Serial Bus (USB)* – A port in the pc that connects via cable allowing other computer peripherals to be attached to the PC without opening the computer case.[7]

*Bits per second (bps)* – The bandwidth of a data communications frequency, as well as the physical media that supports its transmission, is measured using the number of bits per second.[8]

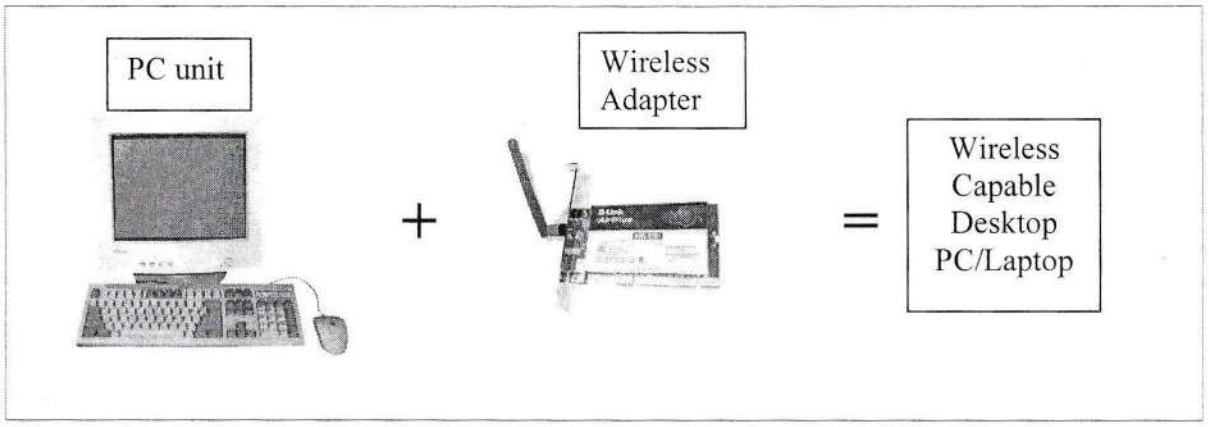


Figure 2: The Wireless capable Desktop PC/Laptop Unit (to be attached to SONY Video camera

Figure 1: USB Cable to be attached to SONY Video camera and Wireless capable Desktop PC/Laptop

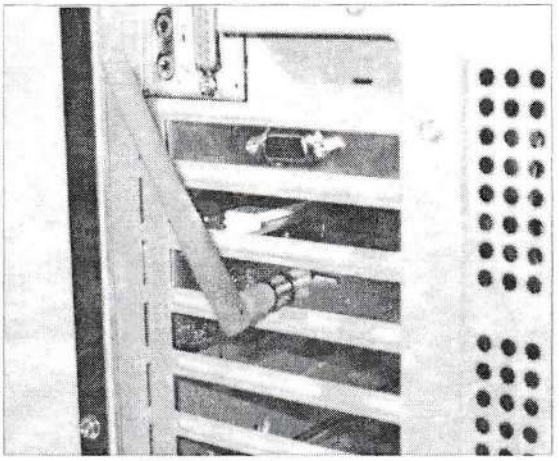

Figure 3: Wireless adapter attached to PC

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# THE MEDIALLY BASED DELTOPECTORAL SKIN FLAP FOR HYPOPHARYNGOESOPHAGEAL RECONSTRUCTION*

ARLENE MARIE R. CAYETANO, MD**
ARMANDO M CHIONG JR.,MD, FPSO-HNS***

## ABSTRACT

OBJECTIVE: To present and evaluate the usefulness of the Deltopectoral cutaneous flap as a means of reconstruction of the hypopharynx and cervical esophagus.
DESIGN: Descriptive
SETTING: Tertiary hospital
CONCLUSION: Any reconstructive procedure after total laryngectomy should take into consideration that more than half of the patients will die from tumor recurrence. The goal therefore is to perform an adequate procedure that guarantees a reasonable quality of life. The reconstructive procedure performed still satifies the requirements for a good reconstructive procedure in cancer surgery. Its availability, dependability, accessibility still makes the deltopectoral flap a good treatment modality in any form of reconstruction of the head and neck area and to most surgeons at any setting.

Using the deltopectoral flap is still a valuable material because of its steadiness especially for patients who have background disorders such as diabetes and malnutrition. Of course, the selection of the type of flap to be used should be made in accordance with the region of the reconstruction, its size, sex and individual considerations. The deltopectoral flap meets almost all of these requirements with a few exceptions.

## INTRODUCTION

Cervical esophageal reconstruction in patients who have undergone cancer surgery has always been a challenge for the head and neck surgeon. More often than not, these patients present with the late stage of the disease because of the symptomless growth of lesions of the hypopharynx and cervical esophagus. They are often debilitated and in a poor nutritional state. The neophyte surgeon is then faced with a challenge of not just giving an ideal reconstructive procedure but also one which can provide a solution with low mortality and morbidity, short duration of hospital stay and to provide a successful early oral alimentation.

History would show that it was Czerny in 1877 who was the first to have performed the first recorded pharyngo-esophageal reconstruction using a local cervical skin flap. It was in 1886 where the first report of reconstruction on the cervical esophagus was done by Mikulicz for a fistula that was created after a cervical esophagectomy. Since then, numerous reconstructive procedures have evolved with regards to cervical esophageal reconstruction. Such reconstructive procedures have taken the form of using free tissue grafting and internal stenting in the 1940's to 1950's by Negus. The use of local mucosal flaps and autografts were done by Som and Hiranandan. Wookey was the first to attempt at reconstructing circumferential defects of the hypopharynx and cervical esophagus in 1942. Jejunal autografts, colon transposition and gastric pull-up gained popularity in the mid-1950's. It was in 1965 when Bakamjian made a breakthrough by using a tubed deltopectoral flap in esophageal reconstruction. This paved the way for other surgeons to develop and refine other reconstructive procedures in head and neck surgery which involved defects from the hypopharynx to the cervical esophagus. Today, these reconstructive procedures involve the use of the pectoralis major myocutaneous flap by Ariyan and Baek, radial forearm free flap by Harii, lateral thigh flap by Baek.

With the numerous modern surgical management options given to us which have been tested and proven effective, our institution would

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**Resident, Department of Otolaryngology-Head and Neck Surgery, Ospital ng Maynila Medical Center
***Consultant, Department of Otolaryngology-Head and Neck Surgery, Ospital ng Maynila Medical Center

like to share its experience with the use of the deltopectoral flap as a means of reconstructing circumferential defects involving the hypopharynx and cervical esophagus. This is a first for our institution.

## OBJECTIVE

To present and evaluate the usefulness of the Deltopectoral cutaneous flap as a means of reconstruction of the hypopharynx and cervical esophagus.

## CASE HISTORY

R.D., 56 year old male, married, from Zamboanga sought consult for his hoarseness which started one year ago with associated weight loss, body malaise and easy fatigability. He consulted an ENT specialist in his province. Indirect laryngoscopy which revealed a mass occupying the area of the cords, neck nodes were palpated. He was advised videostroboscopy. Patient was then referred to another ENT specialist in Manila where CT scan of the neck and videostroboscopy was done. Tracheostomy was also performed. Results of the CT scan revealed carcinoma of the larynx with involvement of the left pyriform sinus, aryepiglottic fold, vocal cord, glottic and subglottic regions. He underwent two biopsies of the larynx which initially revealed laryngeal polyps. The second revealed a granuloma. He was then referred to our institution for further evaluation and management. Suspension laryngoscopy was done and the histopathological report was that of a squamous cell carcinoma of the larynx. He then underwent total laryngectomy with neck dissection. During his hopitalization, he developed massive infection. An emergency debridement was done together with repair of the neopharynx. Despite massive antibiotic coverage for the infection, saliva persisted to drain continuously on the left side of the repaired neopharynx. Subsequently developing a hypopharyngo-cervico-esophageal cutaneous fistula. Being in a poor physical state, nutritional build-up was done to the patient. Four months ago, the patient then was subjected to another major operation for the repair of the fistula. The flap used for the reconstruction was the Deltopectoral flap.

## OPERATIVE TECHNIQUE

Under general anesthesia, the operative site was prepared together with both deltopectoral regions. Skin markings were placed on both deltopectoral regions to identify its landmarks.

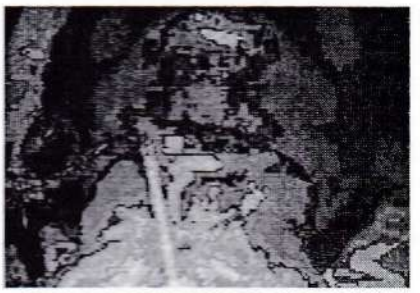


Fig.1- Hypopharyngoesophageal defect

Fig. 2-Skin markings and operative

The first incision was started at the site of the cervico-esophageal fistula which was located at the area of the hypopharynx. Neck flaps were then subsequently developed for proper exposure of the operative field. The esophagus was cleaned very well and the granulation tissue removed. The hypopharyngo-esophageal defect was measured from its most superior to inferior border. The defect measured was 7 cms in its entire length and 3 cms in width. The posterior wall of the esophagus on both sides were undermined to about 4 mm on both sides since it would be the site to where the deltopectoral flap will be attached.

Fig.3 - First Incision

The second incision was done at the site of where the deltopectoral flap would be harvested and was done in the following sequence:

- deltopectoral region was prepped in the usual antiseptic-aseptic technique
- Skin markings were done. The superior border of the flap is the area of the inferior aspect of the clavicle, extending laterally from the sternoclavicular joint. The inferior border is made

parallel to the superior marking, beginning at the 4th intercostal space and crossing onto the shoulder at the level of the apex of the anterior axillary fold. A lateral curvilinear marking over the deltoid connects the previously made superior and inferior markings.

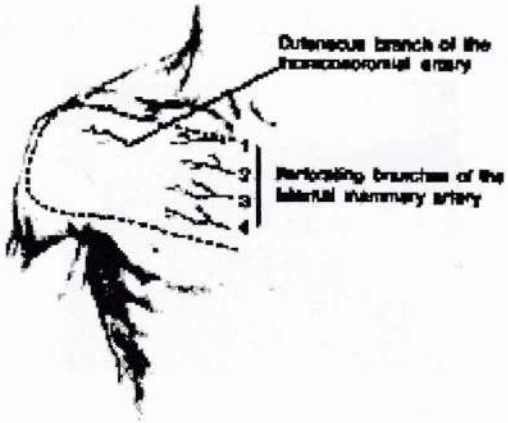
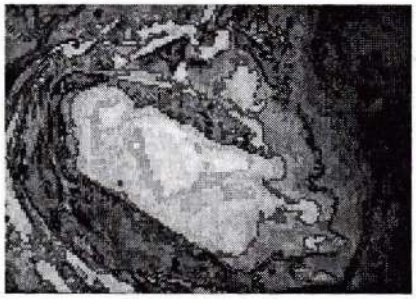



Fig.4 Outline of the deltopectoral flap illustrating vascular supply

➢ The skin incisions were made using a blade no.10 was carried down through the pectoralis and deltoid fascia.

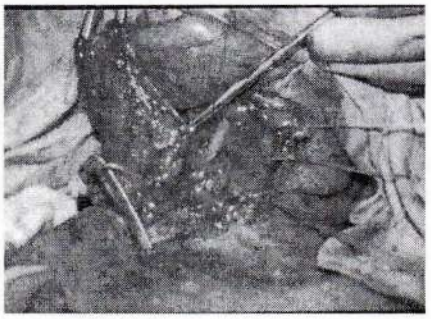
➢ The flap was elevated by sharp dissection from the lateral to medial aspects in a plane deep to the muscular fascia.

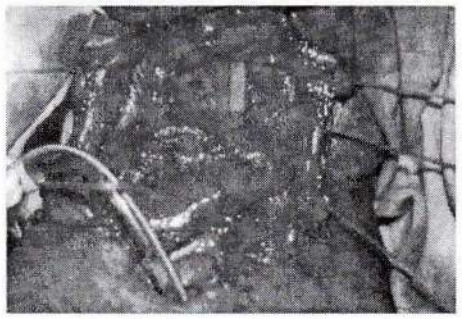
➢ After the flap length was sufficient to reach the recipient site, medial dissection and elevation were terminated to prevent injury to the intercostal perforating vessels.



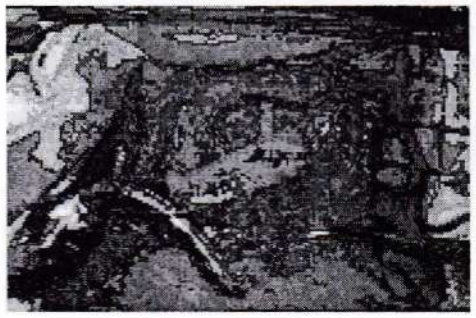
➢ The flap was then tunneled through the inferior limit of the clavicle to reach the recipient site.

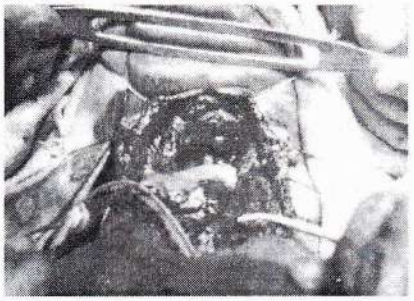
➢ The flap was not tubed on itself. Instead, the flap was laid down on the defect as closure was initiated.





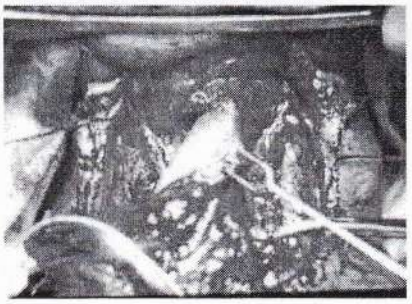
➢ First layer closure was done. The edges of the flap were approximated to the undermined posterior esophageal wall using a Dexon 3-0 with round needle doing an inverted continuous suturing technique in its entire length, starting from the left inferior limit of the esophagus to the hypopharynx then finally to the inferior limit of the right side of the esophagus.

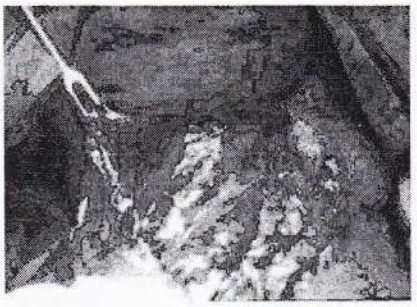




➢ Second layer closure was done like in the manner of closing a neopharynx. Simple interrupted suturing was done using Dexon 3-0 with tapered needle.

➢ A third layer closure was done to ensure stability of the flap to the esophagus.



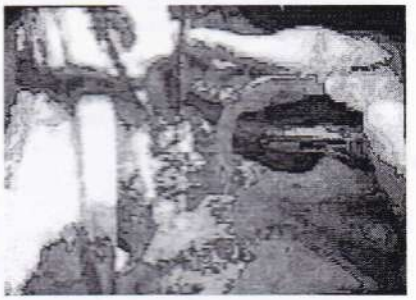


➢ The lower end of the flap was not sutured to the esophageal stump.

➢ A small nasogastric feeding tube was placed for temporary feeding.

➢ Donor site was then secured with tacking sutures using chromic 3-0 with round needle.

➢ Hemostasis done and sterile dressings applied.



Saliva flow was diverted to the anterior chest wall since a second stage procedure was contemplated. The flap was then amputated after two weeks to make sure sufficient donor uptake and neovascularization from the flap to the hypopharynx and cervical esophagus. The distal portion of the flap was anastomosed to the lower esophageal stump.

## DISCUSSION

Bakamjian's introduction of the deltopectoral flap as a means of reconstruction in head and neck surgery was a major milestone. The use of this flap became the standard for reconstruction for more than a decade. Old as it may be, the deltopectoral flap still remains a useful and important armamentarium in head and neck surgery.

The deltopectoral flap is a type of cutaneous flap that used to be the mainstay of head and neck reconstruction before the advent of myocutaneous flaps. Their main use now is in the reconstruction of skin loss. It provides an added bulk as well as their own vascularity, which not only adds protection but also gives them the

ability to survive at difficult recipient sites. They also provide a good color match and does not contract. It is also an indispensible tool in closing fistulas.

The deltopectoral flap is a medially based axial pattern cutaneous flap which receives its blood supply from the first four perforating branches of the internal mammary artery, the thoracoacromial and lateral thoracic arteries also make contributions distally. This flap was once considered as the work-horse of head and neck surgery although now replaced by the pectoralis myocutaneous flap. It is a very reliable and durable skin flap which is located outside the operative field or irradiated field.

Its **Indications** for use are as follows:
1. For replacement of neck and facial skin
2. For closure of pharyngo-cutaneous fistulas
3. For reconstruction of oropharyngeal defects
4. For pharyngoesophageal reconstruction
5. For partial pharyngectomy reconstruction
6. For floor of the mouth reconstruction

Its **Advantages** are:
1. It can be used unilateral or bilateral
2. Its length can be extended up to the tip of the shoulder or behind
3. It has an excellent blood supply with ample venous drainage
4. It is usually non-hair bearing particularly in the deltoid region
5. The donor site is usually hidden, which makes it cosmetically acceptable
6. The flap can be rotated deep or superficial depending on its use
7. The flap can be de-epithelialized or may be split
8. It has a broad reach and its arc of rotation usually does not compromise its vascular supply
9. The flap consists of tissues that has not been preciously violated by surgery or radiotherapy
10. It is very mobile that it can be moved in all planes without compromise of tissue perfusion
11. Its dependent base favors a good venous outflow
12. The flap itself is not too bulky
13. It has an overall success rate of 50%
14. Resumption of oral alimentation is within 79-90 days

Its **Disadvantages** are:
1. Using this type of flap usually requires a second stage operation
2. There is a failure rate of 9-20%
3. A fistula formation is possible of around 58% and stricture formation of about 23-100%

Complications that develop with the use of this type of flap in head and neck reconstruction may be attributable to a number of factors such as injury to the perforating vessels during flap elevation, poor tissue handling, poor tissue turgor, poor post-operative care, presence of systemic disease like diabetes or malnutrition, residual tumor on the site of flap attachment, infection, too much traction on the flap leading to tension necrosis or flap separation, or kinking of the vascular pedicle.

The recent thirty years have brought enormous advances in reconstruction of pharyngoesophageal defects. The early dependence on multiple staged procedures were subsequently replaced by colon transposition, gastric pull-up to microvascular free transfer. With increasing experience with microsurgical reconstruction and free tissue transfer, this new and modern concepts have now become significant tools for reconstruction in head and neck surgery, which have replaced the ever reliable deltopectoral flap. But the choice of reconstruction depends to a great degree on the oncologic needs and patient situation. Who says that the deltopectoral flap has been shelved and totally forgotten as a means of reconstructing hypopharyngoesophageal defects?

We have shown, through our patient, that after total laryngectomy, post-operative hypophyngoesophago-cutaneous fistula still constitutes a most troublesome and challenging problem.

## CONCLUSION

Any reconstructive procedure after total laryngectomy should take into consideration that more than half of the patients will die from tumor recurrence. The goal therefore is to perform an adequate procedure that guarantees a reasonable quality of life. The reconstructive procedure performed still satifies the requirements for a good reconstructive procedure in cancer surgery. Its availability, dependability, accessibility still makes the deltopectoral flap a good treatment modality in any form of reconstruction of the head and neck area and to most surgeons at any setting.

Using the deltopectoral flap is still a valuable material because of its steadiness especially for patients who have background disorders such as diabetes and malnutrition. Of course, the selection of the type of flap to be used should be made in accordance with the region of

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# VOCAL FOLD RETRACTOR*

LEONIDES P. CAYETANO, MD**
JOSE A. MALANYAON, JR., MD, FPSO-HNS***
GIL M. VICENTE, MD, FPSO-HNS****
ANTONIO H. CHUA, MD, FPSO-HNS*****

## ABSTRACT

GENERAL OBJECTIVE: To introduce a new instrument, the Vocal Fold Retractor that provides easy access in examining the subglottic area.
SPECIFIC OBJECTIVES:
1. To present the new instrument; its parts, and its uses.
2. To demonstrate its use in reaching the subglottic area in a cadaver.
3. To present its significance and role in diagnostic procedures of the subglottic region.
MATERIALS AND METHODS: An Allis forceps was modified to become a vocal fold retractor. It was measured, cut, bent, and adapted to fit the usual adult laryngoscope used in microlaryngeal surgery. A pair of lid retractors was used as tips and serve as the retractor for the vocal folds. The stainless steel screw and a ruler was placed on the cut handle to allow precise control while opening the retractor end, and to measure the glottic opening during vocal fold retraction. A stainless steel clip was placed under the Allis forceps to prevent slipping from the laryngoscope during examination.
RESULTS AND METHODS: Direct laryngoscopy was done on four adult cadavers. The vocal fold retractor was introduced inside the laryngoscope and was placed in between the vocal folds. While turning the vocal fold retractor screw in a clockwise manner, gentle retraction of the stainless wire tips led to retraction of the vocal folds allowing maximal exposure of the subglottic area as well as the trachea. Four-millimeter rigid endoscopes sizes $0^0$ and $30^0$ were used for inspection. Full visualization of the inferior side of the vocal folds was achieved.
CONCLUSION: The Vocal Fold Retractor offer access and proper evaluation of the subglottic area. This simple and easy to use instrument will provide more space for good visualization, good accessibility and full inspection of masses and other suspicious lesions in this region and the trachea as well.

## INTRODUCTION

When patients come to ENT specialists due to hoarseness, one way of examining is through indirect laryngoscopy. In a sophisticated way, the rigid endoscope or flexible endoscope is used. In the operating room, a laryngoscope aided with an operating microscope will give the best result of laryngeal examination especially the supraglottic and glottic areas.

In cases where the subglottic area is to be examined, the usual vocal fold palpation using hooks does not give satisfactory results because it can only retract one vocal fold at a time (Figure 1 and 2). This brought about the idea of the vocal fold retractor. This instrument is designed with hooks to maximally retract the both vocal folds simultaneously for an excellent subglottic exposure.

*First Place, PSO-HNS Poster Session on Surgical Instrumentation Contest, 47th PSO-HNS Annual Convention, December 2, 2003, Westin Phil. Plaza Hotel, Manila

**Resident, Department of Otorhinolaryngology-Head and Neck Surgery, JRRMMC
***Diplomate, Phil. Board of Otolaryngology-Head and Neck Surgery; Fellow, Philippine Surgeons, President Phil. Society of Audiology; Chairman, Dept. of ORL-HNS, JRRMMC
****Diplomate, Phil. Board of Otolaryngology-Head and Neck Surgery; Fellow, Philippine Surgeons; President, Rhinology Study Group; Section Head, Rhinology Dept. of ORL-HNS, JRRMMC
*****Diplomate, Phil. Board of Otolaryngology-Head and Neck Surgery; Fellow, Philippine Surgeons; Vice-Chairman, Dept. of ORL-HNS, JRRMMC

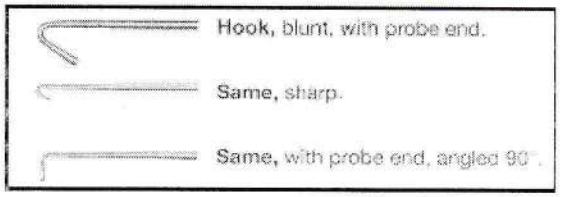


**Figure 1. Hooks used for vocal fold retraction**

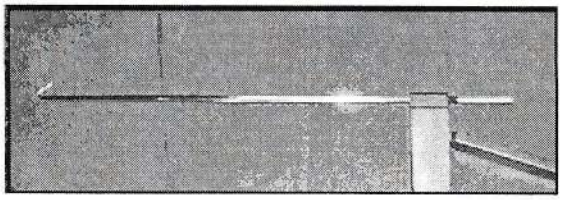

**Figure 2. The hook with the handle.**

## SIGNIFICANCE

This innovative vocal fold retractor will provide excellent exposure of the subglottic area in post-tracheostomy patients. Procedures like biopsy of lesions or tumors found in the subglottic area that are usually inaccessible to routine direct laryngoscopy procedures may be easily visualized using this instrument. Furthermore, this instrument can be used in tethering the true vocal folds and as an adjunct in diagnosing subglottic narrowing when bronchoscopy instruments are not available.

## MATERIALS AND METHODS

The pattern used for this instrument is a 25 centimeter Allis forceps (Figure 3).

**Figure 3. Allis Forceps.**

The Allis forceps, with its long, slender body and fine, short, small fan- like tips is perfect in reaching deep and narrow surgical sites making it the instrument pattern of choice. Furthermore, It is made of stainless steel making it highly resistant to rust and corrosion.

The Allis forceps was then modified to become a vocal fold retractor. (Figure 4 and 5) It was measured, cut, bent, and adapted to fit the usual adult laryngoscope used in microlaryngeal surgery (Figure 6).

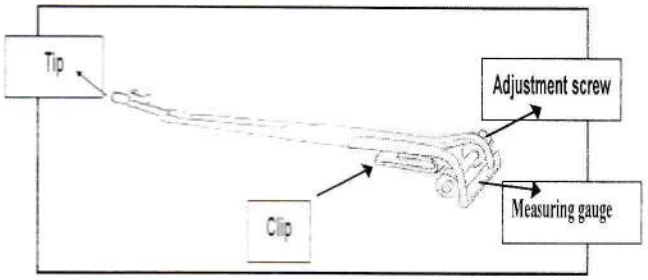


Figure 4. Schematic drawing of the Vocal fold Retractor.

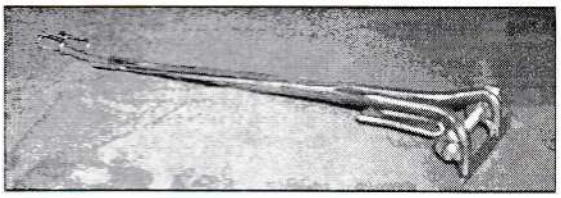

Figure 5. The Vocal Fold Retractor.

Figure 6. The vocal fold retractor fitted to an adult laryngoscope

The Allis forceps was cut from its tip and a pair of lid retractors was then attached to it that will serve as the retractor for the vocal folds (Figure 7). The handles were also cut and bent to allow better manipulation of microlaryngeal forceps and other instruments. A stainless steel screw and a measuring gauge was placed on the cut handle to allow precise control while opening the retractor end, and to measure the glottic opening during vocal fold retraction. A stainless steel clip was placed under the allis forceps to prevent slipping from the laryngoscope during examination.

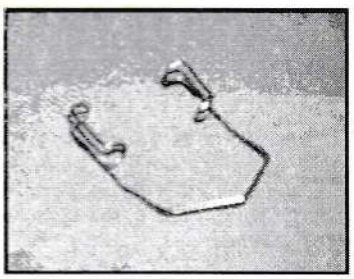

Figure 7.The lid retractor, used as vocal fold retractor tip.

## RESULTS AND METHODS

Direct laryngoscopy was done on four adult cadavers. The laryngoscope was inserted to the right side of the anterior two thirds of the tongue, the tip being directed toward the midline, identifying the epiglottis and exposing the vocal folds[1]. Application of the laryngeal suspension followed. The vocal fold retractor was introduced inside the laryngoscope and its stainless wire end was placed in between the vocal folds (Figure 8 and 9). While turning the vocal fold retractor screw in a clockwise manner, gentle retraction of the stainless wire tips led to abduction of the vocal folds allowing maximal exposure of the subglottic area as well as the trachea (Figure 10). Four-millimeter rigid endoscopes sizes $0^0$ and $30^0$ were used for inspection (Figure 11). Full visualization of the inferior side of the vocal folds was achieved (Figure 12).

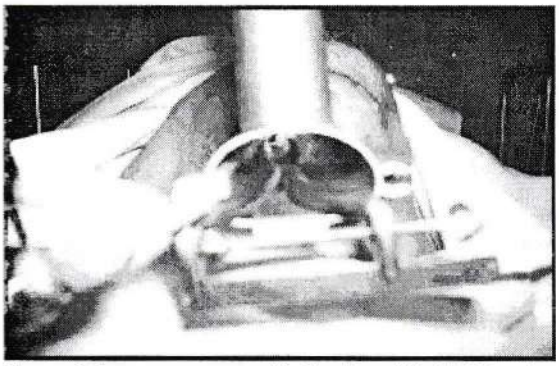

**Figure 8. Laryngoscope with the Vocal Fold Retractor**

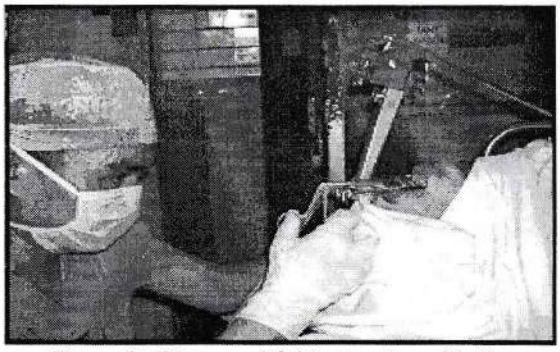

**Figure 9. The vocal fold retractor with the microlaryngeal forceps.**

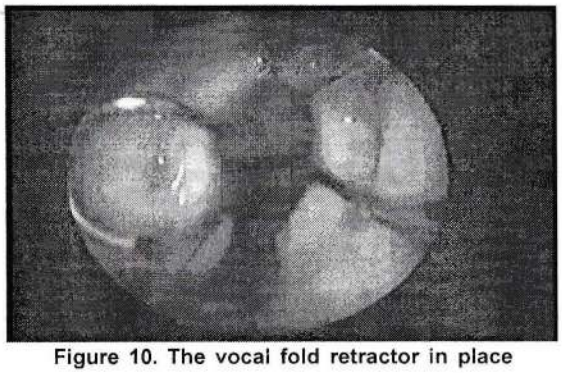

**Figure 10. The vocal fold retractor in place**

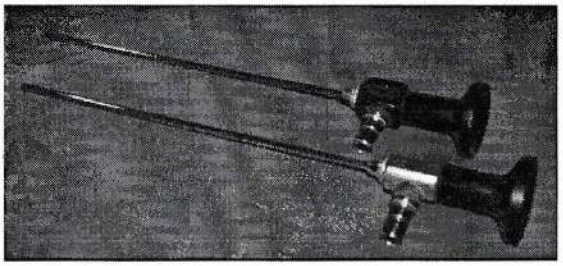

**Figure 11. The 4mm. rigid endoscopes, $0^0$ and $30^0$**

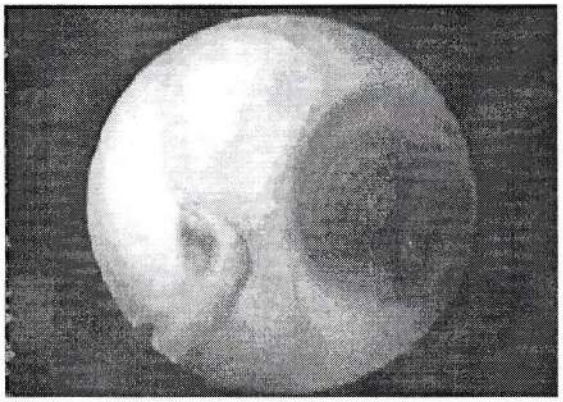

**Figure 12. The vocal fold retractor showing the subglottic area and the trachea.**

## DISCUSSION

Within the last few decades, improved instrumentation for laryngeal examination has become available. The first instrument popularized was the rigid telescope. These instruments were often linked to videostroboscopic system, and clear magnified images of such systems were a great advance over the mirror examination for viewing the larynx [2].

Angled endoscopes allowed surgeons to explore more the macroscopic tumor characteristics. These telescopic imaging techniques improved access and visualization, facilitating removal of lesions when access to the anterior commissure and subglottis were limited [3]. Tumors in the inferior side of the vocal folds can be obstructive or non-obstructive, ulcerative or infiltrative, indurated or friable which bleeds easily and good exposure of the lesion is needed.

The introduction of this new vocal fold retractor that will be used in combination with rigid endoscopy or with microlaryngoscopy hopes to answer these problems. The accessibility in subglottic area will provide better diagnostic evaluation of its lesions. The skills and knowledge of the surgeon however is still important for excellent results.

The vocal fold retractor is a simple instrument made from Allis forceps, which is

cheap and readily available. The eyelid retractor used as tips in this instrument provides atraumatic and safe retraction of the vocal folds. In addition, while using this instrument, the actual glottic opening can also be measured.

The length of this instrument was designed based only in a 17cms. long adult laryngoscope and therefore its use with other sizes of laryngoscope is limited but it can be modified accordingly.

## CONCLUSION

Endoscopes offer access to regions formerly difficult or impossible to explore clinically and permit evaluation of a particular tumor or region from different angles, allowing multiperspective and three-dimensional reconstruction of the lesion [4]. Together with these facts, this simple and easy to use vocal fold retractor will greatly improve subglottic examination. This will provide more space for good visualization, good accessibility and full inspection of masses and other suspicious lesions in the subglottic area and trachea as well.

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# LOW COST VIDEO FRENZEL GOGGLES (LCVFG)*

JASON R. GUEVARRA, MD**
CHARLOTTE M. CHIONG, MD, FPSO-HNS***

## ABSTRACT

Frenzel lenses is an important tool in vestibular pathology evaluation. It contains lenses that magnify patient's eyes but deny the patient of visual fixation so as not to suppress nystagmus. Complete suppression of visual fixation, enhanced imaging, and recordability of images can be achieved with Video Frenzel Goggles. Commercially available video-eye movement recording systems/ video frenzel goggles are very expensive and not readily available. A low cost video frenzel goggles was made out of locally available materials. The video system was provided by a detachable web camera which can be connected to any Personal Computer to produce the image. The Low Cost Video Frenzel Goggles (LCVFG) proposed in this study was comparable to the commercially available video frenzel system in terms of function, weight, comfort and ease of execution of the vestibular tests.

## INTRODUCTION

In the evaluation of a patient complaining of dizziness or vertigo, one of the standard tests involves asking the patient to look in different directions while the clinician observes the patient's eyes. This to detect an abnormal eye movement called nystagmus. In the normal clinical environment, only patients with acute vestibular problems will exhibit this particular symptom since their eyes will be held steady by observation of the surroundings(1). A much more sensitive test is to do this in darkness and there are several methods by which the patient's eye movement can be detected. The best method of achieving this is to use an electronystamograph. An infrared viewer, or Frenzel glasses also allow a subjective assessment of eye movement(2)

Frenzel glasses comprise of a pair of lenses with high diopter lenses(+20 lenses placed in front of the patient) and a lighting system (two small bulbs built into the frames)(2) This serves two purposes: one, significant magnification of the wearer's eyes, which allows the clinician to observe any discrete nystagmus; two, prevents the wearer from observing and fixating on the surrounding environment. This is advantageous because nystagmus, and especially nystagmus caused by a peripheral vestibular lesion, often appears or becomes more intense when visual fixation is removed(3).

Frenzel glasses are less expensive and do not require a totally dark environment compared to electronystagmograph and infrared viewer, although subdued lighting in the room enhances the effect(3).

Frenzel glasses alone does not completely eliminate the chance for fixation. In a video frenzel lenses, patient's vision is in total darkness. Infrared light illuminates the eyes and miniature cameras magnify the eye image onto a TV monitor. Moreover, Video systems provide a mechanism of recording the examination. Video goggles eliminate vision entirely, compared to Frenzel goggles which merely obscure vision. Test validity is greatly improved(3).

This technology has revolutionized the field of vestibular diagnosis by improving the validity of the methods, and increasing the chance to observe and record subtle yet pathological eye movement. However, the system is expensive, and adds to the patients' expenses. A standard video-eye movement recording system may cost as much as $4000(2). A low-cost version of these video-eye movement recording systems will greatly benefit otorhinolaryngologist from developing countries in cutting health care costs.

*Second Place, PSO-HNS Poster Session on Surgical Instrumentation Contest, 47th PSO-HNS Annual Convnetion, December 2, 2003, Westin Phil. Plaza Hotel, Manila

**Resident, Department of Otorhinolaryngology, Philippine General Hospital, University of the Philippines, Manila
***Consultant, Department of Otorhinolaryngology, Philippine General Hospital, University of the Philippines, Manila

## OBJECTIVE

To be able to produce a frenzel glasses with video attachment (Low-cost Video Frenzel Goggles) comparable to the commercially available video-eye movement recording systems.

To determine the acceptability of the Low-cost Video Frenzel Goggles (LCVFG) with regards to comfort, weight, video reception, and ease of performing the tests compared to that of commercially available video-eye movement recording systems.

## METHODOLOGY

A. Low Cost Video Frenzel Goggles(LCVFG)

A low cost frenzel goggles was designed from local materials. A Workman Goggles was used. It is made of light plastic material. The plastic eye protector was removed and a lightweight, non-rust aluminum lens frame was placed. This was painted black to provide total darkness during testing. Three tiny light bulbs were used and placed inside the goggles to illuminate the eyes. This is supplied with 12 volts of power from an adaptor compatible to the 220 volts outlet. One meter of wire was provided for ease of movement. The goggles was also provided with an interchangeable video attachment and cover . The cover and video attachment was made of non-rust aluminum and is compatible with the computer web camera. The web camera, is a light-weight spherical camera (Appendix 1) that can be easily attached to the frenzel glasses. The web camera comes with a compact disc installer that can be easily installed in any PC with at least Pentium II or any equivalent thereof. Upon attachment to the PC or laptop with a USB outlet it immediately projects the eye image to the computer screen for visualization during vestibular testing.

B. Commercially Available Video Frenzel Googles

Real Eyes Goggle and Camera (4)

- Camera easily adjusts for interpupillary distance
- Built in microphone for audio recording
- Push button yellow-green fixation light
- External focus knob
- Comfortable, light tight goggle

RealEyes Monocular(3)

Single camera, goggles and optional 13" TV VCR. The camera can be easily moved from one eye portal to the other. The portal covers pivot to enable the examiner to test the patient in total darkness or allow the patient to see.

RealEyes Quad(5)

Quad split screen allows simultaneous display of four independent screens of information. Complete system includes goggles, two cameras, 17" quad monitor, video filter, room camera and VCR.

OptimEyes Portable(5)

For ultimate portability, OptimEyes includes goggles,camera and a compact 8mm VCR with a 4-inch built-inLCD screen and speaker. The complete system packssecurely into a padded carrying bag for transport to bedside or satellite laboratory.

## RESULTS

A low cost video frenzel glasses (LCVFG) was produced. It is composed of illuminated frenzel goggles, power adaptor and attachable web camera. A personal computer(PC) or lap top is needed for projection and data recording. The following parameters were obtained.

WEIGHT

It is a lightweight due to its plastic and aluminum construction. The total weight of the LCVFG with the web camera attached is 250 grams. It is much lighter than the conventional Video Frenzel Googles which weighs 390 grams The weight is crucial to the comfort of the patient and ease of execution of the vestibular tests. A heavy contraption will not be very stable especially during the Hallpike and headshake tests. The goggles could be dislodged during the test.

COMFORT

The plastic material should be soft and pliable enough to provide adequate fit to the patient. The LCVFG is made of plastic with rubber like qualities. The part touching the face is pliable enough. For a patient with a small face and low nasal bridge, the goggles may be too big and uncomfortable in the nasal area, respectively. This is because the goggles came in only one size, and the shape at the nasal area was designed for relatively high-bridge noses. Since the goggles may be large for smaller faces, especially younger patients, complete darkness inside the goggles may not be achieved.

RESOLUTION

The nystagmus may be viewed in the computer screen Though this is not as

comparable to the commercially available video frenzel goggles in terms of resolution and capture of the eye movements during the test. This is due to the fact that web cameras have a transfer rate of 30 frames/second- full motion video, and the computer image is not as fluid as that of the RealEyes - Video Frenzel Goggles. When compared to an ordinary frenzel glasses, the LCVFG provides greater suppression of fixation and a magnified view of the eye movements, which can be recorded.

## DISCUSSION

It is important for the otorhinolaryngologist to evaluate the exact nature of the patient's dizziness or vertigo, because the pathophysiology determines the patient's sensations. Understanding the complaint determines the workup and the specific tests needed(1,6).

There is a need for the different tests to be executed precisely. Nystagmus, is a hallmark in vestibular testing, and is observed in varying degrees among normal and abnormal patients. For example, spontaneous nystagmus is the hallmark of a static imbalance of tonic activity at the level of the SCC-ocular reflexes. When peripheral in origin, vestibular nystagmus is typically suppressed by visual fixation(6) Therefore, to observe vestibular nystagmus, there is a need to eliminate visual fixation by performing the equivalent of a Romberg test for the eyes. This can be accomplished by using Frenzel lenses, which are illuminated magnifying lenses that prevent visual fixation(6,7). Thus many of the vestibulo-oculomotor tests in the office examination are performed with a frenzel glasses with a +20 lenses, which prevent the patient from focusing on objects in the visual surround(5). Another example is during testing for BPPV, wherein the torsional component may be more prominent since the vertical (and the small horizontal) component is more easily suppressed by fixation mechanisms(8)

Elimination of visual fixation could be best accomplished by occlusive ophthalmoscopy, in which the examiner occludes the opposite eye during fundoscopy and observes for spontaneous nystagmus of the optic disk(5,8). This is the basis for video frenzel system, there is no need for the diopter lenses since video frenzel provide the patient with total darkness. Infrared light illuminates the eyes and miniature cameras magnify the eye image onto a TV monitor. And thus test validity is greatly improved. The data can be easily recorded and replayed for further evaluation. Video frenzels can also be utilized during canalith repositioning maneuvers. Physical therapists also find Frenzels goggles useful in vestibular rehabilitation(6).

There is no locally available video frenzel system at this time. There are several international brands that are expensive and need to be imported. This study was able to produce a low cost video frenzel goggles comparable to the commercial video frenzel glasses. The system is simple and uses a web camera attached to a computer. The web camera is very ideal, because it is very light and inexpensive. It can be temporarily attached to the frenzel goggles. Moreover, the images during the vestibular testing can be visualized in the computer, recorded, replayed and stored for further analysis.

The commercially available video-eye movement recording systems such as those sold by Micromedical Technology(Chatham IL, USA) cost around P 220,000 ($4000) (3). In comparison, the LCVFG cost only P2,950 (computer not included). However, the LCVFG is not as complicated as the one sold by Micromedical Technology, wherein images of both eyes can be recorded. This system also comes with a VCR and optional text editor for additional observation and documentation. [4]The LCVFG records only one eye at a time. Unlike the commercial video-eye movement recording systems which have different choices of goggles for specific vestibular testing and rehabilitation needs, the LCVFG can be used in the different vestibular tests. The Micromedical Technology video-eye movement recording systems records each eye separately on one recording, the LCVFG records only one eye, which is sufficient for simple vestibular tests (Spontaneous and lateral gaze nystagmus test, Dix-Hallpike, Head Shake test) If ever there is a need to observe the other eye, the web camera of the LCVFG can be transferred to the other side. One advantage of the Micromedical Technology video-eye movement recording systems is the audio recording device wherein the audio comments of both the test administrator and patient could be recorded.

Both of the systems are easy to use, but the LCVFG provides more portability and need less connections. The LCVFG could be connected to any computer with a USB port. If a lap top is used, it could be brought to any place. In contrast, the Micromedical Technology video-eye movement recording systems is ideal in an office setting because of the T.V. monitors.

Both systems are helpful in training clinicians to recognize abnormal eye movement. Both provides a quick way to examine eye movements, record transient eye movement abnormalities for later review, facilitates observation of nystagmus during

the Dix-Hallpike maneuver and during rehabilitative maneuvers like canalith repositioning maneuvers (9), and enables observation and qualitative analysis of torsional eye movements.

## CONCLUSION

The Frenzel glasses is an important instrument used in the evaluation of patients with vestibular pathology. The video frenzel goggles completely eliminate visual fixation that may suppress nystagmus during the test. Commercially available video-eye movement recording systems/ video frenzel goggles are very expensive and not readily available . The Low Cost Video Frenzel Goggles (LCVFG) proposed in this study is comparable to the commercially available video frenzel system in terms of function, weight, comfort and ease of execution of the vestibular tests. It is a cheap, easy-to-use, and portable alternative to the more expensive commercially available video frenzel system.

## APPENDIX A: SPECIFICATIONS

I. SPECIFICATIONS OF LOW COST VIDEO FRENZEL GOGGLES(LCVFG):

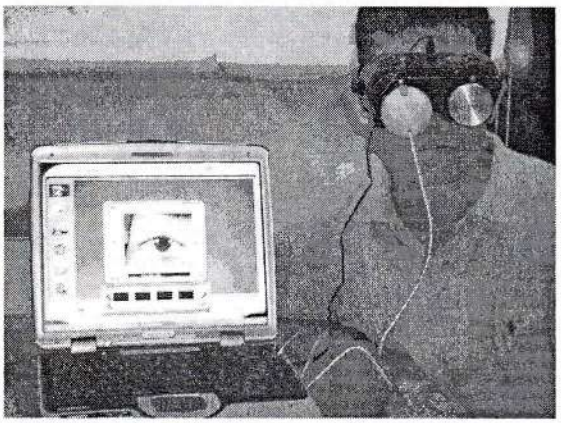

Figure 1.Full set-up: Lap-top and Low Cost Video Frenzel Goggles

Schematic Diagram

**Frenzel Goggles**
- **Size (WxDxH):** 18 x 9 x 7centimeters
- **Weight:** 200 grams
- **Illumination:** three 12 V bulbs

**Adaptor**
- **Weight:** 250 grams
- **Size (WxDxH):** 8.2 x 5 x 5 centimeters
- **Wiring:** 2 meters/ variable
- **Output Power:** 12 volts
- **Input Power:** 220 volts

**Web Camera**
- **Brand:** Genius
- **Platform:** PC, Windows XP compatible
- **Interface:** USB
- **Transfer Rate:** 30 frames/second-full motion video
- **Maximum Pixel Resolution:** 100,000 pixels 352 x 288
- **Field of view:** 52°
- **White Balance:** Automatic
- **Maximum color depth:** 32 bits
- **Still Capture Formats:** BMP, JPEG
- **Maximum AVI frame capture rate:** 30 frames/ second
- **AVI compression:** Yes
- **Weight:** 50 grams
- **Size (WxDxH):** 6 x 6.2 x 7 centimeters

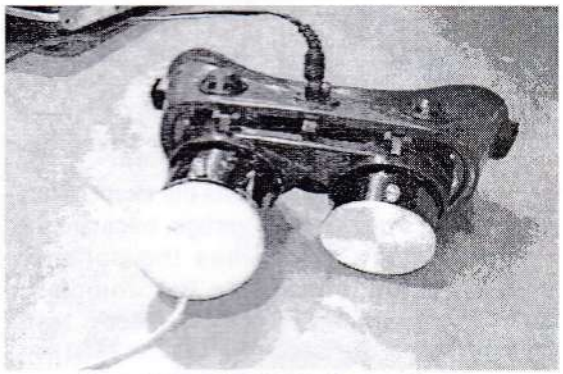

Figure 2: Low Cost Video Frenzel Goggles

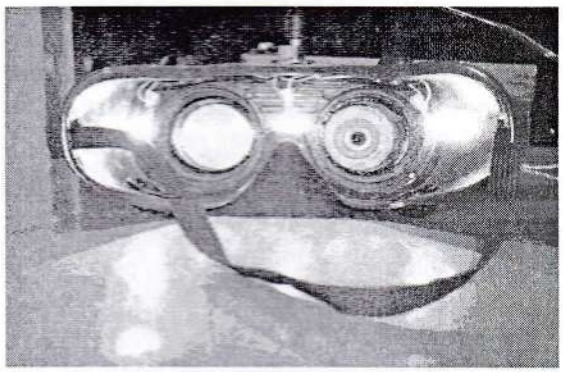

Figure 3: Low Cost Video Frenzel Goggles (Inside View)

II. SPECIFICATIONS OF COMMERCIALLY AVAILABLE VIDEO FRENZEL GOOGLES

**REALEYES GOGGLE AND CAMERA**

GOGGLES
- **Number of video cameras:** TWO
- Light occluded
- **Sensitivity:** 0.01 FC
- **VG-2 LENS (Typical):** 8.0mm f2.0
- **VG-30 LENS (Typical):** 16.0mm f2.0
- **Size (WxDxH):** 6" x 3" x 3" (153mm x 77mm x 77mm)
- **Weight:** 12-14 oz. (340-398 gm)
- **Resolution:** 430 lines typical
- **Input Power:** 12Vdc @ 0.25A maximum;
- **Illumination:** Near IR emitting diodes; 940 nanometers wavelengths typical, Well within ACFIH TLV safety levels for continuous (8 hr) exposure

VIDEO SYSTEMS
- **VCR WITH REMOTE CONTROL**
- **Size (WxDxH):** 17" x 12" x 3.75" (432mm x 305mm x 96mm)
- **Weight:** 9.25 lbs. 4 oz. (4.2 Kg)

**Resolution:** 230 lines typical
**Input Power**:120/240Vac @ 60/50 Hz; 100VA supplied from T-600

**QUAD DISPLAY MONITOR 17"**
**Size (WxDxH):** 16.3" x 15.25" x 15.1" (414mm x 387mm x 384mm)
**Weight:** 37 lbs. 5 oz. (17 Kg)
**Resolution:** 600 lines typical
**Input Power**:120Vac 50/60 Hz 55W

## APPPENDIX B: COSTING

LOW COST VIDEO FRENZEL GOGGLES(LCVFG):

| | |
|---|---|
| **Frenzel Goggles:** | P1000.00 |
| **Adaptor:** | P 500.00 |
| **Web Camera:** | P1450.00 |
| **TOTAL COST:** | **P2950.00** |

MICROMEDICAL TECHNOLOGY VIDEO-EYE MOVEMENT RECORDING SYSTEMS:

**P 220,000.00 ($4000)**

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# ALTERNATIVE PNEUMATOSCOPE: A GOOD SUBSTITUTE TO A COMMERCIALLY AVAILABLE PNEUMATOSCOPE: A PILOT STUDY AMONG SCHOOL CHILDREN IN STA. CRUZ*

KERWIN MARK L. GUBANTES, MD**
JOSE A. MALANYAON, JR., MD, FPSO-HNS***
ELIAS T. REALA, MD**
KONRAD P. AGUILA, MD**
ARCHIMEDES B. BAGNES, MD**

## ABSTRACT:

Otitis Media with effusion (OME) is one of the most frequent pediatric diagnoses and is also one of the most common indications for medical or surgical intervention in this age group. Pneumatic otoscopy is the standard for physical diagnosis of a middle ear effusion. The present economic instability has caused significant increase in the cost of commercially available pneumatoscopes making it inaccessible to upstart Otolaryngologists. Thus, the idea to come up with a cost-effective, available and safe instrument was formulated. The **objective** of this study is to present an alternative pneumatoscope which has the same effectiveness as the commercially available pneumatoscope. **Methods**: The Alternative pneumatoscope was developed using a commercially available nasal aspirator and IV tubing. This Instrument was initially tested on ENT Residents of a Tertiary hospital and was subsequently tested on Grade schoolers of a local elementary school. A total of 130 ears were tested. Test for validity was done computing for sensitivity, specificity and positive predictive value on both instruments and results revealed no significant difference. **Conclusion:** The Alternative pneumatoscope was as effective as the commercial equivalent.

## INTRODUCTION

Otitis media with effusion (OME) is defined as a disorder characterized by the presence of fluid inside the middle ear with intact tympanic membrane and without clinical signs of infection. This is a common childhood disorder and a frequently suspected illness warranting an ENT referral. It is one of the most frequent pediatric diagnoses and is also one of the most common indications for medical and surgical intervention in this age group. The diagnosis and subsequent treatment decision is based upon the clinician's proper evaluation. The clinician must be able to accurately diagnose OME in order to avoid unnecessary treatment or a delay in diagnosis. Pneumatic otoscopy is the standard for physical diagnosis of middle ear effusion. The pneumatic otoscope allows the observer to directly see the effect of positive and negative pressure on the mobility of the tympanic membrane. In this study, we would like to prove that the alternative pneumatoscope made of readily available, cost-effective and safe materials is as effective as the commercially available pneumatoscope in determining middle ear problems such as Otitis media with effusion which is a common cause of conductive hearing loss in children.

*Third Place, PSO-HNS Poster Session on Surgical Instrumentation Contest, 47th PSO-HNS Annual Convention, December 2, 2003, Westin Phil. Plaza Hotel, Manila

**Resident, Department of Otorhinolaryngology-Head and Neck Surgery, JRRMMC
***Chairman, Department of Otolaryngology, Jose R. Reyes Memorial Medical Center, President, Philippine Society of Audiology

## OBJECTIVES

1. To present an alternative pneumatoscope that is made of indigenous materials which is cost-effective, readily available and safe
2. To validate such an instrument by determining the sensitivity, specificity and positive predictive value in comparison with the commercially available one

## MATERIALS AND METHODS

The selection of materials used in the creation of the alternative pneumatoscope was based on cost effectiveness, availability and safety. A rubber nasal aspirator was chosen to be the bulb and an IV tubing cut seven (7) inches from the tip will be the conduit (Figure 1). The two components were glued together using an adhesive. The new alternative pneumatoscope was then tested for pressure by connecting it to a mercurial barometer (Figure 3) and the pressure noted after a full squeeze. Likewise, the commercially available pneumatoscope was also tested for pressure and noted. After knowing the pressure gradient of these instruments, we tested the function of the alternative pneumatoscope initially on four (4) ENT Residents who coincidentally are the co-authors of this paper (Figure 4). After some deliberation, the co-authors decided to do a pilot study on grade schoolers. Grade 1 and Grade 2 pupils of Juan Sumulong elementary school in Sta. Cruz were included in the study. The choice of population was such because they are most prone to develop Otitis media with effusion and thus may develop some degree of conductive hearing loss. Informed consent was required. The students were divided into 2 groups randomly. The first group of subjects was tested with the commercially available pneumatoscope (Figure 6) and the second group was tested using the alternative pneumatoscope (Figure 8). Observers were required to note their findings on pneumatic otoscopy and report it as whether with good mobility or no mobility. Only subjects with intact tympanic membranes were included in the pilot study. Subjects with perforated tympanic membranes, impacted cerumen, or discharging ears were excluded in the study. All subjects included in the study were subsequently tested with a portable tympanometry (gold standard) (Figures 7 and 9). Findings in the tympanometry were compared on the two groups.


**Figure 1:** Indigenous materials such as a rubber nasal aspirator which is readily available in the market and an IV tubing which is widely used in the hospitals are used to create the instrument

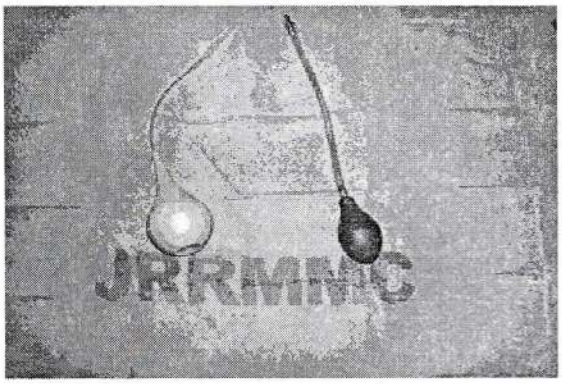


**Figure 2:** The alternative pneumatoscope on the left and the commercially available pneumatoscope on the right head to head

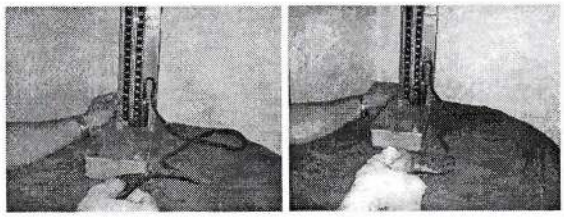

**Figure 3:** The commercially available pneumatoscope on the left and the alternative pneumatoscope on the right being tested for pressure gradient on maximum squeeze. Both instruments yielded almost the same pressure at 30 mm Hg.

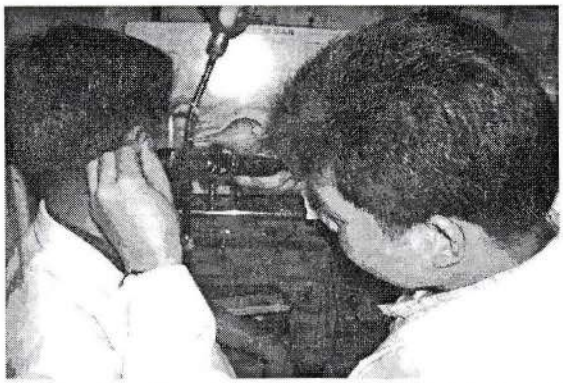

**Figure 4:** The alternative pneumatoscope now being tested on a Resident of Otolaryngology-Head and Neck Surgery of a Tertiary Hospital

**Figure 5**: Instruments used in the Pilot study
1. Welch Allyn Microtymp 2 Portable Tympanometric instrument
2. The alternative pneumatoscope
3. The commercially available pneumatoscope

**Figure 6**: One of the subjects of the Pilot study who belonged to the group whose ears were tested with the commercially available pneumatoscope

**Figure 7**: After being tested with the commercially available Pneumatoscope, the subject then proceeds to another observer to undergo Tympanometry using a portable Tympanometric machine

**Figure 8**: One of the subjects of the Pilot study who belonged to the group whose ears were being tested using the alternative pneumatoscope

**Figure 9**: After being tested with the alternative pneumatoscope, the subject would then proceed to another observer to undergo Tympanometry using a portable Tympanometric machine

Validity tests were done computing for the Sensitivity, Specificity and Positive Predictive values on both groups.

## RESULTS

One hundred thirty-four ears were tested from seventy four (74) subjects were tested. Age ranges from 6 to 8 years old. There were 31(42%) males and 43(58%) females were included in the study. There were 70 ears from 37 patients who were examined using the alternative pneumatoscope (Table 1) and 64 ears from 37 patients were examined using the commercially available pneumatoscope (Table 2). Fourteen ears were excluded from pneumatic otoscopy because wax impaction rendered visibility of the tympanic membrane impossible.

**Table 1**
**Alternative Pneumootoscopy vs. Tympanometry**

| | | Tympanometry | | |
|---|---|---|---|---|
| | | **Positive** | **Negative** | **Total** |
| Alternative Pneumo-Otoscopy | Positive | 59 | 5 | 64 |
| | Negative | 1 | 5 | 6 |
| | Total | 60 | 10 | 70 |

Sensitivity: = 98%
Specificity: = 50%
Positive Predictive value = 92%

**Table 2**
**Commercial Pneumootoscopy vs. Tympanometry**

| | | Tympanometry | | |
|---|---|---|---|---|
| | | **Positive** | **Negative** | **Total** |
| Commercial Pneumo-Otoscopy | Positive | 59 | 4 | 63 |
| | Negative | 1 | 3 | 4 |
| | Total | 60 | 7 | 67 |

Sensitivity: = 98%
Specificity: = 43%
Positive Predictive value = 94%

Tests for validity were determine (Appendix A). The sensitivity of the alternative pneumatoscope was 98% as compared to the commercially available pneumatoscope which was also at 98%. The specificity of the alternative pneumatoscope was 50% as against the commercially available pneumatoscope which was 43%. Likewise the positive predictive value of the alternative pneumatoscope was at 92% as against the commercially available pneumatoscope which was 94%.

Total cost of assembly of the alternative pneumatoscope amounted to P70.00. Comparable cost of the commercially available pneumatoscope amounted P900.00.

## DISCUSSION

Pneumatic otoscopy will readily detect the presence of fluid in the middle ear or perforation in the tympanic membrane. This technique should be part of every pediatric ear examination and is often needed for adults. The principle is that of increasing and decreasing air pressure within the external ear canal while visualizing the movement of the tympanic membrane in response to the pressure changes. The aural speculum is attached to a sealed chamber with a glass viewing window for the examiner. The speculum should have a bulbous flare at the end to provide a good seal when inserted into the ear canal. A rubber bulb is attached to the sealed chamber using a short piece of flexible tubing. The bulb is squeezed in order to apply a small amount of pressure in the external ear canal while observing the tympanic membrane. If fluid is present, the tympanic membrane will have an abnormal or no movement at all. If a perforation is present, the tympanic membrane will have no movement. A shifting meniscus will distinguish an air-fluid level in the middle ear from a scar in the tympanic membrane (Adams, 1989). Early stages of middle ear effusion, a meniscus indicating an air-fluid level may be present and this could be accentuated by pneumatic otoscopy ( Hughes, 1985).Otitis media with effusion is one of the most frequently diagnosed pediatric diseases (Silva,1996). The presence of middle ear effusion can impair the ability to hear and develop appropriate language and speech (Grundfast, 1996). It is for this reason that accurate diagnosis and prompt treatment of OME is vital.

Although pneumatic otoscopy is the standard for the physical diagnosis of middle ear effusion, it is a subjective assessment which relies on the skill of the operator (Bluestone, 1996). That was quite evident in our study because though we have high sensitivity for both procedures at 98%, the specificity for the alternative pneumatoscope and the commercially available pneumatoscope was quite low at 50% and 43% respectively. Because of the difficulty with clinical examinations, particularly in less-experienced hands, tympanometry has been recommended as a screening procedure for children especially those in the high risk groups (Northern, 1980).

The importance of conducting this study can be summarized in the words of Dr. Suchitra Prasansuk: "Primary ear care is essential in ear and hearing care made universally accessible to all people, using scientifically sound and socioculturally acceptable methods, and provided at a cost which is affordable for individuals, families, communities, and the nation." That Otitis media is the number one cause of deafness is what prompted us to engage in this study. Added to this is the fact that Otitis media is preventable by providing the necessary information, education, early diagnosis thru the use of pneumatic otoscopy, and prompt treatment.

The choice of the nasal aspirator together with the IV tubing to be used as the raw materials for the creation of the alternative pneumatoscope was very noble. Not only are they cost-effective, they are also readily available and safe to use.

Based on the results of the test for validity, it would appear that the alternative pneumatoscope is a good substitute for the commercially available pneumatoscope in terms of cost-effectivity, availabilty and safety. The socio-economic impact of this study is such that pneumatic otoscopy would be readily available to ENT and Non-ENT physicians of this developing country of ours.

## CONCLUSION

1. A noble alternative pneumatoscope was presented which is made of indigenous materials and was proven to be cost-effective, readily available and safe
2. Test for validity proved that the alternative pneumatoscope is as effective as the commercially available pneumatoscope

## APPENDIX A

### TESTS FOR VALIDITY

| | Pneumatoscope | |
|---|---|---|
| | **Alternative** | **Commercial** |
| **A. Sensitivity** | a/a+cx 100<br>59/60x 100<br>= 98% | a/a+c x 100<br>59/60 x 100<br>= 98% |
| **B. Specificity** | d/b+d x 100<br>5/10 x 100<br>= 50% | d/b+d x 100<br>3/7 x 100<br>= 43% |
| **C. Positive Predictive Value** | | |
| | a/a+b x 100<br>59/64 x 100<br><br>= 92% | a/a+b x 100<br>59/63 x 100<br><br>=94% |

## APPENDIX B

| SUBJECTS Initials/Age/Sex | COMMERCIAL PNEUMOOTOSCOPY | | TYMPANOMETRY | |
|---|---|---|---|---|
| | R | L | R | L |
| A.A /6/M | M | M | A | A |
| J.C/6/M | M | M | A | A |
| C.A/6/M | M | M | A | A |
| A.B/8/M | M | M | A | A |
| R.D/7/M | M | M | A | A |
| J.E/6/M | M | N | A | B |
| A.L/6/M | M | M | A | A |
| A.A/6/M | M | M | A | A |
| D.A/6/F | M | M | A | A |
| R.C/6/F | M | M | A | A |
| C.C/6/F | M | M | A | A |
| R.G/6/F | N | M | B | A |
| A.G/6/F | M | M | A | A |
| L.M/6/F | M | M | A | A |
| M.O/6/F | M | M | A | A |
| D.R/7/F | M | M | A | A |
| T.Y/7/M | M | M | A | A |
| C.G/6/F | M | IC | A | |
| M.Y/6/F | N | I C | B | |
| C.A/7/M | M | M | A | A |
| J.B/8/M | M | M | A | B |
| J.D/7/M | IC | M | | A |
| A.I/8/M | M | IC | A | |
| J.L/7/M | M | M | A | A |
| J.C/7/M | IC | M | | A |
| R.Y/8/M | M | M | A | A |
| T.S/7/M | M | M | A | A |
| A.G/7/M | N | M | A | A |
| E.C/8/F | M | M | B | A |
| N.C/7/F | IC | M | | B |
| F.B/8/F | M | IC | A | |
| M.F/8/F | M | IC | A | |
| N.J/7/F | M | M | A | A |
| G.M/8/F | M | M | A | A |
| M.O/8/F | M | M | A | A |
| N.T/7/F | IC | M | | A |
| I.V/7/F | IC | M | | A |

**Legend:**

M = positive mobility
N = negative mobility
IC = Impacted cerumen
A = Type A tympanogram
B = Type B tympanogram

## APPENDIX C

| SUBJECTS Initials/Age/Sex | ALTERNATIVE PNEUMOOTOSCOPY | | TYMPANOMETRY | |
|---|---|---|---|---|
| | R | L | R | L |
| L.C/6/M | M | M | A | A |
| C.B/8/M | M | M | A | A |
| A.D/6/M | M | M | A | A |
| R.J/6/M | M | M | A | A |
| R.R/6/M | M | M | B | A |
| V.V/6/M | M | M | A | A |
| A.A/7/F | M | M | A | A |
| M.E/6/F | M | M | A | A |
| C.B/6/F | M | IC | A | |
| K.C/6/F | M | N | A | B |
| M.G/7/F | IC | M | | A |
| R.G/6/F | M | M | A | A |
| K.M/6/F | M | M | A | A |
| R.P/6/F | IC | M | | A |
| R.S/6/F | M | M | A | A |
| J.S/6/F | M | M | B | B |
| C.A/7/F | M | N | A | B |
| C.M/6/F | M | N | A | B |
| B.A/6/F | M | M | A | A |
| A.A/7/M | M | M | A | A |
| R.B/8/M | M | IC | A | |
| E.B/7/M | M | M | A | A |
| E.C/7/M | M | IC | A | |
| J.P/7/M | M | M | A | A |
| J.L/7/M | M | M | A | A |
| C.G/8/M | M | M | A | A |
| D.P/7/M | M | M | A | B |
| R.B/7/F | M | IC | A | |
| J.C/7/F | IC | M | | A |
| J.C/7/F | M | N | B | B |
| C.D/8/F | N | N | B | B |
| M.S/7/F | IC | M | | A |
| A.J/7/F | IC | M | | A |
| D.P/8/F | M | M | A | A |
| M.T/7/F | M | M | A | A |
| J.T/7/F | IC | M | | A |
| J.B/7/F | N | M | A | A |

**Legend:**

M = positive mobility
N = negative mobility
IC = Impacted cerumen
A = Type A tympanogram
B = Type B tympanogram

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# TRIGEMINAL NEURALGIA AS THE INITIAL MANIFESTATION OF A PATIENT WITH VESTIBULAR SCHWANNOMA: A CASE REPORT*

WARREN MICHAEL P. LEE VILLANUEVA, MD**
MARY ROSE AIMEE L. DIRECTO, MD**
ALEJANDRO P. OPULENCIA, MD, FPSO-HNS***
ANTONIO H. CHUA, MD, FPSO-HNS***

## ABSTRACT

GENERAL OBJECTIVE: To present a case of a vestibular schwannoma initially manifesting as trigeminal neuralgia.
SPECIFIC OBJECTIVES: A.To review the literature on trigeminal neuralgia as a symptom in cases of vestibular schwannoma. B.To present the pathophysiology of trigeminal in patients with vestibular schwannoma. C.To present both the diagnostic and therapeutic management of trigenimal neuralgia as a manifestition of vestibular schwannoma.
DESIGN: Case Report
SETTINGS: Tertiary, university hospital
PATIENTS: One patient
RESULTS: A 66 year-old male patient presented with trigeminal neuralgia of four years duration. No other associated systoms aside from progressive bilateral hearing loss attributed to aging was noted. Magnetic resonance imaging reveal a left vestibular schwannoma causing trigeminal nerve compression.
Conclusion: Trigeminal neuralgia may be caused by a myriad of disease entities. We presented a case of trigeminal neuralgia as the initial manifestation of a vestibular schwannoma. On work-up, the patient was discovered to have a vestibular schwonnoma causing a left fifth cranial nerve compression, explaining his symptoms.

When confronted with a patient who presents with trigeminal neuralgia and abnormal hearing test, it is recommended that routine audiometric studies and imaging by CT scan or gadolinium-enhanced magnetic resonance imaging be done to rule out the possibility of an intracranial mass causing nerve compression.

## INTRODUCTION

Trigeminal neuralgia is a rare, painful neurological disorder that affects one or more of the divisions of the trigemnal nerve. It is characterized by brief attacks of stabbing pain that van be excruciating. These attacks may be triggered by light touch, shaving, or even eating. This condition is usually considered idiopathic but must be differentiated from other conditions, which are also associated with facial pain.[1]

There are a number of causes of trigeminal neuralgia: pressure from a blood vessel, demyelinization of the nerve as seen in multiple sclerosis, physical damage to the nerve caused by surgical or dental procedures, unknown (idiophatic), or, rarely, pressure from a tumor on the nerve root at the level of the pons. [2,3]

When presented with a 66 year-old male who consults because of a progressive, lancinating, left-sided facial pain (left hemifacial hyperesthesia) of four years, a medical practitioner should ask himself several question: Is this an idiophatic trigeminal neuralgia? Is the pain due to local inflammatory condition? Is the patient's condition due to an extra or intracranial mass? In the presence of coincidental co-existence of an intracranial mass and trigeminal neuralgia, could there be an independent relationship between the two?

Matsuka et al. reports that among patients with trigeminal neuralgia-like symtoms, 6 to 16 per cent are variously reported to have intracranial tumors. [4] Left hemifacial

*First Place, PSOHNS Interesting Case Report Contest, Midyear Convention, April 25, 2003 Waterfront Hotel and Convention Center, Cebu City
** Resident, Department of Otolaryngology- Head and Neck Surgery, UERMMC
***Consultant, Department of Otolaryngology- Head and Neck Surgery, UERMMC

hyperesthesia, however, is an uncommon initial presenting symptom of vestibular schwannoma, and a review of literature shows no similar case having been reported in the Philippines.

This case report aims to present an uncommon case of trigeminal neuralgia as the initial manifestation of a vestibular schwannoma. We will also review the literature, and present the pathophysiology of the condition as well as the diagnostic and therapeutic options in such cases.

## CASE REPORT

A 66 year-old male developed intermittent, pricking pain on the left nasofacial area noted while speaking or eating. The pain would last for a few minutes, spontaneously resolve, then recur with the same character and duration. However, the patient was not awakened from sleep by the pain. Over the succeeding months, left-sided facial pain was progressive in duration and intensity. It was characterized as electric-like, with noted radiation to the left supraorbital area, and was precipitated by light touch. The patient likewise noted gradual progressive hearing loss which he attributed to aging. No tinnitus nor episodes of vertigo were experienced. He consulted a local physician who prescribed Carbamazepine 200 mg TID, which afforded temporary temporary relief. One year later, the pain became excruciating and was no longer relieved by Carbamazepine prompting consultation at our institution.

The medical history of the patient did not reveal any previous illnesses in the preceding weeks. Physical examination of the patient revealed grossly normal ears, nose, oral cavity, and throat with no hyperemia nor tenderness. However, tuning fork tests revealed hearing deficits bilaterally. On Weber test, sound lateralized to the right ear, and on Rinne test, both ears had greater bone condition than air condition, with the left ear being the one with poorer hearing.

Neurological examination showed hyperesthesia along the distribution of the ophthalmic and maxillary divisions of the left trigeminal nerve (Figure 1), as well as a diminished corneal reflex on the left side. No other abnormal neurologic findings well observed.

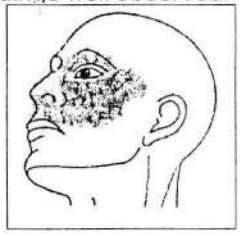

**Figure 1- A diagram representing the pain distribution in the patient.**

A complete blood count and erythrocyte sedimentation rate were requested in order to rule out the possibility that the cause of the neuralgia was due to an inflammatory condition. The results came back normal except for a slightly elevated erythrocyte sedimentation rate.

Because of the impaired tuning fork tests, pure tone audiometry and tympanometry were requested. Results showed a moderate mixed hearing loss in the right ear, and profound sensorineural hearing loss in the left ear. In the right ear speech reception threshold conformed with puretone averages while speech discrimination scored 68 per cent. Speech discrimination could not be tested in the left ear (Figure 2). Because of the impaired audiometric studies, short increment sensitivity index was requested, which showed increased sensitivity of the right ear at 4000 Hz (Figure 3).

Rigid nasal endoscopy was done using a Storz 30° telescope but did not reveal any nasal nor nasopahryngeal masses.

The symptomatology of the patient coupled with the abnormal neurologic and hearing test findings were consistent with an intracranial mass causing left trigenimal nerve compression. Hence, a magnetic resonance imaging of the brain was requested (Figure 4). It revealed a vestibular schwannoma causing compression of the left trigeminal nerve. Upon learning this finding, the patient was then given the option to either undergo stereotactic radiosurgery or open craniotomy for removal of the vestibular schwannoma. Unfortunately, the patient was eventually lost to follow-up.

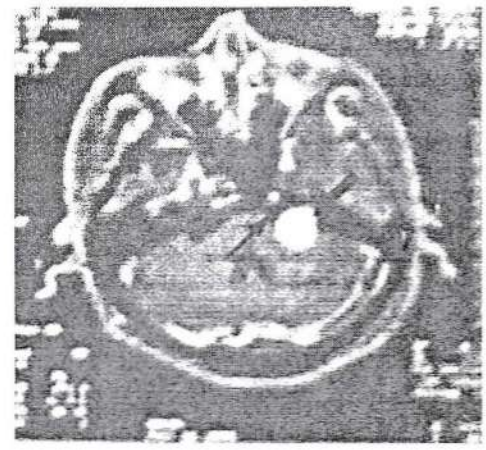

**Figure 4**

Axial cut of a Gadolinium-enhanced magnetic resonance imaging of the brain of the patient shows an enhancing left cerebellopontine angle mass (thick arrow) measuring 1.8 x 2.0 x 1.6 cm extending into and expanding the left internal auditory canal. The mass compresses the cisternal segment left trigeminal nerve. The thin arrow indicates the area of the left trigeminal nerve.

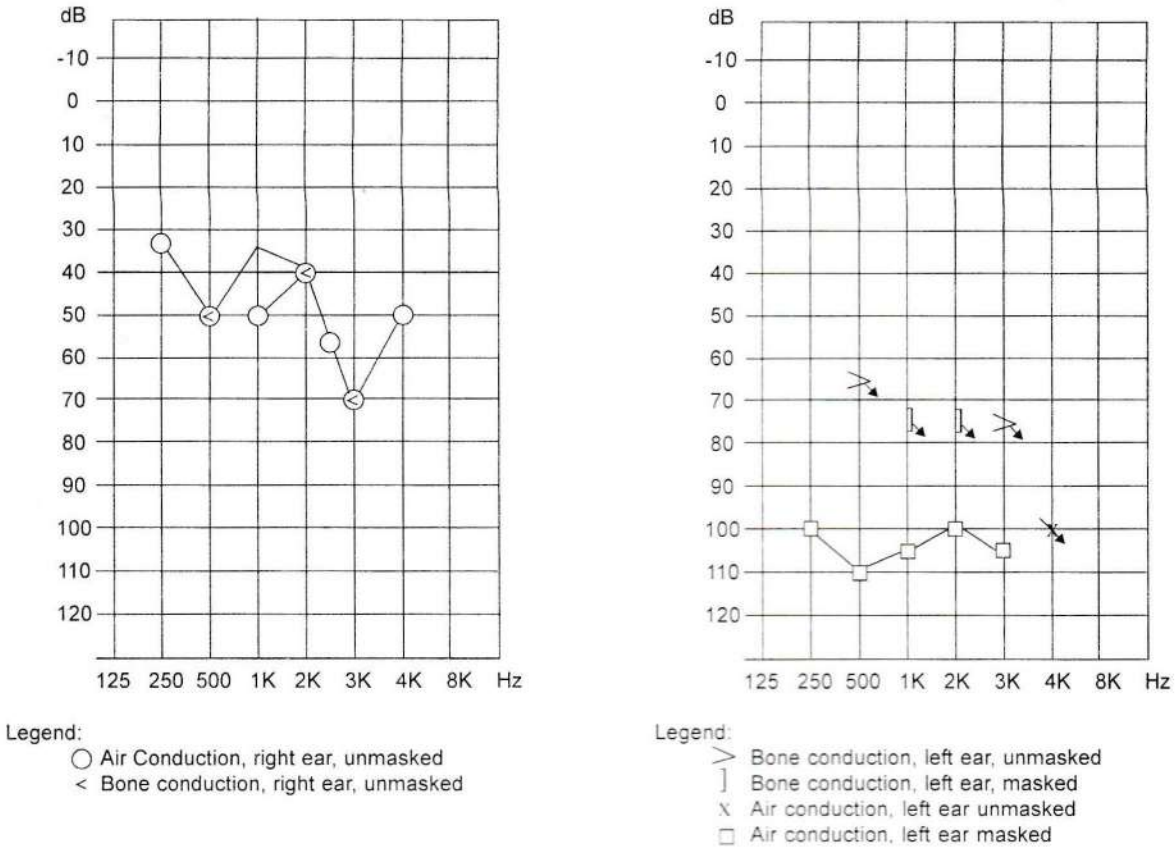


**Figure 2. Pure tone audiometry with tympanometry**

Remarks: Right ear : Moderate mixed hearing loss
Left ear : Profound hearing loss
Speech reception threshold conformed with puretone averages/
Speech discrimination scored : RE: 68% , LE: Could not be tested

SISI

| | Right Ear | | | Left Ear | | | |
|---|---|---|---|---|---|---|---|
| **Freq** | **Int.** | **SISI dB** | **Score** | **Freq** | **Int.** | **SISI dB** | **Score** |
| 1000 Hz | 60 dB | 1.00 dB | 20% | | | | |
| 2000 Hz | 50 dB | 1.00 dB | 20% | | | | |
| 4000 Hz | 80 dB | 1.00 dB | 50% | | | | |
| 500 Hz | 60 dB | 1.00 dB | 40% | | | | |

**Figure 3. Short increment sensitivity index results.**

When a patient presents with unilateral hemifacial hyperesthesia, other causes that may present with facial pain must be ruled out before a diagnosis of idiopathic trigeminal neuralgia is considered. Included in the differential diagnoses are inflammatory conditions which could have radiating pain mimicking trigeminal neuralgia. Compression of the trigeminal nerve by blood vessels or a tumor should likewise be considered.

Is the pain due to a local inflammatory condition? Local causes of facial pain, which include otitis media, sinusitis, herpes zoster, and acute glaucoma, and optic neuritis can be excluded by a careful examination. Absence of a trigger zone for the pain is suggestive of cluster headache (Horton's syndrome). Other neuralgias must be considered. [5] Possible local causes of trigeminal neuralgia in this patient were eliminated by meticulous history taking, physical examination, and by the laboratory examinations.

In the patient, physical examination showed no gross structural abnormalities. Neurologic examination revealed impaired hearing bilaterally, and hyperesthesis along the distribution of the ophthalmic and maxillary divisions of the left trigeminal nerve.

Auditory studies assessed the functional integrity of the auditory system. Routine air, bone, and speech discrimination studies suggested the possibility of a left-sided vestibular schwannoma. Assymetric sensorineural hearing loss or impairment of speech discrimination disproportionate to the pure tone loss required specific investigation for a retrocochlear lesion. [6,7,12] The hearing loss detected by tuning fork tests and quantified by audiometric studies increased the likelihood that the symptoms were caused by compression of the eighth cranial nerve.

Is the patient's condition due to an extra- or intracranial mass? Facial pain may result from a vestibular schwannoma. Trigeminal neuralgia is an uncommon but cetainly not rare manifestation in large tumors. [9]

The trigeminal nerve, the largest cranial nerve, is the great sensory nerve of the head and face, and the motor nerve of the muscles of mastication. It emerges from the side of the pons, near its upper border, in the cerebellopontine angle, by a small motor and large sensory root. [10] It is in this area that, tumors of sufficient size, may cause nerve compression [12], as was seen in the patient presented.

**Figure 5.** View of the brainstem showing the area at which the trigeminal nerve exist the pons in the cerebellopontine angle.

Cerebellopontine angle tumors are the predominant skull base neoplasms that affect the posterior cranial fossa. Vestibular schwannomas account for more than 90% of all cerebellopontine angle tumors followed by meningiomas, which account for 30%. [9]

In the patient presented, imaging studies were performed for definitive anatomic diagnosis. Auditory brainstem response was previously considered the most sensitive to detect even small tumors, with detection rates of 95% to 100%. With the advent of gadolinium-enhanced MRI, ABR false-negative rates have been reported to range from 18% to 30%. [7] At present, computed tomography and Gadolinium-enhanced magnetic resonance jmaging are the principle imaging modalities, and are reported to have 92% to 93% chance of detecting intracranial tumors. [8] In order to confirm nerve compression, a magnetic resonance imaging was requested which revealed a 2 cm vestibular schwannoma causing compression of the left trigeminal nerve.

Growth of vestibular schwannomas generally occurs in three phases: internal auditory canal, cisternal, and brainstem compression. Internal auditory growth results in acoustic and facial nerve compression. As they begin to protrude into the cerebellopontine angle cistern they initially displace cerebrospinal fluid, cranial nerves VII and VIII, and the interior and inferion cerebellar artery. The cisternal component, which is typically globular and centered over the internal auditory canal, may be ovoid or have its center of mass lie above the plane of the internal auditory canal. Tumors which are ovoid in the medial – lateral plane may indent the brainstem to a degree which seems out of proportion to its diameter. Similarly, tumors ovoid in the anterior – posterior plane may attain relatively large size with minimal brainstem compression. Upon contacting the lateral pontine surface, the brainstem compression stage comments. At approximately this time the trigeminal nerve becomes involved (Figure 6). As brainstem compression becomes severe, the fourth ventricle collapses and the hydrocephalic stage begins. While this growth pattern is highly stereotypic, some variations exist. [12] The sensory fibers of the facial nerve may be affected and dysgeusia on the side of the lesion is sometimes reported. The motor fibers of the facial nerve are more resistant to pressure than the sensory fibers, and facial palsy by compression is usually a late complication. [11, 13] Dispacement of the seventh nerve occurs just medial to the cisternal portion.

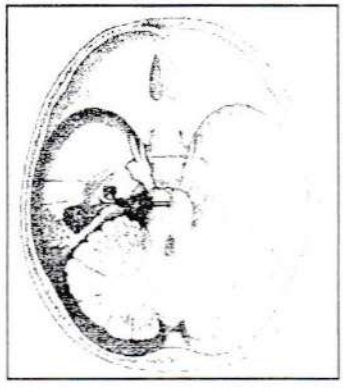

Figure 6.
A diagram illustrating the superior view of a vestibular schwannoma was confirmed by gadolimium-enhanced magnetic resonance imaging.

In the presence of coincidental co-existence of an intracranial mass and trigeminal neuralgia, could there be an independent relationship between the two? The reported clinical symptoms of a vestibular schwannoma are, in decreasing frequency, hearing deficits (60 to 97%), tinnitus (50 to 60%), vestibular disturbance (46 to 59%), numbness or tingling of the face (30%), headache (19 to 29%), dizziness (23%), facial paresis (17%), and trigeminal nerve disturbances (12 to 45%). Although progressive sensorineural is the most common symptom, loss of speech discrimination is characteristic of retrocochlear dysfunction of the cochlear nerve presumably from pressure on the auditory nerve. [4, 5]

Pennarrocha in 1998 reported a case of a vestibular schwannoma which presented as orofacial anasthesia, by compression of the sensory fibers of the facial nerve by the tumor. [13] The Cedars-Sinai Medical Center in April of 2001 reported a case of a 68 year-old man who presented with trigeminal neuralgia, and on further evaluation, had an incidental finding of a vestibular schwannoma on the contralateral side of the brain, but which was not responsible for his symptoms. [14] Further literature search failed to yield any more information on an independent coexistence between ipsilateral intracranial tumor causing trigeminal nerve compression and trigeminal neuralgia.

Treatment of vestibular schwannoma is surgical. Stereotactic radiosurgery is an alternative radiotherapy procedure of choice for tumors measuring 3 cm of less. [15, 16] However, this is not widely available, and the cost is very prohibitive. In the Philippine setting, open craniotomy wirh microsurgery may be better considered if the tumor is large, if the patient is financially constrained, and afraid of radiation related complications.

Lastly, is this an idiopathic trigeminal neuralgia? In view of the data presented, it can be concluded that this is not a case of an idiopathic trigeminal neuralgia, but one occurring as a result of a vestibular schwannoma causing compression at the root of the left trigeminal nerve.

## CONCLUSION

Trigeminal neuralgia is a rare, painful neurological disorder that affects one or more of the divisions of the trigeminal nerve. Although most are idiopathic, it may be caused by a myriad of disease entities including infections, and compression by vessel or intracranial tumor.

Here, we presented an unusual case of trigeminal neuralgia as the presenting manifestation of a vestibular schwannoma. The patient was examined, then subjected to selected diagnostic examinations, including audiometric and gadolinium-enhanced magnetic resonance imaging, which led to the discovery of a vestibular schwannoma causing a left fifth cranial nerve compression, explaining the patient's symptoms.

It cannot be stressed enough that a meticulous history and physical examination, routine audiometric studies, and a high index of suspicion are essential in arriving at a correct diagnosis. Ancillary imaging studies are used to provide confirmation of anatomic diagnosis.

Furthermore, when confronted with a patient who presents with trigeminal neuralgia and abnormal hearing tests, it is recommended that routine audiometric studies and imaging by CT scan or gadolinium-enhanced magnetic resonance imaging be done to rule out the possibility of an intracranial mass causing nerve compression. When tumor less than 3 cm is found, stereotactic radiosurgery, if financially feasible, is the procedure of choice in controlling growth of the tumor, as it is minimally invasive, and offers a shorter hospital stay and convalescence period when compared to standard microsurgical removal.

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# SUBMANDIBULAR MASS: AN ATYPICAL PRESENTATION FOR FOREIGN BODIES*

GERALD D. SINGSON, MD**
ALFREDO Q.Y. PONTEJOS JR., MD, FPSO-HNS***

## ABSTRACT

OBJECTIVE: The author presents an atypical presentation of migration of a fish bone from the oropharynx to the exterior, across to the submandibular space, a locally reported case and discusses the possible pathophysiology and implications of fishbone impactions. In order to increase the awareness of the clinician of the essential diagnostic work up and possible lesions caused by prolonged fish bone impaction necessary to avoid complications, A review of other reported complications of fishbone impaction are made.
SETTING: Tertiary Hospital
SUBJECT: One Patient
RESULTS: A 33-year old female with a previous history of resolved abscess formation of the vallecula secondary to fishbone trauma presented with right submandibular swelling, for two weeks. Excision was done revealing a fishbone in the submandibular space. The report describes a patient with food impaction extruding to the submandibular space. The possible pathophysiology, complications and clinical expectations from fishbone impactions are discussed.
CONCLUSION: Preoperative diagnosis of complication arising from bone injury may be made given sufficient awareness of its possibilities. Imaging studies may or may not be done but a laryngoscopic examination is required. In cases of delayed presentation where a definitive diagnosis is not made and surgical intervention is not yet warranted close observation is essential to avert more serious complications.

## INTRODUCTION

Fish bones are among the commonest of swallowed foreign bodies [1]. Acute presentations of a fish bone impaction calls for prompt diagnosis and treatment, usually with resultant identification and removal of the foreign body. However, in cases where a delayed or chronic presentation occurs, it can be overlooked and as a result can be misdiagnosed, leading to serious complications[2].

We present an atypical presentation of an impacted fish bone migrating from the oropharynx to the exterior, across to the submandibular space, a locally reported case. An awareness of the clinician of the essential diagnostic work up and possible lessions caused by prolonged fish bone impaction is necessary to avoid complications. A review of other reported complications of fishbone impaction are made.

### Case Report

L.S.; a 33-year-old female consulted at our institution due to right submandibular swelling, for two weeks.

Her history started three weeks prior to admission as patient swallowed a large bolus of rice with milkfish and noted a foreign body sensation, which progressed to odynophagia three days after. She consulted and on indirect laryngoscopy and videolaryngoscopy was seen to have an abscess formation at the right vallecula near the epiglotic root (Figure1). No fishbone was seen.

*Second Place, PSO-HNS Interesting Case Report Contest, PSO-HNS Midyear Convention, April 25, 2003, Waterfront Hotel and Convention Center, Cebu City
**Resident, Department of Otolaryngology, Manila Doctors Hospital
***Consultant, Department of Otolaryngology, Manila Doctors Hospital

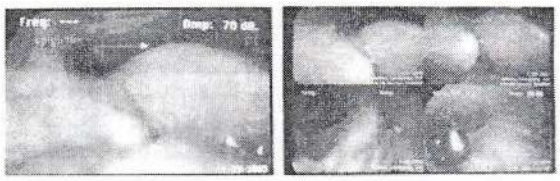

**Fig. 1: Videolaryngoscopy showing abscess with no fish bone at the right vallecula**

The impression then was abscess formation, vallecula, right probably secondary to fishbone trauma. She was treated with Co-amoxiclav for seven days, with subsequent relief of odynophagia. She noted however, a right submandibular swelling.

On follow-up one week later, indirect laryngoscopy and video laryngoscopy (fig. 2) showed resolution of the abscess. On physical exam a right submandibular swelling, tender, non-hyperemic was seen. Lymphadenitis was the impression. Clindamycin was given for one week.

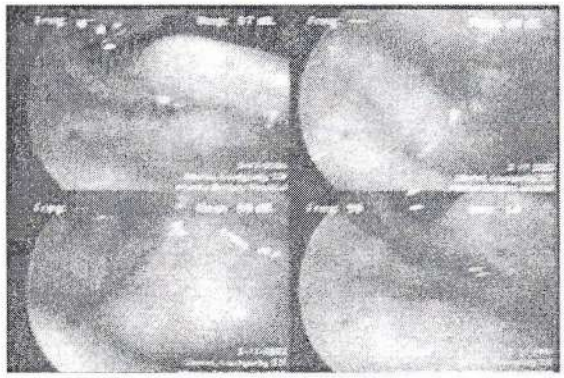

**Fig. 2: Videolaryngoscopy showing resolution of abscess.**

Nine days prior to admission, swelling decreased but still with a palpable mass on the same area. She followed up and a grossly visible non-tender, nodular swelling was seen at the right submandibular area. She was advised excision and subsequently admitted with an impression of submandibular mass, right probably lymphadenopathy.

The patient is a known Asthmatic with controlled symptoms, and on maintainance medications. Family and social history were unremarkable.

On physical examination, a grossly visible nodular swelling was seen at the right submandibular area. It was firm in consistency, immobile, and non-tender. Measuring approximately 2x2 cm. Intraoral examination was normal. The rest of the otolaryngologic exam was unremarkable.

On the first hospital day patient underwent excision under intravenous sedation. A curviliniar incision was done 2 cms. below the right mandible. The mass was noted to be a fish bone, horizontally oriented; surrounded by granulation tissue, reactive lymph nodes and abscess material (fig 3). The fish bone, lymph nodes and abscessed material were removed.

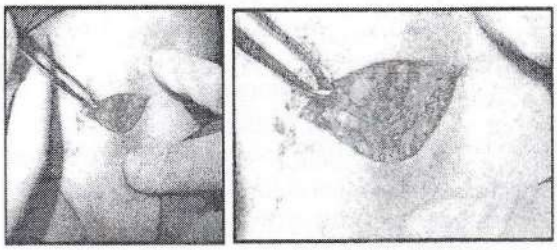

**Fig 3. Fish bone, horizontally oriented; surrounded by granulation tissue, reactive lymph nodes and abscess material**

**Fig 4: 2 cm fishbone (pin bone) specimen.**

Patient was discharged on the second hospital day. Moxifloxicin was given for one week.

Patient recovery and follow-up was unremarkable (Fig. 4).

Fig. 4: Post operative site

## DISCUSSION

Retained foreign bodies in the throat is a common complaint for consult and most foreign bodies will either pass without any problems[3] or are identified and removed by a physician. Chevalier Jackson first mentioned the problem of bone ingestion in terms of chicken and fish bones. He stated that the most common sites of

impaction were the tonsil, the posterior tongue, the vallecula, and the cervical esophagus[4]. The causative factors predisposing to food impaction can be attributed to many factors; age, failure of patient's protective reflex mechanism, carelessness and foreign body properties itself[6]. Usually, patient consults immediately following foreign body ingestion and in which the bone if still present, is usually identified and removed. In some of these patients, foreign bodies may retain becoming asymptomatic for some time. Prolonged fishbone impaction is a foreign body injury that can cause trauma not only to the upper aerodigestive track but also to any other part of the body.

On consult a clinician would not relate the previous history of fishbone ingestion with the newfound submadibular mass. Most clinicians would normally treat a fishbone impaction as an acute problem and not considered as one that could present itself as a subacute or chronic condition. Physical examination is usually sufficient to identify and remove the retained fishbone. Diagnostic management would routinely be a direct laryngoscopic examination; Lateral neck radiographic examinations although not routinely requested, can be done but their reliability is poor, owing to the fact that fish bones are difficult to visualize clearly.[6] CT scan can be done and have been shown to be reliable in demonstrating the location and surrounding tissue damage but is not ecomonically feasible. L.S. was treated as an infectious case probably resulting from an acute fishbone trauma infection that had resolved. Further imaging was no longer requested since the laryngoscopy done showed an infectious process with no apparent retained foreign body, which resolved with medications. Impacted foreign bodies that are missed and not removed can eventually cause trauma by abscess formation and extension, erosion into adjacent structures and by extraluminal migration[7]. These fish bone impaction complications are rare. Usually these bones pass out and are swallowed or vomited[8], but with the long duration of existence of a retained fish bone in the body, considerable damage can be caused. If they do happen it can be catastrophic. Various morbidities having been reported including neck abscesses[9,15], mediastinitis [10,15] and esophaeal aortic or esophagocarotid fistulas[11]. Pediatric age groups usually present with pulmonary complications and other ages present with, perforation, retropharyngeal abscesses, pulmonary complications or pseudoaneurysms formation[12]. There have been reported cases of false aneurysm of the external carotid artery following impaction of a fish bone in the pharynx[13]. Retropharyngeal abscess has been reported locally following fish bone impaction[7], Impaction into the thyroid lobe[14], subclavian arterio-esophageal fistula[15], perforation of the esophagus and other parts of the gastrointestinal tract[16] have also been reported. Resulting in massive bleeding. These fish bones may migrate and may possibly cause damage to the intervening structures. Migration has been reported occurring in the subcutaneous neck area[17], Thyroid lobe, common carotid artery and mediastinum.

Our patient demonstrated a transmigration of her foreign body from the oropharynx to the submandibular space. This potential for impaction and migration has been shown to be higher in linear, sharp-ended fish bones[18]. A fishbone piercing the mucosa so as to enter the parapharyngeal space or pharyngomucosal space can continue its travel to the submandibular space. The fishbone being propelled initially by a strong careless swallow with resultant impaction, the muscular tongue[19] and movement of the neck muscles and viscera assisting in their migration[20]. The potential space of the head and neck communicates posteriorly with the retropharyngeal space and anteriorly to the spaces associated with the floor of the mouth[12].

The extrusion path of foreign bodies, owing to their inherent properties can migrate of transmigrate from one space to the next potential space causing symptoms in the anatomical area they finally settle in. Deep neck abscess, which could have occurred, was most likely prevented by the empiric antimicrobial therapy.

## CONCLUSION

In the case presented the phenomenon of transmigration of the foreign body has been documented. Therefore the possibility of damage to the structures along the path of migration should be borne in mind. The clinician should know that it is possible to make a preoperative diagnosis of complication arising from fish bone injury given sufficient awareness of its possibilities. In cases of delayed presentation where a definitive diagnosis is not made and surgical intervention is not yet warranted close observation is essential to avert more serious complications.

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# SEIZURES ASSOCIATED WITH AN UNUSUAL TEMPORAL BONE MASS: A DIAGNOSTIC AND THERAPEUTIC DILEMMA*

CAMILLE S.A. ESPINA, MD**
CHARLOTTE M. CHIONG, MD, FPSO-HNS***
GERARDO LEGASPI, MD****

## ABSTRACT

TITLE: Seizures Associated with An Unusual Temporal Bone Mass: A Diagnostic and Therapeutic Dilemma
OBJECTIVE: The purpose of this case report is to describe a rare and interesting case of a 14 year old female initially presenting with petit mal type seizures. This uncommon non-otorhinolaryngologic chief complaint however was associated with a mastoid mass on magnetic resonance imaging, and destructive features on high resolution temporal bone computed tomography scanning. Because of the relative rarity of the lesion and its occurrence in this particular site, as well as the ability of the lesion to masquerade as a malignant space-occupying lesion, the case posed a challenge for both the otolaryngologist and the neurosurgeon. DESIGN: Case Report
SETTING: Tertiary Care Center
PATIENTS: One Patient
RESULTS: One case of spontaneous occurrence of temporal meningoencephalocystocoele is described in a fourteen year-old female who presented with seizures. MRI and CT scan showed a destructive-looking mass in the right mastoid area. The patient underwent reduction of the temporal meningoencephalocystocoele after a frozen section revealed brain tissue with focal calcification. Extradural repair using oversized temporalis fascia was done. The available literature is reviewed and a short discussion about the diagnostic and therapeutic management and prognostication follows.
CONCLUSION: While seizure disorder may be considered as an uncommon complaint in otolaryngology practice, the presence of a destructive mass lesion on MRI should raise the suspicion of a possible temporal meningoencephalocystocoele. Review of literature shows the significance of proper diagnosis of meningoencephalocystocoele in the temporal bone area and that these in fact are treatable, and have a good prognosis, depending on the size of the area of herniation. While controversies exist regarding the mode of management, transtemporal excision and repair in this case resulted in the cessation of the seizure disorder in this patient.

## INTRODUCTION:

Seizure disorders are rarely encountered as a presenting complaint by an otolarDepartment of Otolaryngologist. In the course of the diagnostic work-up of these patients, a temporal bone mass lesion may be noted. A detailed study of the imaging characteristics of this lesion presents a variety of differential diagnoses, including malignant temporal bone neoplasia, or congenital cholesteatoma, as in this case of a 14 year old female with seizure disorder as the sole complaint.

Transtemporal approach (combining an extended mastoidectomy with middle cranial fossa exposure) revealed the presence of a temporal bone meningoencephalocystocoele. Radiographic imaging such as high resolution CT scan and MRI though available, still have limitations such that a high index of suspicion is very important in these cases. Given the relative rarity of these lesions, this case is reported as it posed not only as a diagnostic dilemma, but also as a therapeutic challenge.

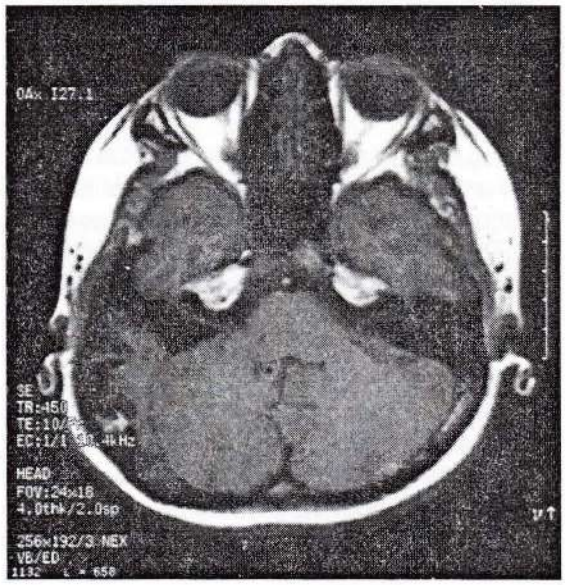
*3rd place, PSOHNS Interesting Case Report Contest, PSO-HNS Midyear Convention, April 25, 2003, Waterfront Hotel & Convention Center, Cebu City

**Resident, Department of Otolaryngology-Head and Neck Surgery, University of the Philippines-Philippine General Hospital
***Consultant, Department of Otolaryngology-Head and Neck Surgery, University of the Philippines-Philippine General Hospital
****Consultant, Department of Neurosciences, University of the Philippines-Philippine General Hospital

## CASE REPORT

A 14 year-old female began experiencing episodes of unresponsiveness and blank staring wherein she would lose consciousness of her surroundings, with episodes lasting 10 seconds, occurring twice a week. There was no history of head trauma, no signs of increased intracranial pressure, and no signs and symptoms of infection. There was a decrease in the patient's memory and skills in algebra, a subject she used to excel in. The impression on initial EEG was that of generalized epileptiform activity. MRI showed a right mastoid mass with an intracranial cystic component and porencephalic dilatation of the right occipital ventricle horn (Fig.1). She was then referred to a neurosurgeon and was advised surgery. The patient's parents brought her to a neurologist for a second opinion, who gave various anticonvulsants, but with incomplete control of seizure activity. A second EEG revealed epileptiform discharges coming from the right temporo-parieto-occipital area, occasionally spreading to the left occipital area. She was then referred to an otorhinolaryngologist for opinion regarding the temporal bone mass seen on MRI. Systemic and otorhinolaryngologic findings were essentially normal. A neurologic examination at this time revealed no facial palsy, intact gross hearing in both ears. The patient would tend to fall to her right side during tandem gait testing. A pure tone audiometry with speech audiometry revealed intact hearing. A temporal bone CT scan was then requested and revealed a destructive lesion in the right mastoid (Fig.2). The primary consideration was that of a malignant neoplasm

**Figure 1.** MRI images of the cerebellopontine angle and temporal bone at the level of the internal auditory canals. The figure on the left is a T1-weighted image showing the presence of a soft tissue density in the right mastoid that is of mixed density, but is primarily isointense with brain. The figure on the right is a T2-weighted image showing the same lesion in the right temporal bone, with areas that are isointense with the brain, and areas which are isointense with the cerebrospinal fluid and intraocular fluid, which are bright on T2-weighted imaging.



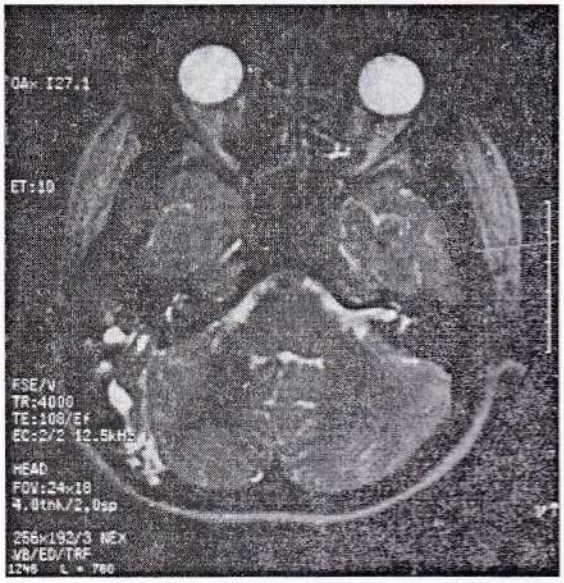



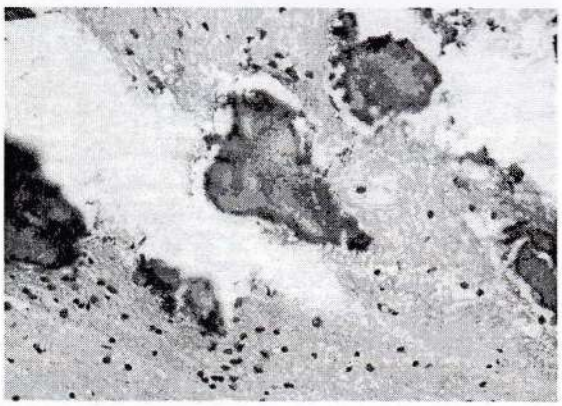

**Figure 2a.** Coronal Computerized Tomographic Scans of the Temporal Bone at the level of the ampullated ends of the superior and horizontal semicircular canals. The tegmen on the right is noted to be dehiscent, with a soft tissue density extending into the mastoid air cell system. Significantly, the bony septations within the mastoid air cell system are still intact, despite the involvement of the air-containing spaces.

**Figure 2b.** Axial Hi-Res Computerized Tomographic Scan of the Temporal Bone at the level of the tympanic segment of the facial nerve showing a soft tissue density in the region of the right mastoid, with destruction of the posterior fossa plate and partial destruction of the mastoid air cells. Both epitympanums are aerated, showing the distinctive "ice-cream cone" appearance of the head of the malleus and the body of the incus.

such as a papillary adenocarcinoma because of its destructive nature and extent to the occipital bone, versus a congenital cholesteatoma. The patient was admitted and a transtemporal approach with frozen section biopsy was contemplated. Intra-operatively, following cortical mastoidectomy, a whitish sac with clear pulsatile fluid filling the mastoid cavity and extending towards the tegmen was noted (Fig.3). A sample was sent for frozen section, and histopathologic examination revealed brain tissue with focal calcification (Fig.4). Amputation of the meningoencephalocystocoele was done, and duraplasty was performed using an oversized temporalis fascia. A lumbar drain was placed. Post-operatively, however, the patient developed a cerebrospinal fluid leak in the post-auricular incision site associated with febrile episodes, and

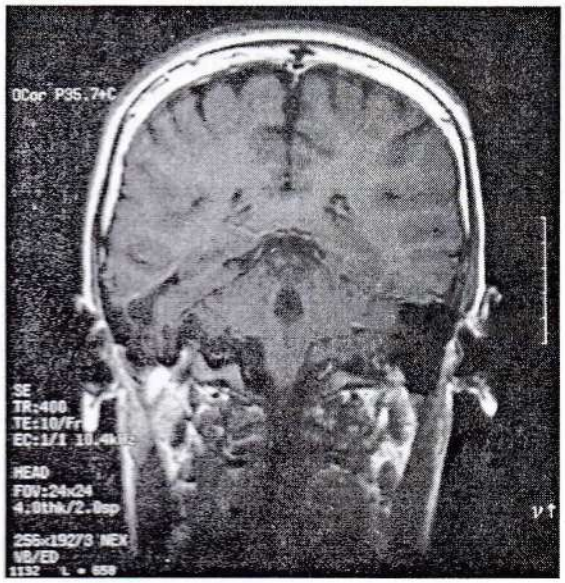
Figure 3. Intraoperative view of a whitish pulsatile sac with clear fluid filling up the mastoid cavity and extending towards the bony tegmen

Figure 4. Intraoperative frozen section showing brain tissue with areas of focal calcification.



CSF cultures grew *Staphylococcus epidermidis,* for which three week treartment of Vancomycin was instituted. Occasional vomiting and nausea was noted in the immediate post-operative period. Seizures were not noted to recur during the entire one month stay in the hospital.

**Figure 5.** Coronal T1-weighted MRI Scan showing the lesion to be continuous with the ventricular system, growing downward towards the temporal bone. If the space-occupying lesion had begun in the mastoid itself, it would have exhibited a different pattern of growth; it would have pushed itself upwards, displacing temporal lobe gyri in the process.



## DISCUSSION

Brain lesions such as meningoencephalocystocoeles are detected with ease antenatally, the earliest reported ultrasound diagnosis being made at 13 weeks of gestation (1). The usual sites of occurrence are in the occipital and the frontal areas, and although there certainly are reported cases of meningoencephalocystocoele appearing elsewhere, these are relatively rare. A French physician by the name of Caboche first described temporal meningoencephalocystocoele in 1902 (2). Initially referred to as "cerebral hernia", this occurred as a post-surgical complication of the drainage of temporal lobe abscess of otogenic nature. Aristegui et al. agree that the more correct term for this lesion would be "meningoencephalic herniation" into the middle ear and mastoid (3).

According to Paleri and Watson, temporal meningoencephalocystocoeles are a rare but well-known complication of surgery for chronic otitis media (2). Sixty three percent of encephalocystocoeles are said to have resulted post-surgically, so a high index of suspicion should be placed on patients who have undergone extensive mastoid operations (3). It may also occur due to bone erosion secondary to chronic otitis media with or without extensive cholesteatoma, or it could be iatrogenic following mastoidectomy, or post-traumatic following injury to the skull base (2). However, the patient did not fulfill any of the above criteria, and presented with

a temporal meningoencephalocystocoele of the spontaneous or non-traumatic type. The incidence of spontaneous congenital encephalocoele has been estimated at 1 per 5000 live births and only less than 5% occur in the temporal bone region (4).

However, others report the incidence of meningoencephalocystocoele to be 1-4 cases in 10,000 live births. Meningoencephalocystocoeles are more commonly seen in females than in males. The pathophysiology behind meningocephalocystocoele formation is the presence of a mesodermal defect leading to a calvarial defect through which there is subsequent herniation of meninges and brain parenchyma. Bone induction of the calvarium may be primarily faulty, or wearing away of surrounding bone due to a mass in that area may transpire (1). It is believed that in the presence of a natural deficiency in the tegmen, a congenitally fragile dura is further thinned out through the years by CSF pulsations, resulting in brain herniation (5).

The most common form of meningoencephalocystocoele is the occipital type, which is sometimes confused with cystic hygromas. In Southeast Asia however, frontal encephalocystocoeles are the more frequent type, especially among Chinese. The usual presentation of a frontal encephalocystocoele is that of an external visible mass located at the dorsum of the nose or forehead. Dermal defects such as tufts of hair and dermal sinuses representing an extension of the cranial defect externally are common. Cerebrospinal fluid rhinorrhea and recurrent meningitis may frequently occur. The other areas affected by meningoencephalocystocoele are the frontoethmoidal (13-15%), parietal (10-12%), or sphenoidal areas (1). There is very little local data about temporal meningoencephalocystocoele and similar case reports in a search done in Herdin. According to Iurato et al., temporal meningoencephalocystocoeles of the spontaneous type are seen in patients aged 6 to 72 years old. The occurrence of bony dehiscences of the tegmen tympani may reach reports of as high as 34% (5). In the case of frontal meningoencephalocystocoeles, this type of malformation is usually associated with chromosomal abnormalities in approximately 13-44% of patients, and it is advised that patients be worked up for associated anomalies so that they may proceed with appropriate genetic counseling. Genetic syndromes such as Meckel-Gruber, Von-Voss, Chemke, and Knobloch may include meningoencephalocystocoeles in their constellation of signs (1). For example, the Von Voss-Cherstvoy syndrome is comprised of phocomelia, thrombocytopenia, urogenital abnormalities, and occipital encephalocystocoele (6). Non-genetic anomalies such as cryptophthalmos, amniotic bands, the use of warfarin, maternal rubella, and diabetes may likewise be associated with meningoencephalocystocoeles. Finally, there are other abnormalities of the central nervous system such as spina bifida, corpus callosum agenesis, Arnold-Chiari and Dandy-Walker malformations that are found to occasionally occur with meningoencephalocystocoeles, the latter two more often associated with the occipital type (1). This particular patient, however, presented with the temporal kind.

A patient with temporal meningoencephalocystocoele would most likely present with CSF otorrhea, epilepsy, a pulsatile mass, meningitis, and aphasia. Other more common signs would be a conductive or mixed hearing loss, and a draining ear or serous otitis media (5). However, these clinical presentations are not always apparent, such as in this patient, who only presented with seizures.

Wilkins et al delineated five distinct types of temporal encephalocoeles according to location, each of them having distinct clinical characteristics: lateral, anterior temporal, anteromedial, posteroinferior, and anteroinferior. In a patient with early type of posteroinferior temporal encephalocoele (also known as aural encephalocoele) for example, the lesion commonly projects through the tegmen tympani into the tympanic antrum or epitympanic recess (7). This patient had no involvement of the epitympanum and middle ear, but had the herniation worsened, it is possible that she would have begun to experience CSF otorrhea and hearing loss, and the symptoms of meningitis (7).

The differential diagnoses of a temporal mass such as was seen in this patient are: temporal bone tumors both benign and malignant, infection, and trauma. The patient however, did not present with any signs of infection, like fever, chills, or the usual signs of increased intracranial pressure, nor did she have any history of trauma to the base of the skull. The mass seemed to have spontaneously occurred and was originally thought to be a neoplasm, probably malignant, owing to its destructive effect in the right mastoid and its' erosion into the occipital bone. A lesion such as a papillary adenocarcinoma was in fact considered, due mainly to the posterolateral location of the lytic lesion seen on high resolution CT scan. In actuality, the mass could have been any one of the tumors known to arise in the middle or in the petromastoid area, like glomus tumor, facial neuroma, carcinoma, or sarcoma (8). Another differential is a congenital cholesteatoma or epidermoid cyst of the temporal bone.

These are indolent and remain asymptomatic for many years, constituting 0.2 to 1.5% of all intracranial tumors, affecting men more than women. They appear as whitish capsules with a mother-of-pearl sheen (9) and it is known that congenital cholesteatomas behave as slowly-growing expansile lesions in the temporal bone or middle ear (8). However, these are diagnosed in the 3rd and 4th decades, while the index patient is still very young. There is likewise the absence of a conductive hearing loss that is characteristic of patients with congenital cholesteatoma.

Aside from the high resolution CT scan, MRI provides invaluable information. Both HRCT and MRI are superior to other diagnostic modalities such as plain radiography in the demonstration of associated intracranial anomalies such as spina bifida, corpus callosum agenesis, and Arnold-Chiari and Dandy-Walker malformations in meningoencephalocoeles in general (1). Specifically, HRCT in axial and coronal planes is the most effectual in exposing bony erosion of the mastoid, ossicles, tegmen, and labyrinth (8). However, although HRCT can make obvious the bony deficiency, it will not make a distinction between the different soft tissue structures or lesions that may be seen in the area of the mastoid and the middle ear (2). Characteristics seen on CT scan that are useful in differentiating the diagnosis of cholesteatoma from other lesions are: presence of air fluid levels, poor mastoid pneumatization, and the tendency to rise in contiguity to the tympanic membrane in acquired primary cholesteatomas; congenital cholesteatomas are usually seen to be hypodense with respect to the brain and isodense with the cerebrospinal fluid (8). These features were not present in the patient.

Magnetic resonance imaging on the other hand reveals the herniated tissue to be isointense with brain tissue, on both T1 and T2-weighted imaging. A break in the dura is usually seen, but was not apparent in this case, while lesions such as cholesterol granulomas light up on both T1 and T2 images, and cholesteatomas light up on only T2 weighted images (2). In the review of the imaging done on this patient, the configuration seen on MRI was that of a neoplasm that was continuous with the ventricular system, growing downwards towards the temporal bone in a flare-like pattern, as if being pulled down by force of gravity, in contrast to a space-occupying lesion that started in the mastoid itself, pushing itself upwards, and displacing temporal globe gyri in the process (Fig.5). Limitations of MRI however ensue in cases where gliotic or edematous brain tissue can mimic cholesteatoma on T1 and T2 images (10).

Other modalities available are CT cisternography, wherein water-soluble contrast material is placed within the theca may flow into the encephalocoele and allows visualization of the communication of the herniated sac with the subarachnoid space and better evaluation of the contents of the sac. Cerebral angiography may also be considered when there is suspicion that the dural venous sinuses have herniated into the sac. However, dural venous anatomy can very easily be seen on MRI (1). These were not requested, as it was already apparent on MRI that the CSF filled sac comprised the complex lesion, and the lesion appeared to be non-vascular, given the absence of filling voids suggestive of a need for more advanced angiographic studies.

There are times when a meningoencephalocystocoele is discovered intra-operatively, as in the case of this patient. When the diagnosis is not certain, a sample should be sent for histopathological examination, which usually shows normal glial tissue, disorganized neural tissue, or gliosis (3). In this patient, normal brain tissue with areas of focal calcification was seen. Given this, amputation was considered appropriate, as prolapsed brain tissue is usually non-functional due to strangulation and ischemia, and no residual dysfunction therefore occurs after excision of the herniated tissue (2).

Some authors like Sakamoto et al. describe meningoencephalic herniation a rare and life-threatening condition (11). Other authors say that the importance of proper diagnosis of meningoencephalocystocoele in the temporal bone area lies in that it is a treatable disease, and has a good prognosis, depending on the site, size, and the contents of the encephalocystocoele. The choice of surgery depends upon the size and the location of the bony defect and the presence of active infection. Small ($<1cm^2$) or medium-sized ($1\text{-}2cm^2$) defects can be managed through a transmastoid approach, or occasionally, with a mini-craniotomy procedure, as described by Feenstra (12). For large, anteriorly-located defects, or when active meningitis is present, a middle cranial fossa approach is the most optimal (2). The absence of brain tissue within the herniated sac is said to be the single most favorable prognostic feature for survival, and although brain tissue was present in this case, the patient seemed to have tolerated the procedure well. The incisional CSF leak was considered minor albeit positive CSF cultures necessitated 21 day parenteral antibiotic admininistration.

## CONCLUSION

A case of a fourteen year-old female presenting with petit mal type seizures and a destructive right mastoid lesion on MRI and CT scan is discussed, and the initial impression made was that of a temporal bone mass, probably malignant. The temporal mass was approached via transtemporal route and revealed brain tissue with focal calcification, and the diagnosis of a temporal meningoencephalocystocoele was made intraoperatively. Meningoencephalocystocoeles should be considered with a high index of suspicion among the differential diagnoses when presented with a case of seizures associated with a temporal bone mass, so that proper surgical management can be instituted.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