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ORIGINAL ARTICLE

USE OF POWERED INSTRUMENTATION IN MICROLARYNGEAL SURGERY: A CLINICAL STUDY

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ABSTRACT: Micro laryngeal surgery is a common and relatively safe ENT surgery, certain laryngeal conditions require surgery for correction. Surgery for voice problems is quite uncommon, most of the voice disorders can be treated with voice therapy or medical treatment. However there are certain conditions may required operative measures. We have been doing micro laryngeal surgery(MLS) in our institute for quite a long time, but use of powered instruments like, microdebrider technique in MLS have been increased in recent days. We are here discussing the advantages of powered instrumentation in MLS and merits and demerits over the conventional instruments, a comparative study in 40 cases was carried out in our institute. Endoscopic debulking of obstructive laryngeal tumors to obtain an adequate airway is traditionally done with cold steel instruments or carbon dioxide lasers, however that technological advances and an increase in the availability of microdebrider have made powered instrumentation a good alternative to cold steel and lasers in this application. XPS microdebrider technique is a safe, effective, and rapid method for debulking obstructive laryngeal tumors and other laryngeal lesions.

KEYWORDS: Laryngoscope, Microbebrider, Vocal cords, Micro laryngeal surgery, Voice therapy.

INTRODUCTION: MLS is a surgery for voice problems, most of the voice disorders can be treated with medications or voice therapy, however there are some conditions in which operative measures are necessary, early detection of pre-malignant and malignant conditions of the larynx may be the best method to improve patient quality of life and survival rates, MLS the Kleinsasser method (K-1962) was introduced in 1962 as a new procedure to diagnose laryngeal disease.

Vocal cord polyp is a commonest benign lesion, hyperplastic well – defined lesion, normally located on the two anterior thirds of the vocal folds. It can be pedunculated or sessile and pale or reddish in colour, next followed by vocal cord nodules and papillomatosis, reinke's oedema, chronic laryngitis and tuberculosis. The aim of this study is to show our results with microbebrider v/s Co2 laser and cold steel instruments in MLS surgery.

ANATOMY OF LARYNX: The larynx is situated in the anterior neck and is a protective sphincter at the inlet of the tracheo-bronchial tree. It extends from the hyoid bone above to the cricoid cartilage below, posterior part of the larynx projects in to the hypopharynx and forms the anterior wall of the hypopharynx.

The laryngeal cavity is divided for clinical purposes in to 3 major compartments:

- Supraglottis
- Glottis.
- Sub glottis.

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Supraglottis: The space above the upper surface of the true vocal cords to the laryngeal inlet is the Supraglottis, laryngeal inlet is a part of the supra glottis and is formed by:

1. Free margins of the epiglottis.
2. Aryepiglottic flods, that extend laterally from the arytenoid cartilage to the epiglottis anteriorly.
3. Upper part of arytenoids and interarytenoid notch.

Just above the true cards but below and medial to the AE folds are two projections known a false vocal cords, the potential space between the true and false cords is called the ventricle. The ventricle contains numerous mucous secreting glands, which constantly lubricate the vocal cords.

GLOTTIS: The glottis begins from the superior (Upper) surface of the two true vocal cords superiorly and extends to 1cm below the free margin of the vocal cord inferiorly.

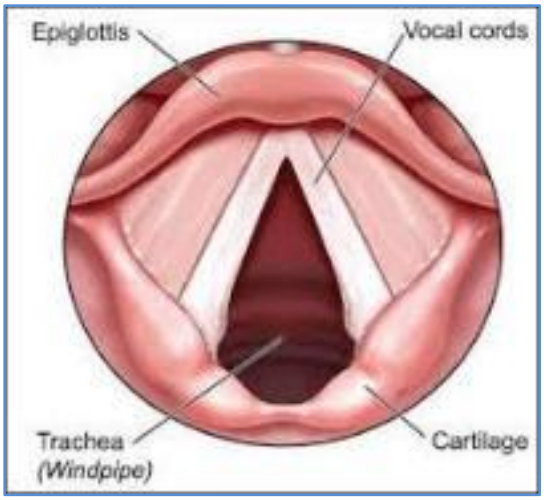

Fig. 1: Anatomy of Larynx

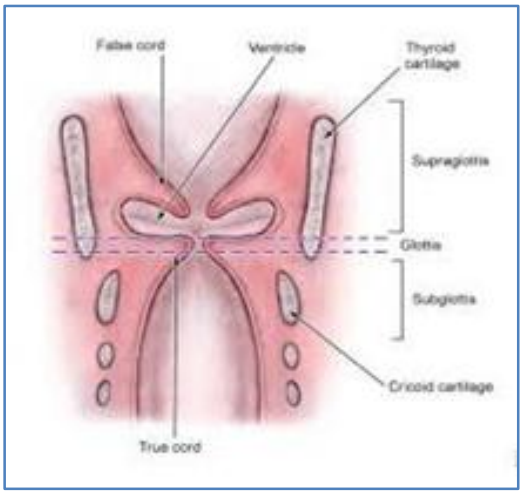

Fig. 2: Coronal Section of the Larynx Showing 03 Major Sub Divisions

The true vocal cords appear pearly white in colour and contains the vocal ligaments, which in turn are the thickened medial edges of the thyro-aryteniod muscles. The two vocal cords meet anteriorly and are attached to the inner surface of the thyroid cartilage at about the level of the thyroid prominence(Adam's apple) this attachment is called the anterior commissure, the space in between two vocal cords is known as 'rima glottis' this is the narroyest part of entire upper airway in adults.

Posteriorly the two vocal cords separate from each other giving it a v-shaped appearance, called posterior commissure. The posterior 1/3rd of the vocal cord is formed by the cartilaginous vocal process of the arytenoid, while the anterior 2/3rd is formed by the vocalis muscle, both the arytenoid and vocalis muscle are covered by mucosa.

SUBGLOTTIS: The subgottis begins superiorly from 1cm below the free margin of the true vocal cord and extends inferiorly to the lower border of the cricoid cartilage. The trachea starts at the lower border of the cricoid cartilage and is attached to it by the crico-tracheal ligament.

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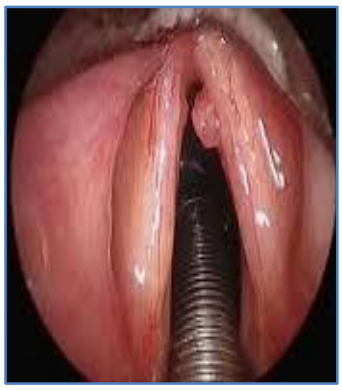
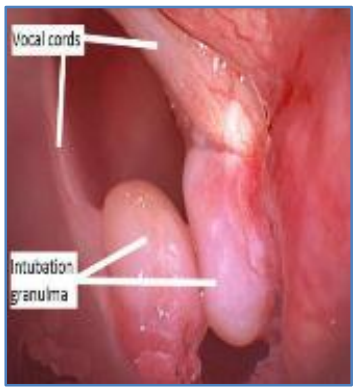
Common Lesions of the Larynx:

1. Non – neoplastic lesions of the larynx (Figure No: 3)



Vocal nodule

Vocal Polyp



Intubation granuloma

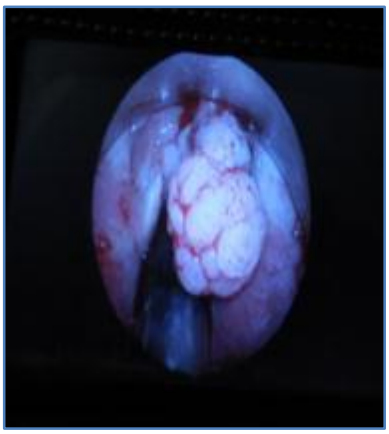
Fig. No. 3

Non-neoplastic lesions of the larynx

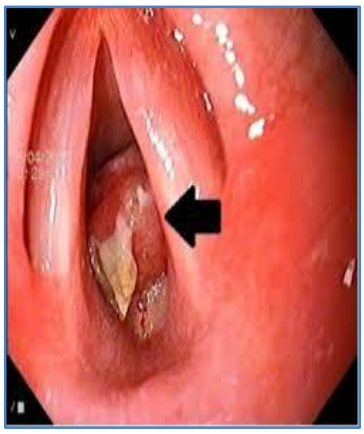
- Vocal cord nodule.
- Vocal cord polyp.
- Intubation granuloma.
- Retention cyst.
- Contact ulcer (Pachydermia).

2. Neoplasms of the Larynx

A – Benign neoplasms of the Larynx (Figure No: 4A)



Papilloma



Hemangioma

Lipoma

Fig: 4 A (Benign neoplasms of the Larynx)

- Papilloma
- Fibroma
- Hemangioma
- Lipoma

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B – Malignant Neoplasm of the Larynx (Figure No: 4B)

Malignancy Larynx
Fig: 4B.

- Squamous cell carcinoma (SCC).

Equipment used for MLS:

1. Laryngoscopes.
2. Microscopes and Telescopes.
3. Micro laryngeal instruments.
4. Co2 Laser.
5. Micro-debrider.

MICRODEBRIDER: It is a vacuum based, hallow-tubed instrument with a guarded, oscillating blade, it was first popularized by setliff for Rhinilogic surgeries, than became a routine for recurrent respiratory papillomatosis (RRP). Powered ENT Instruments will help to facilitate better precision, surgical access and patient outcomes for a variety of ENT surgeries, the powered ENT surgery is firmly established for successfully managing both simple and complex ENT disorders.

XPS microdebrider technique is a safe, effective and rapid method for debulking obstructive laryngeal tumors and it is the preferred initial treatment for these lesions. Microbrider blades comes in a variety of sizes, commonly used are laryngeal skimmer and tricut blade.

The selection of application – specific straight shot blades for air way procedures gives maximum flexibility for treating the patients, blade selection is dictated by the condition being treated and anatomic location cutting edges progress from the less aggressive skimmer blade for precise excision of small lesions in delicate areas of the larynx, the most aggressive tricut blade for rapid removed of large bulkly growths. The blade length ranges from 18 to 45cm in 2.9, 3.5 and 4.0mm diameters to meet the needs of varying patient anatomies.

In comparison to the Co2 Laser, the microdebrider has the following advantages:

- Less expensive equipment.
- Minimal or no risk of thermal injury.
- Fewer people needed to operate the equipment.
- Lower health risk of the operating room staff.
- Removes both blood and tissue.

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MICRODEBRIDER DISADVANTAGES:

- Complication can occur very quickly.
- Unable to provide hemostasis.
- The weight and vibration of the powered instrumentation may hinder tactile feedback.
- Microdebrider adds unique complications.

COMPLICATION AVOIDANCE:

- Pick the correct instrument.
- Maintain clear and unobstructed view
- Avoid high suction.
- Judicious hemostasis.
- Any concern for malfunction stop.
- Every major complication involved the Tircut blade.

METHODS AND MATERIALS: This study was conducted in Govt. ENT Hospital/Osmania medical college, Hyderabad from June 2008 to August 2015, 40 patients presented with hoarseness, dyspnea, hemoptysis and foreign body sensation in throat were included in the study. All the patients were investigated and grouped in to two categories.

1. 20 patients were operated MLS with cold instruments/laser.
2. 20 patients were operated MLS with microdebrider.

All the patients were evaluated with video laryngoscope, and operated under general anaesthesia, 50% cases were operated by cold steel instruments or Co2 laser and other 50% cases were operated with XPS microdebrider, most of the patients were, improved with surgery.

All the patients were followed up to 02 years post operatively. The post op recovery and improvement in quality of voice, and complications were analysed, in our study the surgery done with powered instruments were recovered early with good quality of voice production and the recurrent rate also quite low with powered instrument surgery. The complications were seen less in operated with microdebrider.

Sl. No.	Lesions	No. of Cases Operated	Percentage %
1.	Vocal cord polyps	16	32
2.	Vocal cord nodules	07	24
3.	Ventricular cyst	04	08
4.	Reinke's oedema	02	04
5.	Papillomatosis	06	22
6.	Tuberculosis	02	04
7.	Ca. larynx T1a	03	06
	Total	40	100

Table 1:Percentage of Lesions Of The Larynx

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Sl. No.	Lesions	No. of cases operated with conventional instruments / Co2 Laser	No of cases operated with micro debrider
1.	Vocal cord polyps	07	09
2.	Vocal cord nodules	04	03
3.	Ventricular cyst	03	01
4.	Reinke's oedema	02	Nil
5.	Papillomatosis	03	03
6.	Tuberculosis	01	01
7.	Ca. larynx T1a	Nil	03
	Total	**20**	**20**

Table 2: Total No. of cases operated

RESULTS: The present study is an analysis of 40 patients with common benign laryngeal lesion being vocal cord polyp in 32%, vocal nodules 24%, Reinke's oedema 4%, Tuberculosis–4% and Papillomatosis–22% (which is high in our study compare to the other studies). 03 cases of carcinoma larynx TIa lesion were operated with MLS and sent for HPE to conform the diagnosis, then the debulking of remaining tumor was removed with mircodebrider, most of the benign vocal cord lesion were in the age group of 20–32years and malignant lesion in the age group to 55-60years, the main presenting symptom was hoarseness of voice, the cases done with microdebrider are well recovered early and postoperative recurrence rate was low compare to the cold steel instruments/Co2 laser. The complications during surgery and postoperative period was very low with powered instrumentation.

DISSCUSION: Microscopic voice surgery, otherwise known as micro laryngeal surgery, is a minimal invasive surgery held to correct voice disorders. This procedure is commonly used to treat conditions such as cysts, benign tumors and granulomas on the larynx, the most common benign lesion of larynx presenting with change in voice is vocal cord polyp. Although MLS is considered a relatively safe surgical procedure, it may be associated with significant complications include pain, bruising of the lip, chipped teeth and numbness of the tongue.

Laryngology developed as a surgical specialty in Europe in 1850.[1,2] as a result of Gracia's.[3] investigations into singing phonation. The importance of a human voice as become increasingly evident during the development of the communication age of the 20th century and will become more critical in the 21st century.[4]

The term phono surgery was developed by von leden in the 1960's and refers to surgical procedures that maintain or improve the human voice. The phono surgery includes:

1. Phono microsurgery or endoscopic microsurgery of the vocal folds.
2. Injection techniques, which include the placement of medications as well synthetic and organic biological substances.
3. Layngo plastic phono surgery or open neck surgery.
4. Neural re-innervation of the larynx.

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Successful management of the human voice is typically require the use of laryngeal stroboscopy, this allows for clinical assessment of vocal fold vibration and oscillation, a fundamental component of voice production. The wide spread use of stroboscopy hall marked the instillation of physiologic principles of laryngeal sound production in to the design of new surgical techniques, the purpose of the surgery in this cases is to increase phonation function or to define the pathological diagnosis.[5]

In 1960, laryngeal microsurgery with suspension laryngoscope under general anaesthesia was introduced, this modality of surgery good stability of surgical field. Kojima.[6,7] has used since 1991 laryngeal microsurgery with optic fiber and stroboscope, in this the surgeon uses both hands freely and performs voice and larynx monitoring. It can be used in patients with anatomical problems such as narrow mandible, neck immobility and other defects that prevented the performance of laryngeal microsurgery with suspension microscope.[6]

In 1972 Strong and Jako.[8] reported the first experience with the clinical use of Co2 laser to treat benign and malignant laryngeal lesions, Co2 laser has been carefully used owing to its thermal harmful potential to the mucous and muscular tissue of the vocal fold, leading to vocal deterioration. However refining instrument during the years transformed laser surgery in to a precise procedure.

Shapshay.[9] observed greater advantages of laser over the cold instruments considering micro-precision and capacity of photo- coagulating small vessels on the mucous surface of angiomatous polyps, laser is indicated to treat vascular polyps and granulomas. The instrument improvement can lend to excellent results when used in small and pedunculated lesions like nodules.[10]

The availability of microdebrider have made powered instrumentation a good alternative to cold steel and laser in this application, the suction provided by the Tricut blade tip ensures a clear operative field and precise excision of the lesion. In our study we found that for children with similar disease severity scores, pain scores in the microdebrider and laser group were equivalent, voice quality improvement was greater in microdebrider group and procedure time was significantly shorter in microdebrider group.

We conclude that the microdebrider allows more safe, rapid and meticulous surgery in MLS, which may reduce the cost by decreasing operating time and precise excision without thermal injury.

CONCLUSION: The microdebrider has become an extremely valuable instrument for the otolaryngologist. It is now used in the larynx for treatment of recurrent respiratory papillomatosis, laryngeal stenosis, vocal cord polyps and debridement of large cancer for airway control. When using powered instrumentation the surgeon should use the upmost caution in the larynx to avoid complication like causing debilitating injury and scar with subsequent dysphonia.

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