PHONOMICROSURGERY FOR BENIGN VOCAL FOLD LESIONS USING MEDIAL-MICROFLAP TECHNIQUE WITH COLD INSTRUMENTS IN A TEACHING HOSPITAL OF INDIA

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ABSTRACT

Background: Phonomicrosurgery is a challenging and evolving field. One of the key techniques used for this is micro-flap technique used along with cold micro instruments.

Objective: To convey the role of Microflap technique in phonosurgery and the role of basic microlaryngeal instrumnets in such surgery when sophisticated phonomicrosurgical instruments are not available.

Methods: This is a retrospective study of 33 patients of benign vocal fold lesions who have undergone phonomicrosurgery using microflap technique from the year January 2011 to January 2016. Majority of these cases were vocal nodules (16cases) followed by Cyst in the vocal cord (10 cases) and 5 cases of polyps.

Results: Cases were analyzed using GRBAS scoring and stroboscopic findings. A significant improvement was noted in the voice outcome of these patients except two cases where endoscopic paraglottic fat injection was done along with hyaluronic acid with steroid infiltration into the Reinke’s space, after which there was improvement in voice.

Conclusion: Microflap technique for vocal fold lesion is a unique surgical procedure that allows preservation of vocal cord morphology and at the same time prevents post surgical scarring with excellent voice outcome. This surgery can be performed with good quality regular microsurgical instruments.

INTRODUCTION

Phonomicrosurgery is a challenging and evolving field. The term phonosurgery was first described by G E Arnold & V H Leden with an intent to improve and/or restoration of voice.[1] The credit of injection laryngoplasty goes to Bruenning (1911) for treating a paralyzed vocal cord.[2] The phonomicrosurgery was developed as a model of consistent vocal cord vibration based on Body (Deep lamina propria & Muscle) and Cover (Epithelium & superficial lamina propria) concept (Fig.1) that can vary to different circumstances of laryngeal adjustment (Hirano 1974).[3] Kirstein introduced the concept of direct laryngoscope in the form of autoscope in 1895[4] and Kleinsausser’s development of suspension micro-laryngoscope used in conjunction with microscope in 1960 that has revolutionized the principle of microlaryngeal surgery including phonomicrosurgery.[5] Use of general anesthesia through endotracheal tube during microlaryngoscopy was introduced by Priest (1960)[6]. Since then various laryngoscopic developments have

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taken place for better and comfortable visualization\(^7\).

Bouchayer M & Cornut G (1992) introduced the microflap technique in France for benign laryngeal lesions\(^8\). The term “phonomicrosurgery” was first used by Zietels in 1994 to describe the importance in preservation of the vocal cord epithelium and its superficial lamina propria\(^9\). Microflap techniques was further refined to a mini microflap technique by Satalof et al, in 1995\(^10\). Thus the concept of lateral (larger lesions like reline’s edema) and medial microflap technique developed.\(^11,12,13\) In India, Phaneendra Kumar and Nerukar have popularized the phonosurgery\(^14, 15\). Nerukar has also popularized the microflap technique in India by using hydro-dissection with cold instruments\(^14\).

There are various array of cold instruments (good quality micro knife, sickle knife, micro-scissors of various angles, angled elevators and spatula, straight and angled dissector, different angled fine and curved micro-scissors, angled heart shaped grasping forceps, curved alligator forceps, sharp right handle hook, vascular knife, fine laryngeal suction cannula etc.) are available for phonomicrosurgery using microflap technique. The 1st author has adopted the routine microlaryngeal cold instruments (microlaryngeal right and left curve angle, micro-cup forceps, fine micro-suctions, 18 and 23 gauge needles for fitting into suction cannula for injection/ infiltration) to perform such surgeries as most of these phono-microsurgical instruments are not available in teaching centers across India. Usage of cold instruments remains the foundation for phonomicrosurgery. Benign lesions are best dealt with cold instruments especially when micro-flap technique is used. The authors would like to convey the readers that one should never resort to plucking of vocal cord lesions or excise them at the cost of normal mucosa and underlying lamina propria of vocal cord with scissors. A phonomicrosurgery with microflap technique can well be done with basic good quality microlaryngeal instruments as the author has adopted in this series.

MATERIALS AND METHODS:

A total of 33 patients having benign vocal fold lesions, who have undergone phonomicrosurgery with microflap technique in the Unit-I of the department of ENT-HNS from January 2011 to January 2016 were taken for the study retrospectively. All the patients were operated by the 1st author. Amongst the 33 patients, 8 were females and 25 were males. Informed consent was taken from the entire patients regarding surgery and vocal outcome. The entire patients underwent pre-operative counseling. The lesions included 16 cases of vocal cord nodules, 12 cases of vocal cord cysts and 5 cases of unilateral hemorrhagic polyps out of which pre-op and post-op GRBAS scoring analysis was available for 21 patients (10 cases of vocal cord nodules, 6 cases of vocal cord cysts and 5 cases of vocal cord polyps). Pre & Post operative video telescopy & video-stoboscopy findings were available in all the 33 cases. The speech therapy was started 2 weeks post-operatively for all cases. Patients having benign vocal fold lesions in which microflap technique was not used or removed traditionally due to technical problems, were excluded from this study.

Surgical Technique:

Patient is kept in a supine position with neck flexed and extension of atlanto-occipital joint as done in routine microlaryngoscopy, using a pillow under the shoulder. It is necessary to chose appropriate size and type of laryngoscope to achieve optimum exposure of vocal cord. Sometimes assistant’s help is crucial especially for short neck and obese patient. The key to phonomicrosurgery is hydro-dissection and decongestion. Subepithelial infiltration of normal saline with 1 in 20,000 epinephrine into reline’s space lifts the lamina propria off the vocal ligament. A superficial cordotomy was performed by placing incision just lateral to the lesion with an angled scissors opposite to
the cord, i.e. a left angle scissors for right side vocal cord and vice versa instead of a micro-laryngeal knife. The author adopted the left/ right angled curved micro-scissors for giving incision, raising microflap as well as dissection of the vocal cord lesions from the bed. A small cotton ball soaked with epinephrine was often used to dissect further. Precise dissection helps further separation of the cyst from the bed and is then removed (Fig.2 & 3). Microlaryngeal cup forceps/ alligator forceps were used to retract the microflap during dissection. The cup forceps help in blunt dissection. The lesions like vocal nodule (Singer’s nodule) were removed precisely without disturbing the lamina propria with mucosal preservation (Fig. 4). The sessile polyps are removed in similar way and the redundant mucosa is resected precisely. The dissected bed was

Fig.2: a. After incision just lateral to polyp margin, b. Raising of medial microflap using curved micro scissors, c. Showing cyst being almost dissected out before removal, d. Re-draping of microflap after removal

Fig.3: a. Showing a large cyst on the left vocal cord in a patient with sulcus vocalis, b. Microdissection of cyst after raising and retracting the microflap with fine cup forceps, c. Showing vocal ligament with a thin cover of lamina propria after complete removal of cyst. d. Draping of the microflap insitu.

Fig.4: a. Showing infiltration of left vocal cord in case of singers nodule, b. Raising of medial microflap after giving the incision just lateral to the lesion, c. Blunt dissection of sub-epithelial nodule from the vocal ligament, d. Showing the sub-epithelial collection between the micro flap and vocal ligament, e. After removal on the left side, the microflap is raised and retracted on the right vocal cord and sub-epithelial dissection is being done, f. After complete removal of the vocal cord nodule applied hyaluronidase injection mixed with steroid solution to prevent scarring and fibrosis. After completing the removal of the lesion microflap was draped back in situ. In case a cyst gets ruptured the entire cyst wall needs to be removed or else to be removed traditionally with scissors. In case of residual phonatory gap due to cord atrophy following long standing large polyp removal, fat injection was done using 18 gauge disposable needles attached to the suction cannula into the paraglottic space and additional infiltration of hyaluronidase with steroid into the
Reinke’s space was carried out (Fig. 5). All the patients were kept on voice rest for two weeks. Postoperatively patients were kept on anti reflux measures. Budesonide score was 0, 1 for 15 and 6 patients respectively. Stroboscopic findings were analyzed as described by Stanković et al (2008).

Out of 33 patients’ stroboscopic findings, 29 patients showed normal vocal cord mucosal wave pattern, 4 patients had irregular mucosa with disturbed vibratory pattern and 3 patients had phonatory gap out of which 2 patients underwent micro-endoscopic hyaluronic acid injection along with steroid infiltration into Reinke’s space and paraglottic fat injection (Table-I).

200 micrograms inhaler at a dose of 2 puffs once a day for one month was advised post operatively.

**OBSERVATION AND RESULTS:**

Results were analyzed with pre and post-operative GRBAS scoring (Fig. 6) and stroboscopic findings (Table-I). An auditory-perceptual evaluation method for hoarseness is the GRBAS scale (G – Grade, R – Roughness, B – Breathiness, A – Asthenicity, S – Strain) of the Japan Society of Logopedics and Phoniatrics, is simple and reliable (Hirano 1981). It gives scores of 0, 1, 2, or 3 where 0 is normal, 1 is a slight degree, 2 is a medium degree, and 3 is a high degree (Hirano 2016). Out of 21 cases analyzed, 17 patients had pre op “G” score of 3, 4 patients had score of 2; post operatively, 15 patients had score 0, 6 patients had a score of 1. Pre op scoring with respect to “R” was 3 and 2 for 13 and 8 patients; post op score was 0, 1 and 2 for 17 patients, 3 patients and 1 patient respectively. “B” scoring was 3, 2, and 0 for 14, 2 and 5 patients; post op score was 0, 1 for 17 and 4 patients respectively. Scoring for “A” was 3, 2, 0 for 11, 5, 5 patients pre operatively; 0, 1, 2 for 11, 7 and 3 patients respectively post operatively. Pre op score for “S” was 3, 2, 0 for 5, 12, 4 patients; post op score was 0, 1 for 15 and 6 patients respectively. Stroboscopic findings were analyzed as described by Stanković et al (2008).

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**DISCUSSION:**

Laryngology and phonosurgery is the most evolving subspeciality in the field of ENT-Head & Neck Surgery with tremendous practical advancement during
the last three decades[18]. One of the key development of this speciality is phonomicrosurgery. Removal of vocal fold mass lesion by separating the superficial lamina propria from the lesion while preserving the mucosa for protecting the vibratory area of the vocal cord was the main idea in the development of microflap technique. Microflap technique is the cornerstone of phonomicrosurgery. It has revolutionized the surgical technique in the management of vocal cord pathology after the concept of body cover principle for vibration of vocal cord was recognized.3 Phonomicrosurgical techniques are planned to facilitate aerodynamic competence and vocal quality by creating a smooth vocal fold edge. As there is remote possibility of superficial lamina propria to regenerate after damage, utmost care needs to be taken while raising a large microflap for removal of vocal cord lesion[7]. The microflap technique have been further divided into lateral and medial microflap techniques, the concept of which came in 1995 and 1997 by Courey etal from Vanderbilt University Medical Center[11,12,13]. The lateral flap techniques are more suitable for reinke’s edema, larger lesions and vocal cord scarring where identification of vocal ligament becomes easy with this flap and has little risk of injury to vocal ligament,[11] where as medial microflaps reduces the injury to basal membrane complex[10,12,19]. The medial microflap is most suitable for smaller lesions (like cysts, sessile polyps etc.) where post surgery scarring can be significantly minimized by reducing the exposure of vocal ligament and lamina propria[13]. The medial microflap technique is mostly indicated for lesions situated on the medial aspect of the vocal cord, especially with a thinner mucosal cover and are most suited for cyst and sessile polyp[12] and can be separated easily form underlying vocal ligament[12]. Postoperative voice rest is important in facilitating healing and a period of two weeks helps collagen bridge formation for fixation of flap. The author applies hyaluronic acid along with steroid at the dissected site, after removal of the lesions following microflap technique to prevent post operative scarring. Hirano described the role of extracellular matrix component, including hyaluronic acid, atelocollagen to help regeneration of vocal cord mucosa[21].

CONCLUSION

This work is presented to emphasize that unscrupulous excision of vocal cord lesions can damage the vocal ligament causing scarring and can permanently derange the mucosal wave pattern with dismal voice outcome. Microflap technique can still be performed with good regular microlaryngeal instruments and can prevent permanent vocal cord damage. It is an excellent technique to preserve the crucial histological layers of the vocal cord described by Hirano (fig 1), including mucosa and lamina propria. Post surgery voice therapy is crucial in such cases.

DISCLOSURES

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REFERENCES:

3. Hirano M. “Morphological structure of vocal cord as a vibrator and its variations” Folia Phoniatr.1974; 26, 89-94
4. Kirstein A. Autoscopy of the Larynx and Trachea (Direct Examination Without Mirror). 1897; FA Davis,Philadelphia
8. Bouchayer M & Cornut G. Microsurgical treatment of benign vocal cord lesions: indications,


18. Murty PSN. Phonosurgery a new subspeciality in Otolaryngology; J NTR University of Health Sciences. 2012;1: 7-11
