招待講演 I

Vestibulectomy —Rationale, Surgical Technique and Clinical Applications—

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Vestibulectomy is subtotal resection of the vestibular fold. Excision of this structure is advocated as (1) a definitive *therapeutic* procedure for removal of vestibular fold lesions and (2) an adjunctive *diagnostic* procedure when addressing vocal fold lesions. The surgical objectives are diagnostic and therapeutic when addressing vestibular fold lesions and primarily diagnostic when applied to vocal fold lesions. In the latter, superior exposure of the vocal fold, particularly of the lateral ventricle, permits direct visual and surgical access to the paraglottis and subglottis and is particularly suited to T1 and T2 glottic lesions when definitive excision can be undertaken. In T3 glottic lesions management options are expanded to permit larynx preservation procedures in lieu of the conventional laryngectomy.

Vestibulectomy allows unobstructed visual access intra- and postoperatively, particularly in cases where cordectomy has been performed. Adjunctive vestibulectomy has been useful in cases of post-irradiation glottic carcinoma patients where the glottis cannot be competently visualized during follow-up examinations. Vestibulectomy is suited for inflammatory reactive lesions such as the laryngocele and saccular cysts. Voice is usually unaffected and swallowing and airway function are also preserved.

Vestibulectomy has been performed at the time of transverse cordotomy, a procedure which has been utilized in airway restoration after bilateral vocal fold paralysis. Superior exposure of the vocal fold facilitates adequate cordotomy and optimal airway enhancement.

The single complication in over 100 vestibulectomies has been postoperative superior laryngeal artery hemorrhage. This occurred in a case where vestibulectomy had been performed at the time of transverse cordotomy. The patient was returned to the operating room for hemostasis which was achieved with tamponade and laser coagulation.

Our current assessment is that vestibulectomy achieves (1) superior surgical access to the vocal fold intraoperatively, and (2) enhanced visual access postoperatively for clinical exam in 75~90% of cases—particularly in patients who receive x-ray therapy and in whom reactive swelling of the vestibular fold is not uncommon.

Revision vestibulectomy has been performed in select cases when additional enhancement of exposure and visual access to the vocal folds is needed.

Key words: glottic cancer, supraglottic cancer, serial section study, patterns of spread

Vestibular Folds

The vestibular folds are vestigial laryngeal structures which may serve as the first line of defense against inadvertent entry of ingested materials into the respiratory tract. Victor Negus has written that the down-turned ventricular bands—such as present in arboreal animals—gibbon, chimpanzee and gorilla—are capable of entrapping air and function as the exit valve to immobilize the ribs.

The superior surface of the vestibular fold is lined by squamous epithelium and the undersurface (roof of ventricle) is lined by ciliated epithelium and sero-mucinous glands whose secretions moisturize and lu-

bricate the vocal fold mucosa. Intrinsic musculature is scant and the primary function of the vestibular fold in man is uncertain. Superiorly, the vestibular fold merges with the medial wall of the pyriform sinus to form the aryepiglottic fold. The role of the vestibular fold and supraglottis in deglutition is not essential—subjects who undergo supraglottic and/or partial laryngopharyngectomy operations reliably maintain or regain their ability to swallow without aspiration. Restoration or retention of competent deglutition after surgical resection of the vestibular fold (as after supraglottic laryngectomy or partial laryngopharyngectomy) is one of the many lessons taught by the late Dr. Joseph Ogura.

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This paper was presented at the 10th Annual Meeting of the Japan Laryngological Association, Kanazawa, Japan, March 27, 1998.

Vestibulectomy for Glottic Cancer

This presentation discusses planned excision of the vestibular fold as an important and useful adjunctive or independent procedure to improve visualization of the vocal folds.

The first vestibulectomy in the author's practice occurred when disproportionate vestibular fold swelling developed in a patient following irradiation therapy for early glottic carcinoma. The swelling limited visualization the vocal fold—site of the original neoplasm—such that the tumor status could not be properly monitored. Endoscopic excision of the edematous vestibular fold allowed full visualization of the vocal fold intraoperatively with surgical access to the upper surface of the vocal fold, floor of ventricle, superior paraglottis and enhanced access to the subglottis. Equally important, this improved visual exposure of the glottis was retained at the follow-up examinations performed in the clinic.

On basis of these advantages, vestibulectomy was performed in early glottic carcinomas at the time of initial operative laryngoscopy with the expectation that improved accuracy in tumor staging could be achieved. Tumor extension into the paraglottic and subglottic parts could be evaluated by visual inspection and, additionally, by palpation of the heretofore inaccessible anatomic compartments, and by histologic verification of tumor status achieved by biopsy after vestibulectomy.

Clinical staging of vocal fold carcinoma is appropriately performed at the initial visit and examination and may be modified at subsequent pre-treatment examinations. Staging is based on 1) *epithelial abnormalities* (leukoplakia, keratosis, etc.) at specific anatomic sites and 2) *depth of tumor invasion* based on impaired or limited vocal fold motion.

Mucosal mobility is ideally evaluated under *stroboscopic imaging* and the degree of mucosal fixation—whether focal or widespread, assesses subepithelial disease extensions into the lamina propria and vocalis muscle. *Contrast laryngogram*, can provide information regarding the dynamic alterations of tissue volume and form during phonation and inspiratory phonation—indication of extent of tumor invasion. 3-dimensional imaging data from CT and MRI examinations document the extent of *deep tissue invasion*.

In most cases operative laryngoscopy is performed

Fig. 1 Diagrammatic representation of the vestibulectomy operation.

A: Incision for vestibulectomy, spot-marked with laser.

B: Post-vestibulectomy outcome. Note full exposure of upper surface of vocal fold, floor of ventricle. Dotted line indicates incision of transverse cordotomy for bilateral vocal fold paralysis.

for biopsy confirmation of malignancy. In addition to inspection and biopsy, this presentation advocates that vestibulectomy be performed and that *palpation* of the vocal fold, vestibular fold and the paraglottic and subglottic compartments be included to examine for the depth of *tumor invasion*.

Leukoplakia, particularly with *multi-focal lesions*, is an additional indication for vestibulectomy, so that all of the epithelium-at-risk becomes accessible for detection and excision biopsy.

In *advanced glottic lesions*, such as in T3

carcinomas, definitive tumor excision by subtotal or near total cordectomy, is a therapeutic alternative to irradiation therapy. Subtotal endoscopic cordectomy, particularly in cases when there is no cervical lymph node enlargement or local tumor extension, is a highly suitable management option. The excision of these larger tumors, should be performed in an *en bloc* manner so that all excision margins can be identified, labeled as to site and can be histologically examined for adequacy of tumor excision. After such primary excisions, a "second look" endoscopic examination and biopsy are necessary. The latter operation focuses to sites of concern about residual carcinoma; each biopsy site is precisely labeled and oriented to assure unmistakable identification of the lateral and deep-tumor margins. Follow-up examinations in clinic are scheduled for one-to-two monthly intervals for at least two years and at 6 to 12 month intervals thereafter. Early morning sputums are obtained at the time of follow-up office examination to be examined for cytologic abnormalities. Prompt endoscopy and biopsy are performed in the event of any symptomatic change, laryngoscopic or sputum cytologic findings.

The objectives in all tumor excision are (1) to achieve documented tumor-free margins at excision, (2) to preserve or restore adequate airway, voice and swallowing function and (3) to assure that postoperative office examinations of unobstructed visual access to the original tumor site can be performed with confidence.

Vestibulectomy for Supraglottic Lesions

Specific tumefactions such as lipoma, pleomorphic adenoma and neuromas are among the common histologic lesions of benign or low-grade malignancy which can be definitively managed by vestibulectomy. Inflammatory-reactive lesions, such as an (internal, external or combined) laryngocele are also suitable lesions for endoscopic management. In the latter, definitive management by endoscopic vestibulectomy is delayed until antibiotics, throat gargles and warm compresses to the neck achieve total regression of the extra-laryngeal portion of the swelling.

Vestibulectomy for Transverse Cordotomy for Bilateral Vocal Fold Motion Impairment

Superior exposure of the vocal fold after vestibulectomy has persuaded our recommendation that *transverse cordotomy* for bilateral vocal fold

motion impairment be preceded by preliminary vestibulectomy. The latter enhances exposure of the vocal fold and assures that an adequate cordotomy can be performed to achieve enlargement of the optimum airway. Postoperatively, the vestibulectomy defect permits unobstructed exposure of the cordotomy site so that visual assessment as to the adequacy of airway enhancement can be made.

Vestibulectomy: Surgical Technique

The operation is performed under suspension microlaryngoscopy and utilizes the CO₂ laser or microdebrider. The laryngoscope is centered on the vestibular fold selected for excision. A moistened cottonoid pad is placed in the ventricle to protect the underlying vocal fold and floor of ventricle from an unintended laser impact. The laser incision begins at the vestibulo-epiglottic sulcus, anteriorly, and follows an arciform line, outlined by spot applications of the laser, and ends posteriorly just anterior to the arytenoid. The paraglottic and subglottic compartments are palpated to detect any palpable abnormality, induration, occult mass or fixation—particularly in circumstances, where carcinoma is suspected.

The superior laryngeal artery is commonly encountered in the paraglottic space at the mid-point of the vestibular fold excision. Vigorous bleeding occurs when this vessel is entered and firm tamponade achieves hemostasis. Bleeding from the superior laryngeal artery may be brisk but it is brief and has been controlled with 3~5 minutes of tamponade.

Vestibulectomy—Operative Alternative

The vestibulectomy operation is designed to improve visual access of the vocal fold during standard (office) clinical examination and to enhance surgical access during laryngeal endoscopic operations. The intent is to visualize the floor of ventricle (upper surface of the vocal fold) during clinical and operative inspections. With additional experience it has become routine to palpate the vocal fold as well as evaluate the paraglottic and subglottic spaces with the "velvet-eye" suction tip, thereby expanding the diagnostic and therapeutic potential of evaluation and management of laryngeal disorders. All of the foregoing parts are accessible for biopsy and, when necessary, definitive excision.

Conclusion

This report describes the rationale for and the

clinical application and the surgical technique of subtotal excision of the vestibular fold, as an adjuvant procedure in early and advanced glottic carcinoma excisions. The *diagnostic* objective is to achieve improved exposure of the vocal fold and floor of ventricle—at the time of operation and also during follow-up examinations. In addition to the visual access, the upper surface of vocal fold, paraglottic and subglottic spaces, can be evaluated by direct palpation and all of the foregoing sites are readily accessible for biopsy. The accuracy of clinical staging of glottic carcinoma is improved as a result of the enhanced exposure provided by the vestibulectomy.

The *therapeutic* advantage after vestibulectomy is the expanded choice of management alternatives which can be specifically tailored to best fit the clinical problem. In glottic malignancies, accurate micro-endoscopic excision, laser decortication, en bloc subtotal or even total cordectomy operations can be performed with accuracy after enhanced exposure is provided by vestibulectomy.

Non-malignant lesions including laryngocele and other acquired and congenital lesions can be definitively excised endoscopically following vestibulectomy. These are important therapeutic alternatives for disorders which often occur in elderly subjects and in whom minimally-invasive surgical procedures and

reduced postoperative morbidity are important considerations.

In short, the improved surgical exposure *after vestibulectomy* allows accurate assessment of the laryngeal disorder, expands endoscopic options and provides an optimally-enhanced postoperative follow-up examination.

Reference List

- 1) Kashima HK et al : Vestibulectomy in early vocal fold carcinoma. *Head and Neck Cancer*; Elsevier Science Publishers 181~189, 1993.
- 2) Kashima HK : Bilateral vocal fold motion impairment: Pathophysiology and management by transverse cordotomy. *Annals of Otology, Rhinology, Laryngology* 100(9) : 717~721, 1991.
- 3) Szwarc BJ & Kashima HK : Endoscopic management of a combined laryngocele. *Ann Otol Rhinol Laryngol* 106 : 556~559, 1997.
- 4) Negus V : *The Comparative Anatomy and Physiology of the Larynx*. Hafner Publishing Company, New York 1949.

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