Ann Otol Rhinol Laryngol 109:2000
REPRINTED FROM *ANNALS OF OTOLOGY, RHINOLOGY & LARYNGOLOGY*
June 2000 Volume 109 Number 6

CLINICAL NOTE

LARYNGEAL DIVERSION AND TRACHEOTRACHEAL SPEECH FISTULA FOR CHRONIC ASPIRATION

DESHENG WANG, MD
FUZHOU, CHINA

PAVEL DULGUEROV, MD
GENEVA, SWITZERLAND

Intractable aspiration is a life-threatening problem and often requires a procedure for blocking or separating the larynx from the bronchial tree. The disadvantage of these techniques is a compromise of phonation. We report the use of a speech fistula after laryngotracheal diversion to restore voice. It allows for the definitive treatment of aspiration, while maintaining the use of the vocal folds for phonation.

KEY WORDS — aspiration, laryngotracheal diversion, tracheotracheal speech fistula.

The normal human larynx has 3 major functions: as an air conduit, in airway protection, and in phonation. Phonatory ability is not essential for survival, and under certain circumstances, the voice has to be compromised in an effort to preserve the airway and prevent aspiration.

The treatment of aspiration comprises conservative management and surgical procedures. Patients who can handle their secretions, can talk, and do not present episodes of recurrent pneumonia may be managed with a variety of conservative techniques such as nasogastric or gastrostomy tubes, swallowing rehabilitation, food texture changes, head position adjustments, breath-holding, and postswallow volitional cough. For severe aspiration, a surgical intervention is necessary.

The surgical management of aspiration can be divided into adjuvant and definitive procedures.[1] The adjuvant procedures include tracheostomy, cricopharyngeal myotomy,[2,3] laryngeal suspension,[4] cricoid resection,[5] and various vocal fold medialization techniques.[6,7] If the patient presents intractable life-threatening aspiration, more definitive surgical procedures should be applied. The definitive procedures consist of various techniques for blocking or separating the larynx and the trachea and include laryngeal stenting,[8] glottic and supraglottic laryngeal closure,[9,10] laryngeal diversion,[11,12] and total laryngectomy. An obvious disadvantage of these definitive procedures is the compromise of phonation.

CASE REPORT

An 80-year-old man had had a left tonsillar squamous cell carcinoma that was treated with radical neck dissection and irradiation 21 years earlier. He developed progressive dysphagia, and a gastrostomy had been performed at another facility 7 months earlier. He presented with moderate dyspnea, and a stenosis of the oropharynx was diagnosed.

The stenosis was circumferential at the lower level of the tonsils. A tracheostomy and a transoral carbon dioxide laser resection of the stenosis were performed. A surprising finding was the presence of a separate exophytic lesion of the aryepiglottic fold, the biopsy of which revealed verrucous carcinoma. The performed treatment was a horizontal supraglottic laryngectomy, complicated by a large wound dehiscence. The pharyngocutaneous fistula required a pectoralis major myocutaneous flap for closure. However, the tongue–to–thyroid cartilage sutures were lost, with the result that the larynx was unsuspended and unprotected.

Severe aspiration ensued. Videofluoroscopy revealed a lack of pharyngeal contraction, cricopharyngeal dysfunction, a lack of laryngeal elevation, and severe aspiration. Despite intensive swallowing therapy, the situation did not improve, and a tracheostomy tube with an inflated cuff remained necessary. Even though the voice remained excellent, a total laryngectomy was considered.

Lindeman's technique[11] of laryngeal diversion and separation was used to manage the problem. The upper part of the trachea was dissected and separated from the esophagus, and severed between the second and third tracheal rings. The proximal stump was then sutured to the esophagus in an end-to-side anastomosis. The distal portion was sutured to the neck skin. The remaining larynx was kept intact.

From the Division of Head and Neck Surgery, Geneva University Hospital, Geneva, Switzerland. Dr Wang is currently in the ENT Department, Affiliated Union Hospital, Medical University of Fujian, Fuzhou, China.

CORRESPONDENCE — Pavel Dulguerov, MD, Division of Head and Neck Surgery, Geneva University Hospital, 24, rue Micheli-du-Crest, 1211 Geneva 14, Switzerland.

Fig 1. Postoperative videofluoroscopy still image print. Majority of contrast material passes through larynx and tracheoesophageal anastomosis (open arrow). Small portion of contrast material takes normal route through upper esophagus (arrowheads).

After this intervention, aspiration was totally controlled. The patient could swallow normally, and the tracheostomy tube was removed. Videofluoroscopy revealed that half of the contrast material was passing through the laryngeal-tracheal-esophageal route (Fig 1).

Two weeks later, to rehabilitate the phonation function, a fistula was created between the upper wall of the tracheostoma and the subglottic area, and an indwelling Blom-Singer prosthesis was placed under endoscopic guidance (Fig 2). The voice quality was satisfactory, and there was no aspiration. Finally, the gastrostomy was closed.

DISCUSSION

Aspiration can occur in patients with various pathological processes. It is important to determine the underlying cause, because this conditions the overall prognosis and hence will guide therapeutic decisions. For patients with intractable aspiration, the described procedures often result in alteration or loss

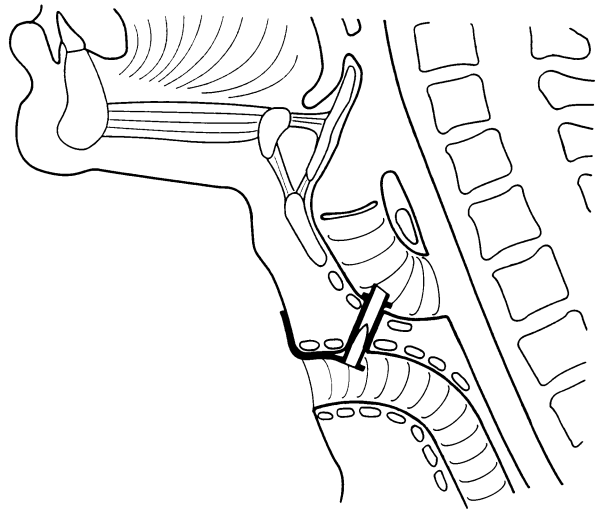

Fig 2. Schematic drawing of postoperative status. Tracheoesophageal anastomosis is depicted as performed for laryngeal diversion procedure. Tracheotracheal speech fistula is shown between 2 portions of transected trachea. Normal supraglottic structures are shown, contrary to situation in our patient.

of phonation. Laryngotracheal diversion appears to be the most frequently selected management,[11-15] because it allows a satisfactory treatment of aspiration while the larynx remains intact. Because the procedure is reversible, rehabilitation of dysphagia could result in an anatomically normal upper aerodigestive tract. In patients whose underlying disease process precludes any hope of resumption of safe swallowing, total narrow-field laryngectomy is advocated, although phonation is compromised permanently.

In the case reported, the patient had no hope for recovery of safe swallowing. The severity of aspiration was due to several independent factors: the patient's advanced age, delayed effects of irradiation (poor pharyngeal function, cricopharyngeal dysfunction, decreased laryngeal ascension with swallowing[16]), the circumferential resection of the pharyngeal constrictors, the supraglottic laryngectomy, and the presence of an adynamic segment between the tongue and the glottis. Because of all these factors, success from swallowing reeducation and other surgical procedures appeared dim, and total laryngectomy was considered. In order to conserve the vocal folds, a laryngotracheal separation and diversion procedure was selected, in association with a Blom-Singer prosthesis for voice rehabilitation. Because the prosthesis is placed between the upper wall of the tracheostoma and the subglottic area, the vocal folds retain their normal vocal function when the patient phonates. The voice quality achieved is excellent.

Various tracheoesophageal prostheses have been widely used for voice rehabilitation after total laryngectomy. To our knowledge, there is no report about

their use after laryngotracheal separation intervention, probably because few patients who undergo this procedure have the intact neuromuscular laryngeal control necessary for phonation.

We think that there is a potential for the use of speech prostheses in association with laryngotracheal diversion. The procedure allows for the definitive treatment of aspiration, while maintaining the use of the vocal folds for phonation. Further, the placement of a speech fistula does not preclude the reversibility of laryngotracheal diversion. Although we staged the procedures, both could be performed during the same general anesthesia.

REFERENCES

1. Miller FR, Eliachar I. Managing the aspirating patient. Am J Otolaryngol 1994;15:1-17.

2. Sasaki CT, Suzuki M, Horiuchi M, Kirchner JA. The effect of tracheostomy on the laryngeal closure reflex. Laryngoscope 1977;87:1428-33.

3. Berg HM, Jacobs JB, Persky MS, Cohen NL. Cricopharyngeal myotomy: a review of surgical results in patients with cricopharyngeal achalasia of neurogenic origin. Laryngoscope 1985;95:1337-40.

4. Goode RL. Laryngeal suspension in head and neck surgery. Laryngoscope 1976;86:349-52.

5. Krespi YP, Pelzer HJ, Sisson GA. Management of chronic aspiration by subtotal and submucosal cricoid resection. Ann Otol Rhinol Laryngol 1985;94:580-3.

6. Koufman JA, Isaacson G. Laryngoplastic phonosurgery. Otolaryngol Clin North Am 1991;24:1151-77.

7. Isshiki N, Tanabe M, Sawada M. Arytenoid adduction for unilateral vocal fold paralysis. Arch Otolaryngol 1978;104: 555-8.

8. Weisberger EC, Huebsch SA. Endoscopic treatment of aspiration using a laryngeal stent. Otolaryngol Head Neck Surg 1982;90:215-22.

9. Montgomery WW. Surgical laryngeal closure to eliminate chronic aspiration. N Engl J Med 1975;292:1390-1.

10. Habel MB, Murray JE. Surgical treatment of life-endangering chronic aspiration pneumonia. Plast Reconstr Surg 1972; 49:305-11.

11. Lindeman RC. Diverting the paralyzed larynx: a reversible procedure for intractable aspiration. Laryngoscope 1975; 85:157-80.

12. Baron BC, Dedo HH. Separation of the larynx and trachea for intractable aspiration. Laryngoscope 1980;90:1927-32.

13. Lindeman RC, Yarington CT Jr, Sutton D. Clinical experience with the tracheoesophageal anastomosis for intractable aspiration. Ann Otol Rhinol Laryngol 1976;85:609-12.

14. Eisele DW, Yarington CT Jr, Lindeman RC, Larrabee WF Jr. The tracheoesophageal diversion and laryngotracheal separation procedures for treatment of intractable aspiration. Am J Surg 1989;157:230-6.

15. Eibling DE, Snyderman CH, Eibling C. Laryngotracheal separation for intractable aspiration: a retrospective review of 34 patients. Laryngoscope 1995;105:83-5.

16. Lazarus CL, Logemann JA, Pauloski BR, et al. Swallowing disorders in head and neck cancer patients treated with radiotherapy and adjuvant chemotherapy. Laryngoscope 1996; 106:1157-66.