Management of laryngotracheal stenosis – our experience

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Abstract

Objective To describe our experience in the management of laryngotracheal stenosis (LTS).

Study design Prospective study.

Materials and methods This study was carried out from 2001 to 2004 on 30 cases. All cases were investigated by spiral computerized tomography and endoscopic examination.

Results There were 21 males and 9 females treated for LTS resulting from trauma (19), intubation (9) and congenital (2). Patients were divided into four groups based on surgical procedures they underwent: group I, endoscopy dilatation group (7 cases); group II, laryngotracheoplasty with Montgomery tube insertion (12 cases); group III, laryngotracheoplasty with Montgomery laryngeal stent insertion (5 cases) and group IV, cricotracheal resection with M-tube insertion (6 cases). The number of patients decannulated in group I, group II, group III and group IV were 4, 10, 0 and 5, respectively. We found statistically significant difference between decannulated and non-decannulated group for site and length of stenosis.

Conclusion Patients undergoing dilatation for LTS require multiple procedures. Open surgical exploration with stent has a better outcome than those with repeated dilatation.

Keywords Laryngotracheal stenosis · Laryngotracheoplasty · Cricotracheal resection · Intubation · Trauma · Dilatation

Introduction

Laryngotracheal stenosis (LTS) is a sequelae to laryngotracheal trauma [1]. Depending upon the site of injury it can present as supraglottic or glottic stenosis but the commonest is subglottic stenosis. The subglottic stenosis can be caused by disruption of the supporting skeleton of the cricoid cartilage and tracheal rings, failed treatment, non-recognition of the acute trauma and prolonged intubation [1]. LTS is a challenging condition for the otolaryngologist – head and neck surgeon. Acquired laryngeal stenosis in adult and children is usually a complication of prolonged intubation or due to external trauma [2]. The incidence of laryngeal stenosis following intubation ranges from 2 to 12% [3]. Ninety percent of cases of subglottic stenosis in children are secondary to endolaryngeal intubation [2].

Supraglottic stenosis can be managed by supraglottic laryngectomy, laryngeal widening procedure and laser excision. The anterior glottic web can be treated either by laser excision, repeated endoscopic excision or by an external excision with a silastic or tantalum keel. Posterior glottic stenosis is managed by excision of stenosis and arytenoids separation with a modified silastic keel with stenting to keep the posterior glottis open.

The subglottic stenosis in pediatric patient can be managed by repeated dilatation, intralesional steroid injection, carbon dioxide (CO₂) laser excision, or by endoscopic Montgomery tube (M-tube) insertion. It is always better to wait till the age of 7–8 years before considering open surgical exploration in children as it can interfere with future growth of the child’s larynx. The open surgical procedures include Evan’s laryngotracheoplasty (LTP) with stenting (Swiss Roll), Cotton’s laryngotracheal reconstruction using costal cartilage graft or by using hyoid-muscle pedicle flap.
In adults, open surgical procedures used are LTP, cricotracheal resection (CTR), or tracheal resection. Although dilatation represents a safe, well-tolerated procedure, temporarily improvement is often followed by recurrent symptomatic disease requiring repeated dilatation or airway surgery. Advantage of major airway reconstruction are that they are a single-stage, definitive treatment. However, they do carry higher morbidity and mortality than dilatation.

In this prospective study, we describe our experience in management of LTS in 30 cases and compare the use of various surgical modalities to determine the best treatment for these difficult patients. One new modality of treatment for glottic stenosis using Montgomery laryngeal stent has also been described.

**Materials and methods**

This prospective study was conducted on 30 cases with LTS in the Department of Otolaryngology and Head and Neck Surgery from 2001 to 2004. After detail history and clinical examination, all cases were evaluated radiologically by spiral CT with three-dimensional reconstruction and were taken up for endoscopic assessment under general anesthesia to assess for the site, consistency and length of stenosis. We used the Modified Mayer-Cotton grading system to rate the severity of LTS [1].

Endoscopy and dilation was done in 7 cases (23.3%), 6 of these cases were children and one was having tracheoesophageal fistula. Open surgical procedure was done in 23 patients; LTP with M-tube insertion in 12 cases (40%) where the length of stenosis was more than 2.5 cm, LTP with Montgomery laryngeal stent insertion in 5 cases (16.66%) when there was associated glottic and supraglottic stenosis and cricotracheal resection with M-tube insertion in 6 cases (20%) where the length of stenosis was <2.5 cm. Though, the CTR with thyrotracheal anastomosis is a difficult and technically challenging procedure, it has the best surgical outcome in treatment of subglottic stenosis. It was done in cases having small length of stenosis so that it could easily be resected and to avoid the need for harvesting cartilage graft for laryngotracheoplasty. Laryngofissure was done by midline thyrotomy approach and anterior tracheal wall defect was repaired by using costal cartilage and strap muscle. Additional procedures like Montgomery laryngeal keel insertion was done in one case (3.3%), repair of tracheoesophageal fistula in one (3.3%). There was no mortality and no major complication.

Postoperatively surgical outcome was assessed by the number cases decannulated and quality of voice after decannulation. Preoperative voice assessment could not be done because of critical ill condition of patients and tracheostomy. Postoperative voice was assessed subjectively by pitch, quality, loudness and intelligibility.

The data was analyzed statistically by using Pearson correlation, paired ‘t’ test, Chi-square test and Mann-Whitney test. The study was approved by the institutional review committee.

**Results**

Out of 30 patients, 21 were males and 9 were females, between 4 months and 55 years of age (mean age was 18.56 years). Eleven patients were below the age of 15 years, 17 patients were between 16 and 40 years of age and only 2 patients were more than 41 years of age. Out of 30 cases, 5 were children and 25 were adult.

All the patients presented with a history of the respiratory distress (28 patients with breathlessness at rest and 2 patients with breathlessness on exertion). Dysphonia was present in 27 patients (90%) and 24 patients (80%) had external laryngeal deformity. All patients were tracheostomy dependence. Trauma was found to be the commonest cause of stenosis seen in 19 cases (63.33%) (blunt trauma in 16 cases (53.33%) + penetrating injury in 3 cases (10%)]. The second commonest cause of stenosis was intubation seen in 9 patients (30%) as shown in Table 1.

All cases were evaluated by endoscopy to see for site, type, grade and whenever possible length of stenosis on endoscopy and a note was made for other additional findings. Out of 30 cases, subglottis with or without trachea was involved in 24 cases (80%), subglottis and glottis were involved in 4 cases (13.33%) and the stenosis was transglottic in 2 (6.67%). Subglottis was the commonest involved site.

Length of stenosis could be measured in 14 cases only during endoscopy. In other 16 case length of stenosis could not be measured because of high grade or a complete stenosis. The mean length of stenosis was 2.02 cm, median length of stenosis was 2.0 cm, largest length of stenosis was 4.5 cm and smallest length was 0.5 cm. Mean of percentage of stenosis 82.6% (SD 29.10). Six cases (20.66%) had grade I stenosis, 2 cases (6.66%) had grade II stenosis, and 17 cases (56.66%) had grade III stenosis and 5 cases (16.66%) had grade IV stenosis. Grade III stenosis was the commonest type of stenosis. Arytenoid dislocation was seen in 3 cases (10%), arytenoid fixation was present in 2 cases (6.66%) and tracheoesophageal fistula in 2 cases (6.66%) was noted.

**Airway outcome:** To assess the airway outcome, cases were divided into four groups according to the surgical procedures they had undergone.