Role of Radiofrequency Cautery in Laryngomalacia: a Study in 12 Patients

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Abstract Laryngomalacia is the most common condition causing inspiratory stridor at or shortly after birth accounting for approximately 60% of cases. Inspiratory stridor typically occurs after few days or week and is initially mild, but over a period of 6–9 months it gets more pronounced. Spontaneous improvement usually occurs over a period of 18 months to 2 years. Although majority of cases of laryngomalacia have benign course without any long-term sequel. Typically symptoms are worse during sleep and supine position while the same improves in prone position. There are 12 cases in the present study with the average age of the baby was 4.74 months (142 days). Male to female ratio of 1:1. Those babies with life-threatening apnea, significant cyanotic (blue) spells, failure to thrive with feeding difficulty, significant chest wall and neck retractions with breathing and requires oxygen to breathe were included in the study. One patient presented with tracheostomy tube in place. Two babies were preterm. These preterm babies were initially kept on ventilator before the final diagnosis was made. The findings were different in all the cases. The common findings are cyclical collapse of supraglottic larynx with inspiration, short aryepiglottic folds, indrawing of cuneiform and corniculate cartilages forward over the

laryngeal inlet resulting in prolapse during inspiration. The surgical procedures in laryngomalacia babies were combined according to the type of laryngomalacia. The procedures performed were supraglottoplasty (Unilateral/Bilateral), epiglottoplasty, aryepiglottoplasty, aryepiglottic fold division, epiglottopexy. The procedures were performed by radiofrequency cautery under general anesthesia. The average hospital stay in nine patients was less than 36 h and more than 7 days in remaining three patients. In tracheostomized patient second surgical procedure was done as after the first procedure failed to decannulate the child. The postoperative period was uneventful. The average follow up was 10 months.

Keywords Laryngomalacia · Surgical procedures

Introduction

Laryngomalacia is the most common condition causing inspiratory stridor at or shortly after birth accounting for approximately 60% of cases. Stridor occurs as a result of prolapse of the supraglottic structures into laryngeal inlet on inspiration. Inspiratory stridor typically occurs after few days or week and is initially mild, but over a period of 6–9 months it gets more pronounced. Spontaneous improvement usually occurs over a period of 18 months to 2 years. Although majority of cases of laryngomalacia have benign course without any long-term sequel. Only in few percentage of cases the symptoms are worse during sleep and supine position while it improves in prone position. If infant is sleeping, the signs of respiratory distress are more evident like tachypnea, intercostals recession, suprasternal and subcostal recession and inspiratory sound.

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Materials and Methods

This study was carried out over a period of 3 years from June 2006 to May 2009. The setting was in private and mission hospital with fully equipped pediatric Intensive care unit. First baby in the study was new born. Two babies in the present series were preterm but the presentation was after 10 days of birth. These preterm babies were initially kept on ventilator before the final diagnosis was made (Table 1).

The diagnosis was made by examining the child under inhalational anesthesia with 30 degree sinus endoscope and also by flexible laryngoscope. In all cases vocal cord movements were checked and proper archiving and analysis of videolaryngoscopy was done.

Only those children with moderate or severe degree of laryngomalacia were included in the present study. These babies were having combination of symptoms like:

- Life-threatening apnea
- Significant cyanotic (blue) spells
- Failure to thrive with feeding difficulty
- Significant chest wall and neck retractions with breathing
- Requires oxygen to breathe
- Heart or lung problems as a result of chronic oxygen deprivation
- All babies regurgitate and have reflux, but children with laryngomalacia may have more than other babies.

The surgery was done under General Anesthesia with proper endotracheal intubation. The surgery performed by

Radiofrequency cautery with medium power setting. The target areas varied depending on the videolaryngoscopic findings and type of laryngomalacia.

There is a classification of laryngomalacia based on anatomical considerations. Type-1, with inward collapse of aryepiglottic fold (Fig. 3); Type 2 is long inward epiglottis which curls on itself (Fig. 1, 2); Type-3 inward collapse of cuneiform and corniculate cartilage; Type-4 posterior inspiratory displacement of epiglottis against posterior pharyngeal wall or over the vocal cords (Fig. 4); Type-5 Short aryepiglottic folds.

There are various surgical procedures described for laryngomalacia babies. In supraglottoplasty the redundant mucosa over supraglottic areas like corniculate cartilage arytenoids and aryepiglottic folds (Fig. 6). In epiglottoplasty the redundant mucosa over the lateral edges of epiglottis, arytenoids and aryepiglottic folds are removed (Fig. 5). In aryepiglottoplasty the aryepiglottic area was burned at multiple sites either by laser or radiofrequency cautery. While in aryepiglottic fold division the folds are divided by endoscopic scissors after the laser or radiofrequency application.

All the cases were having combination of various types of Laryngomalacia. The hospital stay in nine cases was less than 36 h. While in remaining three cases it was more than 7 days. In postoperative period antireflux medication and positioning maneuvers were used.

The management of laryngomalacia babies is joint team effort of ENT Surgeon, Neonatologist and Intensivist.

Table 1 Age, sex, severity of respiratory distress, type of laryngomalacia procedure performed and total hospital stay in 12 cases

	Age	Sex	Respiratory distress	Type of laryngomalacia	Procedure performed(B/L)	Total hospital stay
1	At birth	F	Very severe	Type-1, 2 and 3	SP, EP, AED	36 h
2	4.5 month	M	Severe	Type-1 and 3	SP,EP, AED	<24 h
3	40 days	M	Severe	Type-3 and 5	SP,AED	<24 h
4	3 months	F	Severe	Type-1, 3	AED	<24 h
5	20 days	F	Ventilator	Type-4, 5	EP, AED	21 days
6	2.5 years	F	Tracheostomized	Type-1, 2, 3 (redundant mucosa)	SP, EP, AED	10 days
7	5 months	M	Moderate–severe	Type-1, 3	AED	<24 h
8	1 month	M	Ventilator	Type-4, 5	EP, AED	1 month
9	36 days	F	Severe	Type-1, 3	SP, AED	<24 h
10	38 days	F	Severe	Type-1, 2 and 3	SP, EP, AED	<24 h
11	4.5 month	M	Moderate–severe	Type-1, 2 and 3	SP, EP, AED	<24 h
12	4 month	M	Severe	Type-2, 5	EP, AED	<24 h

SP supraglottoplasty

EP epiglottoplasty

AE aryepiglottoplasty

AED A-E fold division

Fig. 1 Long tubular epiglottis ("Pranam sign")

Fig. 2 Short AE fold with long tubular epiglottis

Fig. 3 Infolding of epiglottis and AE folds

Discussion

The aryepiglottic folds are tall, foreshortened, and thin and arytenoids are large with redundant mucosa. Other factors

Fig. 4 Type-4 severe post. Infolding of epiglottis

Fig. 5 Radiofrequency used over epiglottis (Ryle's tube in pyriform sinus)

that are associated, abnormally pliable supraglottic cartilage, neuromuscular abnormalities, and gastroesophageal reflux. Epiglottis is classically described as omega shaped and folded upon itself. The laryngomalacia babies usually presents with varied degree of symptoms from mild stridor, failure to thrive to very severe degree of stridor. These severe stridor laryngomalacia babies who do not improve by positioning maneuvers and antireflux medication requires surgical intervention.

In tracheostomized child beside the classical anatomical features there was excessive redundant mucosa at inter-arytenoid level which was hanging down into the glottis and subglottis.

The usual surgical intervention in most of these severe laryngomalacia babies is supraglottoplasty. It can be done by radiofrequency cautery, Lasers (carbon dioxide or diode), or microdebrider [6]. It can be done on one side or both sides. But in Indian perspective bilateral is preferred because of the cost of surgery.

Fig. 6 Target areas in supraglottoplasty

The laser assisted supraglottoplasty was described in 1985 by Seid [3]. The Roger et al. [2] reported the largest series of supraglottoplasty with or without laser in 115 patients with success rate of 98%. In 2001, Reddy et al. [1] evaluated the efficacy of unilateral versus bilateral supraglottoplasty. In his retrospective study on 106 patients, 59 patients with unilateral and 47 patients with bilateral supraglottoplasty. In unilateral supraglottoplasty [7], 15% patients later required bilateral procedure.

The other surgical procedure in laryngomalacia babies is epiglottoplasty. This procedure was described in 1987 by Zalzal et al. [4, 5] on ten patients.

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