One Case of Laser Microsurgery Management in Severe Laryngomalacia

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Laryngomalacia is the most common laryngeal malformation that occurs mainly in newborns and children. Symptoms include inspiratory high pitched wheezing, dyspnea, and cyanosis. In most cases, symptoms aggravate until eight months and gradually disappear without any treatment as the patient grows older, but surgical treatment is required in severe cases. The surgical treatment options include epiglottoplasty, supraglottoplasty, aryepiglottoplasty, tracheostomy, and many others performing a resection of excessive mucosa in the larynx. Unlike conventional surgeries, the authors recently treated a case of a two-month-old infant with severe laryngomalacia using a CO₂ laser. After performing CO₂ laser surgery twice, the patient was cured without complications.

Key words

Laryngomalacia; Laser; Microsurgery

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INTRODUCTION

Laryngomalacia is the most common laryngeal malformation that occurs mainly in newborns and children. The disease was first reported by Rilet and Barthez in 1853 and was given several names in the 1960s. Hollinger called the disease laryngomalacia.^{1,2} Laryngomalacia is believed to be caused by immatures cartilage growth that forms the skeleton of the larynx^{3,4} or a minute incongruity of the larynx muscles involved in respiration.⁵ Symptoms are inspiratory high pitched wheezing, dyspnea and cyanosis which can be worsen while the infant is crying, breast feeding, lying in a supine position. In most cases, symptoms aggravate until 8 months and gradually disappear without any treatment as the patient grows older than 12 months, but surgical treatment is required in severe cases. Surgical treatments are epiglottoplasty, supraglottoplasty, aryepiglottoplasty, tracheostomy and many others performing resection of excessive mucosa in larynx. But unlike conventional surgeries, authors recently treated a case of a two-month-old girl with severe laryngomalacia using a CO₂ laser. Lasers used in laryngomalacia surgery have benefits on shorter operation time, lesser bleeding risks and quick recovery after operation.

CASE REPORT

Female patient was born on February 14, 1997, from a 29-year-old healthy mother after 39 weeks and 3 days of gestation by natural childbirth. Birth weight was 3.4 kg, respiratory system and pulse immediately after birth showed normal findings. On the third day after birth, dyspnea and jaundice occurred, Echocardiography revealed an interventricular septal defect, coarctation of the aorta,

and patent ductus arteriosus. An arterial canal ligation was performed during chest surgery. On the second day after surgery, the tracheal intubation was removed, but she was referred to otolaryngology department for cyanosis and dyspnea.

When patient was first referred to otolaryngology department, patient was weighing 4.3 kg. Cyanosis was not severe while oxygenated but dyspnea and a chest depression with wheezing sound during inspiration was observed. Also contractile heart murmur was heard on the right sternum of the infant. For the lungs, there were no abnormal findings in the computed tomography and blood tests. The patient was unable to take nutrition orally due to severe dyspnea and was dependent on tube feeding. An omega-shaped epiglottis was observed by flexion laryngeal endoscope, which confirmed that the right part of the epiglottis had been sucked into the larynx during inspiration. Furthermore, the swelling of the arytenoid cartilage was partially sucked into the larynx during inspiration, making it more difficult to maintain proper respiration.

On the operation day, larynx was exposed with a pediatric laryngoscope under general anesthesia. Bilateral ends and lingual surface of epiglottis were vaporized and excised with a CO₂ laser attached to the surgical microscope (2W, continuous mode) (Fig. 1, 2). The excision site, approximately one-quarter of the total lateral length of the epiglottis was removed from both sides, leaving only around one half of the original epiglottis. The volume was reduced by vaporizing the lateral surfaces on both sides of the arytenoid cartilage and lingual side of epiglottis. The day after surgery, inspiratory wheezing and chest depression disappeared. And as a result, the patient was

Fig. 1. Preoperative view of epiglottis in laryngomalacia.

Fig. 2. Redundant tissue was vaporized with CO₂ laser on bilateral ends and lingual surface of epiglottis.

Fig. 3. Second operation was performed to vaporize the aryepiglottic folds.

able to remove the tracheal intubation. Flexion laryngeal endoscopic exam was performed seven days after surgery. Showing that the swelling at the surgical site did not disappear completely, but the epiglottis was not aspirated during inspiration. In consultation with the pediatrics department, the laryngomalacia was not completely resolved, but it was decided to observe the course, judging that the degree of illness had been decreased from severe to mild. Twenty-four days after surgery, the patient was referred again to the otolaryngology department for chest depression and dyspnea that had not disappeared completely. The patient was also having a mild heart failure at that time. In consultation with the thoracic surgery department, airway obstruction symptoms were aggravating the heart failure and the incompletely cured laryngomalacia must be treated properly for complete remission. Twenty-eight days after first surgery, reoperation was performed under general anesthesia. This time, both side of the epiglottis and the aryepiglottic fold were vaporized (Fig. 3). Tracheal intubation was removed on the operation day. As laryngeal edema persisted, mild dyspnea has occurred for few days. But after one week, the symptoms disappeared and the heart failure also improved.

DISCUSSION

Infants can breathe normally with their nose while breast feeding, as they have flexible epiglottis and a high position of larynx which is about second vertebral body. When breast feeding starts, soft palate, epiglottis and aryepiglottic fold closes simultaneously to protect the larynx from aspiration. But in laryngomalacia patients, closure

occurs excessively which leads to plug the whole larynx even there is no feeding motion.

Mostly laryngomalacia improves within a year to year and a half without any treatment. The reasons are, when the infant grows older, larynx moves to the lower portion of the neck. As the larynx moves down, not only the inner diameter of the larynx grows, but also epiglottis is parted away from the tongue base and straightens up which leads to less block the glottis. Also maturation of epiglottis with calcified portion gives the epiglottis to stay up still during inspiration.

In these conservative cases, generally the role of otolaryngologist is to explain the nature of the illness to the parents. In addition, they should check the upper airway breathing and oral intake of the patient to be appropriate. So that laryngomalacia does not impair the infants' ordinary growth rate. On the other hand, serious laryngomalacia requires proper treatment, in which case a tracheostomy is traditionally performed.

Although there is no consistent criterion for severe laryngomalacia, there have been cases of severe dyspnea, dysphagia, heart failure, low growth rate problems due to airway obstruction. Furthermore, the disease is concerned to be severe if esophageal reflux is diagnosed together. And it also needs to be treated primarily.⁶

In addition to tracheostomy, other surgical therapies have been performed since the end of the 19th century, but the usefulness of these surgical treatments have not been studied. In 1984, Lane used microcupped forceps and Belluci scissors to remove the obstruction of epiglottis and reported dramatic improvement in symptoms.³ Seid et al. also reported an effective treatment using a CO₂ laser to make excision on the shortened epiglottis folds.⁶ In 1987, Zalzal et al. introduced a method of removing the mucosa of the epiglottis folds, epiglottis cartilage, and corniculate cartilage site with epiglottis scissors and called it "epiglottoplasty".⁷ In 1987, Solomon et al. introduced epiglottopexy.⁸

CO₂ laser surgery is easy to operate with short surgery time, and has less bleeding tendency during operation. In this case, there are no significant differences from conventional surgical methods except for using a CO₂ laser for excision. In 1995, Roger et al. vaporized the bottom of the epiglottis with a laser in severe cases so that the epiglottis could build an anterior scar through fibrosis.⁵

In our case, on the first surgery, excess mucous membrane entering the larynx during inspiration was vaporized by the CO₂ laser. But after operation, the remaining epiglottis failed to stay straight and plugged the larynx while inspiration. In the second operation both sides of the

epiglottis and aryepiglottic fold were vaporized additionally with CO₂ laser.

Laryngomalacia involves upper laryngeal lesions that show a group of similar symptoms rather than a particular illness, in which surgical procedures are not necessary in most cases. It is important to distinguish whether the obstruction site is the anterior part or the posterior part of the upper laryngeal lesion, and select a method to solve the problem depending on the nature of the lesion. Depending on the author's experience, a laser should be used in cases of narrow operation field surgery using a small laryngoscope. Because, as the operation field narrows it becomes more difficult to perform excision surgery using microforceps and microscissors rather than using a laser.

Surgical complications have been reported, including bleeding, temporary dysphagia due to excessive laser use, formation of epiglottis granuloma, and prolonged tracheal intubation due to glottis edema. Mostly with mild symptoms, and they can usually be prevented by cautious surgical procedure and post-operative care.

CONCLUSIONS

Laryngomalacia generally improves naturally and does not require special treatment. On the other hand, surgical treatment should be considered in some severe cases. Usage of laser in laryngomalacia operation is easy to operate and also giving high accuracy. Various surgical methods including laser technique can be applied depending on the type and severity of the lesion.

CONFLICT OF INTEREST

Seung Hoon Woo is the Editor-in-Chief of the journal but was not involved in the review process of this manuscript. Phil-Sang Chung is an editorial board members of the journal but was not involved in the review process of this manuscript. Otherwise, there is no conflict of interest to declare.

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