

Short Term Intubation Resulted in a Disastrous Subglottic Stenosis: A Case Report

Behzad Shahrjerdi, Suzina Sheikh Ab. Hamid, Ali Ango Yaroko

ABSTRACT

Introduction: Subglottic stenosis is one of important complications of intubation. This should be considered as an emergency condition if followed by developing a difficulty in breathing and needed evaluation and resuscitation of the airway as well.

Case summary: We report a case of patient presented with noisy breathing and respiratory distress with history of short time intubation due to laryngeal edema because of facial burn. He developed shortness of breathing after extubation and in direct laryngoscopy a disastrous stenosis at subglottic area noted. Two times dilatation were not helpful for him and finally open laryngotracheal reconstruction was performed by Shiann Yann Lee technique. Currently the patient is well and the latest direct laryngoscopy showed a patent airway with an acceptable subglottic caliber.

Conclusion: In spite of performing a non-traumatizing intubation with appropriate size of endotracheal tube, using the high volume-low pressure cuffed tube with proper deflation and avoiding prolonged intubation and ventilation, still there is a chance of developing laryngotracheal stenosis after extubation. Consequently, precise post intubation observation, follow up and keeping in view for the possibility of stenosis is necessary.

KEY WORDS

subglottic stenosis, intubation, respiratory distress

INTRODUCTION

Partial or complete narrowing of the subglottic area can be congenital or acquired. The problem is affecting soft tissue and cartilaginous support. The most common cause of acquired stenosis is intubation that may lead to injury in subglottic area due to pressure and motion of tube against the mucosa, soft tissue and cartilaginous framework and initiates ischemia and necrosis.

CASE SUMMARY

Eighteen years old man with no known chronic medical illness presented himself to emergency unit with complaint of noisy breathing and shortness of breath associated with hoarseness of the voice for five weeks duration which has been worsened due to URTI for a few days. The patient alleged history of superficial burn over the face eight weeks prior to this presentation, resulted in elective intubation due to laryngeal edema with uncuffed size 7.0 endotracheal tube that followed by self extubation after five days. The patient denied any respiratory complaint within two weeks after extubation.

On examination, biphasic stridor was noted with predominant expiratory phase. Clear and equal sound heard in lungs auscultation. Facial burn healed properly without noticeable scar over the face and neck. In indirect laryngoscopy, normal supraglottic area and symmetrical mobility of vocal cords seen, but a disastrous subglottic stenosis with a pin point airway lumen identified (Figure 1).

The patient was admitted and tracheostomy was performed under local anesthesia immediately followed by elective direct laryngoscopy. There was subglottic stenosis that was seen just 3 cm below the vocal cords with pinpoint lumen. Incision and dilatation was performed followed by local application of mitomycin C.

Further management included twice direct laryngoscopy and dilatation in the period of 6 months. Then laryngotracheal reconstruc-

tion performed by using Shiann Yann Lee's technique and T-tube was inserted (Figure 2). Direct laryngoscopy was done after 3 months which showed patent airway with no more significant stenosis followed by removal of T-tube.

Currently patient does not have any more stridor or shortness of breathing and is under ENT follow up every 6 months.

DISCUSSION

Subglottic stenosis is a congenital or acquired narrowing of subglottic area and may present as a life threatening airway emergency. It is very important for an ENT surgeon to deal with proper diagnosis and management of this problem¹.

The most common cause of stenosis is trauma in both children and adults. Around 90% of the cases of acquired stenosis are caused by endotracheal intubation². If the irritation persists, the edema and inflammation lead to ulceration and granulation tissue formation. After removal of irritation source, healing occurs with fibroblast proliferation, formation of scar and contracture consequently, progressing to stenosis or occlusion of the airway³.

The symptoms of stenosis in laryngotracheal lumen may be presented after variable period and the patients can be asymptomatic for a period of time till trachea has stenosed to 30% of normal diameter and may be as long as 12 weeks prior to diagnosis⁴.

Several factors are responsible for obstruction of airway due to intubation including intubation trauma, period of intubation, size of the endotracheal tube in relation to size of the larynx, composition of endotracheal tube, vibration due to ventilator effect and cuff-pressure⁵.

One of the most important factors that results in tracheolaryngeal stenosis, is the duration of intubation. Usually developing of stenosis happens after period of 7-10 days of intubation and risk of injury to laryngotracheal airway dramatically increases after that, but rarely

Received on July 4, 2012 and accepted on October 5, 2012

Department of Otorhinolaryngology-Head & Neck Surgery, School of Medical Sciences, Universiti Sains Malaysia

Health Campus, 16150 Kota Bharu, Kelantan, Malaysia

Correspondence to: Behzad Shahrjerdi

(e-mail: behzad1977sh@yahoo.com)



Figure 1. Pinhole subglottic stenosis

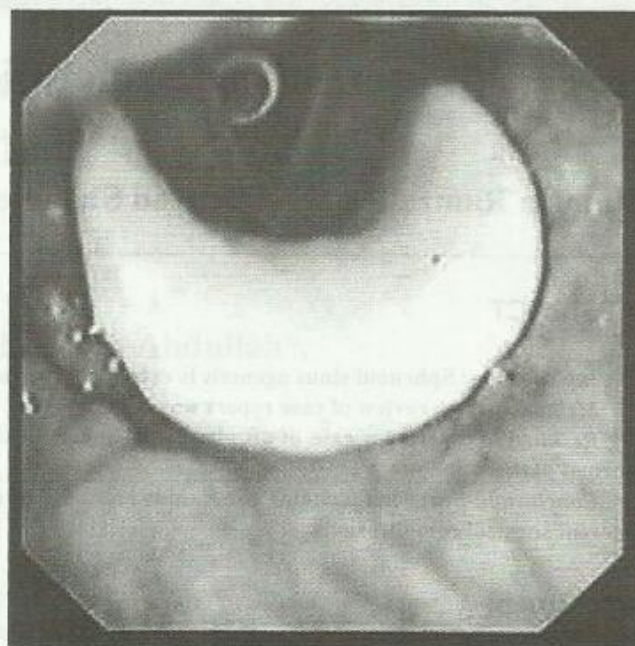


Figure 2. After insertion of T-tube

severe injury reported within one week of intubation. However, stenosis can be developed by intubation as short as one day⁶.

To clarify that duration of intubation affects the injury and subsequent laryngeal stenosis remains controversial. In human studies, the results are usually affected by the fact that the more complicated patients need longer period of intubation which has larger number of infections, more episodes of hypotension, etc.⁷.

In a prospective study in 200 patients, Whited reported that stenosis occurred in 0 of 50 patients intubated for 2-5 days, 4 of 100 patients intubated for 5-10 days, and 7 of 50 patients those intubated for 10-24 days⁸.

The size of endotracheal tube is also important. The significance of the size of the endotracheal tube in relation to the size of the larynx is emphasized by the high incidence of post intubation laryngeal injury and consequent stenosis in females^{9,10}. In a retrospective study, Hawkins found that about 90% of adults with subglottic and glottic stenosis due to intubation were women¹⁰. For adult males, tube size should not be more than 7-8 mm internal diameter and not more than 6-7 mm for adult females. In children, the proper size should be chosen according to the age⁴.

The movement of endotracheal tube and laryngotracheal lumen in relation to each other is also an imperative factor, in formation of stenosis. Flexion and extension of the neck, inspiration, cough and deglutition affect the interaction between tube and laryngotracheal lumen. This movement may result in injury either by alterations in pressure and mucosal necrosis or by frictional erosion followed by infection⁷. Radiologic imaging has determined that the endotracheal tube can move about 38 mm during flexion and extension of the head¹¹. Besides, the head movement may increase the pressure on the laryngeal mucosa due to greater deformity of the tube against the cricoid cartilages¹².

Although with the introduction of endotracheal tubes with high volume-low pressure cuff which have a large area of contact the incidence of stenosis due to intubation reduced. A prospective study had shown even intubation with high volume-low pressure cuffed tube, stenosis had been seen in 11% of the patients¹³. When the pressure of the cuff surpasses the pressure of mucosal capillary (30 mm of Hg), the part of mucosa between cuff and the cartilage becomes ischemic. The cuff of the endotracheal tube in adults is usually positioned in the trachea, just below the larynx and consequently does not cause laryngeal injury. In spite of possibility of injury of laryngeal mucosa due to cuff pressure, the tube itself might lead to damage of the laryngeal mucosa and it appears to be more the blamable for laryngeal stenosis¹⁵.

In our patient, intubation was conducted with appropriate size of tube in relation to his age. In addition, the high volume-low pressure cuff was deflated within 24 hours and the period of intubation was only 5 days without requirement of ventilation. However, regardless

of attempt to avoid laryngotracheal stenosis, the subglottic stenosis noted after a period of two weeks.

CONCLUSION

In spite of performing a non-traumatizing intubation with appropriate size of endotracheal tube, using the high volume-low pressure cuffed tube with proper deflation and avoiding prolonged intubation and ventilation, still there is a chance of developing laryngotracheal stenosis after extubation. Consequently, precise post intubation observation, follow up and keeping in view for the possibility of stenosis is necessary.

REFERENCES

- Walner DL, Loewen MS, Kimura RE. Neonatal subglottic stenosis-incidence and trends. *Laryngoscope* 2001; 111: 48-51.
- Hawkins DB. Glottic and subglottic stenosis from endotracheal intubation. *Laryngoscope* 1977; 87: 339.
- Montgomery WW. Subglottic stenosis. *Int Surg* 1982; 67: 199-207.
- Spittle N, McCluskey A. Tracheal stenosis after intubation. *BMJ* 2000; 321: 1000-2
- Cavaliere S, Bezzi M, Toninelli C, Foccoli P. Management of post-intubation tracheal stenosis using the endoscopic approach. *Monaldi Arch Chest Dis* 2007; 67: 273-80.
- Yang KL. Tracheal stenosis after a brief intubation. *Anesth Analg* 1995; 80: 625-7.
- Bishop MJ. Mechanisms of laryngotracheal injury following prolonged tracheal intubation. *Chest* 1989; 96: 185-186.
- Whited RE. A prospective study of laryngotracheal sequelae in long-term intubation. *Laryngoscope* 1984; 94: 367-77.
- Harrison GA, Tonkin JP. Prolonged (therapeutic) endotracheal intubation. *Br J Anaesth* 1960; 40: 241-9.
- Hawkins DB. Glottic and subglottic stenosis from endotracheal intubation. *Laryngoscope* 1977; 87: 339-46.
- Hedden M, Ersoz CJ, Donnelly WH, Safar P. Laryngotracheal damage after prolonged use of orotracheal tubes in adults. *JAMA* 1969; 207: 703-8.
- Conrardy PA, Goodman LR, Lainge F, Singer MM. Alteration of endotracheal tube position. *Crit Care Med* 1976; 4: 8-12.
- Bergstrom J, Moberg A, Orell SR. On the pathogenesis of laryngeal injuries following prolonged intubation. *Acta Otolaryngol* 1962; 55: 342-6.
- Stauffer JL, Olson DE, Petty TL. Complications and consequences of tracheal intubation and tracheostomy: a prospective study of 150 critically ill adult patients. *Am J Med* 1981; 70: 65-76.
- Sajal D, Sarmishtha D. Post intubation tracheal stenosis. *Indian J Crit Care Med* 2008; 12: 194-7.