ROLE OF LARYNGEAL MASK AIRWAY IN INTERVENTIONAL BRONCHOSCOPY PROCEDURES FOR UPPER TRACHEAL STENOSIS: CASE SERIES

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Abstract

Background: Bronchoscopic interventional procedures are novel means of treating airway lesions which are less invasive and well tolerated for patients with endo-luminal lesions, but managing the airway and oxygenating the patient in a field that is shared by both anesthesiologist and bronchoscopist is a major concern. Also in cases with subglottic and upper tracheal stenotic lesions an airway device placed inside the lumen interferes with the procedure and occasionally bears the hazard of ignition. Therefore, an airway device placing above the glottis with effective oxygenation is required. Laryngeal mask airway is a supra-glottic device which facilitates assisted or spontaneous positive pressure ventilation.

Methods: In this study, eight patients with subglottic stenoses due to different etiologies are presented who underwent fiberoptic bronchoscopy and therapeutic interventions through laryngeal mask.

Results: In all these patients, we experienced simple access to the vocal cord, glottis and trachea and also the lesion, besides effective oxygenation of the patient. Furthermore, bronchoscopist and patients were both comfortable with the procedures.

Conclusion: Laryngeal mask airway could be regarded as a reliable alternative for airway management during interventional bronchoscopic procedures, especially when they are located near the glottis or in the upper third of the trachea.

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Introduction

Upper airway lesions, especially in the sub glottic region, can cause serious conditions that are hardly tolerated by the patients and occasionally may be life threatening. These lesions have several etiologies with the most common of them being prolonged tracheal intubation or tracheostomy in the Intensive care unit (ICU). Other causes include: trauma, infection, burn, tumors, connective tissue diseases such as systemic lupus erythematosus and Wegener`s granulomatosis; and even idiopathic subglottic stenosis[1-3].

Treatment of tracheal stenosis is categorized to two main fields: surgical resection and reconstruction; and endoscopic therapies. Interventional bronchoscopic techniques, including: electrocautery, Argon Plasma Coagulation (APC), cryotherapy, laser, balloon bronchoplasty, and stent placement are novel means of treatment that have opened new horizons in upper airway management[4,5].

All these procedures require a secure method for airway management besides endotracheal tube, since it might either bypass the lesion or if introduced into stenotic trachea, might cause edema, bleeding and laceration and is also associated with the risk of ignition during bronchoscopic thermal therapies[6-7].

Laryngeal mask airway (LMA) is a supraglottic airway devices which can be utilized for bronchoscopic procedures and has the benefit of being placed above the glottis with excellent visibility of glottis and subglottis and thus, feasibility for treating subglottic and upper tracheal lesions[7-9].

In this study, we present 8 patients with upper tracheal stenosis who underwent therapeutic bronchoscopy through the laryngeal mask airway under general anesthesia.

Methods

In this study, we present 8 patients with upper airway lesions who were referred to Interventional Bronchoscopy Unit of Masih Daneshvari Hospital.

Patients were initially evaluated by the anesthesiologist for their underlying condition and then they signed an informed written consent regarding the procedure.

Method of anesthesia was almost similar in all patients. Initially, Lidocaine in the form of 10% spray with a maximum dosage of 1 mg/kg was used to anesthetize the pharynx and then Midazolam (1 mg) and Sufentanyl (5 microgram/kg) were injected intravenously as premedication. After 3 minutes, standard doses of Thiopental as hypnoic and Atracurium were injected to induce general anesthesia. Titrated propofol (up to a total dose of 1-2 mg/kg) was also used as hypnotic agent.

Bispectral index (BIS) was used to evaluate the level of anesthesia, Therefore; After reaching a BIS level of 60, LMA (LMA company, sizes 4-5 depending on patient) was inserted and mechanical ventilation was started using a standard anesthesia machine with following setting: tidal volume: 10cc/kg, respiratory rate: 12/min, O2 flow: 5lit/min (PEEP = 0). To ensure adequate level of anesthesia, BIS was monitored throughout the procedure and was kept around 60 using propofol infusion (100-150 microgram/kg/min).

Thereafter, FOB was introduced into LMA to perform the interventional procedures. During the procedure, vital signs and blood O2 saturation (SpO2) were monitored.

The incidence of post bronchoscopy sore throat was assessed in all patients. Also, the bronchoscopist's satisfaction with the use of LMA was determined by asking about the ease of bronchoscope insertion and procedure performance and a score resembling their satisfaction given between 1-10.

Ethical approval for this study was provided by the Medical Research Ethics Committee of National Research Institute of Tuberculosis and Lung Diseases (NRITLD).

Case 1

A 32 year-old female who had been intubated for 1 week because of suicide attempt resulting in loss of consciousness, presented with cough, dyspnea, and wheezing 10 days after. She was referred to this center with primary diagnosis of post intubation tracheal stenosis. FOB through LMA (size 4) showed a nodule at the posterior commissure of right vocal cord and

also multiple granulation tissue formation at upper and middle parts of the trachea. The nodule was removed by cryotherapy and then APC was performed to ablate the granulation tissue. Throughout the procedure which lasted 40 minutes, patient`s hemodynamics were stable and no complication occurred. SpO2 was always above 96% except for two episodes of drop (87% and 72%, respectively). After the procedure, patient reported just a mild sore throat and the bronchoscopist's satisfaction score was 10.

Case 2

A 21 year-old male presented with dyspnea and hoarseness 1 month after ICU admission and intubation for 12 days, due to electric shock. FOB was performed for the patient after inserting LMA (size 5); and 2 nodular lesions at the posterior commissure of vocal cords, and 3 web-like stenoses were seen at the middle part of the trachea. Cryotherapy was done to ablate the nodules and the tracheal webs were removed using APC. While performing the procedure, no decrease in SpO2 or other complications occurred. Patient and Bronchoscopist satisfaction was optimum.

Case 3

A 77 year-old female who was a known case of metastatic lung adenocarcinoma originating from thyroid cancer was referred for dyspnea, hoarseness, hemoptysis and stridor. After inserting the LMA (size 4), FOB was performed and subglottic tracheal stenosis and some nodular lesions due to tumoral invasion were revealed. APC was done to remove the stenotic lesions. Throughout the 1 hour procedure, patient's SPO2 varied from 85% to 98% and she was hemodynamically stable. Also, minimal bleeding occurred which was treated by APC and eventually she did not complain of sore throat after awakening. Bronchoscopist satisfaction score was 10.

Case 4

A 33 year-old female with a history of exertional dyspnea and hoarseness since 3 years ago which had been already diagnosed as Idiopathic subglottic stenosis, was referred for therapy. FOB was introduced and a stenosis of 20 mm length was seen at about 10 mm below the vocal cords. The diameter of the trachea at the site of stenosis was around 6 mm. Initially, the bronchoscopist tried to dilate the airway by rigid bronchoscope size 7.5, but during the procedure, severe oxygen desaturation happened and therefore, LMA (size 4)was used and APC was performed through the working channel of FOB to open the airway. The procedure lasted 30 minutes and was completed successfully with no complication. Patient`s vital signs were completely stable, and SPO2 remained around 90% throughout the procedure. Patient reported moderate sore throat after the procedure and the bronchoscopist was fully satisfied.

Case 5

A 29 year old female with post intubation tracheal stenosis was referred to our center for continuing her therapeutic interventions. Ten years ago, she had experienced a severe car accident resulting in coma state for 3 months. She had undergone bronchoscopic dilation and also stent placement before. In our center, she underwent flexible bronchoscopy via LMA (size 4) which showed severe stenosis at the upper part of the trachea and also granulation tissue inside the stent. APC was utilized to destruct the granulation tissue. Vital signs were within normal range during the procedure and SPO2 was always greater than 98%. A mild sore throat was reported by the patient after the bronchoscopy and the bronchoscopist satisfaction was 8 due to bronchoscope adhesion to shaft of LMA which hindered the procedure.

Case 6

A 22 year old female with subglottic stenosis secondary to Wegener granulomatosis, presented with cough and dyspnea. Fiberoptic bronchoscopy was performed through LMA (size 4) to resolve the stenosis by the means of APC. Throughout the 30-minute procedure, the lowest oxygen saturation was 96% and no instability in vital signs occurred. Patient reported a mild sore throat after recovery from anesthesia and bronchoscopist satisfaction was complete.

Case 7

A 25 year old male patient was referred with subglottic stenosis due to prolonged intubation in ICU. He had experienced car accident about 2 months ago and had been unconscious and intubated for about 20 days. After recovery and discharge from hospital he had experienced dyspnea and during preliminary examination had been diagnosed with subglottic stenosis. After LMA (size 5) insertion Fiberoptic bronchoscopy was performed and the stenosis was managed with APC. Since the stenosis was placed exactly below the glottis severe edema was expected, therefore; corticosteroid was administered in advance. The procedure was well performed and the patient recovered from anesthesia uneventfully and with mild sore throat. Bronchoscopist satisfaction score was 9 due to adhesion of bronchoscope to LMA.

Case 8

A 32 male patient, a known case of Down syndrome, was emergently referred to our ward with cyanosis, dyspnea and hypoxia. He had experienced several similar episodes during the previous months and was repeatedly intubated and admitted to ICU, therefore; a severe subglottic stenosis had been developed gradually. In addition to typical Down syndrome features with large tongue and short neck, he was morbidly obese. After induction of anesthesia the patient turned out to be a non-ventilate, non-intubate patient. LMA was inserted and both ventilation and APC treatment were performed uneventfully. Therefore, in this special case LMA had a life saving role in addition to simply a route for ventilation and device insertion. The patient was sent to ICU for further management. Bronchoscopist satisfaction was optimum.

Discussion

In this case series, we described 8 patients with tracheal stenosis consisting of 5 post intubation tracheal stenoses, 1 idiopathic subglottic stenosis, 1 tracheal stenosis secondary to Wegener granulomatosis and 1 tumoral invasion. For all these patients interventional bronchoscopy procedure was performed through LMA and each procedure was completed with no important complication.

Since the introduction of Laryngeal mask airway in 1988, it has been utilized for routine and emergency anesthetic procedures, difficult airway cases, and cases of impossible intubation while resuscitation [10]. It has been described to be an airway device which fills the gap between face mask and endotracheal tube and facilitates assisted or spontaneous positive pressure ventilation [11]. Hemodynamic changes have been shown to be less, using LMA for airway management, compared to other invasive airway devices like endotracheal tube[8]. Other advantages mentioned for LMA include rapid insertion without a laryngoscope, acceptable protection of airway and effective ventilation during general anesthesia and deep sedation, easy access to glottis and upper trachea, low frequency of cough and sore throat during recovery, and less involvement of anesthesiologist's hands compared to mask ventilation[12-14].

We experienced LMA as a suitable device because of its supra-laryngeal placement and accessibility and visualization of vocal cords, glottis and trachea. Besides, it maintained effective gas exchange in all patients, especially the patient who developed hypoxia during rigid bronchoscopy and the patient with Down's syndrome, for whom it was life saving. The bronchoscopist passed the FOB through the large bore of LMA with no inconvenience and in one patient with bleeding, he was able to control the hemorrhage quickly and effectively. Sore throat was one of our major concerns, but fortunately except for one patient with moderate degree of sore throat, all others reported none or just mild degree of discomfort.

Myers described use of an LMA along with a flexible fiberoptic bronchoscope as a safe and effective method to visualize and manage lesions of the laryngo-tracheal region, especially when combined with a fiberoptic laser[15]. Jameson has stated the convenience of FOB placement, ease of access to subglottic region, and acceptible lung ventilation as advantages of LMA[9] and Chhetri described LMA as a simple and safe alternative to other ventilating methods during endoscopic laser treatment of subglottic stenosis[7]. Also, Park has described the valuable role of LMA

in insertion of T-tube in sub-glottic stenosis, which is yet another challenge for anesthesiologists, since ventilation is sometimes severely impaired during the procedure[16].

In conclusion, laryngeal mask airway could be regarded as a reliable alternative for airway management during interventional bronchoscopic procedures, especially when they are located near the glottis or in the upper third of the trachea.

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