



# Anaesthesia Management During Interventional Bronchoscopic Procedures: Laryngeal Mask Airway or Rigid Bronchoscope

Girişimsel Bronkoskopik Prosedürler Sırasında Anestezi Yönetimi: Laringeal Maske Havayolu veya Rijit Bronkoskop

Lida Fadaizadeh, Mahsa Sadat Hoseini, Mohammad Bagheri

Telemedicine Research Center, National Institute of Tuberculosis and Lung Diseases, Shahid Beheshti University of Medical Sciences, Tehran, Iran

**Objective:** Interventional bronchoscopy procedures are novel and effective modes of diagnosing and treating airway lesions. Airway management and ventilation are a major concern, especially when considering the fire hazard of ventilating during endobronchial thermal therapies. The aim of this study was to evaluate the usage of laryngeal mask airway (LMA) compared to rigid bronchoscopy for the ventilation of patients undergoing diagnostic or therapeutic interventional bronchoscopy procedures.

**Methods:** During this prospective randomised clinical trial study, patients were randomly allocated to two groups for ventilation: LMA and rigid bronchoscopy. Vital signs, including blood pressure, heart rate and percentage of blood O<sub>2</sub> saturation before and during the procedure, degree of sore throat after recovery and physician's satisfaction, were recorded.

**Results:** A total of 83 patients, including 45 in the "LMA" and 38 in the "rigid" groups, were enrolled in this study. Their mean age was 51±17 years, and 59 (71%) were male. There was a statically significant difference between "rigid" and "LMA" categories regarding the decrease in O<sub>2</sub> during the procedure in proportion to baseline figures (p=0.028). Haemodynamic parameters were better maintained using LMA compared to rigid bronchoscopy.

**Conclusion:** Laryngeal mask ventilation maintains better oxygenation and haemodynamic stability and ensures physicians' and patients' satisfaction regarding ease of use, airway access and fewer complications compared to rigid bronchoscopy. Therefore, LMA can be introduced as a reliable alternative for ventilation during interventional airway procedures.

**Key Words:** Laryngeal mask, rigid bronchoscope, interventional bronchoscopy

**Amaç:** Girişimsel bronkoskopi prosedürleri havayolu lezyonlarının tanı ve tedavisinde yeni ve etkili yöntemlerdir. Özellikle endobronşiyal termal tedaviler sırasında ventilasyonun yakma tehlikesi göz önüne alındığında hava yolu yönetimi ve ventilasyon başlıca endişe konusudur. Bu çalışmanın amacı tanılmal veya terapötik girişimsel bronkoskopi prosedürü uygulanan hastaların ventilasyonunda rijit bronkoskopiye kıyasla laringeal maske havayolu (LMH) kullanımını değerlendirmektir.

**Yöntemler:** Bu prospektif randomize klinik çalışma sırasında hastalar iki ventilasyon grubundan birisine randomize olarak atandı: LMH ve rijit bronkoskopi. İşlem öncesinde ve sırasında kan basıncı, kalp hızı ve kan O<sub>2</sub> satürasyon yüzdesi dahil yaşamsal bulgular, derlenme sonrası boğaz ağrısının derecesi ve hekim memnuniyeti kaydedildi.

**Bulgular:** "LMH" grubunda 45 ve "rijit" grubunda 38 olmak üzere toplam 83 hasta çalışmaya alındı. Yaş ortalaması 51±17 yılı ve 59'u (%71) erkekti. Başlangıç değerlerine oranla işlem sırasında O<sub>2</sub> miktarındaki düşüş açısından "rijit" ve "LMH" grupları arasında istatistiksel olarak anlamlı fark vardı (p=0,028). Rijit bronkoskopiye kıyasla LMH kullanımında hemodinamik parametreler daha iyi korundu.

**Sonuç:** Rijit bronkoskopiye kıyasla laringeal maske ventilasyonu daha iyi oksijenasyon ve hemodinamik stabilite sağlamakta ve kullanım kolaylığı, hava yoluna erişim ve komplikasyonların azlığı açısından hekim ve hasta memnuniyetini temin etmektedir. Bu nedenle, LMH girişimsel hava yolu prosedürleri sırasında ventilasyon için güvenilir bir alternatif olarak sunulabilir.

**Anahtar Kelimeler:** Laringeal maske, rijit bronkoskop, girişimsel bronkoskopi

## Introduction

The diagnosis and treatment of airway lesions have been revolutionised since the expansion of the interventional pulmonology field. There has been an increasing trend to utilise endoscopic treatment modalities, including laser, electrocautery, cryo-therapy and argon plasma coagulation (APC) via fiberoptic bronchoscope (FOB) and rigid bronchoscope. These novel techniques play a valuable role in improving the patient's quality of life, particularly through removing intraluminal obstructions resulting from tracheobronchial tree tumours (1-4).

On the other hand, performing these bronchoscopic procedures is unpleasant and hardly tolerable for patients and necessitates general anaesthesia. Since the working fields of both the anaesthesiologist and bronchoscopist are the same, airway

management and preventing hypoxemia in patients are the principal concerns. Different modes of ventilation can be utilised for maintaining patient oxygenation, ranging from a nasal cannula and face mask to laryngeal mask airway (LMA) and rigid bronchoscopy and endotracheal tube, each having its own advantages and disadvantages. As an example, during the performance of all modes of endobronchial thermal therapies, ignition of the endotracheal tube and fire hazards are major risks that threaten the patient's life (1, 3, 5).

Another noticeable problem, especially in younger patients or those with a smaller body size, is the difficulty of passing the FOB through the endotracheal tube (6, 7). Some specialists use a flexible bronchoscope via rigid bronchoscope using jet ventilation in order to overcome this hardship (8); yet, this technique is not suitable in cases suffering from laryngeal or subglottic lesions and severe tracheal stenosis (3, 6).

The laryngeal mask airway is one of the supraglottic airway devices providing the possibility of positive pressure ventilation (6). It was first introduced in 1988 (9), and several advantages have been noted for it, including relatively simple insertion (without using a laryngoscope), securing the airway in an efficient way during general anaesthesia and deep sedation, allowing easy passage of large FOBs, even in children, and most noteworthy, placement above the larynx. This advantage brings two positive points: access to subglottic structures and lesions and minimum risk of ignition, owing to having a safe distance from the site of the bronchoscopic intervention (7, 10-14).

The aim of this study was to evaluate the maintenance of anaesthesia in two methods of performing interventional bronchoscopy, one with LMA and the other with rigid bronchoscopy, in patients undergoing diagnostic or interventional procedures.

## Methods

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

This clinical trial study was performed during a 1-year period, and all patients who were referred to this centre with an indication of diagnostic and/or therapeutic bronchoscopy due to airway lesions, including an endoluminal mass or tracheal stenosis, were enrolled in this study. These patients were allocated to one of these two groups on a sequential basis: the "LMA" group, using LMA and mechanical ventilation, and the "rigid" group, using rigid bronchoscopy and jet ventilation.

Initially, patients were assessed for their underlying condition and the possibility of anaesthesia, and as exclusion criteria, those who had been suffering from poorly controlled cardiovascular disease, patients with severe respiratory distress re-

garded as an airway emergency, patients with a tracheostomy and non-fasting patients were eliminated from the study. All other patients signed an informed written consent form regarding the procedure.

Before beginning the procedure, the pharynx was locally anaesthetised with 10% lidocaine in the form of a spray with a maximum dosage of 1 mg kg<sup>-1</sup> and then midazolam (1 mg), and sufentanil (5 microgram kg<sup>-1</sup>) was injected intravenously as premedication. After 3 minutes, general anaesthesia was induced by injection of propofol as a hypnotic and atracurium as a muscle relaxant using standard doses considering the patient's weight. Infusion of propofol (up to a total dose of 100-150 µg kg<sup>-1</sup> min<sup>-1</sup>) was also used for maintenance of anaesthesia.

After reaching an adequate level of anaesthesia in each group (bispectral index <60), the selected device (LMA or rigid bronchoscope) was inserted. In the LMA group, patients were ventilated using a standard anaesthesia machine (tidal volume: 10 cc kg<sup>-1</sup>, respiratory rate: 12/m, FiO<sub>2</sub>: 100%, in, O<sub>2</sub> flow: 5 lit), and patients who underwent rigid bronchoscopy were ventilated by a jet ventilator using the following set-up: frequency: 150-200 R min<sup>-1</sup>, PIP: 25, FiO<sub>2</sub>: 100%, driving pressure: 2.5-3 bar, minute ventilation: 15-20.

Diagnostic or therapeutic procedures-for example, transbronchial needle aspiration, argon plasma coagulation of tracheal tumours or stenosis, balloon dilatation of stenosis and many other procedures-were performed with special probes and devices that are designed for use through the working channel of a fiberoptic or rigid bronchoscope, accordingly.

Demographic characteristics, underlying disease and presentation were recorded in a questionnaire for each patient. Further, a baseline measurement of vital signs involving blood pressure, heart rate and percentage of blood O<sub>2</sub> saturation (SpO<sub>2</sub>) was recorded, and thereafter, the trend of each parameter was recorded on a 5-min basis throughout the procedure. In addition, the site of the lesion and type of the procedure were recorded, and after awakening from anaesthesia, patients were asked about feeling a sore throat, and its grade was recorded as follows: 0: no sore throat, 1: mild, 2: moderate, 3: severe. Eventually, the anaesthesiologist's and bronchoscopist's level of satisfaction was recorded using a 10-point numerical scale, with 0 indicating the worst and 10 indicating the best level of satisfaction.

## Statistical analysis

Statistical analysis of the data was done using Statistical Package for the Social Sciences ver. 20.0 (SPSS, Inc., Chicago, IL, USA). For the description of variables, mean and SD were used for quantitative variables, and frequency and percentage were used for qualitative ones. Analysis of variance and repeated measures was used for comparing changes in SpO<sub>2</sub>, blood pressure, heart rate and bispectral index during the

Table 1. Characteristics of patients in the "LMA" and "rigid" groups

Groups / Characteristics		LMA	Rigid
Age (years), Mean±SD		52±17	49±16
Sex, No (%)	Male	23 (51%)	36 (94.7%)
	Female	22 (49%)	2 (5.3%)
Presentation, No (%)	Dyspnea	32 (71.1%)	22 (57.9%)
	Cough	4 (8.9%)	4 (10.5%)
	Hemoptysis	7 (15.6%)	10 (26.3%)
	Stridor	2 (4.4%)	2 (5.3%)
Underlying disease, No (%)	Lung cancer	20 (44.4%)	26 (68.4%)
	Post-intubation tracheal stenosis	10 (22.2%)	5 (13.2%)
	Unknown	5 (11.1%)	2 (5.3%)
	Others	10 (22.2%)	5 (13.2%)
Type of the procedure, No (%)	APC	36 (80%)	36 (94.7%)
	Biopsy	3 (6.7%)	0
	Transbronchial needle biopsy (TBNA)	4 (8.9%)	0
	Cryotherapy	1 (2.2%)	0
	Balloon dilation	0	1 (2.6%)
	Injection	0	1 (2.6%)

SD: standard deviation; LMA: laryngeal mask airway, APC: argon plasma coagulation

procedure between the two groups. Chi-square and Fisher's exact tests were used for comparing levels of sore throat and physicians' satisfaction between two categories of patients. P value <0.05 was considered significant.

## Results

A total of 83 patients were enrolled in this study: 45 in the LMA and 38 in the rigid bronchoscopy (RB) group (Table 1).

The most common indication for bronchoscopy was lung cancer, which accounted for 46 (55.4%) of the patients, followed by post-intubation tracheal stenosis, with 15 (18.1%) patients (Table 1).

Most of our patients (75 cases, 90.3%) underwent interventional bronchoscopy, consisting of primarily APC (72 cases, 86.7%) and injection, cryotherapy and balloon dilatation (1 patient each). Biopsy was performed in 7 patients (simple biopsy in 3 and transbronchial needle aspiration in 4 of the patients). Diagnostic bronchoscopy was performed for 1 patient with hemoptysis (Table 1).

Regarding the trend of mean heart rate changes from baseline and throughout the procedure, it was revealed that although no statistically significant difference existed between the two groups ( $p=.073$ ), in the LMA group, a smooth trend of change was detected, with no dramatic change until the end of the procedure. On the contrary, in the RB group, a rise was seen from the middle of the procedure towards the end, which means that the patients experienced tachycardia

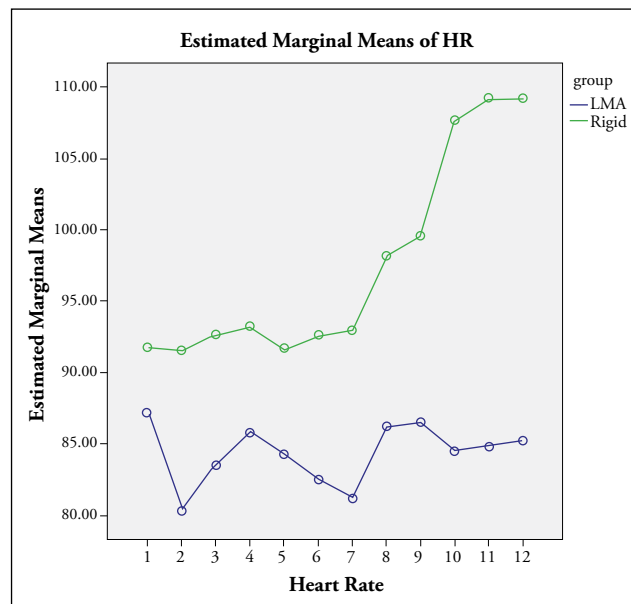


Figure 1. Comparison of heart rate changes during the procedure in the "LMA" and "rigid" groups  
LMA: laryngeal mask airway; HR: heart rate

during the end of the procedure, although the changes were not significant in either of the groups ( $p=.062$ ) (Figure 1).

As for systolic blood pressure (sBP), a statistically significant change ( $p=.001$ ) existed between the two groups, which was mainly due to a dramatic rise during the middle phase of the procedure in the RB group (Figure 2). But, for diastolic blood pressure (dBP), although mild

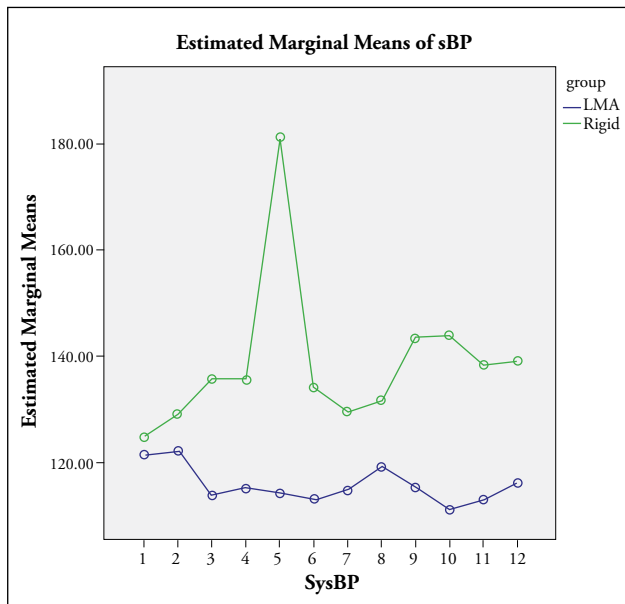


Figure 2. Comparison of systolic blood pressure changes during the procedure in the “LMA” and “rigid” groups  
LMA: laryngeal mask airway; sBP: systolic blood pressure

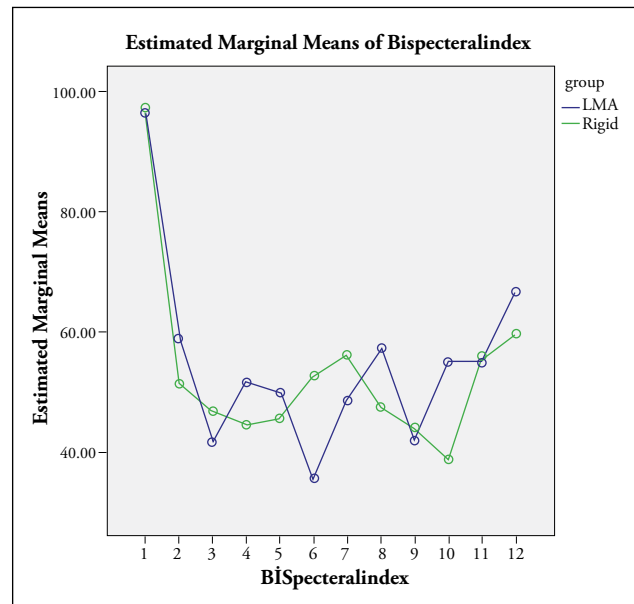


Figure 4. Comparison of bi-spectral index changes during the procedure in the “LMA” and “rigid” groups  
LMA: laryngeal mask airway

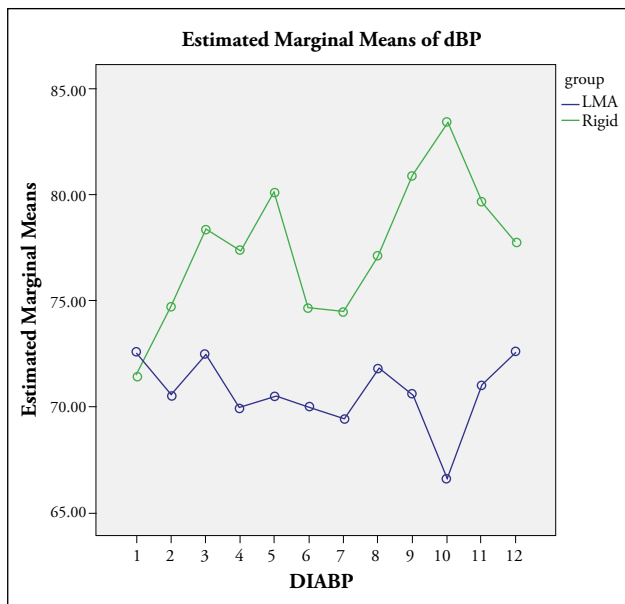


Figure 3. Comparison of diastolic blood pressure changes during the procedure in the “LMA” and “rigid” groups  
LMA: laryngeal mask airway; dBP: diastolic blood pressure

changes existed, this change was not statistically significant ( $p=0.141$ ) (Figure 3).

Considering arterial oxygen saturation ( $\text{sat O}_2$ ) during the procedures, a very significant and dramatic change was detected in the RB group ( $p=0.028$ ). The  $\text{sat O}_2$  changes in the RB group showed a declining trend, beginning from the initiation of the procedure and maximising during the middle phase, which partially corrected towards the end of the procedure. Unlike this trend, in the LMA group, a very stable trend with mild changes and normalisation at the end was detected.

It is noteworthy that the level of consciousness of each patient was monitored using bi-spectral index throughout the procedure. The results of this examination show that all patients experienced a stable and deep level of general anaesthesia, and none of the patients had experienced early emergence or light anaesthesia ( $p=.43$ ) (Figure 4).

The degree of sore throat was evaluated after recovery; mild sore throat was reported by 23 patients (51.1%) in the “LMA” group and 18 patients (47.4%) in the “rigid” group. However, 6 patients in the former group (13.3%) complained of moderate sore throat in comparison with just 1 patient (2.6%) in the “rigid” group. Severe sore throat was reported by 2 patients (5.3%) in the “rigid” and 1 patient (2.2%) in the “LMA” group. It is also notable that the percentage of patients with no complaint of sore throat was 44.7% (17 patients) and 33.3% (15 patients) in the “rigid” and “LMA” categories, respectively. However, there was no significant difference between these two groups regarding these figures ( $p=0.25$ ).

Eventually, the mean level of anaesthesiologist satisfaction was 9.93 for using LMA, which was significantly higher than the corresponding figure for rigid bronchoscopy (9.44,  $p=0.007$ ). Conversely, the bronchoscopist was more satisfied with using a rigid bronchoscope, as the mean level of satisfaction was 9.97 versus 9.69 for rigid and LMA, respectively ( $p=0.008$ ). The major complaint of the bronchoscopist was the adhesion of the FOB to the lumen of the LMA during the procedure.

## Discussion

The present study showed that using a laryngeal mask airway as an alternative technique for ventilating patients undergo-

ing diagnostic or interventional bronchoscopy is simple and feasible and is associated with less haemodynamic and oxygenation instability.

It is obvious that bronchoscopic interventions necessitate a team approach and bring a major challenge for both the bronchoscopist, who is performing a diagnostic or therapeutic measure on the respiratory tract, and anaesthesiologist, who is liable for securing the patient's airway and maintaining haemodynamic and oxygenation conditions in a stable and safe status.

Various modes of airway management have been used to maintain and secure the airway, but choosing the most adequate method, considering the pathology and site of the lesion, the interventional procedure and the possible risks, is a major concern.

One method of airway management in this field is spontaneous breathing of patients using a nasal cannula or face mask for oxygenation. This method is most applicable in cases with pharyngeal, glottic and sub-glottic lesions, but its major disadvantage is the insecurity of the airway during complications, such as bleeding, and the anaesthesiologist's hands are always occupied for performing the chin lift manoeuvre or fitting the mask.

Laryngeal mask ventilation is an alternative method of airway management during upper airway interventional procedures for which some of the disadvantages mentioned above are omitted by eliminating the need for special manoeuvres and in which the glottis is reached much faster. But since the nose and pharynx are bypassed, inspection of these areas is not possible. Moreover, a deeper level of sedation and anaesthesia is usually needed.

Regarding endotracheal tube or rigid bronchoscope insertion, it is obvious that the patients must reach a very deep and steady state of anaesthesia and that the lesions in the upper levels of the airway are always bypassed. Additionally, the upper tracheal lesions are always major obstacles in device insertion, which sometimes makes using these methods impossible (6, 8-10). Furthermore, using an endotracheal tube always bears the hazard of inflammation during laser and electrocautery procedures, which makes this method dangerous for endotracheal lesions.

Rigid bronchoscopy has always been considered the gold standard method for interventional bronchoscopic procedures, since many of the therapeutic manoeuvres, such as tumour ablation and stenosis dilatation, can be performed using this device. But, in this study, the majority of the patients had lesions in the upper trachea, where bronchoscopy fixation was a challenge when using devices, like balloon dilators or APC devices.

The results of this study showed that LMA is a suitable alternative for airway management that maintains oxygenation

and haemodynamic stability effectively and an accurate level of anaesthesia as defined by BIS monitoring, compared to rigid bronchoscopy, from the anaesthesiologist's point of view. Similarly, in some other studies, LMA has been proposed as an alternative method of airway management during bronchoscopy and laser treatment, particularly in cases of difficult airways and subglottic lesions. Other advantages of LMA over alternative devices are ease of insertion, better glottis view and rapid access of lesions with a flexible bronchoscope via the large bore of this device, which have also been indicated in these studies (10, 12, 15-18).

In our study, the high rate of anaesthesiologist satisfaction with using LMA also reconfirms the fact that technically, this method is feasible and even well tolerated by patients, since almost one-third of patients in the "LMA" group had no complaints of sore throat, and only mild levels of sore throat were reported by about one-half of the patients in this category.

Although bronchoscopist satisfaction in this study was higher when using rigid bronchoscopy, which was mainly due to adhesion of the FOB to the LMA lumen because of insufficient lubrication, the grade of satisfaction with LMA was also high enough (more than 9.5).

So far, a considerable number of studies have repeated the use of LMA in various interventional procedures of the upper airway, and its advantage and feasibility have been repeatedly emphasised; but, none has compared the use of this method with others regarding complications, advantages, disadvantages and physician and patient satisfaction. In this study, various parameters were evaluated, and as a conclusion, it became evident that LMA is a feasible and reliable method of ventilation that ensures both patient safety and physician satisfaction, especially in cases, such as subglottic lesions.

## Conclusion

Laryngeal mask ventilation is a safe, simple and feasible method of airway management during upper airway interventional procedures that effectively maintains oxygenation and haemodynamic stability and ensures physician and patient satisfaction regarding ease of use, airway access and fewer complications. Therefore, LMA can be introduced as a reliable alternative for ventilation during upper airway interventional procedures, mostly in situations where performing rigid bronchoscopy is not possible.

**Ethics Committee Approval:** Ethics committee approval was received for this study from the Medical Research Ethics Committee of National Research Institute of Tuberculosis and Lung Diseases.

**Informed Consent:** Written informed consent was obtained from patients who participated in this study.

**Peer-review:** Externally peer-reviewed.



**Author Contributions:** Concept - L.F.; Design - L.F.; Supervision - L.F.; Funding - L.F.; Materials - M.H.; Data Collection and/or Processing - M.H.; Analysis and/or Interpretation - M.H.; Literature Review - G.H.; Writer - M.H.; Critical Review - G.H.

**Conflict of Interest:** No conflict of interest was declared by the authors.

**Financial Disclosure:** The authors declared that this study has received no financial support.

**Etik Komite Onayı:** Bu çalışma için etik komite onayı Tüberküloz ve Akciğer Hastalıkları Araştırma Enstitüsü Ulusal Tıbbi Araştırma Etik Kurulu'ndan alınmıştır.

**Hasta Onamı:** Yazılı hasta onamı bu çalışmaya katılan hastalardan alınmıştır.

**Hakem değerlendirmesi:** Dış bağımsız.

**Yazar Katkıları:** Fikir - L.F.; Tasarım - L.F.; Denetleme - L.F.; Kaynaklar - L.F.; Malzemeler - M.H.; Veri toplanması ve/veya işlemesi - M.H.; Analiz ve/veya yorum - M.H.; Literatür taraması - G.H.; Yazıyı yazan - M.H.; Eleştirel İnceleme - G.H.

**Çıkar Çatışması:** Yazarlar çıkar çatışması bildirmemişlerdir.

**Finansal Destek:** Yazarlar bu çalışma için finansal destek almadıklarını beyan etmişlerdir.

## References

- Ross AF, Ferguson JS. Advances in interventional pulmonology. *Curr Opin Anaesthesiol* 2009; 22: 11-7. [\[CrossRef\]](#)
- Rodrigues AJ, Coelho D, Dias Júnior SA, Jacomelli M, Scordamaglio PR, Figueiredo VR. Minimally invasive bronchoscopic resection of benign tumors of the bronchi. *J Bras Pneumol* 2011; 37: 796-800. [\[CrossRef\]](#)
- Gao H, Ding X, Wei D, Cheng P, Su X, Liu H, et al. Endoscopic management of benign tracheobronchial tumors. *J Thorac Dis* 2011; 3: 255-61.
- Ernst A, Silvestri GA, Johnstone D; American College of Chest Physicians. Interventional pulmonary procedures: Guidelines from the American College of Chest Physicians. *Chest* 2003; 123: 1693-717. [\[CrossRef\]](#)
- Simoff MJ, Sterman DH, Ernst A. Thoracic Endoscopy: Advances in interventional pulmonology. In: Jantz MA, Silvestri GA. *Fire and ice: laser bronchoscopy, electrocautery and cryotherapy*. Massachusetts: Blackwell; 2006:134-46.
- Niggemann B, Haack M, Machotta A. How to enter the pediatric airway for bronchoscopy. *Pediatr Int* 2004; 46: 117-21. [\[CrossRef\]](#)
- Yazbeck-Karam V, Aouad M, Baraka A. Laryngeal mask airway for ventilation during diagnostic and interventional fiberoptic bronchoscopy in children. *Paediatr Anaesth* 2003; 13: 691-4. [\[CrossRef\]](#)
- Gillbe C, Hillier J. Anaesthesia for bronchoscopy, tracheal and airway surgery. *Anaesthesia and Intensive Care Medicine* 2005; 6: 422-5. [\[CrossRef\]](#)
- Nguyen A, Popat K. Airway management devices and approaches. *Advances in Anaesthesia* 2007; 25: 205-32. [\[CrossRef\]](#)
- Sung A, Kalstein A, Radhakrishnan P, Yarmush J, Raoof S. Laryngeal mask airway: use and clinical applications. *J Bronchol* 2007; 14: 181-8. [\[CrossRef\]](#)
- Hilbert G, Gruson D, Vargas F, Valentino R, Favier JC, Portel L, et al. Bronchoscopy with bronchoalveolar lavage via the laryngeal mask airway in high-risk hypoxemic immunosuppressed patients. *Crit Care Med* 2001; 29: 249-55. [\[CrossRef\]](#)
- Jameson JJ, Moses RD, Vellayappan U, Lathi KG. Use of the laryngeal mask airway for laser treatment of the subglottis. *Otolaryngol Head Neck Surg* 2000; 123: 101-2. [\[CrossRef\]](#)
- Yavaşcaoglu B, Tokat O, Basagan EM, Kaya FN, Erisen L, Kutlay O. The use of the laryngeal mask airway in children with subglottic stenosis. *J Int Med Res* 2001; 29: 541-5. [\[CrossRef\]](#)
- Slonim AD, Ognibene FP. Enhancing patient safety for pediatric bronchoscopy: alternatives to conscious sedation. *Chest* 2001; 120: 341-2. [\[CrossRef\]](#)
- Chhetri D, Long J. Airway management and CO<sub>2</sub> laser treatment of subglottic and tracheal stenosis using flexible bronchoscope and laryngeal mask anaesthesia. *Operative Techniques in Otolaryngology-Head and Neck Surgery* 2011; 22: 131-4. [\[CrossRef\]](#)
- Lee J, Hashmi N, Mandel J, Mirza N. Use of potassium-titanyl phosphate laser with flexible bronchoscope through a laryngeal mask airway in patients with difficult airways. *Operative Techniques in Otolaryngology-Head and Neck Surgery* 2011; 22: 165-8. [\[CrossRef\]](#)
- Fadaizadeh L, Hosseini MS. Laryngeal mask airway in interventional bronchoscopy for tracheal lesions. *Acta Anaesthesiol Taiwan* 2013; 51: 137. [\[CrossRef\]](#)
- Fadaizadeh L, Hosseini MS, Dabir S. Role of laryngeal mask airway in interventional bronchoscopy procedures for upper tracheal stenosis: case series. *Middle East J Anaesthesiol* 2013; 22: 223-7.