ENDOSCOPIC SURGERY WITH USE OF A LARYNGEAL MASK AND A FIBEROPTIC FLEXIBLE BRONCHOSCOPE

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Stenotic or obstructive tracheobronchial lesions often cause respiratory impairment, in some cases leading to life-threatening conditions. For bronchoscopic surgery such as neodymium:yttrium aluminum garnet (Nd:YAG) laser ablation, cautery resection, and argon plasma coagulation for airway lesions, the procedure is usually performed after securing an airway with endotracheal intubation. Tracheal intubation may increase resistance to ventilation because of narrowing of the diameter of the airway, and it may worsen the tracheal stenosis by causing edema. Additionally, maneuvering the fiberscope is often interrupted because the space between the endotracheal tube and the fiberscope is narrow. Endoscopic surgery with a rigid bronchoscope is also a useful technique, but fully trained personnel are needed to manage the rigid bronchoscope, and the sites that can be reached with it are limited. On the other hand, the laryngeal mask¹⁻³ is a reusable device with a larger internal diameter, potentially allowing easier passage of instruments, and does not require the usual endotracheal intubation or mask ventilation.¹ To date, little information is available about endoscopic surgery with a laryngeal mask and a flexible bronchoscope for tracheobronchial lesions. We investigated endoscopic surgery with a laryngeal mask and a flexible bronchoscope (LM operation) and compared it with surgery with an endotracheal tube and a flexible bronchoscope (ET operation).

From January 1995 to February 2000, a total of 57 patients, aged 10 to 87 years, with tracheobronchial lesions were randomly allocated to undergo an LM or ET operation. The study was ethically approved. All patients or their parents or guardians gave complete written informed consent. The LM operation was performed with the patient under general anesthesia with a laryngeal mask placement.¹ Anesthesia was induced with propofol (2.5-3.0 mg/kg) and maintained with sevoflurane in 66% to 75% air. A muscle relaxant such as vecuronium bromide was used when necessary. The ET operation was performed with local anesthesia with 1% lidocaine. Patients received atropine sulfate, hydroxyzine hydrochloride, and pentazocine before the operation. When necessary, diazepam or pentazocine was added intravenously during the procedure. After the flexible bronchoscope (BF1T30;

Olympus, Tokyo, Japan) was passed through the slit of the cap of the swivel connector (Portex Catheter Mount; SIMS Portex Inc, Kent, United Kingdom), which connected the laryngeal mask and anesthesia equipment, it was introduced into the laryngeal mask tube and the trachea. A variety of instruments such as an Nd-YAG laser probe, an electrocautery probe, and a grasping forceps through the working channel of the flexible bronchoscope were applied to the target lesion, and the specimen was retrieved with a grasping forceps. For stent insertion we used an expandable metallic stent. After a guidewire through the working channel of the flexible bronchoscope was introduced beyond the stenosed site, the bronchoscope was removed and a thin, flexible bronchoscope (BF3C30; Olympus) was passed through the slit of the swivel connector. After the stent loader was also passed through the slit of the connector and introduced beyond the stenosed site under direct vision of the thin bronchoscope, the expandable metallic stent that was passed through the stent loader was then pushed out to sit across the stenosis under bronchoscopic vision. Percutaneous oxygen saturation with a pulse oximeter, blood pressure, and the electrocardiogram were monitored during the procedure.

The patients' general condition was evaluated according to the American Society of Anesthesiology (ASA) grading system,⁴ with higher grades indicating higher surgical risk. The patients' sedation during the operation was assessed according to the scores reported by Ramsay and associates,⁵ with higher scores indicating more sedation. Conditions for passing a flexible bronchoscope through the laryngeal mask tube or the endotracheal tube were assessed as follows: 1 = very easy to pass the bronchoscope, 2 = easy to pass the bronchoscope, 3 = slightly difficult to pass the bronchoscope, and 4 = difficult to pass the bronchoscope. Results were considered satisfactory when the purpose of the procedure, such as curative resection, reduction of the tumor, stenting, removal of the foreign body, and dilation of airway stenosis, was accomplished. Any outcome that did not accomplish the purpose was judged unsatisfactory. Continuous, normally distributed data are expressed as means $\pm$ SD. For the analysis of differences between groups, we used the Student *t* tests or, if the results were not normally distributed, the Mann-Whitney *U* test. The χ^2 or Fisher exact tests were used to compare proportions. All analyses were performed with the StatView version 4.5 statistical package (Abacus Concepts Inc, Berkeley, Calif).

There were no significant differences between the 2 groups with respect to demographic characteristics, ASA physical status, and type of operative procedures (Table I). Placement of the laryngeal mask and adequate ventilation were achieved

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Table I. *Patients' characteristics and outcome*

	<i>LM group</i>	<i>ET group</i>	<i>P value</i>
Age (y)	61.3 ± 20.2	58.4 ± 21.0	.543
Sex (M/F)	18/9	22/8	.808
Weight (kg)	53.3 ± 10.5	56.6 ± 12.5	.274
Height (cm)	157 ± 8.68	159 ± 9.91	.407
ASA physical status	2.15 ± 0.864	1.87 ± 0.776	.225
Endoscopic procedures (%)			
Dilation of airway stenosis	9 (33)	10 (33)	
Curative resection	5 (18)	6 (20)	
Stenting	5 (18)	6 (20)	
Removal of the foreign body	5 (18)	6 (20)	
Fibrin glue application	3 (11)	2 (7)	
Condition score for passing a flexible bronchoscope through the laryngeal mask or the endotracheal tube	1.0	2.54 ± 0.51	<.0001
Sedation score	1.0	1.69 ± 0.88	.0001
Operative times	26.6 ± 13.6	41.3 ± 21.3	.0033
Result (%)			
Satisfactory	27 (100)	29 (97)	
Unsatisfactory	0 (0)	1 (3)	
Operative events (%)			
Conversion	0 (0)	1 (3)	
Bleeding	3 (11)	3 (10)	
Hypoxemia	0 (0)	3 (10)	
Postoperative events (%)			
Respiratory failure	0 (0)	1 (3)	
Sore throat	2 (7)	3 (10)	
Cough	1 (3)	3 (10)	
Total No. of patients with operative and postoperative events (%)	6 (22)	12 (40)	.415

ASA, American Society of Anesthesiology.

at the first attempt in all patients. Results of a blood chemistry test were not significantly different 24 hours after the operation in the 2 groups. The condition for passing a flexible bronchoscope through the laryngeal mask or the endotracheal tube differed significantly in the LM and ET operations (Table I). Operative time was significantly shorter in the LM group (26.6 minutes; SD 13.6 minutes) than in the ET group (41.3 minutes; SD 21.3 minutes). There were no significant differences in the number of the patients with operative and postoperative complications in the 2 groups. One patient in the ET group was converted to the procedure with a laryngeal mask placement and a flexible bronchoscope because the patient was irritable and because hemorrhage made visibility through the bronchoscope difficult. In 3 cases in the ET group, the operation was interrupted because of hypoxia, necessitating adequate ventilation. A major postoperative complication occurred in the ET group. The patient necessitated overnight mechanical ventilation because of postoperative respiratory failure. In the LM group, mild bleeding into the airway was observed in 3 patients, but no particular treatment was necessary. Percutaneous oxygen saturation, blood pressure, and electrocardiogram were not changed during the procedure in the 2 groups. No postoperative complications either related to or unrelated to the laryngeal mask placement were observed.

Although the use of general anesthesia in bronchoscopic surgery might be considered a disadvantage, the procedure allowed no motion of the patient and steady visualization of

the airway with subsequent reduced risk of injuring the tracheobronchial wall during the procedure and reduced complications. Endoscopic surgery with a laryngeal mask and a fiberoptic flexible bronchoscope, facilitating the bronchoscopic maneuvers, may be an alternative to endoscopic surgery with an endotracheal tube in the treatment of selected tracheobronchial lesions.

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