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**A RETROSPECTIVE ANALYSIS OF PEDIATRIC CASES UNDERGOING FIBEROPTIC BRONCHOSCOPY UNDER GENERAL ANESTHESIA: A FIVE-YEAR EXPERIENCE AT A SINGLE CENTER**  
**GENEL ANESTEZİ ALTINDA FİBEROPTİK BRONKOSKOPİ YAPILAN PEDIATRİK VAKALARIN RETROSPEKTİF ANALİZİ: TEK MERKEZDE BEŞ YILLIK DENEYİM**

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**ABSTRACT**

The use of the laryngeal mask (LMA) during flexible fiberoptic bronchoscopy (FOB) is more advantageous compared to other airway devices. In this study, the use of LMA for airway maintenance in FOB in pediatric patients was planned to be reviewed in the light of the literature by evaluating the postoperative complications encountered with the demographics of the patients, the duration of anesthesia and bronchoscopic diagnoses. Between January 2017 and January 2022, the files of pediatric patients who underwent FOB were reviewed retrospectively. The patients' demographics, the airway device used for airway maintenance in FOB (LMA, endotracheal tube, tracheal tube), bronchoscopy indications, bronchoscopic diagnoses, duration of anesthesia, post-procedure hypoxia, laryngospasm, and the number of patients requiring bronchospasm were all recorded. The study included 162 pediatric patients ranging in age from 0 to 17. The median age was 6.9 years old (interquartile range 0-17 years old), and the median weight was 24.5 kg (interquartile range 2.5-89). The patient group having thoracic CT abnormalities and requiring an operation to support the diagnosis was the most prevalent FOB indication (n=37, 22.8%). In all, 28 patients (17.3%) experienced temporary hypoxia, whereas 62 patients (38.3%) experienced bronchospasm. In pediatric patients, FOB via LMA is a safe method. Appropriate equipment, experienced personnel, good patient selection and adequate follow-up of the patient after bronchoscopy are among the most important factors in the prevention and reduction of complications.

**Keywords:** Child, fiberoptic bronchoscopy, laryngeal mask

**ÖZ**

Laringeal maske (LMA)'nin fleksibl fiber optic bronkoskopi (FFB) sırasında kullanımı diğer hava yolu araçlarıyla karşılaştırıldığında daha avantajlıdır. Bu çalışmada, çocuk hastalarda FFB'de hava yolu idamesi için LMA kullanımının uygulama başarı oranları ve karşılaşılan postoperative komplikasyonları hastaların demografik özellikleri, ASA risk grupları, anestezi süresi ve bronkoskopik tanıları ile değerlendirilerek literatüre eşliğinde gözden geçirilmesi planlandı. Ocak 2017 - Ocak 2022 tarihleri arasında FFB yapılan çocuk hastaların dosyaları geriye dönük olarak incelendi. Hastaların demografik verileri, FFB'de hava yolu idamesi için kullanılan hava yolu gereci (LMA, endotrakealtüp, trakealtüp), bronkoskopi endikasyonları, bronkoskopik tanıları, anestezi süresi, işlem sonrası desaturasyon, laringo spazm, bronco spazm ve reentübasyon gereken hasta sayısı kaydedildi. Çalışmaya yaşları 0-17 arasında değişen 162 pediatik hasta dahil edildi. Median yaş 6.9 (çeyrekler arası aralık 0-17 yaş) ve median ağırlık 24.5 kg (çeyrekler arası aralık 2.5-89) idi. Torasik BT anormallikleri olan ve tanıyı desteklemek için ameliyat gerektiren hasta grubu en sık görülen FOB endikasyonuydu (n=37, %22.8). Toplamda 28 hastada (%17.3) geçici hipoksi, 62 hastada (%38.3) bronco spazm görüldü. Pediatik hastalarda LMA yoluyla FOB güvenli bir yöntemdir. Uygun ekipman, deneyimli personel, iyi hasta seçimi ve bronkoskopi sonrası hastanın yeterli süre izlemde tutulması komplikasyonların önlenmesinde ve azalmasında en önemli etkenler arasındadır.

**Anahtar kelimeler:** Çocuk, fiberoptik bronkoskopi, laryngeal maske

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**INTRODUCTION**

Bronchoscopy, rigid or flexible bronchoscope with the respiratory tract and lungs of many malignant, infectious and non-infectious inflammatory disease that can be applied for diagnostic purposes as well as for the treatment of an intervention procedure (1). The diagnostic indications for use of the procedure has been manifested in a clearer way and reliability over time (2,3).

It provides the opportunity to obtain information about many infectious and/or non-infectious inflammatory diseases with samples taken by bronchoalveolar lavage (BAL) performed under the guidance of fiberoptic bronchoscopy (FOB) procedure (4). The most common complications during or after FOB procedure are hypoxemia, laryngospasm, bronchospasm, epistaxis and pneumothorax, and the frequency of complications has been reported as 1-7% (5). FOB can be performed with different airway devices such as the endotracheal tube, laryngeal mask (LMA) and face mask (6). However, LMA can provide a better airway evaluation (7).

The aim of this study was to retrospectively present the demographic characteristics, treatment indications and complications of patients who underwent fiberoptic bronchoscopy (FOB) in our clinic.

**MATERIAL AND METHOD**

**Preoperative Procedures**

The research was approved by the Ethics Committee of Medicine School, Erciyes University (2022-304). In this study, records of 828 pediatric patients aged 0-18 years who underwent FOB between January 2017 and January 2022 were reviewed retrospectively. Patients who were eligible for the trial but whose names were on the lists and who declined FOB because of the patient's refusal, failure to get consent prior to the surgery, or for other reasons were not included in the study. Between the stated dates, there were a total of 828 patient records, and the data of 162 patients were recorded overall according to the exclusion criteria. Age, gender, chronic disease, FOB indication, route of administration, pathologic bronchoscopic findings, and procedure complications were all investigated. Patients had been examined by an anesthetist at least a day before the procedure, and their informed consent was taken. Intravenous (IV) 0.1 mg kg<sup>-1</sup> midazolam was given for premedication 30 minutes earlier than the FOB. During the procedures, routine anesthesia monitoring of the cases was performed, including peripheral oxygen saturation (SpO<sub>2</sub>), capnometry, measurements of body temperature, 3-

channel electrocardiographs, and monitoring of blood pressure during the procedure.

**Operative Procedures**

For anesthetic induction, Intravenous (IV), 2 mg kg<sup>-1</sup> propofol and 1 mcg kg<sup>-1</sup> fentanyl were given. Following the ventilation with the mask for two minutes, a lubricated traditional LMA (LarySeal®, Flexicare, UK) chosen on the basis on the patient's weight was positioned by the anesthetist. When inserting the LMA, it was done with the forefinger technique. In accordance with the instructions, the LMA was insufflated. The effectiveness of manipulation was evaluated by monitoring capnography waveforms, auscultating lung ventilation, and watching bilateral chest motions. The procedure used to be carried out the use of a 3.8 mm FFB (EB 530P, Fujinon, Tokyo, Japan) with a working canal of 1.2 mm under general anesthesia. Through the use of laryngeal mask airway, an FFB was inserted into the trachea. Transient hypoxia was evaluated as SpO<sub>2</sub> that fell below 92% but did not last longer than 60 seconds (sec). Low SpO<sub>2</sub> values lasting longer than 60 seconds and/or accompanied by laryngospasm or bronchospasm were accepted as major complications. Demographic data, insertions of LMA/other instruments, laryngeal spasm/bronchial spasm, and re-intubations and transfers to intensive care units were all evaluated characteristics from patients' anesthetic and bronchoscopy records.

**Statistical Analysis**

The package application SPSS v.25 [IBM SPSS Statistics 25 software (Armonk, NY: IBM Corp.)] was used to analyze the data. For continuous variables, descriptive statistics were shown as mean, standard deviation, and median. For categorical variables, frequency and (%) were shown. For "Demographic Data (Gender, Age, etc.)" as a result of the analysis; were shown as mean ± standard deviation and median, minimum-maximum for continuous variables, and frequency and (%) for categorical variables.

**RESULTS**

Between January 1, 2017 and January 2022, the files of 162 pediatric patients were evaluated for FOB. Ninety-three (57.4%) of the patients were female and sixty-nine (42.6%) were male. The median age of the patients was 6.9 years (range, 0 months-17 years) and the median weight was 24.5 kg (interquartile range 2.5-89 kg) (Table I).

In our study, most of the bronchoscopies were performed via LMA (n= 157, 96.9%), and 1.2% intubation tube was used in two of the patients (Table II).

**Table I.** Demographic characteristics of the patients

	<b>Median</b>	<b>Interquartile range</b>
Age (year)	6.9	0-17
Weight (kg)	24.5	2.5-89
Duration of anesthesia (min)	35.3	10-90
Duration of Process (min)	27.6	7-67
	<b>Patient (n)</b>	<b>Percentage (%)</b>
Gender (M/F)	69/93	42.6/57.4

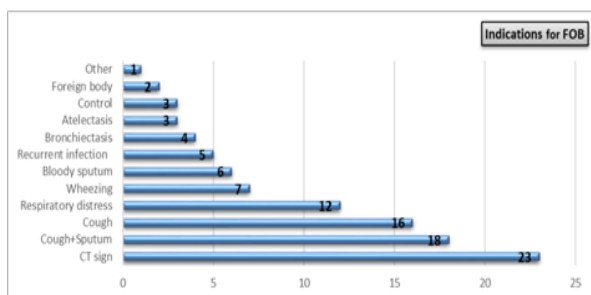
Values are expressed as mean ± standard deviation or n (%).

**Table II.** Demographic data of the patients

	Patient (n)	Percentage (%)
LMA	157	96.9
Tracheostomy Can- nula	3	1.9
ETT	2	1.2

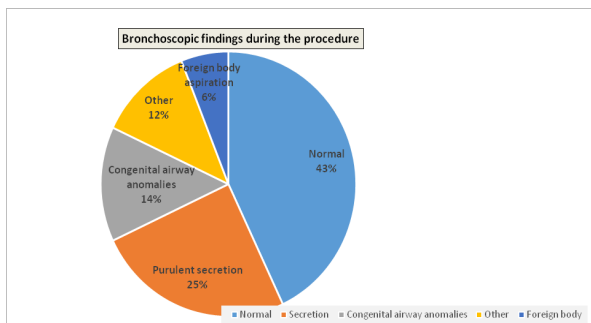
LMA; Laryngeal mask airway, ETT; Endotracheal tube

The most common indications for FOB are; Thorax CT findings were present (n=37, 23%), cough (n=26, 16%) and cough+sputum (n=29, 18%). Indications for FOB, with their frequencies, are given in Figure I.



**Figure I.** Indications for Fiberoptic bronchoscopy (FOB)

Bronchoscopic findings were normal in 69 (43%) patients who underwent FOB. Congenital airway anomalies (n=23, 14%), presence of purulent secretion suggestive of active infection (n=40, 25%), other (n=20, 12%) and foreign body aspiration (n=10, 6%) were (Figure II).

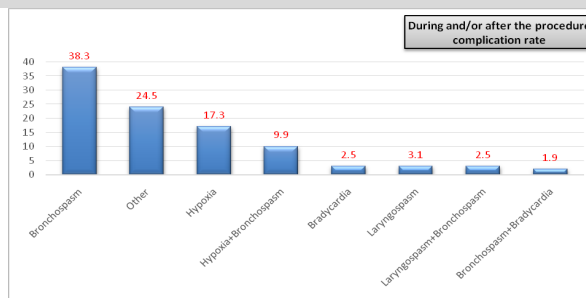


**Figure II.** Bronchoscopic findings during the procedure Fiberoptic bronchoscopy (FOB)

Bronchoscopy procedure was completed in all patients. The median duration of anesthesia was 35.3 min. Following removal of the LMA at the end of the FOB procedure, 62 patients (38.3%) experienced bronchospasm, 28 patient (17.3%) hypoxia, 16 patient (9.9%) bronchospasm+hypoxia, and other complications 40 patient (24.5%) (Figure III).

### DISCUSSION AND CONCLUSION

Fiberoptic bronchoscopy (FOB) is a procedure that has an important place in the diagnosis and treatment of lung diseases, especially in childhood, and is widely used in clinical practice. Current guidelines recommend combined sedation with an opiate and a benzodiazepine to reduce complications and increase patient comfort. Benzodiazepines, opiates, and propofol are the most



**Figure III.** During and/or after the procedure complication

frequently preferred sedative agents that can be used alone or in combination for this purpose (8). We wanted to share our 5 years of experience with this study.

FOB can be carried out with specific airway gadgets such as the endotracheal tube, laryngeal masks (LMA) and face masks (6). However, LMA can grant a higher airway contrast(7). In our clinic, LMA is used more frequently for airway control in FOB. In our study, the rate of LMA applicable to all age groups was found to be 96.9%. Two patients (1.2%) needed an intubation tube during the FOB procedure, and we think that the reason for the failure of the LMA application in the first attempt may be related to the abnormal airway anatomy or the experience of the practitioner group. The results are consistent with the literature. In the literature, the most frequently reported indications for fiberoptic bronchoscopy in childhood are stridor, infection, and atelectasis (9-11).

In our study, unlike the literature, it was seen that the most common indication for fiberoptic bronchoscopy was the findings obtained from computerized tomography (CT) examinations of symptomatic and asymptomatic patients who applied to the pediatric chest diseases outpatient clinic at a rate of 22.8%. We think that the wide age range of the patients in our study group explains this difference. The ability of computerized tomography to provide a roadmap specifically for bronchoscopy has been established in the diagnosis of both central and peripheral diseases. When CT and FOB are used together, they clearly enhance our ability to diagnose a wide variety of intrathoracic diseases (12).

FOB was performed in 29 (17.9%) patients with the indication to investigate the etiology of cough. Among the patients with the highest diagnostic success of FOB, there are pediatric patients with foreign body aspiration (13).

In our study, ten patients underwent bronchoscopy as a result of an analysis of the patients who underwent FOB with the indication of suspicious foreign body aspiration. FOB, which is a safe bronchoscopy technique, is a safe procedure that can be applied in children and has minor complications. Complication rates during or after the procedure vary between 1-7%. A few complication may additionally happen during and after the FOB procedure, which includes bronchospasm, nausea, vomiting, laryngospasm, edema of the larynx, and cardiac arrhythmias (5, 14). The incidence of respiratory complications during FOB varies. In FOB applications, bronchospasm may be triggered due to the treated area (15). In our study, bronchospasm developed in 62 (38.3%) patients, hypoxemia in 28 (17.3%) patients, bradycardia in 4 (2.5%) patients, hypoxia+bronchospasm in 16

(9.9%) patients, and laryngospasm in 5 (3.1%) patients. FOB with LMA is a safe and valuable diagnostic and therapeutic method in patients with pediatric respiratory symptoms. Pre-procedure preparation, monitoring during this procedure performed under general anesthesia and a trained team are highly reliable.

#### Conflict of interest:

The authors declare that there are no conflicts of interest.

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