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Flexible Fiberoptic Bronchoscopy: Indications, Diagnostic Yield and Complications

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A B S T R A C T

Background: Bronchoscopy is the examination of the airways with flexible or rigid endoscopes. The advantage of the flexible bronchoscope is that it can help in investigation of bronchioles for any findings. Bronchoscopy has progressed from a diagnostic tool to interventional and endobronchial ultrasound (EBUS) bronchoscopy in recent decades.

Objective: Objective of the present study was to know indications, diagnostic yield and complications of Flexible Fiberoptic Bronchoscopy.

Methodology: We looked at the medical records of 153 individuals who had a bronchoscopic surgery at the Medical Teaching Institute, Lady Reading Hospital in Peshawar between September 2020 and September 2021, using patient files, bronchoscopy suit records and hospital HMIS. Before the procedure, each patient or patient's relative signed a written informed consent form. Demographic information, comorbidities, indications for the procedure, radiological findings, bronchoscopy findings, final diagnosis, and bronchoscopy complications were all obtained.

Results: Of 153 patients, 91 (59%) were men. Majority of the participants (52%) were above 60 years of age. Hypertension (40%) was predominant comorbidity, followed by DM-II (39%), Asthma (22%) and others. 40% patient had significant exposure to tobacco smoke. The primary indication for bronchoscopy was suspected pulmonary infections (27%), followed by suspected malignancy or a lung mass on CT (23%) and hemoptysis. Other indications include, bilateral hilar LN, Undiagnosed lung infiltrates in immunocomprised patients etc. Overall diagnostic yield was 51%.

The most common finding on chest X-ray was air space shadowing, followed by lung mass, hilar lymphadenopathy and cavity formation. Other less common features on Xray and CT included interstitial opacities and others. 13% of the X-rays and 2.6% of the CTs were reported as normal.

Conclusion: Bronchoscopy procedure help in disease prevention and findings of different disease like different chest infections, smear-negative TB, and malignancy. In detecting of these illness and other respiratory disorders, Flexible Bronchoscopy has a critical importance rule. Furthermore, it is a safe method with a high diagnostic yield for a variety of patients with respiratory illnesses.

Key words: Bronchoscopy; FFB; LRH; Peshawar

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Introduction

Bronchoscopy is the examination of the airways with flexible or rigid endoscopes. The advantage of the flexible bronchoscope is that it can see the third generation bronchioles.¹ Bronchoscopy has progressed from a diagnostic tool to interventional and endobronchial ultrasound (EBUS) bronchoscopy in recent decades. Pulmonologists, thoracic surgeons, ear nose throat surgeons, and anesthesiologists use it for diagnosis of stages of cancer, removal of foreign body, airway stenting, dilatation, intubation, and therapy of troublesome airways, along with many other things.

Flexible Fiberoptic Bronchoscopy (FFB) is an invasive procedure that has been used for diagnostic and therapeutic purposes for many years. It has a light source, fibre optics, and a camera for seeing the upper and lower airways directly.² For respiratory infections, FFB is a generally safe therapy with a high diagnostic yield.³ Its capacity to assist in diagnosis has been bolstered by a series of technological advancements. FFB testing can be used to diagnose hemoptysis, chest infection, parenchymal lung disorders, lung nodules or masses,

chronic lung infiltrates, mediastinal lymphadenopathy, and probable lung transplant rejection. FFB can be used to treat foreign body aspiration, endobronchial mass ablation or debulking, airway stenosis, and lung lavage. FFB can have a wide range of adverse effects, which can be classified as pharmacological or procedure-related. Neuropathy, convulsions, and even coma have been associated to overdosing on local anesthetics.⁴ Another medication-related side effect is long-term neuromuscular paralysis.⁵ A team of highly qualified and experienced personnel is required to acquire better results from FFB methods. A committed team of skilled bronchoscopists working alongside an endoscopic person and a respiratory therapist who are familiar with the various bronchoscopy suit equipment may reduce the complication rate. The frequency of bronchoscopy indications varies based on previous investigations. Various studies have been conducted around the world to investigate the findings and consequences associated with FFB, with variable numbers of patients and indications. These studies highlight the indications for bronchoscopy procedures and their diagnostic yield for identifying various respiratory illnesses such as

Table 1. Demographic characteristics of study cases

Indications	Frequency	Percentage
Age groups		
<30	19	12
30 to 60	55	36
>60	79	52
Gender		
Male	91	59
Female	62	41
Smoking status		
Active smokers	17	11
Ex-smokers	45	29
Non smokers	91	59
Chronic Diseases		
Diabetic Mellitus	59	39
Hypertension	61	40
Heart Failure	19	12
Chronic Kidney Disease	12	8
Bronchial Asthma	33	22
Chronic Obstructive Lung Disease	25	16
Obstructive Sleep Apnoea	12	8
Interstitial Lung Disease	8	5

hyperthermia and hemodynamic instability. Along with the various indications, these studies looked into other complications that occurred during the bronchoscopy technique, such as pneumothorax.

Flexible bronchoscopy, however, is rarely used in developing nations,⁶ particularly in Sub-Saharan Africa and Asia, where there are a scarcity of pulmonologists and cardiothoracic surgeons, which is worsened by a lack of necessary infrastructure.⁷ Few developing countries in Asia and Africa have reported more regularly on their experiences and outcomes using flexible bronchoscopy in recent years.

In Pakistan, however, compared to the number of centers doing upper gastrointestinal (UGI) endoscopies, very few centers perform flexible bronchoscopy.⁸ One of the institutes with excellent infrastructure and professionals to do advanced bronchoscopy is the Lady Reading Hospital (LRH) in Peshawar, Pakistan. Bronchoscopies are routinely performed at LRH by the Department of Pulmonology. The pulmonology team usually deals with foreign body aspiration emergencies, whereas the thoracic surgeon handles diagnostic and interventional operations for lung diseases. The Bronchoscopic Suit at LRH was one of the first sites in Peshawar to begin flexible bronchoscopy; nevertheless, there are no published studies on flexible bronchoscopy from this region. We describe our early experience using flexible bronchoscopy in this center, as well as the results.

Methodology

We looked at the medical records of 153 individuals who had a bronchoscopic surgery at the Medical Teaching Institute, Lady Reading Hospital in Peshawar between September 2020 and September 2021, using patient files, bronchoscopy suit records and hospital HMIS. Before the procedure, each patient or patient's relative signed a written informed consent form. Demographic information, co-morbidities, indications for the procedure, radiological findings, bronchoscopy findings, final diagnosis, and bronchoscopy complications were all obtained. Bronchoscopic procedures were performed by a chest physician. The procedure was performed in an equipped endoscopic unit. Before the procedure, vital signs were taken and continually monitored before and after the procedure, and all patients were observed until they were discharged. All patients received enough supplemental oxygen through a nasal cannula to maintain appropriate oxygen saturation. All of the patients were given lidocaine spray for the pharynx and hypopharynx. With fiber-optic bronchoscopy, all bronchoscopic operations were performed in a supine position. All of the patients had Broncho alveolar lavage (BAL). According to the clinical indication, bronchial brushing, endobronchial biopsy, or blind trans-bronchial biopsies were also performed.

Statistical Analysis

Means, Medians, standard deviation and frequencies were calculated using Excel version 2010.

Table 2. Indications of Bronchoscopy

Characteristics		Frequency	Percentage
Diagnostic		135	88%
Suspected Malignancy		36	23%
Pulmonary infections	MTB	34	27%
	Pneumonia	7	
Hilar prominence/Lymphadenopathy		19	12%
Hemoptysis		23	15%
Undiagnosed Pulmonary infiltrates in Immunocompromised patients		16	10%
Therapeutic	Lung collapse	4	8%
	Surgical intervention	2	
	Stridor (foreign body)	7	
Aborted		5	3%

Table 3. Diagnostic yield by indication

Indications	Total Number		Percentage	Diagnostic yield		Percentage
	Total Number	Percentage		Total Number	Percentage	
Suspected Malignancy	36	23%	19	52%		
Suspected Pulmonary infections	MTB	34	41	27	31	79%
	Pneumonia	7		4		57%
Hilar prominence /Lymphadenopathy	19	12%	4	21%		
Hemoptysis	23	15%	4	17%		
Undiagnosed Pulmonary infiltrates in immunocompromised patients	16	10%	7	43%		

Result

Of 153 patients, 91 (59%) were men. Majority of the participants (52%) were above 60 years of age, 36% were 30 to 60 while the remaining 12 % were below 30 years of age (Table 1). Hypertension (40%) was predominant comorbidity, followed by DM-II (39%), Asthma (22%) and others (Figure 1). 40% patient had significant exposure to tobacco smoke (Table 1).

The primary indication for bronchoscopy was suspected pulmonary infections (27%), followed by suspected malignancy or a lung mass on CT (23%) and hemoptysis. Other indications include, bilateral hilar LN, Undiagnosed lung infiltrates in immunocompromised patients etc (Table 2). Overall diagnostic yield was 51%. It was highest in suspected Pulmonary TB, where 79% of the suspected cases were diagnosed as having TB. For malignancy the yield was 52%. Hemoptysis had the lowest yield of 17% (Table 3).

The most common finding on chest xray was air space shadowing, followed by lung mass, hilar lymphadenopathy and cavity formation. Other less common features on Xray and CT included interstitial opacities and

others. 13% of the x-rays and 2.6% of the CTs were reported as normal (Table 4).

No major complications were recorded during the procedure. 1.9% of the procedures were complicated with bleeding, where cold normal saline and intravenous tranexamic acid were used. Other minor problems included bronchospasm and desaturation. No complications, related to local anesthetics, were recorded. No deaths were recorded, which can be attributed to the procedure (Table 5).

Discussion

FFB is a helpful tool in the diagnosis and treatment in a variety of pulmonary disorders.⁹ The most common reason, according to our research, was to detect respiratory diseases, particularly MTB, lung carcinoma and other pulmonary infections. The total diagnostic yield, in our study, was 51%, with suspected MTB patients having the highest yield. The overall diagnostic yield of the bronchoscopy method varies between studies due to differences in study settings and populations. According to prior studies, the output ranged between 44 percent and 75 percent.¹⁰ Our research's overall diagnostic yield is

Table 4. Radiological appearance of patient who underwent diagnostic bronchoscopy

Findings	Chest X-ray		HRCT	
	Total Number	Percentage	Total Number	Percentage
Normal	20	13.0%	4	2.6%
Air space disease	42	27.4%	41	26.7%
Interstitial pattern	19	12.4%	24	15.6%
Cavity	9	5.8%	12	7.8%
Mass	30	19.6%	35	22.8%
Mediastinal lymph node	15	9.8%	18	11.7%
Other	18	11.7%	19	12.4%

Table 5: Complications

Complications	Frequency	Percentage
Bronchospasm	2	1.3%
Desaturation	2	1.3%
Bleeding	3	1.9%

almost identical to what has been reported in the international literature.

Although the indications for bronchoscopy have been consistent since its inception, the frequency of these indications varied between different studies. Chest infection was the most common indication in a study conducted by Saqib M et al where tuberculosis was diagnosed in 34.6% of patients, followed by malignancy 16.1% and pneumonia 7%.⁸ In another study conducted by A Suleman et al the main indication was malignancy (48%), followed by pulmonary tuberculosis and undiagnosed lung infiltrates.¹¹ The two most common reasons in our analysis corresponded with prior studies, with chest infection accounting for nearly 27% of the cases and lung cancer accounting for 23%. Some studies in the West found that cancer is the most common cause of death, while others found that pneumonia is the most common cause of death in 2020.^{12,13} In Pakistan, the annual incidence rate of MTB is 230 and mortality is 39 deaths per 100,000 population.¹⁴ Furthermore, multi-resistant MTB accounts for 4.2 percent of all MTB infections in new cases and 16% in retreatment cases, highlighting the necessity of early diagnosis of the organism.¹⁵ Early detection of pulmonary MTB can also aid in disease prevention and progression.

Bronchoscopy, on the other hand, is crucial in the diagnosis of MTB patients with a negative smear.¹⁶ Previous research has demonstrated a wide range of bronchoscopy diagnostic yield in patients with negative smear TB, with estimates as low as 10%.¹⁷ MTB diagnosis was confirmed in 79% of the cases in our investigation,

which is greater than most of the prior studies. Because Pakistan is considered an endemic location, clinicians have a high index of MTB suspicion in patients who present with respiratory symptoms, and as a result, the threshold for a bronchoscopy operation has been lowered.¹⁸ It's difficult and time-consuming to diagnose pulmonary infiltrates in immunocompromised patients.¹⁹ Bronchoscopy is a common procedure used to diagnose these patients.²⁰ Nonetheless, a number of studies have been carried out to determine the effectiveness of the bronchoscopic treatment in this situation. The reported diagnostic yields ranged from 15 to 67 percent, which is greater than our diagnostic yield to some extent. We believe there are two explanations for our patients' decreased diagnostic yield. All of our immunocompromised patients were on antimicrobials and antifungal medicines, and no additional modalities were used on them. Our findings revealed that bronchoscopic techniques had a good diagnostic yield in such patients. Furthermore, hemoptysis is one of the most common and alarming respiratory symptoms, and it should be treated as a life-threatening condition that requires immediate attention. Endobronchial tumours, chest infection, and alveolar bleeding are all plausible reasons that can be distinguished with a bronchoscopic method.²¹ It also plays a role in determining the source of bleeding. During bronchoscopy, alveolar haemorrhage is distinguished by more bloody successive aliquots, which are also accompanied by the presence of hemosiderin-laden macrophage in BAL histopathology.²² This distinguishing trait was discovered in four of the patients in our research.

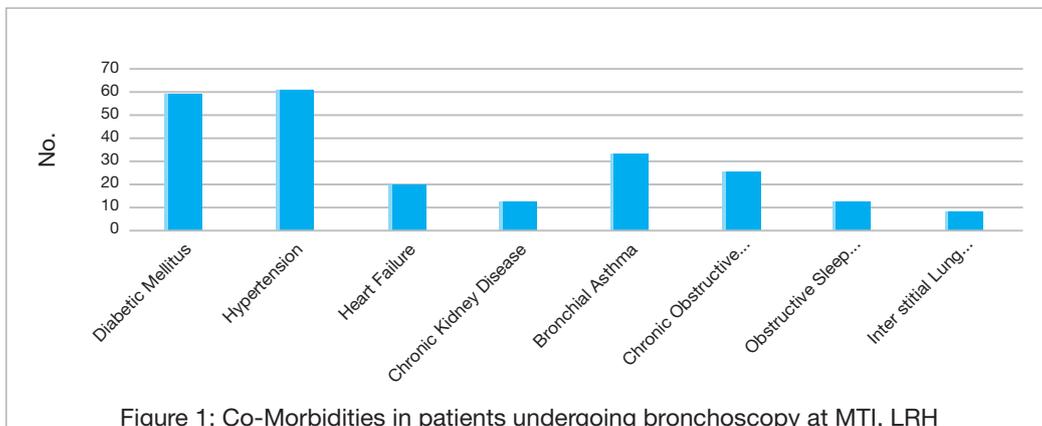


Figure 1: Co-Morbidities in patients undergoing bronchoscopy at MTI, LRH

Conclusion

Despite significant expenditure in disease prevention, chest infections, particularly smear-negative MTB, are the most common reason for bronchoscopy procedures, followed by malignancy. In detecting this illness and other respiratory disorders, Flexible Bronchoscopy has a critical importance rule. Furthermore, it is a safe method with a high diagnostic yield for a variety of patients with respiratory illnesses.

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