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Original Article

Frequency of Acute Complications after Fiber-Optic Bronchoscopy Procedure in a Tertiary Care Hospital

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Abstract

Objective: To assess the frequency of acute complications in patients undergoing bronchoscopy presenting to a tertiary care facility.

Methods: A cross-sectional study was conducted at the Pulmonology unit of Khyber Teaching Hospital, Peshawar, from 14-10-2022 to 14-04-2023 on 221 patients of either gender, aged between 16 to 70 years, who underwent bronchoscopy. The sample size was calculated using WHO sample size calculator; all the patients aged 16 to 70 years undergoing the bronchoscopy, regardless of their gender, were included in the study. Basic demographic features like age, gender, and occupation were recorded. A bronchoscopy was performed by a consultant using a fiberoptic bronchoscope Olympus BF type 1T150. After obtaining the required variables, the data was analyzed using SPSS version 22. The frequency of acute complications in patients undergoing bronchoscopy was determined.

Results: The mean age of the patients was 42.91±14.99 years. The frequency of bronchospasm was 6 (2.7%), hypotension 2 (0.9%), Desaturation/Hypoxia 11 (5%), mild hemorrhage 18 (8.1%), moderate hemorrhage 3 (1.4%), severe hemorrhage 5 (2.3%), mild tachycardia 17 (7.7%), moderate tachycardia 2 (0.9%), severe tachycardia 3 (1.4%) and pulmonary edema 1 (0.5%).

Conclusion: Fiber-optic bronchoscopy demonstrated a low rate of acute complications, predominantly mild hemorrhage and desaturation, with severe adverse events being rare, indicating the procedure's relative safety in tertiary care settings.

Keywords: Bronchoscopy, Complications, Therapeutic Indications, Pneumonia

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Introduction

Bronchoscopy is a noninvasive procedure that has been used in pulmonary medicine for diagnostic and therapeutic indications.[1] The primary benefits of a flexible fiber-optic bronchoscope are that it provides a detailed view of the airways, it is comparatively an easy procedure, and it does not need general anesthesia. The bronchoscope can take samples, particularly bronchoalveolar lavage (BAL), during the procedure.[2] For Bronchoscopy, certain indications are recurrent pneumonia or persistent pneumonia, persistent cough, undiagnosed hemoptysis, and persistent chest radiograph opacities, clinical/ radiological suspected cases of pulmonary tuberculosis with negative sputum acid-fast bacillus (AFB) stain.[3] Complications arising during bronchoscopy examination are related to the bronchoscope itself, factors relating to the patient such as the age of the patient and severity of disease, anesthesia techniques, and the skills, diligence, and experience of the bronchoscopist. Complications of bronchoscopy may be mechanical or physiological.[4] Mechanical complications of bronchoscope include epistaxis, airway obstruction, airway trauma and hemorrhages; the clinical manifestations that may be observed in patients include hemoptysis, a persistent cough of unknown origin, stridor, lymph node enlargement in the mediastinum or hilar region, staging of lung cancer based on lymph node involvement, abnormal infiltrates in the lungs,

pneumonia, atelectasis, suspicion of tracheomalacia, tracheoesophageal fistula, and monitoring of lung transplant recipients.[5] Because of its large size, the typical bronchoscope cannot reach peripheral pulmonary lesions (PPLs) that are located at more distant anatomical locations. The first bronchoscopy was performed on adult patients for peripheral pulmonary lesions (PPLs). In the current study, tachycardia occurred in 1.9% of the individuals that were examined. The therapeutic indications of a treatment or medication refer to the specific conditions or diseases for which it is recommended or approved.[6] Mostly, the complications that occur are minor and temporary; their frequency has been reported to be 1.9%.[5] of the procedure carried out. The study reported bronchoscopy complications as 48%, including arrhythmia, bronchospasm, bleeding, hypotension, pulmonary edema, and respiratory failure. The current research will help to estimate the frequency and severity of clearly defined acute complications of bronchoscopy that occur during the procedure, and it will help to recognize possible risk factors for these complications.[7] In the past, it was widely believed that bronchoscopy bleeding was associated with big tumors and had a high death rate. The careful examination of subsequent data did not turn up any cases of bleeding that required transfusions sometimes; the utilization of bronchoscopy is imperative for healthcare professionals and clinicians in managing individuals afflicted with pulmonary disorders. Since its inception in clinical practice, flexible bronchoscopy has emerged as a fundamental instrument in diagnosing and treating individuals afflicted with pulmonary ailments.[8] Rigid bronchoscopy has demonstrated significant utility in therapeutic applications. The utilization of a flexible bronchoscope, which incorporates fiber optics, a camera, and a light source, facilitates the immediate and direct observation of the respiratory passages.[9] This tool has the capability to facilitate the examination of the respiratory system, commencing from either the oral or nasal cavities and extending to the sub-segmental bronchi.[10] Bronchoscopy is frequently employed in the investigation of certain disorders, yet its diagnostic and therapeutic efficacy is limited. One of the infectious reasons that can be attributed to a particular medical condition is cystic fibrosis.[11] The main aim of the study was to determine the frequency of acute complications in patients undergoing bronchoscopy and presenting to a tertiary care facility.

Methods

This cross-sectional study was conducted at the pulmonology unit of Khyber Teaching Hospital Peshawar using a non-consecutive sampling technique from 14-10-2022 to 14-04-2023. Descriptive Study. The sample size of the study was (n=221), and the sample size for the study was calculated using the WHO sample size calculator12, taking the confidence level as 95%, the prevalence of complication as 1.9%, and the precision as 1.8%. The sample size for this study was calculated using the WHO sample size calculator, with a confidence level of 95%, prevalence of complications of 1.9%,[5] and precision of 1.8%. All patients aged 16 to 70 years undergoing the bronchoscopy, regardless of gender, were included in the study. At the same time, the patients with repeated bronchoscopy who were hemodynamically unstable and unwilling to participate were excluded from the study. Ethical approval was taken from the institute's ethical review board. Informed consent was taken from all patients. Basic demographic features like age, gender, and occupation were recorded. A bronchoscopy was performed by a consultant using a fiberoptic bronchoscope Olympus BF type 1T150. After obtaining the required variables, the data was analyzed using SPSS version 22. Quantitative variables such as age were expressed as mean ±S.D. Qualitative variables like gender, occupation, comorbidity, and bronchoscopy complications such as Laryngospasm, bronchospasm, hypoxia, hypotension, hemorrhage, tachycardia, pulmonary edema, and pneumothorax were described as frequency and percentage. Bronchospasm, laryngospasm, tachycardia, hypoxia, hemorrhage, hypotension, pulmonary edema, and pneumothorax were stratified among age, gender, occupation, and comorbidity to see effect modifiers. Post-stratification Chi-square test will be applied, and a P-value ≤0.05 was taken as significant. All results were presented in the form of tables and charts.

Results

Out of 221 patients presenting for bronchoscopy. The data showed that the mean age of the patients was 42.91 ±14.99 years. According to the age distribution, there were 81 (36.7%) patients in the age group of 16 to 35 years; there were 65 (29.4%) patients in the age group of 36 to 50 years while there were 75 (33.9%) patients in the age group of 51 to 70 years. In our study, there were 127 (57.5%) male and 94 (42.5%) female patients.

Table 1: *Demographic details of the patients*

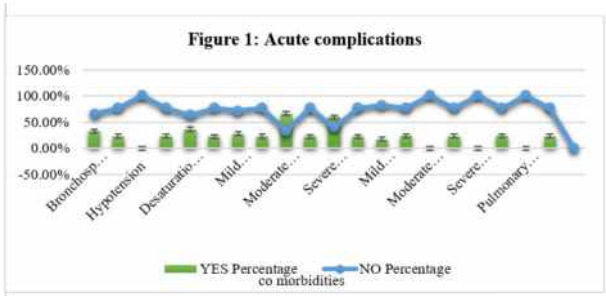
Variables	n	%
Male	127	57.5
Female	94	42.5
16 to 35 years	81	36.7
36 to 50 years	65	29.4
51 to 70 years	75	33.9
Age (years) [Mean±SD]		42.91±14.998

The frequency of hypotension in our study was 2 (0.9%).

The frequency of Desaturation/Hypoxia in our study was 11 (5%). The frequency of mild hemorrhage was 18 (8.1%), moderate hemorrhage 3 (1.4%), and the frequency of severe hemorrhage was 5(2.3%). The frequency of mild tachycardia was 17 (7.7%), moderate tachycardia 2 (0.9%), and severe tachycardia 3 (1.4%). The frequency of pulmonary edema in our study was 1 (0.5%).

Table 2: *Complications seen in the patients post bronchoscopy*

Hemorrhage		n	%	P Values
Mild hemorrhage	Yes	18	8.1	0.005
	No	203	91.9	
Moderate hemorrhage	Yes	3	1.4	0.023
	No	218	98.6	
Severe hemorrhage	Yes	5	2.3	0.031
	No	216	97.7	
Desaturation/ Hypoxia	Yes	11	5	0.011
	No	210	95	
Hypotension	Yes	2	0.9	0.113
	No	219	99.1	
Frequency of comorbidity	Yes	6	2.7	0.000
	No	215	97.3	



In our study 105 (47.5%) patients were employed while 116 (52.5%) were unemployed Stratification of acute complications with age, gender, comorbidity seen in a table of stratification of data presented in Table no. 3.

A graph shows the acute complications among patients with bronchoscopy. Severe side effects related to bronchoscopy examination or treatment were analyzed. One possible explanation for the rising number of serious complications and fatalities linked to bronchoscopy is the procedure's expanding utilization.

Table 3: *Stratification of acute complications with age*

Acute complications		Age distribution						P value
		16 to 35		36 to 50		51 to 70		
		n	%	n	%	n	%	
Bronchospasm	Yes	2	33.3	3	50.0	1	16.7	0.48
	No	79	36.7	62	28.8	74	34.4	
Hypotension	Yes	1	50.0	1	50.0	0	0.0	0.58
	No	80	36.5	64	29.2	75	34.2	
Desaturation/ Hypoxia	Yes	4	36.4	3	27.3	4	36.4	0.98
	No	77	36.7	62	29.5	71	33.8	
Mild hemorrhage	Yes	10	55.6	1	5.6	7	38.9	0.05
	No	71	35.0	64	31.5	68	33.5	
Moderate hemorrhage	Yes	1	33.3	2	66.7	0	0.0	0.29
	No	80	36.7	63	28.9	75	34.4	
Severe hemorrhage	Yes	3	60.0	0	0.0	2	40.0	0.31
	No	78	36.1	65	30.1	73	33.8	
Mild tachycardia	Yes	8	47.1	3	17.6	6	35.3	0.49
	No	73	35.8	62	30.4	69	33.8	
Moderate tachycardia	Yes	0	0.0	0	0.0	2	100.0	0.14
	No	81	37.0	65	29.7	73	33.3	
Severe tachycardia	Yes	0	0.0	0	0.0	3	100.0	0.05
	No	81	37.2	65	29.8	72	33.0	
Pulmonary edema	Yes	0	0.0	1	100.0	0	0.0	0.3
	No	81	36.8	64	29.1	75	34.1	

Discussion

Therapeutic bronchoscopy encompasses the administration of drugs and the extraction of foreign bodies as illustrative instances. Bronchoscopy is contraindicated in cases of severe hypoxemia, hemodynamic instability, and untreated hemorrhagic diathesis.[13] Furthermore, the presence of instabilities in the cervical area and the safety of bronchoscopy are well-acknowledged in the medical community. Rigid bronchoscopes can cause vocal cord injury or scratch or rupture of airways. Flexible bronchoscopy carries a low risk. Bronchoscopy still has very few complications. Despite the fact that the majority of patients tolerate bronchoscopy well, a brief period of surveillance is necessary following the surgery. The majority of issues arise early and are easily noticeable during the process.[14]

The majority of data pertaining to complications related to bronchoscopy has been mostly acquired through surveys and retrospective research; the present study observed a prevalence of serious complications associated with bronchoscopy at a rate of 0.739%, while the death rate was found to be 0.013%. Similar findings were observed in the literature.[15] In recent years, there has been a notable increase in the utilization of bronchoscopy, particularly for therapeutic purposes such as bronchoscopy, high-frequency electrocautery, laser, argon plasma coagulation (APC), balloon dilatation, and stenting. Consequently, there has been a corresponding rise in the incidence of serious complications associated with these procedures; it has been reported that tachycardia and cardiac arrest can occur during fiberoptic bronchoscopy. Numerous patients having bronchoscopy were found to have tachycardia, a substantial rise in heart rate, according to studies. Another study found that the incidence of tachycardia was positively correlated with the hypoxia that was encountered after the surgery. In the current study, tachycardia occurred in 1.9% of the patients who were being examined.[16]

In the present study, an examination of acute complications associated with bronchoscopy revealed the following frequencies: bronchospasm in 6 cases (2.7%) and hypotension in 2 cases (0.9%). The level of desaturation/hypoxia observed was 11, accounting for 5% of the total sample. The incidence of mild hemorrhage was found to be 18 cases, accounting for 8.1% of the total sample. Similarly, there were 3 cases of moderate hemorrhage, representing 1.4% of the sample. A similar study[17-18] showed the finding in comparison to our study as Pneumothorax (1%), bleeding (1%), hypoxemia (4%), atrial tachycardia (3%), bronchospasm (2%), and post-bronchoscopy fever (2%), were among the complications that these patients experienced. All patients healed without any significant repercussions after these problems were appropriately addressed, and the vast majority of bronchoscopy indications are diagnostic rather than therapeutic. Comorbid disorders were linked to the majority of deaths within the first ten years of fiberoptic bronchoscopy. Thirty-three percent of death cases were caused by myocardial infarction, while seventeen percent were related to preexisting pulmonary diseases such as emphysema and pneumonia. Hemoptysis, hoarseness, radiographic anomalies, and ABF isolation are the most common indicators.[13,19]

In our study, the incidence of severe hemorrhage was 5 (2.3%), mild tachycardia was observed in 17 cases (7.7%), moderate tachycardia in 2 cases (0.9%), severe tachycardia in 3 cases (1.4%) and pulmonary edema was observed in 1 case (0.5%) as observed in our study.[20,21] The occurrence of tachycardia and cardiac arrest has been documented in the context of bronchoscopy. In a study, it was observed that a significant increase in heart rate, known as tachycardia, was detected in numerous patients undergoing bronchoscopy.[22] Another study discovered a positive correlation between hypoxia experienced at the conclusion of the surgery and the occurrence of tachycardia.[23-24] In the present investigation, a total of 1.9% of the patients under examination exhibited the occurrence of tachycardia.

Conclusion

Flexible bronchoscopy was associated with a low frequency of acute complications in the present study. Most observed complications were mild in nature, with mild hemorrhage and desaturation being the most common events. Severe complications such as severe hemorrhage, severe tachycardia, hypotension, and pulmonary edema were infrequent. A significant association of certain complications with age was observed, particularly for mild hemorrhage and severe tachycardia. These findings indicate that fibro-optic bronchoscopy is a relatively safe procedure when performed in a tertiary care setting with appropriate patient monitoring and trained personnel.

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Authors' Contribution

RJF: Conception.

AY, MY: Design of the work.

KR, SA, SS: Data acquisition, analysis, or interpretation.

AY, MY, KR, SS: Draft the work.

RJF, SA: Review critically for important intellectual content.

All authors approve the version to be published.

All authors agree to be accountable for all aspects of the work.

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