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PEAK EXPIRATORY FLOW RATE CHANGES AND HYPOXEMIA DURING FIBEROPTIC BRONCHOSCOPY

Respiratory Medicine

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ABSTRACT

Background: Arterial hypoxaemia is the common complication, since respiratory depressant drugs are used for premedication, and the airway is also partially occluded by the bronchoscope. The study is therefore designed to find out the changes in arterial oxygen tension and PEFR during FOB.

Objectives:

- To find out the changes in arterial oxygen tension and in peak expiratory flow rate during FOB.

Methods: 100 patients aged 20 years above undergoing FOB were evaluated for the arterial oxygen tension and peak expiratory flow rate changes at KNCH, Jodhpur.

Results: All patients developed a fall in PaO2 following FOB but hypoxemia was noted only in 18 cases. The change in PEFR after FOB, no significant statistical difference could be observed on statistically comparison.

Conclusion: All patients showed a decline in arterial PaO2 after FOB which was highly significant. FOB itself does not causes any significant or serious complications.

KEYWORDS

hypoxemia, fiberopticbronchoscopy, peak expiratory flow rate

INTRODUCTION:

Bronchoscopy was established by Jackson in 1907 for the investigation of pulmonary diseases. Flexible bronchoscope was introduced by Ikeda[1] in 1964 for the early diagnosis of bronchial carcinoma and fiberscopes became available commercially in 1967. Flexible bronchoscopy (FB) is a safe and frequently performed procedure for the assessment, diagnosis, and treatment of patients with respiratory diseases. FB is now established as an essential diagnostic and therapeutic tool in respiratory medicine. The transnasal approach is most often used. Bronchofiberscopy is preferred over straight bronchoscopy as it eliminates heavy sedation to the patient and when performed in sitting position there is less hypoxaemia. Arterial hypoxaemia is the commonest complication of FOB.When bronchoscopy is performed under conscious sedation without supplemental oxygen, oxygen desaturation will occur rapidly giving a good indication of ventilatory status.

The British Thoracic Society (BTS)[2] guidelines recommend that oxygen supplementation should be used to achieve an oxygen saturation (SpO2) of at least 90% to reduce the risk of significant arrhythmias during the procedure and also in the post-operative recovery period. The mechanisms responsible for the arterial PaO_2 decline during FOB were not defined by this investigation. It appears that the procedure includes both a mode of intrapulmonary shunt and zones of low ventilation-perfusion ratio. It seems likely that loss of lavage fluid and induction of bronchospasm by tracheal stimulation during the procedure both play roles.

OBJECTIVES

- To find out the changes in arterial oxygen tension and peak expiratory flow rate during FOB.

MATERIALS AND METHODS:

Type Of Study- observational study**.**

Study Place: This study was done in 100 patients above 20 years of age irrespective of their sex and occupation at K.N.C.H, Jodhpur.

Selection Criteria :

Inclusion Criteria:

All patients were above 20 years of age, having PaO2>60mm Hg.

Exclusion Criteria:

Uncooperative patients,

Hemodynamically unstable patients,

PROCEDURE:

A fiberoptic bronchoscope (OLYMPUS MODEL TH 190) was used in the study. Arterial blood samples were taken from femoral artery both before and after flexible fiiberopticbronchoscopy.

For arterial blood samples, 2 ml. disposable syringe with needle was used which was heparinised by pushing heparin solution (5000 I.U.).

OBSERVATIONS AND RESULTS

The study was undertaken in one hundred patients of various chest pathologies. To evaluate its safety and complications like hypoxia, following points were assessed:

- To evaluate decrease in arterial oxygen tension in blood after the procedure, if present,
- To evaluate the peak expiratory flow rate after bronchoscopy, if any,

Table 1: Patient Characteristics

Variable		Values
No. of patients		100
Age	Years	22-84
	Mean±S.D	59.3±11.83
Sex	Males	89%
	Females	11%
Height		60.00-69.00
	Mean±S.D	65.05±2.6

Table 2 : Distribution Of Cases According To PaO_2 (mmHg)

	Mean PaO_2 mmHg	Range of PaO_2	Mean fall in PaO_2	Range of fall in PaO_2
Before Bronchoscopy	80.73±11.37	61-100	10.96	7.82-14.09
After Bronchoscopy	69.77±11.07	50.9-99.4		

SE=0.94, T=1.1, P value=0.001 (S)

Table 3: Effect Of Bronchoscopy On PEFR

	Mean PEFR%	Range of PEFR%	Mean rise in PEFR%	Range of rise in PEFR%
Before Bronchoscopy	71.95±12.58	51-100	1.81	1.01-2.607
After Bronchoscopy	69.78±12.71	50-99		

SE=1.49 T=5.64 P value=0.57

The % change in PEFR before bronchoscopy ranged from 51-100% with a mean value of 71.95 with standard deviation +/-12.58. After bronchoscopy % change in PEFR ranged from 50-99% with a mean value of 69.78 with standard deviation +/-12.71. The% change in PEFR after bronchoscopy was not statistically significant ('p'>0.05).

Table 4: Correlation Between PaO2 With PEFR Before And After FOB

PFT Parameters		PaO_2 [mmHg]		
		>90 mmHg [Normal]	75-89 mmHg [Mild]	<75 mmHg [Severe]
PEFR%	Before	70.40±12.27	71.07±12.31	74.05±13.18
	After	74.44±8.26	72.34±11.81	71.38±13.30
P value		0.078	0.895	0.419

Table 5: Correlation Between PaCO2 With PFEFR Parameters Before And After FOB

PFT Parameters		$PaCO_2$ [mmHg]		
		35 -45 [Normal]	<35 mmHg [Alkalosis]	>45 [Acidosis]
PEFR%	Before	72.48±13.40	70.00±11.21	72.88±9.76
	After	71.98±12.71	71.03±11.95	72.87±13.49
P value		0.669	0.406	0.999

Table 6: Correlation Between pH With PEFR Parameters Before And After FOB

PFT Parameters		pH		
		7.35-7.45 [Normal]	<7.35 [Acidemia]	>7.45 [Alkalemia]
PEFR%	Before	72.37±13.57	71.33±11.59	71.52±11.72
	After	73.40±13.28	72.33±11.75	69.92±11.66
P value		0.803	0.355	0.522

DISCUSSION:

The patients studied were distributed mainly in the age group of 20 to above 70 years, out of which 89 were males and 11 were females. Bronchoscopic procedures like punch biopsy, bronchial washing and brush biopsy were performed.

In our study, all patients showed a decline in arterial PaO_2 after fiberoptic bronchoscopy ranging from 7.82-14.09 mmHg. All patients studied, the decline in arterial PaO_2 from 80.73 (SD ± 11.37) to 69.77 (SD ± 11.07) mm Hg was highly significant ('p'<0.05). The mean fall in PaO_2 levels in the study was 10.96 mmHg.

M.S.Hendy et al[5] 1984, observed in 26 patients during fiberoptic bronchoscopy that hypoxemia was seen in patients having lung biopsy during routine fiberoptic bronchoscopy.

Sharma et al[6] 1993, selected 21 patients for arterial blood gas during bronchoscopic study and concluded that arterial hypoxemia during fiberoptic bronchoscopy can be of substantial degree and persists for a variable period of time after completion of the procedure. Bronchoalveolar lavage has also been associated with hypoemia which can be distressing to the patient.

Sharma et al[7] 1999, studied 50 patients in whom a significant fall in PaO2 was seen (mean fall 8 +/- 2.45 mm Hg). The lowest values were recorded at the completion of the procedure. In all patients studied during room air breathing, the decline in arterial PaO_2 from 63.69+/- 6.43 to 56.65+/- 5.47 was highly significant ($p<0.05$).

Jones and O'Driscoll June[7] 2001, studied 44 patients in whom oxygen saturation was monitored during the procedure with pulse oximetry (PO) and arterial blood gas levels. No difference in saturation values was found between arterial blood gas levels and PO analysis both before and after FOB. Saturation values (mean +/- SD) were significantly decreased after FOB (from 96.5 +/- 1.0% to 91.6 +/- 3.6%, $p < 0.05$), and desaturation (arterial oxygen saturation <90%) was detected in 22 of the patients (50%) during the procedure.

G. Hassan et al[13] 2005, observed that during bronchoscopy done on 56 hospitalized patients, statistically highly significant ($p < 0.001$) fall of SaO_2 was observed progressively while bronchial tree was being examined and various procedures like forceps biopsy, brush biopsy and bronchoalveolar lavage were performed.

Peak expiratory flow rate were performed before and after bronchoscopic procedure. no significant statistical difference was found on statistica comparison. Same findings were observed by **Chiug-Chi lin, Jen Liang Wu[9] 1989,** no significant change in PEFR was seen , except for a decreased PaO_2 level after bronchoscopic examination.

Y. Matsushima et al[10] 1984, measured pulmonary functions in patients who were undergoing routine diagnostic flexible fiberoptic bronchoscopy either through an 8 mm endotracheal tube or transnasally. In these patients with moderate airway obstruction, after inserting the endotracheal tube, functional residual capacity increased significantly. Removal of flexible fiberoptic bronchoscopy and endotracheal tube caused functional residual capacity to return toward the normal value.

RESULTS:

No patient had hypoxemia before the procedure. All patients developed a fall in PaO_2 but hypoxemia was noted in 18 cases.

Peak expiratory flow rate was done prior to and after bronchoscopy. It was seen that there was no significant difference in peak expiratory flow rate before and after bronchoscopic examination. Although there was decrease in PEFR, but these changes were of no statistical significance by 'paired t' test.

CONCLUSION:

All patients showed a decline in arterial PaO_2 after FOB which was highly significant. FOB does not cause any significant or serious complications.

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Conflict Of Interest: None declared

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