

COMPARISON OF PEAK EXPIRATORY FLOW RATE IN PRE-OPERATIVE AND POST-OPERATIVE PERIOD IN UPPER ABDOMINAL SURGERY

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Abstract

Background: Despite improvements in surgical and anaesthetic techniques, pulmonary disorders remain the most frequent post-operative problem encountered in surgical patients. Post operative Pulmonary Complications (PPCs) consists of atelectasis, pneumonia, pulmonary aspiration, and acute respiratory distress syndrome. In present study we aim to compare respiratory functions through pre and postoperative peak expiratory flow in patients undergoing elective upper abdominal surgeries. **Materials and Methods:** A prospective observational study including adult patient undergoing elective upper abdominal surgery aged >18 years to < 70 years with a sample size of 100. **Result:** History of smoking at present was given by 15% cases. Most common associated co-morbidity observed in the study group was hypertension (16%). Mean PEFR at baseline was 330.3 L/min which reduced significantly during the immediate post-op period (272.6 L/min at day 1). After the immediate post-op period, the PEFR values showed gradual increase, but remained significantly lower than the baseline values, even by the end of day 7(292.3L/min). Mean percentage decrease in PEFR during the immediate post-op period was 17.5%. Mean PEFR values was significantly higher among males, which remained so, throughout the study period (p0.05). **Conclusion:** Upper abdominal surgery under general anesthesia is usually associated with post-operative pulmonary complications. Decreased peak expiratory flow rate is one of them. Patients' Pre-existing risk factors like smoking and hypertension and post-operative inadequate pain management play a major role in decreasing peak expiratory flow rate in such patients.

INTRODUCTION

Anaesthesia as does surgery alters the ventilatory function beginning with the induction of anaesthesia and often lasting well into the postoperative period. Pulmonary complications impact both short-term and long-term survival after surgery [1]. The most frequent problem after upper abdominal and thoracic surgery is atelectasis, which reduces lung compliance and Functional Residual Capacity. It has been well-known that patients undergoing generally develop a severe pulmonary restrictive pattern [2], and carry a high risk of postoperative respiratory complications [3,4] The occurrence of these complications closely relates to the existence of pre-operative risk factors.

Among them are: advanced age, presence of pulmonary disease or other medical illnesses, smoking and its intensity, obesity, malnutrition, type of anaesthesia, duration of surgery and surgical technique, abnormal spirometric values, decreased ability to exercise and prolonged preoperative hospitalization time. [5] Spirometry measures the volume of inhaled and exhaled air and respiratory flows, being especially useful in the analysis of data derived from forced expiratory maneuver and the Peak Expiratory Flow Rate (PEFR). The latter is the clinically most useful measure of lung function. In present study we aimed to compare respiratory functions through pre and postoperative peak

expiratory flow in patients undergoing elective upper abdominal surgeries.

MATERIALS AND METHODS

A Prospective, Observational, Clinical study was conducted in Department of Anaesthesiology and Critical Care of a Tertiary Care Hospital. A sample size of 100 patients was taken for a study duration of 18 months.

Inclusion Criteria

- Adult patient undergoing elective abdominal surgery through upper abdominal surgery.
- Age group >18 years to < 70 years

Exclusion Criteria

- Patient refusal
- Uncooperative patient
- Patient with uncontrolled pulmonary disorders existing prior to surgical procedure
- Patient undergoing emergency surgery
- Patient requiring the dissection of diaphragm as a part of surgical procedure
- BMI >30
- ASA grade III and IV
- Pregnant females

A prospective observational study was conducted after approval from the institutional ethics committee and written informed consent was obtained from the patient. The surgery took place under Standard Anaesthesia Protocol. We measured the PEFR in all cases with a portable device, the Mini Portable Peak Flow Meter ranging from 60 to 800 l/min, according to the Guidelines for Pulmonary Function Tests, 2002, with the patient sitting. We instructed the patients to exert a maximal inspiration to total lung capacity followed by a maximal, short and explosive forced expiration through the measuring device, without extending the measure to residual volume. The expiratory effort needed last only a second or two. We repeated the test three times, considering the

best result if the readings did not differ more than 20 ml/ min from each other. The PEFR of patients by above mentioned method was measured at preoperative period and within the first twenty-four postoperative hours, post operative day three, day five and day seven. All post-operative complications were also assessed like: fever >99-degree Fahrenheit, productive cough, clinically abnormal chest findings or abnormal new findings on chest x-ray compared to pre-operative X ray.

RESULTS

Mean age of the study group was 40.58 years with half of the cases in the age group of 31 to 50 years. 83% were females and 17% were males. History of smoking at present was given by 15% cases. Most common associated co-morbidity observed in the study group was hypertension (16%) followed by hypothyroidism (3%) and diabetes (2%). Mean PEFR at baseline was 330.3 L/min which reduced significantly during the immediate post-op period (272.6 L/min at day 1). After the immediate post-op period, the PEFR values showed gradual increase, but remained significantly lower than the baseline values, even by the end of day 7(292.3L/min). Mean percentage decrease in PEFR during the immediate post-op period was 17.5%. After the immediate post-op period, the PEFR values showed improvement, but still remained 11.5% lower than the baseline value. Mean PEFR values was significantly higher among males, which remained so, throughout the study period (p0.05). No difference was observed between changes in the PEFR values during pre- and post-op period with respect to age of the subjects (p>0.05).

Table 1: Mean PEFR comparison pre-op and post-operatively in males and females

PEFR	Gender	N	Mean	SD	%age Fall	p-value
Pre-op	M	17	349.4	31.9		0.02
	F	83	326.4	37.2		
Day1	M	17	297.7	44.8	14.8%	0.016
	F	83	267.5	46.4	18.1%	
Day3	M	17	305.3	36.4	12.6%	0.037
	F	83	280.7	45.0	14.0%	
Day5	M	17	318.8	37.6	8.8%	<0.01
	F	83	286.3	42.6	12.3%	
Day7	M	12	324.2	46.0	7.2%	0.011
	F	71	286.9	46.2	12.1%	

Table 2: Mean PEFR comparison pre-operatively and post-operatively in smokers and non-smokers

PEFR	Smoking	N	Mean	SD	% age Fall	p-value
Pre-op	Yes	15	326.4	28.9		0.01
	No	85	352.7	37.3		
Day1	Yes	15	267.1	35.8	18.2%	<0.01
	No	85	304.0	47.1	13.8%	
Day3	Yes	15	280.0	36.1	14.2%	<0.01
	No	85	312.7	44.2	11.3%	
Day5	Yes	15	286.5	32.1	12.2%	<0.01
	No	85	322.0	43.1	8.7%	
Day7	Yes	11	287.5	39.6	11.9%	0.018
	No	72	323.6	47.3	8.2%	

Table 3: Mean PEFR comparison pre-op and post-operatively in cases with and without hypertension

PEFR	Hypertension	N	Mean	SD	% age Fall	p-value
Pre-op	Yes	16	311.3	46.0		0.07
	No	84	333.9	34.5		
Day1	Yes	16	245.0	65.9	21.3%	0.01
	No	84	277.9	41.4	16.8%	
Day3	Yes	16	256.3	61.5	17.7%	<0.01
	No	84	290.4	38.6	13.0%	
Day5	Yes	16	270.6	53.5	13.1%	0.033
	No	84	295.8	40.3	11.4%	
Day7	Yes	14	267.1	57.2	14.2%	0.03
	No	69	297.4	44.3	10.9%	

DISCUSSION

In present study, we observed that mean PEFR at baseline was 330.3 L/min which reduced significantly during the immediate post-op period (272.6 L/min at day 1). After the immediate post-op period, the PEFR values showed gradual increase, but remained significantly lower than the baseline values, even by the end of day 7 (292.3 L/min). Mean percentage decrease in PEFR during the immediate post-op period was 17.5%. After the immediate post-op period, the PEFR values showed improvement, but still remained 11.5% lower than the baseline value. The reason for this change might be attributed to post-operative pain and atelectasis. Burcharth J et

a. [6] in their study observed that respiratory function following major abdominal surgery reduced significantly in the immediate post-op period and remain low throughout the first postoperative week. Mean PEFR values was significantly higher among males, which remained so, throughout the study period ($p < 0.05$). Silva et al. evaluated pre and postoperative PEFR values in patients undergoing upper abdominal surgery and concluded a significant decrease of this variable, as well as smaller PEFR values in females [7]. Praveen et al. [8] study showed that (34.1%) male patients out of 41 had postoperative complications as compared to 15 (48.3%) out of 31 female patients. The reason for this change might be attributed to higher muscle mass in males than in females.

Mean decrease in PEFV values during the immediate post-op period was significantly more among smokers (18.2% vs 13.8%; $p=0.018$). Smokers have a significantly lower FEV1/FVC ratio than non-smokers, which might be the reason for this observation. Filardo et al.^[8] identified smoking and its intensity as a variable with increased risk for post-operative lung complications. Praveen et al.^[9] also observed that overall, 40% of smokers had postoperative complications as compared to 13% non-smokers ($p<0.01$). In present study, no difference was observed between changes in the PEFV values during pre- and post-op period with respect to age of the subjects ($p>0.05$).

Mean decrease in PEFV values during the immediate post-op period was significantly more among the hypertensives (21.3% vs 16.8%; $p=0.01$). The difference was maintained till the day 7 of the follow up (14.2% vs 10.9%; $p=0.03$).

CONCLUSION

It is evident from our study that upper abdominal surgery under general anesthesia is usually associated with post-operative pulmonary complications. Decreased peak expiratory flow rate is one of them. Patients' Pre-existing risk factors like smoking and hypertension and post-operative inadequate pain management play a major role in decreasing peak expiratory flow rate in such patients.

Limitations

Present study suffers from regional bias associated with single center-based studies; hence the results cannot be generalised. Due to smaller sample size, results cannot be generalised.

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