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PREDICTION OF MORTALITY AND MORBIDITY IN MIDDLE AND OLD AGED SURGICAL PATIENTS-COMPARISON OF STANDARD SCORING SYSTEM AND ADDITION OF PULMONARY FUNCTION TESTS WITH HAEMODYNAMIC INDICES.

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ABSTRACT **INTRODUCTION:** Post operative pulmonary complications are as prevalent as cardiac complications and contribute similarly to morbidity, mortality, and length of stay.The purpose of this study is to evaluate the role of preoperative pulmonary function test with hemodyanamic indices in risk prediction of morbidity and mortality in middle and old aged surgical patients during perioperative and postoperative period so, that definite steps can be taken while inducing such type of patients and to evaluate strategies to reduce the perioperative pulmonary risk and focuses on post-operative pulmonary complications like hypoxia, hypercarbia, atelectasis, pneumonia and respiratory failure. **MATERIALS AND METHODS:** Grading of pulmonary function tests was done by using following criteria's: The criteria taken for PFT are FEVI, FVC, and FEVI/FVC, which determine the severity of disease. Patients were divided into three groups and a control group. **Control group:** with PFT findings > 85 % of predicted values. (25 patients) **Group I:** with PFT findings > 65 % but < 85 % of predicted values (5 Patients). **Group II:** with PFT findings > 50 % but < 65 % of predicted values (9 Patients). **Group III:** with PFT findings < 50 % of predicted values (l I patients). All the data obtained in study groups were compared from control group and statistical evaluation was done by applying ODD Ratio and 95% Confidence Interval. **RESULTS:** The maximum number of patients having preoperative pulmonary symptoms and X -ray findings lies in group III.Tachycardia and hypertensive episodes were noted mainly in patients having PFT values less than 50%. The reduction in mean oxygen saturation in arterial blood, and arterial partial pressure of oxygen postoperatively was seen in patients having PFT values less than 50%. **CONCLUSION:** Post operative pulmonary complication contribute significantly to overall perioperative morbidity and mortality rates .The frequency rate of these complications varies from 5-70% .Postoperative pulmonary complications prolong the hospital stay by an average of 1-2 weeks.

KEYWORDS :

INTRODUCTION

Devlin (1990) states "It is important that we join with colleagues in other Disciplines to develop measures of the outcome of surgery.

As intensivists we use risk assessment to identify a highly selected group of patients who are at such high risk of morbidity and mortality that they might benefit from high dependency unit, and we seek to identify those patients who might benefit from hemodynamic manipulation to improve these outcome.(Neil Jackson,2005).Post operative pulmonary complications are as prevalent as cardiac complications and contribute similarly to morbidity, mortality, and length of stay.Pulmonary complications may even be more likely than cardiac complications to predict long term morbidity after surgery, particularly in older patients. (Amir Qassem, MD, 1992).

Pulmonary function tests provide measures of flow rates, lung volume, gas exchange, and respiratory muscle function. Basic pulmonary function tests available in the ambulatory setting include spirometry and pulse oximetery.

The primary purpose of hemodyanamic monitoring during anaesthesia care is the early detection, identification, and treatment of life threatening conditions (Hensurd DD, 1993).

The purpose of this study is to evaluate the role of preoperative pulmonary function test with hemodyanamic indices in risk prediction of morbidity and mortality in middle and old aged surgical patients during perioperative and postoperative period so, that definite steps can be taken while inducing such type of patients and to evaluate strategies to reduce the perioperative pulmonary risk and focuses on post-operative pulmonary complications like hypoxia, hypercarbia, atelectasis, pneumonia and respiratory failure.

MATERIALS AND METHODS

The present study was conducted on patients ranging from 35 to 55 years of age of average weight and height of ASA.Grade I and grade II scheduled for elective surgical procedures at Nehru hospital, B.R.D Medical College, Gorakhpur after the permission of ethical committee. A day before operation a thorough general and systemic examination was done.

In addition to routine investigations, pre-operative chest X-ray, E.C.G., sputum analysis and antibiotic sensitivity were carried out.

The following pulmonary function tests (P. F. Ts) were carried out: Forced expiratory volume in I sec, expiratory reserve volume, residual volume, forced vital capacity, peak expiratory flow, mid-expiratory flow rate, and arterial blood gas analysis.

Bed side pulmonary function tests including breath holding time, forced expiratory time and matchstick blowing test was done. Match stick blowing test was done by asking the patient to blow a match stick with open mouth from a distance of 15 centimetres.

Grading of pulmonary function tests was done by using following criteria's: The criteria taken for PFT are FEVI, FVC, and FEVI/FVC, which determine the severity of disease.

- Normal PFT Outcomes - >85 % of predicted values
- Mild Disease - >65 % but < 85 % of predicted values
- Moderate Disease - >50 % but < 65 % of predicted values
- Severe Disease - <50 % of predicted values

Patients were divided into three groups and a control group.

- **Control group:** with PFT findings > 85 % of predicted values. (25 patients)
- **Group I:** with PFT findings > 65 % but < 85 % of predicted values (5 Patients)
- **Group II:** with PFT findings > 50 % but < 65 % of predicted values (9 Patients)
- **Group III:** with PFT findings < 50 % of predicted values (l I patients)

All the patients were premedicated with injection fentanyl 1-2 micro gram/kg and injection glycopyrrolate 0.2mg given intramuscularly 30

minutes before general anaesthesia.

The routine monitoring like pulse rate, blood pressure, ECG, Sp02, temperature, recording were done throughout the surgery.

All the patients were pre-oxygenated with 100% oxygen by face mask and were induced with thiopentone sodium 4-5 mg/kg (2.5% solution) and succinylcholine 1-2 mg/kg intravenous was given to facilitate intubation.

Heart rate, systolic blood pressure ,diastolic blood pressure ,mean arterial blood pressure ,mean oxygen saturation were recorded throughout perioperative period and post operatively at regular interval.

All the patients were watched for intraoperative complication hypoxia, hypercarbia, bronchospasm, arrhythmias, hypertension and other untoward events.

Anaesthesia was maintained with nitrous oxide, oxygen and vecuronium. At the end of surgery, the neuromuscular block was reversed with neostigmine and glycopyrrolate in appropriate dose.

All the patients were watched for postoperative complications hypoxia, hypercarbia, breath holding, bronchospasm, laryngospasm, tachypnoea, cough, arrhythmias and hypertension, nausea, vomiting etc.

All the data obtained in study groups were compared from control group and statistical evaluation was done by applying ODD Ratio and 95% Confidence Interval.

OBSERVATION AND RESULTS

The following observations were made

Table 1:Above Table shows number of patients having preoperative diseases, X-ray findings and on drug therapy.

	Control		Group I		Group II		Group III	
	No	%	No	%	No	%	No	%
Other associated diseases	2	8%	1	20%	2	22.22%	5	45.45%
H/o of smoking	5	20%	1	20%	3	33.33%	7	63.63%
X- ray findings	3	12%	1	20%	2	22.22%	6	54.54%
Drug therapy	4	16%	1	20%	3	33.33%	6	54.54%

Table 2: Showing number of patients having preoperative pulmonary symptoms

Symptoms	Control		Group I		Group II		Group III	
	No	%	No	%	No	%	No	%
Crepts	1	4%	1	20%	1	22.22%	2	18.08%
Wheeze	1	4%	-	-	1	11.11%	2	18.08%
Diminished breath sounds	1	4%	1	20%	1	11.11%	2	18.08%
Productive cough	2	8%	-	-	1	11.11%	3	27.27%
Dyspnoea	-	-	-	-	-	-	1	9.09%

Above table shows that patients were having pulmonary symptoms more common in group III.

Table 3: Showing mean systolic blood pressure changes in mm Hg with SD at different interval in different group

Group	Preoperative	Intraoperative			Postoperative
		1/2 Hr	1 hr	2 hr	
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Control Group	121.4 ±10.75	122.20 ± 10.80	122.80 ± 11.28	123.42 ±9.68	126.80±10.69
Group I	130.0 ±18.25	122.50 ± 12.58	122.50 ± 12.58	125 ±14.21	127.5 ±15.0
Group II	141.0 ± 7.48	139.25 ± 6.13	139.25 ± 6.13	136.6 ±5.16	137.75±5.8
Group III	146.4 ± 6.31	143.42 ± 5.12	142.85 ± 4.45	140.50 ± 2.57	145.42 ± 5.99

Table 4: showing mean diastolic blood pressure changes in mm Hg with SD at different interval in different groups.

Group	Preoperative	Intraoperative			postoperative
		1/2 Hr	1 Hr	2 Hr	
	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD	Mean ±SD
Control Group	84.24 ± 9.03	82.36 ± 6.63	81.04 ± 6.60	82.42 ±6.45	84.08 ± 9.005
Group I	84.50± 11.81	84.0 ±11.31	84.0 ±11.31	84.0 ± 11.3	84.0 ± 11.31
Group II	92.0 ± 6.0	89.3 ± 5.75	89.0 ± 5.89	89.0 ± 5.89	89.0 ± 5.89
Group III	93.71 ± 3.92	91.14 ± 2.52	90.29 ± 5.09	90.5 ± 6.00	92.3 ± 292

Table5: Showing mean of mean arterial blood pressure changes in mm Hg with SD at different interval in different groups

Group	Preoperative	Intraoperative			Postoperative
		1/2 Hr	1 Hr	2 Hr	
	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD	Mean ± SD
Control	98.18 ± 1.58	98.18 ± 1.58	97.37 ± 1.43	98.18 ± 1.58	99.0 ± 1.683
Group I	98.75 ± 0.50	97.25 ± 0.48	99.0 ±0.60	99.1 ± 0.66	98.75 ± 0.50
Group II	93.45 ± 0.99	94.54 ± 1.12	95.64 ± 1.52	95.89 ± 1.58	94.00 ± 1.10
Group III	91.57± 1.01	94.14 ± 1.06	95.15 ± 1.22	95.45 ± 1.40	88.57 ± 0.87

Table 6: Showing Intraoperative complication in various groups

Complications	Control group(25)		Group I(5)		Group II (9)		Group III (11)	
	No	%	No	%	No	%	No	%
Hypoxia	1	4%	-	-	1	11.11%	2	18.18%
Hypercarbia	1	4%	-	-	1	11.11%	2	18.18%
Other Complications	2	8%	1	20%	2	22.22%	4	36.36%

Above table shows that hypoxia, hypercarbia and other complications are more common in group III

Table 7: Showing odd ratio, z biostatistics and p value of hypoxic events in various groups intraoperatively.

Complication	Hypoxia			
Groups	Odd ratio	95%CI	Z Value	P Value
Group I	-	-	-	-
Group II	3	-o. 108-0.250	0.77	0.218
Group III	5.33	-0.054-0.338	1.418	0.078

Table 8: Showing odd ratio, z biostatistics and p value of hypercarbic events in various groups intraoperatively.

Complication	Hypercarbia			
Groups	O ratio	95%CI	Z Value	P Value
Group I	-	-	-	-
Group II	3	-0.108-0.250	0.77	0.218
Group III	5.33	-0.054-0.338	1.418	0.078

Table 9: Showing odd ratio, z biostatistics and p value of other events in various groups intraoperatively

Complication	Other events			
Groups	O ratio	95%CI	Z Value	P Value
Group I	2.875	-0.168-0.408	0.816	0.207
Group II	3.28	-0.120-0.390	1.04	0.149
Group III	6.57	0.003-0.551	1.98	**0.023**

Above table shows that the significant p value is seen only in III group.

Table 10: Showing odd ratio, z biostatistics and p value of hypoxic events in various groups intraoperatively.

Groups	Hypoxia			
	Odd Ratio	95%CI	Z value	P value
Group I	-	-	-	-
Group II	3.28	-0.103-0.388	1.136	0.128
Group III	9.58	O. 094 0.655	2.616	**0.0045**

Above table shows that the significant p value is seen only in III group.

Table 11: Showing odd ratio, z biostatistics and p value of hypercarbic events in various groups intraoperatively

Groups	Hypercarbia			
	Odd Ratio	95%CI	Z value	P value
Group I	-	-	-	-
Group II	3.28	-0.103-0.388	1.136	0.128
Group III	6.57	0.019-0.548	2.104	**0.017**

Above table shows that the significant p value is seen only in III group

Table 12: Showing odd ratio, z biostatistics and p value of hypoxic events in various groups intraoperatively.

Groups	Other events			
	Odd Ratio	95%CI	Z value	P value
Group I	1.83	-0.246-0.406	1.96	0.315
Group II	2.09	-0.168-0.372	0.742	0.228
Group III	4.19	-0.037-0.524	1.701	**0.044**

Above table shows that the significant p value is seen only in III group.

Table 13: Showing postoperative management of patients in different groups.

Treatments	Control		Group I		Group II		Group III	
	No	%	No	%	No	%	No	%
Bronchodilators	1	4%	1	20%	2	22.22%	4	36.36%
Oxygen therapy	2	8%	1	20%	4	44.44%	9	81.81%
Prolonged intubation	-	-	-	-	1	11.11%	4	36.36%
Mechanical ventilation	-	-	-	-	-	-	3	2727%
Antiarrhythmic	1	4%	1	20%	1	11.11%	-	-
Antihypertensive	1	4%	-	-	1	11.11%	2	18.08%

Above table shows that oxygen therapy was required in 81.81% of patients with prolonged intubation in 36.36% with mechanical ventilation in 27.27% in group III postoperatively.

DISCUSSION

Post operative pulmonary complications are an important part of the risk of surgery and prolong the hospital stay by an average of one or two weeks .Much of the literature on the assessment of perioperative risk has focussed on identifying the now well defined pulmonary risk factors (Gerald W.Smetana, MD 1999).

Potential patient related risk factors that may contribute to the risk of postoperative pulmonary complications include smoking, poor general health status, older age, obesity, chronic obstructive pulmonary disease and asthma (Steve Withy et al 1989).

Spirometry is pivotal to the screening, diagnosis, and monitoring of respiratory disease and is increasingly advocated in primary care practice, Although spirometry is often described as a simple screening test, due consideration is essential not only of equipment selection, but, importantly, of test performance and correct interpretation of results (Tam Eaton et al 1990).

Taken ASA classification into consideration and addition of PFT with haemodynamic parameters to predict better morbidity in middle and old aged surgical patients. The proposed study was done on 50 patients of ASA grade I and II who were scheduled to undergo elective surgical intervention. All males were selected for study of average age group of 35 to 50 years of age.

Table 1 shows number of patients having other positive findings in different groups, incidence was maximum in group III i.e. H/o of smoking, other problems, X ray findings and patients on drug therapy, DH Wong et al (1995) Studied factors associated with postoperative pulmonary complications in patients with severe COPD in 105 patients and found that 37% had one or more post operative pulmonary complications. Peter H. Hewson et al (1996) studied pulmonary function test in 27 adolescents with asthma. The results of pulmonary function tests correlate asthma symptoms and treatment in 11 of the 37 assessments (30%). This study supports the view that pulmonary function testing by flow loop spirometry should be part of the routine assessments of acute and chronic asthmatics.

Table 3 shows changes in mean systolic blood pressure in mm Hg in each group at different intervals. Table shows preoperative mean systolic blood pressure in group I 130.0 $\pm$ 18.25 ,in group II 141.0 $\pm$ 7.48 in group III 146.4 $\pm$ 4.31 as compared to control group 121.4$\pm$ 10.75. Mean postoperative systolic blood pressure in group I was 127.5 $\pm$15.0, in group II is 137.75$\pm$ 6.8 and group III is 145.42 $\pm$ 4.99 as compared to control group 126.80$\pm$10.69.

Table 4 shows changes in mean diastolic blood pressure in mm Hg in each group at different intervals. Table shows preoperative mean diastolic blood pressure in group I 84.50 $\pm$ 11.81,in group II 92.0 $\pm$ 4.0,in group III 93.712$\pm$2.92 as compared to control group 84.24 +9.03 .Mean postoperative diastolic blood pressure in group I was 84.0 $\pm$11.31, in group II is 89.0 $\pm$ 5.89and group III is 92.3 $\pm$ 2.92 as compared to control group 84.08 $\pm$ 7.005.

Table 5 shows changes in mean of mean arterial blood pressure in mm Hg in each group at different intervals. Table shows preoperative mean of mean arterial blood pressure in group I 99.9 $\pm$14.29,in group II 109.45 $\pm$ 4.49,in group III 109.3l $\pm$4.08 as compared to control group 92.77 $\pm$ 19.31.

Table 6 shows intra operative complications in various groups. According to our criteria of hypoxemia i.e. SpO2 less than or equal to 90% or Pa02 less than or equal to 65 mmHg and hypercarbia i.e. PACO2 more than or equal to 45 mm Hg.

Above table shows that in group III, 18.18% of patients were hypoxia, 18.18% of patients were hypercapnic and other complications (Bronchospasm, larngyospasm, Arrhythmias, and hypertension.) were found in 36.36% of patients. In group II 11.11% of patients were hypoxic, 11.11% of patients were hypercapnic and other complications were found in 22.22% of patients. In group I, only 20 percent of patients show sign of other complications (Bronchospasm, larngyospasm, Arrhythmias, and hypertension). In control group only 4 % were hypoxic and hypercapnic intraoperatively. This shows that the severity of hypoxia and hypercarbia was noted in group III in which the preoperative PFT is severely deranged.

Table 7 shows statistical comparison of intraoperative hypoxia of different groups with control group using Odd Ratio and 95%CI (-0.108-0.250),z value 0.77 and p value 0.218 which is insignificant and in group III OR is 5.33 ,95%CI(0.054-0.338),z value 1.418 and p value 0.078 which is also insignificant.

Table 8 shows statistical comparison of intraoperative hypercarbia of different groups with control group using Odd Ratio and 95%CI and p valve. Table shows that in group II OR 3, 95% CI (-0.108-0.250), z value 0.77and p value 0.218 which is insignificant and in group III OR is 5.33, 95% CI (-0.054-0.338), z value 1.418 and p value 0.078 which is also insignificant.

Table 9 shows statistical comparison of intraoperative other events (Bronchospasm, laryngospasm, arrhythmia and hypertension) of different groups with control group using Odd Ratio and CI 95% and p valve. Table shows that in group I OR 2.875 , 95% CI (-0.168-0.408), z value 0.816 and p value 0.207 which is insignificant, in group II OR is 3.28 , 95% CI (-0.120-0.390), z value 1.04 and p value 0.149 which is insignificant and in group III OR is 6.57 ,95% CI (0.003-0.551), z valve 1.98 and p value 0.023 which is significant. Thus it was noted that there was no significant change in any parameters in group I and II but significant change is noted in group III other events (Bronchospasm, larngyospasm, Arrhythmias, and hypertension.).

Table 10 shows statistical comparison of postoperative hypoxia of different groups with control group using Odd Ratio and CI 95% and p valve. Table shows that in group II OR 3.28, 95% CI (-0.103-0.388), z value 1.136 and p value 0.128 which is insignificant and in group III OR is 9.58, 95% CI(0.094-0.655), z value 2.616 and p value 0.0045 which is highly significant. Above table shows that the significant p values in seen only in group III.

Table 11 shows statistical comparison of postoperative hypercarbia of different groups with control group using Odd Ratio and CI 95% and p valve. Table shows that in group II OR 3.28, 95% CI (-0.103-0.388), z value 1.136 and p value 0.128 which is insignificant and in group III OR is 6.57, 95% CI (0.019-0.548), z value 2.104 and p value 0.017 which is highly significant. Thus above table shows that significant valves are seen only in group III.

Table 12 shows statistical comparison of postoperative other events (Bronchospasm, laryngospasm, arrhythmia and hypertension) of different groups with control group using Odd Ratio and CI 95% and p valve. Table shows that in group I OR 1.83, 95% CI (-0.246-0.406), z value 1.96 and p value .315 which is insignificant, in group II OR is 2.09, 95% CI (- 0.168-0.372), z value 0.742 and p value 0.228 which is insignificant and in group II OR is 4.19, 95% CI (-0.037-0.524), z valve 1.701 and p value 0,044 which is significant, Thus above table shows that significant valves.

Table 13 shows - no of patients requiring various treatment bronchodilators like levosalbutamol, ipratropium bromide and budesonide. Oxygen therapy was required in 81.81% of patients with prolonged intubation in 36.36% and mechanical ventilation in 27.27%

in group III postoperatively. Mechanical ventilation was given for 24-48 Hrs and oxygen therapy was given for 48-72 Hrs. Antiarrythmic commonly used are amiodarone, digoxin, lignocaine. Antihypertensive used are beta blockers, ACE inhibitors and CCB.

Thus we have seen that haemodynamic changes and preoperative and postoperative pulmonary complications were more common in patients having abnormal preoperative pulmonary function tests and depend upon the severity of derangement of pulmonary functions.

So the incidence of hypoxemia and hypercapnia are directly related to preoperative functional status of the patient and we found maximum in group III, severity was so much that most of the patients required oxygen therapy and few ventilatory support, postoperatively, few hours to days.

CONCLUSION

Post operative pulmonary complication contribute significantly to overall perioperative morbidity and mortality rates .The frequency rate of these complications varies from 5-70% .Postoperative pulmonary complications prolong the hospital stay by an average of 1-2 weeks.

The following conclusions were drawn. The maximum number of patients having preoperative pulmonary symptoms and X -ray findings lies in group III.Tachycardia and hypertensive episodes were noted mainly in patients having PFT values less than 50%.

The reduction in mean oxygen saturation in arterial blood, and arterial partial pressure of oxygen postoperatively was seen in patients having PFT values less than 50%.

Intraoperative hypoxia, hypercarbia, and other complications as bronchospasm, laryngospasm, and arrhythmias were noted mainly in patients having PFT values less than 50%.

Postoperatively statistically significant incidence of events was seen only in patients having PFT findings less than 50% in complications like hypoxia, hypercarbia and other events.

The following preventive measures to avoid complications in patients with deranged PFT values undergoing general anaesthesia should be taken-

PREOPERATIVE

A- Encourage cessation of smoking for atleast 8 weeks.
B- Treat airflow obstruction in patients with chronic obstructive pulmonary disease or asthma.
C- Administer antibiotic and delay surgery if respiratory infection is present.
D- Begin patient education regarding lung - expansion manoeuvres like chest physiotherapy, breathing exercises.

INTRAOPERATIVE

A- Limit duration of surgery to less than 3 hours.
B- Deep plane of anaesthesia should be maintained to avoid exaggerated hemodynamic response.
C- Substitute less ambitious procedure for upper abdominal surgery when possible.

POSTOPERATIVE

A- Use deep breathing exercises or incentive spirometry
B- Use epidural analgesia or intercostal nerve blocks when necessary
C- Provide oxygen support, or mechanical ventilation when required.

Lastly, it is seen that postoperative pulmonary complications rate is directly proportional to preoperative pulmonary function tests. Important to the risk for surgery and anaesthesia prediction will be better if pulmonary function tests are routinely assessed along with other predictors. Preoperative chest physiotherapy and respiratory therapy are the main stay of preoperative preparation that will definitely decrease the morbidity and mortality postoperatively.

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