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Effect of Conventional Physiotherapy V/S Acapella on Pefr in Atelectasis in Upper Abdominal Surgeries-A Comparative Study

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ABSTRACT

Background: Postoperative pulmonary complications are most commonly occurring complications after the upper abdominal surgeries in which alters the pulmonary functions very severely and this in turn turns out to be prolonged hospital stays, longer recovery time after the surgery. Due to restricted thoracic movements, pain patients do not breath properly and due to the effect of anesthesia inspiratory muscles get affected, this also a cause for not being able to breath properly and reduce capacity of coughing. All these factors predispose the infection in lungs, reducing ventilation perfusion. Due to which there is reduced lung PEFR and SPO2 postoperatively. With the acapella device this study aims to improve PEFR and SPO2 after the surgery, and hence give early improvement and recovery from the surgery, and short hospital stay, and to prevent further pulmonary infections due to the retention of cough. And to clear the chest, maintain oxygen level in blood.

Aim Of The Study: The objective of the study was to determine the effect of acapella devices on PEFR and SPO2 when compared with conventional physiotherapy treatment in patients with upper abdominal surgeries.

Methodology: A comparative study was conducted in Sri Aurobindo Institute Of Allied Health And Paramedical Sciences, Indore. 30 samples of both male and female between age 20-70 years upper abdominal surgeries, who have developed atelectasis , who fulfill inclusion criteria were randomly selected and assigned into two groups. Group A was treated with acapella device therapy and Group B was treated with conventional physiotherapy treatment. The patients were assessed and evaluated for their oxygen saturation and peak expiratory flow rate on the first day after surgery and final assessment and evaluation was done at the day of discharge.

Result: The data was evaluated by statistical analysis and found that the mean value of O2 and PEFR in the experimental group after treatment were 97.8% and 216.7% and before treatment 91.9% and 76.7 % respectively. In control group after treatment were 96.9% and 122.0% and before treatment were 90.8% and 74.7% respective

Conclusion: The study reveals that acapella device therapy shows improvement in SPO2 and PEFR in atelectasis in upper abdominal surgeries.

Keywords: Physiotherapy, Acapella, Atelectasis, Postoperative pulmonary complications, PEFR, SPO2, Conventional physiotherapy, Peak flow meter.

INTRODUCTION

Upper abdominal surgeries are the most frequently undertaken surgeries worldwide. Approximately 500 to 1000 out of every 100,000 people undergo upper abdominal surgery[14]. A series of events occurs after surgeries, in which fatigue and pain cause limited movement, decreased diaphragmatic mobility due to the effects of anesthesia, and decreased physical activity. All of these factors contribute to postoperative pulmonary complications (PPCs).

Impaired breathing patterns or reduced chest mobility due to pain or the effects of anesthesia can lead to changes in neural drive, further reducing the functional residual capacity and Peak Expiratory Flow Rate (PEFR) of the lungs in the postoperative period. This can result in altered ventilation-perfusion ratios, leading to hypoxemia and an increased respiratory rate, affecting arterial oxygen levels in the body.

Incisions made around the diaphragm and abdominal musculature can significantly impact respiration and contribute to the development of Postoperative Pulmonary Complications (PPCs).

One post-surgery effect is the decreased cough reflex, which is a major contributing factor to the development of PPCs due to an increased risk of infection and the retention of secretions, leading to a reduced vital capacity.[3]

Surgical procedures cause tissue damage, resulting in a systemic inflammatory response that leads to changes in the endocrine and metabolic systems. This is one of the factors involved in the development of postoperative pulmonary complications.[9]

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The term "postoperative pulmonary complications" encompasses various diseases. After upper abdominal surgeries, the lungs frequently develop a restrictive pattern for numerous reasons, including: Reduced lung volume and capacity due to decreased lung compliance resulting from the decreased anterior-posterior (A-P) diameter of the rib cage and abdomen, influenced by general anesthesia's effect on inspiratory muscles (such as the diaphragm) and incision-related pain sensation.[29]

Common Postoperative Pulmonary Complications Include: Atelectasis, Pneumonia, Bronchitis, Bronchospasm, Exacerbation of previous lung disease

Atelectasis is characterized by the imperfect expansion of the lung, resulting from the partial or complete collapse of lung respiratory units, i.e., alveoli. This leads to altered oxygen (O2) and carbon dioxide (CO2) exchange.

The study demonstrates that atelectasis can develop during both the intraoperative and postoperative periods. This development is attributed to the effects of general anesthesia, neuromuscular blockers inducing muscle paralysis, increased intra-abdominal pressure, and various operative positions (e.g., the Trendelenburg position).[16]

PEP is prescribed for patients with pulmonary diseases, neurological disorders, or those undergoing surgery. Positive Expiratory Pressure (PEP) devices are used to facilitate airway clearance, increase lung volume, and address alveoli collapse. Several devices have been invented for this purpose, such as the Flutter, RC Cornet, PEP/RMT set, and Acapella. [4, 18]

Acapella is an oscillatory PEP device that provides oscillations to the airway, helping to loosen secretions and move them centrally. Acapella delivers high-frequency oscillation and positive expiratory pressure using counterweighted levers and magnets.

SUBJECT AND METHOD

PARTICIPANTS

In this study a total no. of patients were 30, 17 were male and 13 were female between the age group of 20 to 60 years after upper abdominal surgery were taken. patients with any systemic complications excluded. And non cooperative patients and the patients on ventilator.In which 15 patients of group B treated by conventional therapy and 15 patients of group A treated with acapella. Patients have undergone upper abdominal surgery. Before starting the physiotherapy treatment pre assessment of PEFR SPO2 was done. physiotherapy and acapella was given to the patients.

STUDY DESIGN AND RESEARCH METHODYLOGY

This study was done among the patients of upper abdominal surgery and patients. Conducted in Sri Aurobindo hospital surgical department indore 2022. For the duration of 12 monthsThe vagueness of study is comparison between conventional techniques and acapella for improving lung capacities. Data collected by Sample design is a convenient design.

PROCEDURE AND OUTECOME

In this study a total 30 patients were included after upper abdominal surgery. patients firstly were educated about their present conditions. Patients were asked to sign the consent form. Patients are divided into 2 groups A and B Then complete physiotherapy assessment was done on both the group and the goal of study and treatment was explained. Before starting the physiotherapy treatment pre assessment of PEFR and SPO2 was done. Group A received treatment with acapella and conventional physiotherapy was performed on group B.

After 1 week of intervention given to both the groups post assessment of PEFR and SPO2 is noted.

Patients were given the freedom to quit from the study. If they change their minds at any time period during ongoing study. By the end of the study , all the values were recorded.

STATISTICAL ANALYSIS:

Research Design: Before and After Comparative Research Design

Tools: The tools, R Studio, Excel and Jamovi were used to analyze the study.

Techniques: There were two demographic variables, Age and Gender hence the descriptive analysis of these variables were given first for both control and experimental group to ascertain about the random distribution of patients in control and experimental groups. We had two scales 1) PEFR and 2) SPO2. In both control and experimental groups we had applied the paired t-test taking statement of null hypothesis from H0_1 to H0_4. After this, we have applied the independent t-test taking statement of alternate hypothesis from H1_5 and H1_6.

RESULT

Inferential Analysis:

H1_5: PEFR Post Scores of Control Group would be less than PEFR Post Scores of Experimental Group.

Table 4.11: Descriptives of PEFR

	Group	N	Mean	Median	SD	SE
PEFR_Post	Control	15	122	120	28.1	7.25
	Experimental	15	217	200	48.8	12.6

Table 4.12: Homogeneity of Variances Test (Levene's)

	F	df	df2	p
PEFR_Post	4.35	1	28	0.046

Note. A low p-value suggests a violation of the assumption of equal variances

Figure 4.9: Distribution of PEFR Post of Control and Experimental Groups

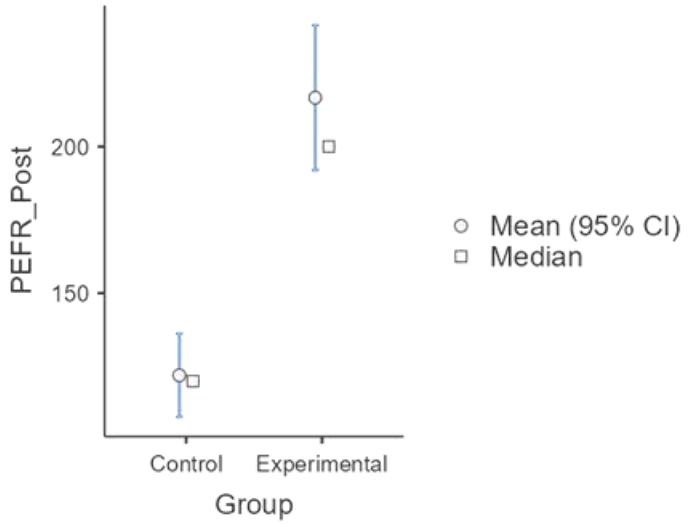

Table 4.13: Independent Samples T-Test for PEFR Post b/w Control and Experimental Groups

		Statistic	df	p
PEFR_Post	Welch's t	-6.51	22.4	< .001

Note. H_a $\mu_{Control} < \mu_{Experimental}$

The above table 4.13 shows that the p-value is less than 0.05 means our alternate hypothesis accepted, the mean of the PEFR Post of the control group was found to be less than the mean of the PEFR Post of the experimental group.

H1_6: SPO2 Post Scores of Control Group would be less than SPO2 Post Scores of Experimental Group.

Table 4.14: Descriptives of SPO2

	Group	N	Mean	Median	SD	SE
SPO2_Post	Control	15	96.9	97.0	1.22	0.316
	Experimental	15	97.8	98.0	1.15	0.296

Table 4.15: Homogeneity of Variances Test (Levene's)

	F	Df	df2	p
SPO2_Post	1.62e-29	1	28	1.000

Note. A low p-value suggests a violation of the assumption of equal variances

Figure 4.10: Distribution of SPO2 Post of Control and Experimental Groups

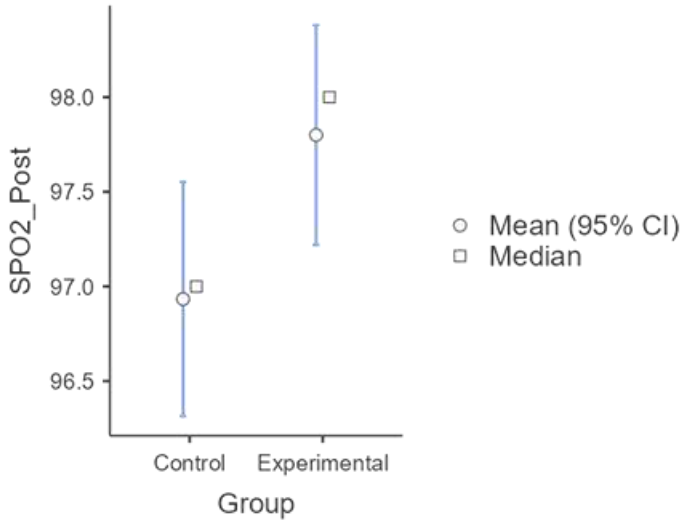

Table 4.16: Independent Samples T-Test for PEFR Post b/w Control and Experimental Groups

		Statistic	df	p
SPO2_Post	Student's t	-2.00	28.0	0.027

Note. H_a $\mu_{Control} < \mu_{Experimental}$

The above table 4.16 shows that the p-value is less than 0.05 means our alternate hypothesis accepted, the mean of SPO2 Post of the control group was found less than the mean of SPO2 Post of experimental group.

DISCUSSION

In this we have found that there is slight difference in the pre and post value of PEFR and SPO2 in both groups, but there is a significant difference in post value of PEFR and SPO2 in control and experimental groups. The result of this study has been supported by various studies. This study indicates that pep device is proved to be useful in increasing the PEFR value and airway clearance as compared to the conventional physiotherapy techniques alone in postoperative atelectasis. A pep device is much beneficial in the postoperative complications or to reduce the complications to further deteriorate.

PEFR and SPO2 value in patients treated with acapella is improved much more easily and conveniently, rather than conventional treatment.

CONCLUSION

The study shows significant difference in pre and post PEFR and SPO2 values of patients treated with breathing exercise with acapella than in patients treated with conventional physiotherapy treatment in the management of postoperative pulmonary complications after upper abdominal surgeries.

The open device “ACAPELLA” has a more beneficial effect in management of PPCs rather than conventional physiotherapy treatment. Limitation of the study are The study was conducted on small sample size, Sputum quantity is not assessed, PFT was not assessed

SCOPE FOR THE STUDY

effect of acapella on PEFR and SPO2 in atelectasis in upper abdominal surgery is key to improving the lungs function and reduce the postoperative complications without any invasive process, and reduce the chances of eventful hospital stay. Early improvement in postoperative atelectasis. As acapella is useful in lung expansion.

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