

EFFECT OF INCENTIVE SPIROMETER IN POST OPERATIVE PATIENTS WITH GENERAL ANESTHESIA

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Abstract : Post-operative care of patients is not limited to early mobilization only, but it also includes deep breathing exercises, coughing exercises and incentive spirometry (IS). Objective of the study was to assess the effects of incentive spirometer in post-operative patients with general anesthesia.

Methods: A randomized controlled trial was conducted on post-operative patients with general anesthesia in Aziz Bhatti Shaheed Teaching Hospital Gujrat, DHQ Gujranwala and THQ Wazirabad during August to November, 2022. A sample of total 94 participants was selected randomly with equal proportion in both groups (intervention and control) on the basis of inclusion and exclusion criteria. Incentives Spirometer (IS) was applied to the intervention groups. Two time assessment was taken from the participants. Data were entered and analysis through SPSS. In descriptive analysis, frequency tables were drawn. Independent t-test and paired t-test were applied for between and within group comparison respectively. All results were calculated at 95% confidence interval and p-value ≤ 0.05 was considered as a significant value.

Results: Average age of participants was 36.91 ± 6.80 and 35.72 ± 6.40 years in interventional and control group respective. Approximate equal male and female in both groups. Between group and within group comparison was found statistical significant with p-value < 0.001 .

Conclusion: It was concluded that on the basis of output, incentive spirometer was an effective intervention in post-operative patients with general anesthesia. Incentive spirometer could be tested for other parts of body related pulmonary activities.

Index Terms- Incentive spirometer, post-operative , general anesthesia.

I. INTRODUCTION

Incentive spirometry works on the principle of sustained maximal inspiration, which is utilized in thoracic surgery

patients with the aim of reversing pathophysiological changes because of PPCs. It is thought that sustained deep breathing will draw in collapsing alveoli and restore preoperative lung function.¹

With visual confirmation of their inspirational efforts, patients can autonomously practice deep breathing exercises using the incentive spirometry (IS) approach. This method is claimed to improve the precision of deep breathing exercises and motivate patients to do them². Visual feedback also helps with accuracy of spirometry, making it easier for both patient and physiotherapist, as it requires less supervision at physiotherapist's end³.

Incentives spirometry is commonly used after operative procedure because of the assumption that episodic ventilation encourages oxygenation and restores alveolar aeration.⁴ The patients use incentive spirometer which is either flow mediated or as volume oriented. Flow mediated spirometers come with three chambers that could measure airflow at 600, 900, and 1200 mL/s each.⁵ Whereas the volume-oriented spirometer has one-way valve. The patients are instructed to mimic sighing or coughing, inhaling deeply through a mouthpiece and watching the piston rise.⁶

To reduce the substantial clinical and financial impact of post-operative pulmonary complications incentive spirometry is used by physiotherapists, where patients are guided a breathing method involving deep breathing exercises whilst a gadget is employed that visualizes the inspired flow and/or volume and offer feedback. By stretching the tissue, deep breathing is supposed to mobilize secretions and surgically expand portions of a collapsed lung⁷⁻⁸

The aim of this study is to evaluate the incentive spirometry effectiveness in post-operative patients and to educate the physiotherapy community that its usage can lower post-operative pulmonary complications like (atelectasis, pneumonia and decreased lung activity).⁹

II. METHODOLOGY

A clinical trial was done that held in difference hospitals in surgical wards on the basis of criteria like (nonsmokers, no history of any respiratory issue non asthmatic patients & patients without mental disabilities) the patients included those go through general anesthesia. Participants (students, businessman, teachers & House wife) from any profession participated in this research with age 19 to 65 years³⁵ and undergone an operation under general anesthesia¹. Participants presented Pulmonary disease (Asthma, COPD & Lung cancer)^{2,3}, cognitive disorders (Alzheimer's disease, Dementia, Epilepsy-related cognitive dysfunction)², Electrical impedance tomography (EIT) (pacemaker, automatic implantable cardioverter defibrillator, and implantable pumps)², unable to perform and understand correctly the techniques² were excluded. An informed consent was obtained from all the patients willing to undergo the trial². A flow-oriented incentive spirometer (Tri-Ball) was used in this research and a questionnaire used to find and for notice the results. Before treatment a reading was taken that helps us to find out the condition of the patients total 94 patients were included in this research these are separated in to two equal groups (A=47 and B=47) All patients selected on the basis of inclusion and exclusion criteria. In group A, spirometer was applied as an exercise whereas to the group B, no any type of exercise was done and used this group as a control group. First assessment was taken at baseline through spirometer before given any session of spirometer and other assessment was completed after 4th week of exercises. One session of 10 repetitions and 3 sessions in a day within an hour were done till 4 weeks. Patients were asked to inspire through spirometer and readings were taken and recorded. The rest period between the repetitions is for 3-5 seconds. If patient feel dizziness or shortness of breath the break was increased till 15 seconds. Data were entered and analyzed through a statistical software, Statistical Package for Social Sciences (SPSS) version 24, IBM Corp. To calculate the normality of data of quantitative variables, Shapiro Wilk test was applied. For descriptive analysis, mean and standard deviation was calculated for quantitative normal data whereas frequency and percentages were used for qualitative variables. For between groups comparison, Independent t test was applied whereas dependent t test was used for with group comparison. All results were calculated at 95% confidence interval and p-value ≤ 0.05 was considered as a significant value.

RESULTS

Total 94 admitted patients were selected randomly from the Aziz Bhatti Shaheed Teaching Hospital Gujrat, DHQ Gujranwala and THQ Wazirabad. Selected patients were allocated groups (Group A that was interventional group And randomly in hospital

Table no-1 Descriptive analysis of demographic variables

Variables	Unite / Categories	Interventional Groups	
		Intervention Group (Incentive Spirometer) n=47	Control Group (Without Intervention) n=47
Age of Participants	Years	36.91±6.80	35.72±6.40
Gender	Female	8(17.02)	6(12.77)
	Male	39(82.98)	41(87.23)
Occupation of participants	Student	11(23.40)	7(14.89)
	Public Job	13(27.66)	20(42.55)
	Private Job	13(27.66)	12(25.53)
	House wife	3(6.38)	1(2.13)
	Businessmen	4(8.51)	4(8.51)
	Other	3(6.38)	3(6.38)
Material Status	Single	11(23.40)	9(19.15)
	Married	36(76.60)	38(80.85)
Surgical procedure	Laparotomy	17(36.17)	10(21.28)
	Tracheotomy	12(25.53)	18(38.30)
	CABG	10(21.28)	15(31.91)
	Cholecystectomy	6(12.77)	2(4.26)
	Others	2(4.26)	2(4.26)
Respiratory issue before operation	Yes	10(21.28)	11(23.40)
	No	37(78.72)	36(76.60)

Average age of participants was 36.91±6.80 and 35.72±6.40 years in interventional and control group respective. Approximate equal male and female in both groups. Mostly participants were with public and private job in both groups. Married participants were more but equal in interventional and control group. There was equal proportion in both groups with no respiratory issue.

Table no-2 Descriptive analysis through frequencies and percentages

		Interventional Groups	
		Intervention Group (Incentive Spirometer)	Control Group (Without Intervention)
Pre intervention incentive spirometer	Red (600cc)	35(74.47)	37(78.72)
	Yellow (900cc)	12(25.53)	10(21.28)
Post intervention incentive spirometer	Yellow (900cc)	19(40.43)	35(74.47)
	Green (1200cc)	28(59.57)	12(25.53)

Proportion of pre intervention in both groups were equal in intervention and control group whereas this proportion was found totally different at post intervention and improvement was clearly shown in interventional group.

Table 3. Within group analysis through paired sample t-

	Mean	Std. Deviation	95% Confidence Interval of the Difference		t	P-value
			Lower	Upper		
Intervention Group (Incentive Spirometer)	402.13	168.74	-451.67	352.58	-16.34	<0.001*
Control Group (Without Intervention)	306.38	182.26	-359.9	252.87	-11.52	<0.001*

Within group comparison was calculated with dependent t-test and results are presented in table 3. Mean difference and statistically significant between pre and post assessment was shown that improvement was presented in both groups (interventional and control group) however, in interventional group change was shown more as compare to control and this difference was statistical significant with p-value <0.001.

Table 4. Comparison between Intervention and control group

	Intervention Group (Incentive Spirometer)	Control Group (Without Intervention)	t-test for Equality of Means					
			t	df	P-Value	Mean Difference	95% Confidence Interval of the Difference	
							Lower	Upper
Pre intervention incentive spirometer (cc)	676.60±132.23	663.83±124.11	0.48	92	0.63	12.77	-39.77	65.3
Post intervention incentive spirometer (cc)	1078.72±148.82	970.21±128.39	3.78	90	<0.001*	165.5	165.47	165.47

Table 4 shows the between group comparison that was calculated by independent t test that indicated the statistical significant difference with p-value <0.001 that clearly showed that interventional group with incentive spirometer was shown significant improvement as compare to control.

III. DISCUSSION :

In this randomized clinical trial, main objective of this study was to find the effectiveness of incentive spirometer in post-operative patients with general anesthesia.¹⁰ To fulfill this objective, total 94 post-operative patients were selected and allocated into two equal groups¹¹. In Group A, incentive spirometer was applied as an intervention and in Group B that was control group. 47 participants in each group after allocation the group¹². Current study revealed that incentive spirometer had statistical significant effect in improving the pulmonary activity on post-operative patients who had general anesthesia at the time of operative surgery.¹³

Outcomes of this study was align with a previous randomized control trail that represent the improving trend of pulmonary function as well as improving the blood circulation and rapid recovery in surgery wound in patients with post-operative patients. In that study, in post-operative care, incentive spirometer was recommended. For better outcome related to pulmonary activities good compliance is required towards the patients¹⁴⁻¹⁵. Another pre-interventional study to find the effect the of incentive spirometer on recovery of postoperative patients.¹⁶ Intervention (incentive spirometer) 3 day Performance level was assessed and showed a statistically significant value, which revealed that the incentive spirometer had improved by increasing the lung capacity and volumes in post-operative patients.¹⁷⁻¹⁸ In a recent RCT , that was conducted in a tertiary referral teaching hospital on 212 patient with CABG and their surgery was done urgently¹⁹. This study was also in support of current study. Incentive spirometers can be clinically effective, but perhaps only when adherence is high. {Eltorai, 2019 #45} More studies are recommended on the urgency basis.²⁰

RECOMMENDATION(S) :

- multicentral clinical trail on this domain is required
- further study recomanded with proper randomization & masking & blinding
- further study recomanded with controlling confounding effect of variable

LIMITATION(S) :

- this study there is no masking or any type of blinding
- Followup & its purely effect of treatment was not accessed
- Confounding effect was not accessed & controlled

IV. CONCLUSION

It was concluded that on the basis of output, incentive spirometer

was an effective intervention in post-operative patients with general anesthesia. Incentive spirometer could be tested for other parts of body related pulmonary activities.

Conflict of Interest

There was no conflict of interest.

Financial Statement

No funding's given by any authorities; it was a project thesis of doctor of physical therapy.

Data availability

Data will be provided on the demand by corresponding author.

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Running Title: Effect of incentive spirometer in Post Operative patients with general anesthesia.