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Efficacy of balloon physiotherapy in preventing the chest complications

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Abstract

Background: Arterial hypoxia occurs due to perfusion of non-ventilated alveoli; these changes become maximal within 48 -72 hours after operation and usually return to normal within 7 days without ever becoming clinically evident.
Objective: To study the efficacy of balloon physiotherapy in comparison to incentive physiotherapy.
Methods: A prospective study was conducted among eighty three patients who have undergone major laparotomy operations i.e. opening of abdominal wall. They were divided into two groups. One group received the balloon physiotherapy and the other group received the incentive physiotherapy. Comparison was made between the two groups. Data was analyzed using appropriate statistical tests.
Results: At two degree of freedom X square value corresponds to probability 0.05 was 5.99. Calculated value was 0.4884. It was not found to be statistically significant. It was also noted that there was no significant difference noted between two groups of ASA grade. Balloon physiotherapy was found equally effective in comparison to chest physiotherapy.
Conclusion: Balloon physiotherapy is cheaper than incentive physiotherapy. It was found to be equally good in comparison with incentive physiotherapy. Hence we recommend use of balloon physiotherapy in low resource settings.

Keywords: Physical activity, ASA grade, Qualitative assessment

Introduction

During the immediate postoperative course after upper abdominal surgery, pulmonary complications often occur, caused, inter alia, by reduced regional ventilation and by atelectases as a result of: narrowing of the small peripheral bronchi, and impaired respiratory function.[1]

Abdominal surgery, especially upper abdominal surgical procedures are known to adversely affect pulmonary function. Pulmonary complications are the most frequent cause of postoperative morbidity and mortality.[2]

Postoperative respiratory morbidity continues to be a major factor in the utilization of resources and maintenance of hospitalization after major surgery.

The incidence of pulmonary complications is higher after upper abdominal or chest surgery than other parts of the body. Impaired ventilation and ineffective expectoration results in result in a postoperative failure of expansion or progression of collapse of lung segments, thereby encouraging infection. The ensuing shunt with venous admixture results in hypoxemia. Postoperative oxygen supply may therefore falter while oxygen demands are increased due to metabolic hyper metabolism and hyper-catabolism of the neuro-endocrine stress response to trauma. At the same time, the work of breathing is increased due to the need for increased alveolar ventilation, a stiffened abdominal wall and possibly diaphragmatic dysfunction. These patho-physiological changes underpin the events in the immediate postoperative period.[3]

To prevent the chest complications after upper abdominal surgery, the incentive physiotherapy is used most commonly. Balloon physiotherapy is equally good, cheaper as compared to incentive physiotherapy. Present study attempts to compare the incentive and balloon physiotherapy outcomes among patients who have undergone the upper abdominal surgery.

Material and Methods

Study design: Cross sectional with comparison group.
Study sample: 83 patients who have undergone major laparotomy during the study period.
Study participants: Patients between 18-60 years of age.
Study period: August 2006 to July 2007.
Ethical considerations: Institutional Ethics Committee permission was obtained. Individual informed consent was taken from all study participants after explaining them the study purpose.
Methodology: The study participants were divided into two groups. One group consisting of 45 patients received the balloon physiotherapy. Another group consisting of 38 patients received the chest physiotherapy.

This study was done on eighty three patients admitted for emergency treatment. An emergency major laparotomy was done with abdominal wall opened. All sampled patients were between 18 to 60 years of age. The site and length of wound were recorded after surgery. Wound was cephaled and cauded to the umbilicus were classified as long and vertical. Use of nasogastric tube just after surgery was regarded as

putative risk factor. The dosage of drug used for reduction in post-operative pain was expressed as in terms of Tramadol. The anesthesia chart was reviewed to determine, the duration of anesthesia and ASA classification.

In essence, the ASA classification[4]dividesthe patients into five groups;

1. Healthy (class-1)
2. Mild to moderate systemic disease (class-2)
3. Severe systemic disease (class - 3)
4. Severe systemic disorder that are already life threatening (class-4) and Selected patients for study purposes were examined fully with special attention to respiratory system (class-4)
5. Moribund (class-5)

Statistical analysis: Data was analyzed using student's t test and chi square test. P value less than 0.05 was considered significant.

Results

Table 1: Qualitative assessment of different surgical variables

Variables	Balloon physiotherapy (N = 45)	Incentive physiotherapy (N = 38)	"t" value	p-value
Duration of surgery in hour	2.26±0.28	2.27±0.09	-0.045	0.9642
Length of incision in cm.	13.87±0.81	13.84±0.78	0.037	0.9706
Nasogastric Tube intubation duration in hour	126.71±12.21	127.32±12.70	0.049	0.9610
Analgesic Dose in mg.	1373.33±116.24	1386.84±126.02	-0.118	0.9064

Table 1 shows the qualitative assessment of different surgical variables among two groups of patients. The mean values of all the studied variables were similar in both the groups and the difference was not found to be statistically significant. ($p > 0.05$).

Table 2: Comparison of ASA Grade among two groups of patients

Groups	Grade-1	Grade-11	Grade-111	Total	Result
Balloon physiotherapy	02	40	03	45	$X^2 = 0.4884$ P=0.7833
Incentive physiotherapy	00	35	03	38	
Total	02	75	06	83	

It can be seen from Table 2 that the distribution of patients from both the groups of balloon and incentive physiotherapy as per the ASA grade was similar and the difference was not statistically significant ($p > 0.05$). This shows that both the types of physiotherapy were equally good in preventing the chest complications after upper abdominal surgery.

Discussion

The mean values of all the studied variables were similar in both the groups and the difference was not found to be statistically significant ($p > 0.05$). The distribution of patients from both the groups of balloon and incentive physiotherapy as per the ASA grade was similar and the difference was not statistically significant ($p > 0.05$). This shows that both the types of physiotherapy were equally good in preventing the chest complications after upper abdominal surgery.

Lyager S et al[1] concluded that in general, they have a low frequency of severe postoperative pulmonary complications, as compared with the results reported in the literature. They ascribe this to their very effective pre- and postoperative respiratory therapy.

Richardson J et al[3] reported similar findings in accordance with the present study. They stated that in patients with low risk, deep breathing exercises should

be done whereas they recommended incentive spirometry for high risk patients who are undergoing the upper abdominal surgery.

Dikshit MB et al[5] Hyper ventilation such as during exercise improves respiratory muscle strength and lung capacity. By noting the above facts the authors were of the view that for strengthens respiratory muscles one should do physical exercises such as brisk walking, yoga under yoga expert after excluding or fit for yoga.

Drinkers J et al[6] in their study found that Eight patients in the control group and three in the intervention group developed atelectasis (P = 0.07). The median duration of atelectasis was 0 days in the intervention group and 1.5 days in the control group (P = 0.07). No adverse effects of preoperative inspiratory muscle training were observed and patients considered that inspiratory muscle training was a good preparation for surgery.

Roukema JA et al[7] found that the incidence of post-operative complications was 19% in the study group and 60% in the control group. Hence they concluded that pre-operative and post-operative breathing exercises should be done for all patients who are undergoing surgery for upper abdomen.

Thomas JA et al[8] reported that the Physical exercise helps in the increase of respiratory muscle strength. This has been noted by different researches that there was a correlation in to maximum expiratory pressure which was representation of respiratory muscle strength.

Celli BR et al[9] in their study the control group (44 patients) received no respiratory treatment, the IPPB group (45 patients) received intermittent positive pressure breathing therapy for 15 min 4 times daily, the IS group (42 patients) was treated with incentive spirometry 4 times daily, and the DBE group (41 patients) carried out deep breathing exercises under supervision for 15 min 4 times daily.

Hall JC et al[10] also concluded that when the use of resources is taken into account, the most efficient regimen of prophylaxis against respiratory complications after abdominal surgery is deep breathing exercises for low risk patients and incentive spirometry for high risk patients. This was in agreement with the findings of the present study.

Manzano RM et al[11] found that the chest physiotherapy group presented improved oxygen-hemoglobin saturation after chest physiotherapy during the immediate postoperative period.

Conclusion

In the present study there was null hypothesis noted hence the authors reached to the conclusion that both balloon and incentive physiotherapy were equally effective in preventing chest complications.

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