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ORIGINAL ARTICLE

Effect of deep breathing exercises and incentive spirometry on respiratory distress scoring in second degree inhalational burn patients

Summiya Siddique Malik[1], Sadaf Saeed[2], Sumaira Kanwal[3]

[1] Foundation University Islamabad, Islamabad, Pakistan
[2] District Head Quarter Hospital, Abbottabad, Pakistan
[3] Margalla Institute of Health Sciences, Rawalpindi, Pakistan

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Correspondence

Summiya Siddique
physiotherapy19@gmail.com

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A B S T R A C T

Objective: Study was conducted for 6 months in PIMS Hospital Islamabad. Data was collected on self-structured Questionnaire, Respiratory distress scoring, Objective tools of Arterial blood gases and vital signs with signed consent.

Methodology: The subjects were randomly allocated in experimental and control groups. Baseline data was collected and re-collected on Day 0 and Day 7 respectively and assessed using non-probability convenient sampling technique. Both groups were given standard medical and nursing care.

Results: The experimental group was given single treatment regimen i.e. Deep breathing exercises (with 5-10 repetitions of each DBE being possible onto patient for 15-30 minutes twice daily). The control group was given 10-15 cycles of ISM with prior steam inhalation and nebulization with salbutamol for a period of 15-20 minutes for 35-45 minutes twice daily for a period of 07 days.

Conclusion: The experimental group results show that deep breathing exercises are significantly effective in improving post burn complications like pneumonia in patients suffering from second degree inhalation burns.

Keywords: *Deep breathing exercise, incentive spirometry, burn patients.*

Introduction

Injury to the pulmonary system through direct mode can result from both heat injury and chemical irritation produced as a result of the combustion end products. The metabolism of mitochondria is disturbed due to inhalation of gases like carbon dioxide and hydrogen cyanide which leads to systemic insult. The death rate and incidence of illness can further be complicated and increased from 3-10% to 20-30% due to injury caused by inhalation of smoke, therefore it is important to recognize the presence of inhalation injury.[1, 2] The factors responsible for indicating the factors responsible for increasing death rate due to the burn injury caused by inhalation involve increase in TBSA scoring and increase in age.[3-6] Further an increase in requirements of fluid and onset of Acute respiratory distress syndrome is also responsible for increasing the incidence of death rate.[6] The mortality rate also significantly increases if inhalation injury is being complicated by some specific diseases like pneumonia.[7, 8] The circumstances of the burn injury are also quite important in indicating inhalation injury, like if a burn occurring in an area that is completely bounded like an automobile then there is very high chance of inhalation burn injury because the temperature in such an environment may increase up to 1000ºF (538ºC).[9, 10] A lot of researches have been done to address the post-burn respiratory complications but the most important and major gaps being still found in this regard include how to prevent these post burn complications irrespective of the good hygiene. Pakistan is deprived in Burn care as only a few setups are available and there is not much work done in cardiopulmonary physical therapy. This study was done to aware people about better cardiopulmonary rehabilitation.

The current research was based on finding out the most effective treatment regimen in preventing complications in post inhalation burn patients suffering from second degree inhalation burn. This study is going to add evidence-based treatment in the practice of chest physical therapy and an effective treatment of pneumonia in second degree inhalation burn patients.

Methodology

A total of 30 patients from both genders between the age of 20-50 years, suffering from second degree inhalation burns after first surgical intervention using nasal cannulas and face mask were included in the study. Unconscious patients and those suffering from other types of burns were excluded. Non-probability convenient sampling technique was used.

After taking informed consent, the participants were randomly allocated to control group and experimental group containing 15 patients each. Patients in control group were given 5-6 cycles of incentive spirometry ISM twice a day for seven days, with each session lasting 20-30 minutes. The patients were also given steam inhalation and nebulization prior to ISM. Patients in the experimental group were given 4-6 repetitions of deep breathing exercises DBE, twice a day for seven days. The DBE involved belly breathing, pursed lip breathing, diaphragmatic breathing and active cycle of breathing techniques. Baseline data was collected by physical therapist on Day 0 and then patients in both groups were given two sessions of allocated regimens each day and then data was re-collected on day 07. Respiratory distress was measured using Silverman-Andersen retraction scoring with 0 score indicating lag, score 1 as normal and score 2 as lead.

The study was conducted according to the ethical guidelines of Pakistan Medical Research Council (PMRC) and the Declaration of Helsinki. Anonymity and confidentiality of participants was maintained throughout the research. This data was analyzed by using statistical package for social science SPSS version 21. Categorical variables were presented as frequency and percentages whereas continuous variables were presented as mean and standard deviation. Statistical significance between groups was assessed using independent samples t-test and for within the group comparison paired samples t-test was used. Statistical significance was assumed at p-value <0.05.

Results

A total of 30 participants were enrolled in the study with 15 males and 15 females. The demographic variables are shown in Table 1. There were 7 males and 8 females in the Control group, and 8 males and 7 females in the experimental group. The mean age of participants was 29.6 years and 38.4 years, mean GCS 13.6 and 14.2, and duration of exposure 10.2 seconds and 9.7 seconds in the control and experimental group respectively.

Table 2 describes the comparison of Silverman-Anderson respiratory distress score after the delivery of physiotherapy sessions in control and experimental group. Significant difference was noted for post-session chest movement between the two groups. The experimental group had a significantly lower score than control group, 1.66±0.48 compared with 1.93±0.25, p=0.021. There was no significant difference in the other variables.

Table 3 shows the effect of intervention on respiratory distress before and after administration of session. There was a significant improvement in chest movement, the score improved from 2.06±0.26 to 1.66±0.48 post session, p=0.009. Similarly, a significant improvement in the Silverman-Anderson score for intercostal retractions was observed, 2.0±0.37 pre-session compared with 1.40±0.50 post-session, p<0.001. Reduction of respiratory distress score was noted in the remaining variables, like xiphoid retractions, nasal flaring and expiratory grunt as well but it was not statistically significant.

Table 1: Demographic Variables

Variable	Control	Experimental
Age (mean±SD)	29.6±6.66 yrs	38.4±4.91 yrs
Gender Male, n (%) Female, n (%)	 7 (46.7) 8 (53.3)	 8 (53.3) 7 (46.7)
GCS (mean±SD)	13.6±1.11	14.2±1.08
Duration of exposure (mean±SD)	10.2±5.2 sec	9.7±3.8 sec

Table 2: Post session scores of Control and Experimental group

Feature	Group	Silverman-Anderson Score		p-value
		Mean	S.D.	
Chest movement assessment post-session	Control	1.93	0.25	0.021*
	Exp.	1.66	0.48	
Intercostal retraction assessment post-session	Control	1.06	0.25	0.207
	Exp.	1.40	0.50	
Xiphoid retraction assessment post-session	Control	1.06	0.25	0.200
	Exp.	1.40	0.50	
Nasal flaring assessment post-session	Control	1.06	0.26	0.200
	Exp.	1.40	0.51	
Expiratory grunt assessment post-session	Control	1.06	0.26	0.200
	Exp.	1.40	0.51	

* Significant difference (p<0.05)

Table 3: Pre and post session scores of experimental groups

Feature	Group	Silverman-Anderson Score		p-value
		Mean	S.D.	
Chest movement	Pre-session	2.06	0.26	0.009*
	Post-session	1.66	0.48	
Intercostal retractions	Pre-session	2.00	0.37	<0.001*
	Post-session	1.40	0.50	
Xiphoid Retractions	Pre-session	1.60	0.63	0.082
	Post-session	1.40	0.50	
Nasal flaring	Pre-session	1.53	0.63	0.164
	Post-session	1.40	0.50	
Expiratory grunt	Pre-session	1.53	0.63	0.164
	Post-session	1.40	0.50	

* Significant difference (p<0.05)

Discussion

The results of between group comparisons with the help of student's t-test are given in table 2. The mean, standard deviation and p-values for variables of both experimental and control group variables are mentioned above. The significant value is p<0.05.The results show that both techniques were giving significant results for certain variables including Nasal flaring and Expiratory grunt with p<0.05.The rest of the variables studied in the treatment were also giving better results but the results are not that much significant that is in those p>0.05 and hence were not considered significant. Hence favoring acceptance of Null hypothesis and Alternate hypothesis is not accepted. The table 2 shows the results for experimental group patients showing significant effect of Deep breathing Exercises on variables including Chest movement and Inter-costal retractions by giving p-value that is p<0.05. The rest of variables were being improved but the p>0.05 and hence were not considered significant.

In June2007 a study was conducted on comparison between two burn rehabilitation protocols, F. Okhovation with co-workers conducted a research on patients of General hospital Tehran in year 2005.The aim of the study was to compare the aim of burn rehabilitation treatment with routine burn rehabilitation treatment to find out rehab related problems. The results of this study indicate significant difference (p<0.01) in burn contractures between two groups, that intensive burn rehabilitation decreases burn complications. BRT could consider BRT protocols.[8] The journal BURNS witnessed a research conducted by Oscar E. Suman and his coworkers on Respiratory management of pulmonary injury. Chest physiotherapy has come to mean gravity-assisted bronchial drainage with chest percussion and vibrations.

Conclusion

The experimental group results show that deep breathing exercises are significantly effective in improving post burn complications like pneumonia in patients suffering from second degree inhalation burns. The current research results of some variables are not significant due to small sample size. A large sample multicenter study with appropriate design is necessary to conclude more significant results.

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