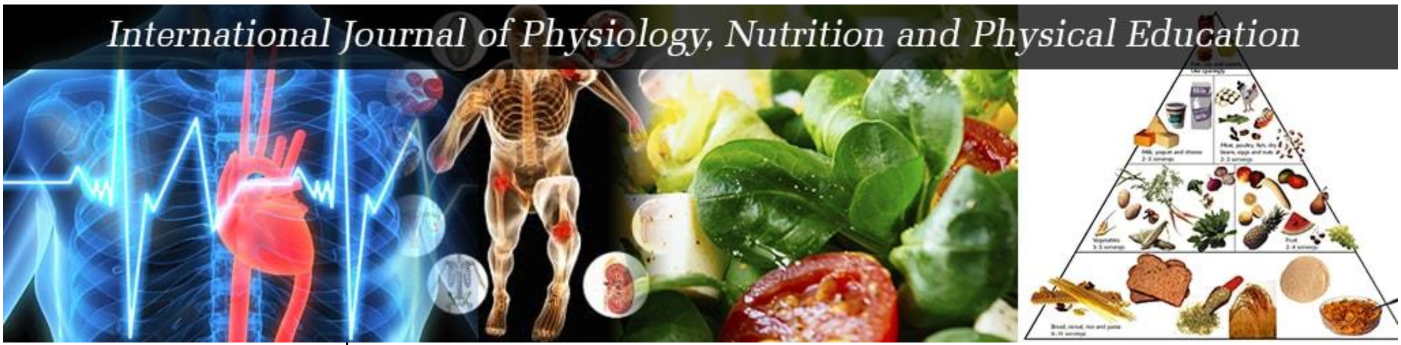

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Effect of incentive spirometry and lateral costal expansion in patients with upper abdominal surgery

Payal Thakre and Dr. Javid H Sagar

Abstract
Aim: To determine the effect of Incentive Spirometry and Lateral Costal Expansion along in patients with Upper Abdominal Surgery.
Methodology: Abdominal surgery subjects were recruited in the study.
Results: Significant findings were found.
Conclusion: The present study concludes that Incentive Spirometry and Lateral Costal Expansion both are effective.

Keywords: Spirometry, abdominal surgery, breathing techniques

Introduction

As we know that there is nothing more than basic and essential than breathing but there is a difference between breathing to live and breathing with the goal of improving or maintaining good Health. The difference between these practices generally has to do with two factors that is the conscious act of breathing properly and how deeply air is inhaled and exhaled via the diaphragm and lungs. If patients understand then they must perform respiratory exercise to prevent pneumonia, and the movement is imperative for preventing blood clots, encouraging circulation to the extremities, and keep the lungs clear [1]. The term abdominal surgery broadly covers a surgical procedure that involves Opening the abdomen [2]. For opening the abdomen a well calculated and well performed incision is of paramount importance to abdominal surgery. Any error such as a poorly chosen incision, unsatisfactory means to close or unsuitable selection of suture material may result in serious complications.

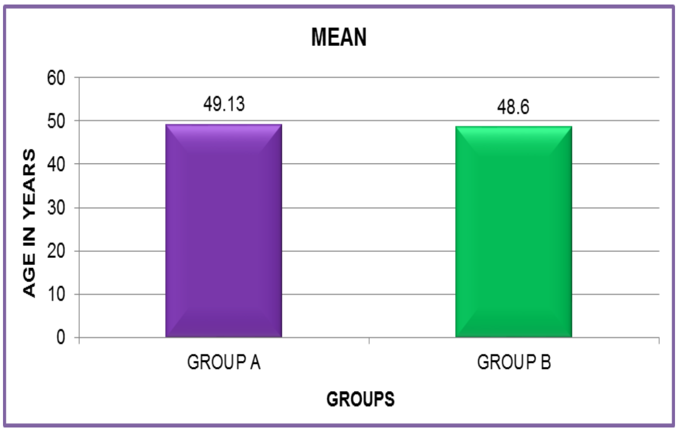
Postoperative pulmonary complications (PPC_S) following abdominal surgery are very common and always associated with increased morbidity and mortality. The reported incidence of pulmonary complications after abdominal surgery varies from 6% to 76%. The reasons for such a wide variation include the different types of patients selected for study and variations in the definition of pulmonary complications. Out of these, reported incidence rates for Upper Abdominal Surgery (UAS) range from 17% to 88%.The incidence of atelectasis ranges from 20% to 69% and for the postoperative pneumonia from 9% to 40%.[3-4]

Methodology

31 abdominal surgery subjects were recruited in the study. They were recruited from inpatient department of Krishna Institute of medical sciences, based on the fulfilment of inclusion and exclusion criteria. Informed consent was taken from each individual participating in the study. 31 patients were allotted into 2 groups i.e. Group A and Group B. The patients were allotted to each Group randomly. First patient was given 2 chits naming Group A and B. Patient was asked to draw a chit and according to chit they were recruited to that group. Second patient was recruited to remaining Group and then subsequent patients were recruited by the same sequence of groups.

Table 1: Age distribution of patients in Group A and Group B.

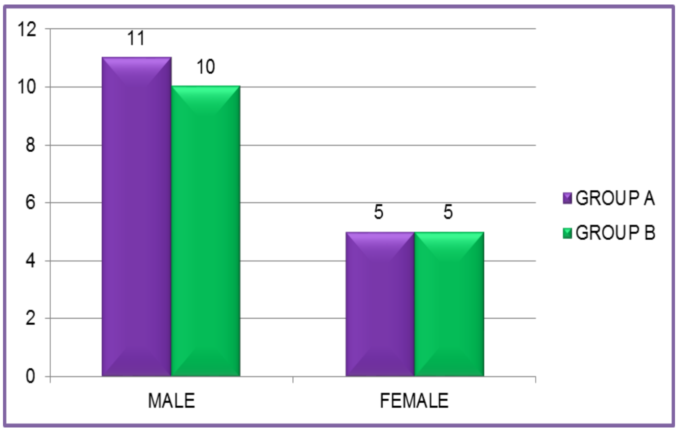
Groups	Mean Age	Standard deviation
Group A	49.13	7.83
Group B	48.6	7.67



Graph 1: Age distribution of patients in Group A and Group B.

Table 2: Gender wise distribution of patients in Group A and Group B

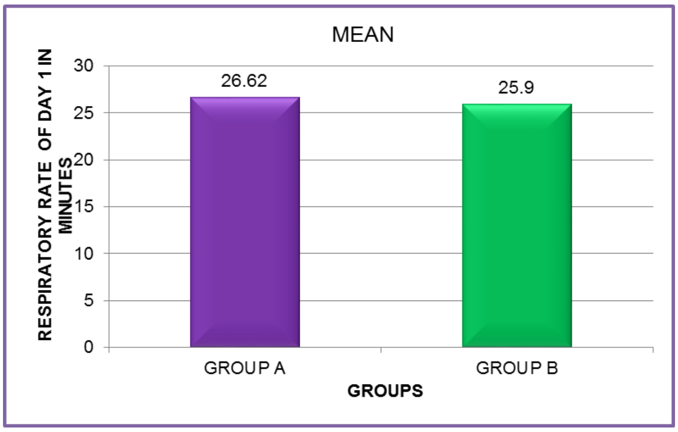
Gender	Group A	Group B
Male	11	10
Female	5	5
Total	16	15



Graph 2: Gender wise distribution of patients in Group A and Group B

Table 3: Respiratory rate on day 1 of Group A and Group B

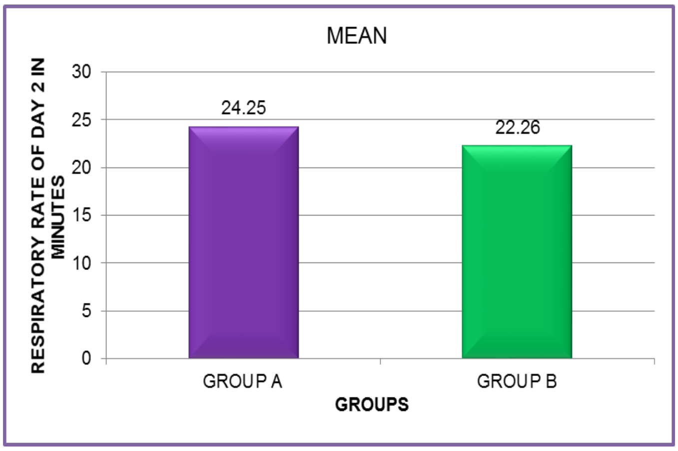
Groups	Mean	Standard deviation	95% confidence limit		P-value and t value
			Lower	Upper	
Group A	26.62	1.89	25.62	27.63	P=0.43 t=0.80
Group B	25.9	3.24	24.07	27.63	



Graph 3: Respiratory rate on Day 1 of Group A and Group B

Table 4: Respiratory rate on day 2 of Group A and Group B

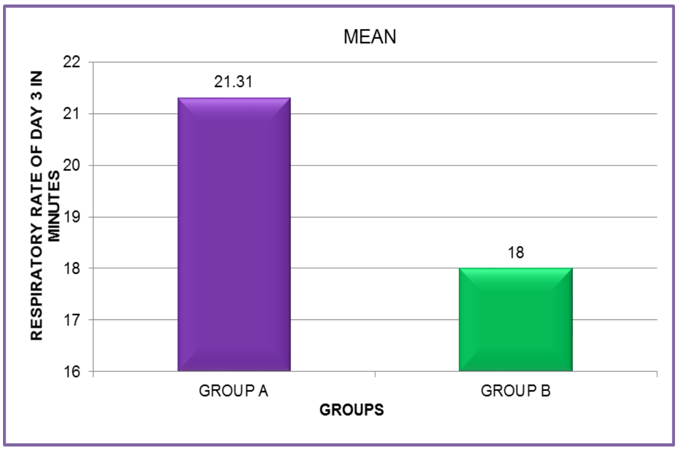
Groups	Mean	Standard deviation	95% confidence limit		P-value and t value
			Lower	Upper	
Group A	24.25	2.41	22.97	25.53	P=0.03 t=2.25
Group B	22.26	2.49	20.89	23.65	



Graph 4: Respiratory rate on Day 2 of Group A and Group B

Table 5: Respiratory rate on day 3 of Group A and Group B

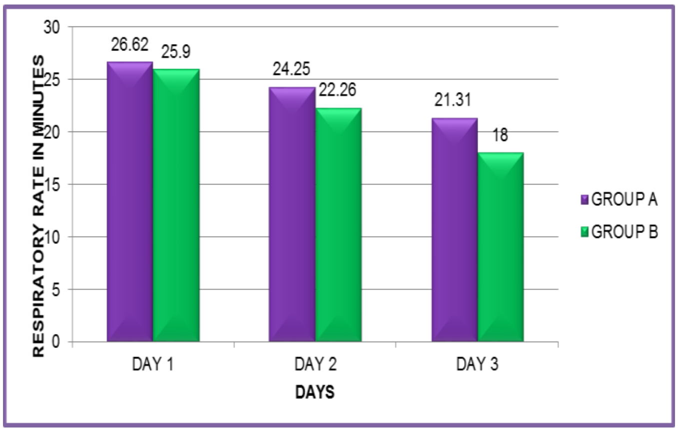
Groups	Mean	Standard deviation	95% confidence limit		P-value and t value
			Lower	Upper	
Group A	21.31	3.11	19.65	22.97	P=0.002 t=3.37
Group B	18	2.27	16.74	19.26	



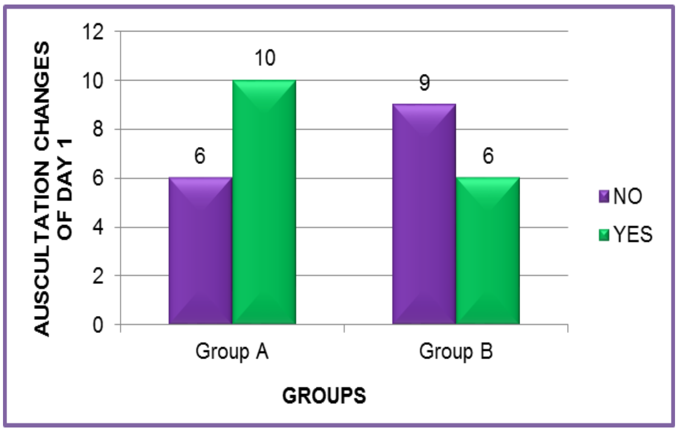
Graph 5: Respiratory rate on Day 3 of Group A and Group B

Table 6: Respiratory rate of first 3 days of Group A and Group B

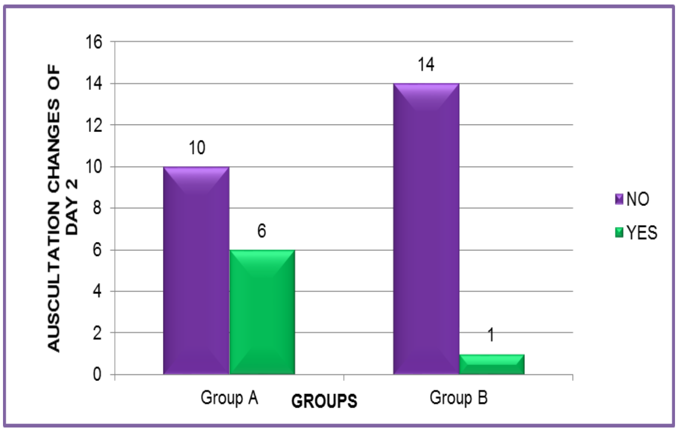
Groups	Day1	Day 2	Day 3	P value	F value
	Mean± SD	Mean± SD	Mean± SD		
Group A	26.62± 1.89	24.25±2.40	21.31±3.11	<0.001	54.79
Group B	25.9±3.25	22.26±2.49	18±2.27	<0.001	75.07



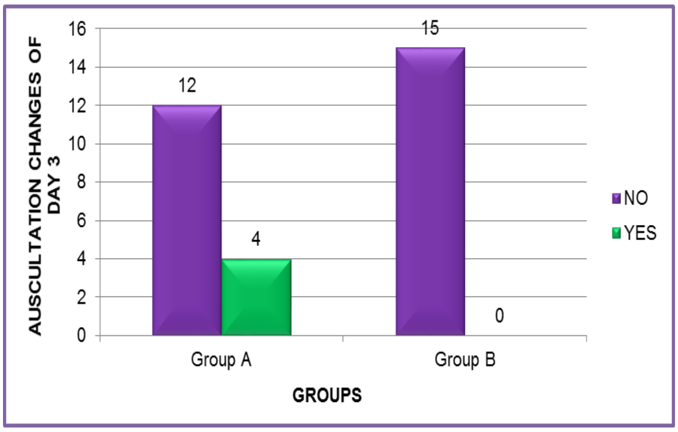
Graph 6: Respiratory rate of first 3 days of Group A and Group B



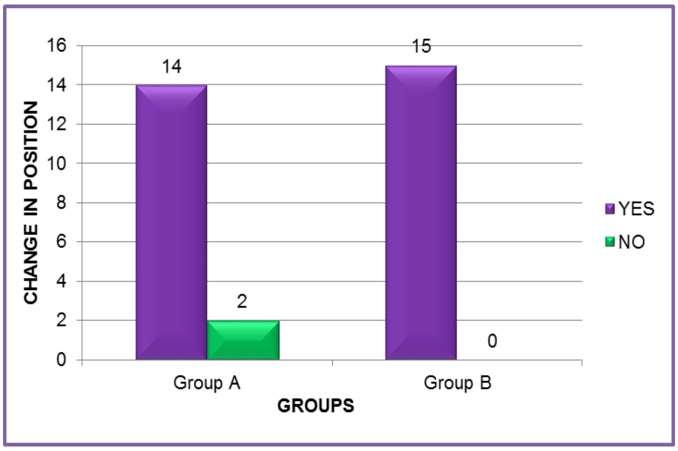
Graph 7: Auscultation changes of two groups on Day 1



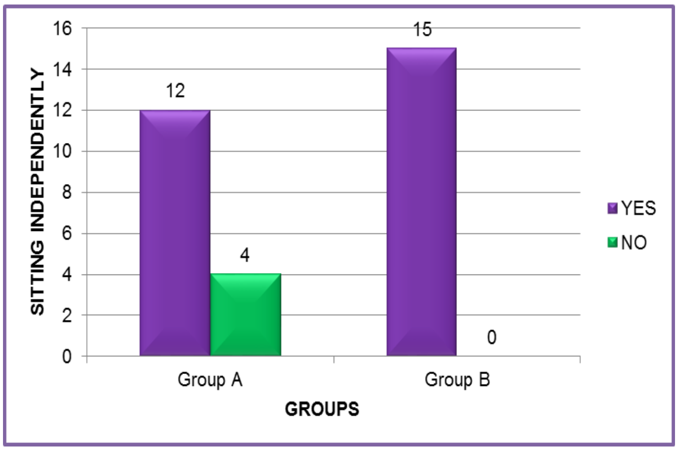
Graph 8: Auscultation changes of two groups on Day 2



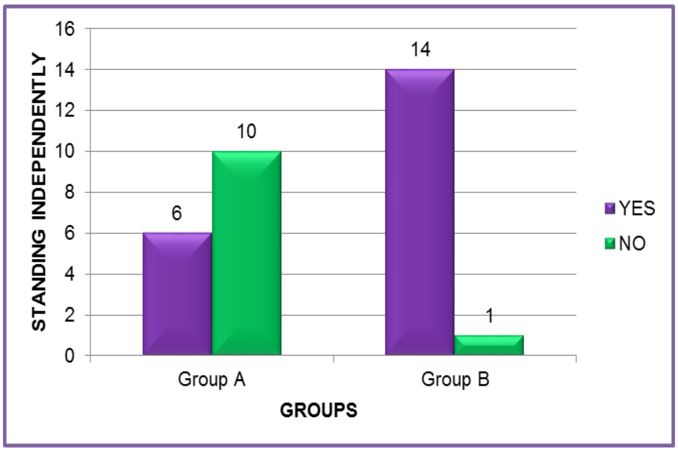
Graph 9: Auscultation changes of two groups on Day 3



Graph 10: Change in position of two groups on Day 4



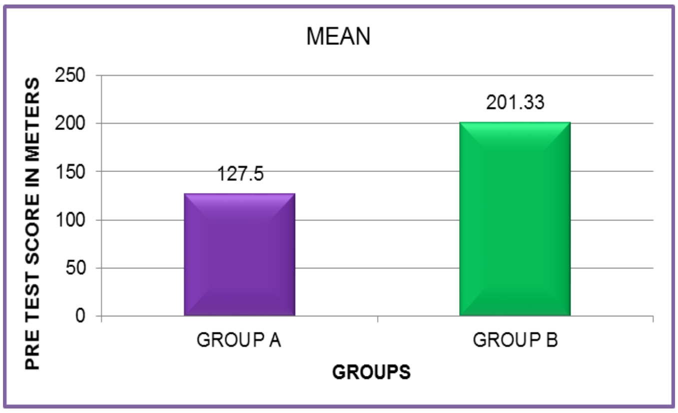
Graph 11: Sitting independently of two groups on Day 4



Graph 12: Standing independently of two groups on Day 4

Table 7; Six minute walk test score on day 5 of Group A and Group B

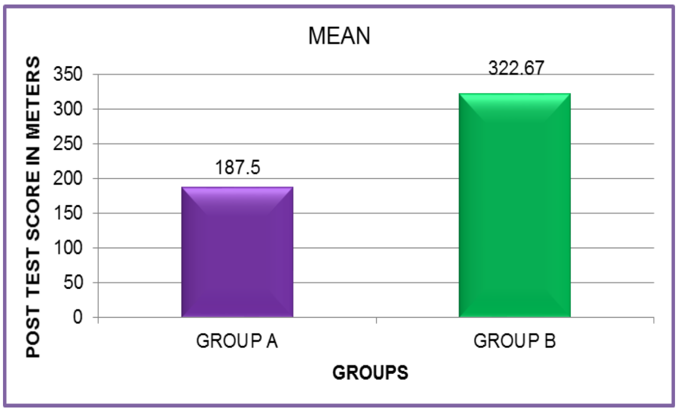
Groups	Mean	Standard deviation	95% confidence limit		P-value and t value
			Lower	Upper	
Group A	127.5	58.37	96.41	158.59	P=0.0005 t=3.92
Group B	201.33	45.02	176.40	226.27	



Graph 13: Six minute walk test score on Day 5 of Group A and Group B

Table 8: Six minute walk test score on day 8 of Group A and Group B

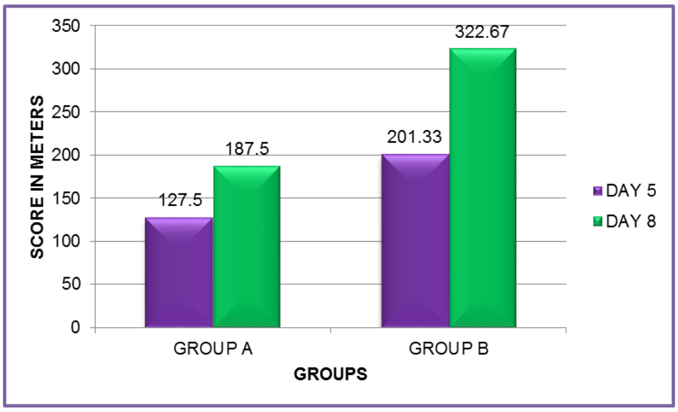
Groups	Mean	Standard deviation	95% confidence limit		p-value and t value
			Lower	Upper	
Group A	187.5	62.28	160.57	297.76	P=<0.0001 t=6.42
Group B	322.67	52.19	226.93	355.57	



Graph 14: Six minute walk test score on Day 8 of Group A and Group B

Table 9: Six minute walk test score of Group A AND GROUP B on day 5 and day 8

Groups	Day 5	Day 8	P value	t value
	Mean ± SD	Mean ± SD		
Group A	127.5±58.37	187.5±62.28	<0.0001	8.62
Group B	201.33±45.02	322.67±52.19	<0.0001	14.94



Graph 15: Six minute walk test score of Group A and Group B on day 5 and day 8

Discussion

Abdominal Surgery may lead to some impairment in the respiratory functions. Areas of microatelectasis develop during anesthesia and grow in the presence of shallow monotonous ventilation and reduced mucociliary clearance that accompanies postoperative somnolence [5, 6]. This study has been designed to determine the effect of Incentive Spirometry and Lateral Costal Expansion in patients with Upper Abdominal Surgery (UAS). The present study was comparing the two treatments and find out the best which improves the respiratory rate, pulmonary complications, functional mobility and capacity. This study was at 1 week interventional study where Group A received Incentive Spirometry and Conventional Chest Physiotherapy and Group B received Lateral Costal Expansion and Conventional Chest Physiotherapy for every 2 hourly during waking hours for 7 days. It was successfully completed with 31 subjects with their informed written consent. Respiratory rate and Auscultation changes were taken pre intervention on day 1, 2 and 3. Pre intervention assessment on 2nd and 3rd day was taken to check the effectiveness of previous day treatment and the mobilization status were taken pre intervention on day 4 to check the effectiveness of treatment given till 3rd day and lastly 6MWT score were taken pre intervention on day 5 and on day 8 i.e. after completion of 7 days of treatment.

There were 16 patients in Group A and 15 patients in Group B. Amongst 16 patients in Group A 11 were male and 5 were female and amongst 15 patients in Group B 10 were male and 5 were female. Data analysis was done by using Paired 't' test, Unpaired 't' test and Repeated Measures ANOVA for quantitative data i.e. for Respiratory rate and 6MWT score and Fisher's exact test was used for qualitative data i.e. for Auscultation changes and Mobilization status. Davis SP [7] had done study on use of Incentive Spirometry immediate after abdominal surgery and suggested that Incentive Spirometry is beneficial for patients affected in this way as it promotes deep breaths, which will aid their recovery.

Orfanos *et al.* [8] evaluated the effects of deep breathing exercises and ambulation on pattern of ventilation in post-operative patients, and concluded that deep breathing exercises are able to achieve much larger increases in tidal volume than ambulation, and also said that positioning alone had a great effect on pattern of breathing. The largest effect was seen when the patients stood, which accounted for 65% of the increase in minute volume seem during ambulation. Bartlet and co-workers [9] postulated that frequent maximum inspiratory effort would reinflate collapsed regions of the lung and prevent or reverse atelactasis. This approach was based on the notion that the underlying mechanism of atelactasis is diminished ventilation in the lung bases. The factors that might contribute to such diminished ventilation include anaesthesia, the effects of narcotics; wound pain, the muscular splinting associated with abdominal incisions, pre-existing pulmonary disease, obesity and general debility that accompanies advanced age and severe illness. Under these circumstances, a regimen based upon frequent Incentive Spirometry should be more beneficial than occasional episodes of physiotherapy aimed at maximum inspiratory effort.

Hence, all the above evidences suggest that any form of maximal inspiratory therapy is better than nothing, yet no particular regimen has clear superiority.

The findings of this study state that Incentive Spirometry and Lateral Costal Expansion both can significantly improve respiratory rate up to the normal range, prevent pulmonary complications and improve functional mobility and capacity but Lateral Costal Expansion improves respiratory rate (up to the normal range), functional mobility (standing independently) and functional capacity of an individual early as compared to Incentive Spirometry. The latter finding is particularly important as previous studies have failed to explain the effects of providing Incentive Spirometry in one Group and Lateral Costal Expansion in other Group on functional mobility and functional capacity, when in fact Lateral Costal Expansion is more effective in improving these two components early.

Conclusion

The present study concludes that Incentive Spirometry and Lateral Costal Expansion both are effective in improving respiratory rate up to the normal range, preventing pulmonary complications and improving functional mobility and capacity.

Whereas lateral coastal expansion is found to be more effective in improving respiratory rate (up to the normal range), functional mobility (standing independently) and functional capacity early, in patients after Upper Abdominal Surgery (UAS).

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