International Journal of Applied Research 2017; 3(2): 373-376

ISSN Print: 2394-7500
ISSN Online: 2394-5869
Impact Factor: 5.2
IJAR 2017; 3(2): 373-376
www.allresearchjournal.com
Received: 27-12-2016
Accepted: 28-01-2017

Sejal S Shingavi
Intern Student, Dr. A.P.J. Abdul Kalam College of Physiotherapy (PIMS), Loni, India

Atharuddin Kazi
Associate Professor, Dr. A.P.J. Abdul Kalam College of Physiotherapy (PIMS), Loni, India

Sambhaji Gunjal
Assistant Professor, Dr. A.P.J. Abdul Kalam College of Physiotherapy (PIMS), Loni, India

Maria Lamuvel
Assistant Professor, Dr. A.P.J. Abdul Kalam College of Physiotherapy (PIMS), Loni, India

Correspondence
Sejal S Shingavi
Intern Student, Dr. A.P.J. Abdul Kalam College of Physiotherapy (PIMS), Loni, India

Effects of active cycle of breathing technique and autogenic drainage in patient with abdominal surgery

Sejal S Shingavi, Atharuddin Kazi, Sambhaji Gunjal and Maria Lamuvel

Abstract
Background: Surgery has become an important part of global health care, estimated to about 234 million patients operated yearly. Surgery and general anesthesia directly affects the respiratory system. Surgeries alter postoperative pulmonary function causes impairment of lungs volume such as total lung capacity, vital capacity and tidal volume and can develop post pulmonary complications. Hence, the purpose of the study is to compare the effect of Active cycle of breathing technique (ACBT) and Autogenic drainage (AD) in abdominal surgery patients to prevent those complications.
Methods: Thirty participants who underwent abdominal surgeries with age 25-65 years were included in the study and divided into two groups. Group A was given ACBT and Group B was given AD for one week of intervention. Total seven sessions was given in a week and pre and post readings were taken by using inch tape at 3 levels (axillary level, 4th intercostal space, xyphoid process)inspiratory capacity was taken with help of incentive spirometer, peak expiratory flow rate with peak flow meter.
Results: It showed significant difference when post values of group A and group B were compared with outcome measures like inspiratory capacity with incentive spirometer, peak expiratory flow rate with peak flow meter, and chest expansion using inch tape.
Conclusion: The present study concluded that Active cycle of breathing control is more effective than Autogenic drainage for improving chest expansion, peak expiratory flow rate and inspiratory capacity in abdominal surgery patients.

Keywords: ACBT, AD, abdominal surgeries, incentive spirometer, peak flow meter, inch tape

Introduction
Surgery has become an important part of global health care, which is estimated to about 234 million patients operated yearly [1]. Surgical removal of a mass or masses from the abdomen through an abdominal incision-either up and down is called Laparotomy [2]. Diseases affecting the abdominal cavity are generally treated under their own name (E.g. appendicitis). Surgeries of the abdominal organs are performed according to the description of that organ (stomach, kidney, liver, etc.) Diseases affecting the abdominal cavity are generally treated under their own name (E.g. appendicitis). Most commonly performed abdominal surgeries are: Appendectomy, it is a surgical procedure for removal of appendix through the abdominal cavity.
Exploratory laparotomy refers to the opening of the abdominal cavity and for the direct examination of its contents, for example, to locate a source of bleeding or trauma etc. Laparoscopy is a minimally invasive procedure of the abdominal cavity where rigid tubes are passed through small incisions into the abdominal cavity [3].
Pulmonary complications are most common, and are defined as pulmonary abnormalities occurring in the post-operative period producing clinically significant identifiable disease and dysfunction that adversely affect the clinical course [4]. Pulmonary complications have significant impact on morbidity, mortality after major abdominal surgery [5]. Post-operative pulmonary complications (PPC'S) have been reported to occur in 5-10% of the general patient population and in 4-22% of patients who has undergone abdominal surgery [6]. Due to PPCs there is a lack of lung inflation that occurs because of change of breathing pattern which becomes shallow. Prolong recumbent positioning also adds to impairment of mucociliary clearance with decrease cough effectiveness and increase risk associated with retained pulmonary secretions. Because of retained pulmonary secretions, anaesthesia, opioids, analgesics and post-operative pain, it also contributes to change in ventilation

pattern. Patients operated with upper abdominal surgery (UAS) usually develop a restrictive lung pattern, with changes to pulmonary mechanics in the first postoperative days. This can cause a reduction in inspiratory capacity, total inspiratory time, and ventilation at the lung bases, leading to a high risk of developing pulmonary complications (PPCs) [7].

Breathing and chest physiotherapy have been used to prevent atelectasis. The goals of chest physiotherapy are to improve ventilation–perfusion matching, increase lung volume, enhance mucociliary clearance, and decrease pain [8]. Respiratory exercises during hospitalization shows improvement in respiratory muscle strength, oxygenation, coughing mechanism, chest wall mobility and lung ventilation, and decreases the work of respiration and prevents postoperative pulmonary complications [9].

Chest Physiotherapy plays an important role to reduce the effects of general anaesthesia which affects the lungs and together with pain from incision and stitches makes deep breathing and coughing difficult and thick mucus collected in patient's lungs. Deep breathing, coughing and early mobility after surgery are important to help clear any phlegm and prevent patient from developing a chest infection.

ACBT as described by Webber and Pryor comprises of repeated cycles of three ventilator phases as breathing control, thoracic expansion and forced expiratory technique. ACBT has shown to be effective in mobilizing and clearing the excess bronchial secretions and to improve lung function. It neither causes nor increases hypoxemia or increase airflow obstruction [1] Thoracic expansion exercises re-expand the lung tissue and helps in mobilizing and clearing excess bronchial secretions which is explained by the phenomenon of interdependence [1]. During a forced expiratory maneuver, the compression of the airway occurs downstream (toward the mouth) from the equal pressure point. The squeezing action takes place which moves peripherally and decreases the lung volume with the increase in air speed as air flows through the narrowed segment which facilitates the movement of secretions along the airway [10].

Autogenic drainage [AD] is a system of breathing exercises to sequentially attend the highest possible expiratory flow to move secretions from peripheral to central airways without forced expirations and associated airway closure. It has three phases: unstick, collect, evacuate performed at different lung volumes. The upper airways were cleared of secretions by huffing or blowing the nose. High frequencies reveals secretions located in small airways. Low frequencies mean that secretions were moved to larger airways. At the end of the session the mucus was evacuated by stronger expiration or a high volume huff. During a huff, the pressure in the airway (intraluminal pressure) decreases from the peripheral airways to the mouth, because of frictional pressure loss and loss of convective acceleration pressure (Mead *et al*. 1967).

Objectives of the study

To study the effect of ACBT and Autogenic drainage in abdominal surgery patients & to compare the effect of ACBT verses Autogenic drainage in abdominal surgery patients.

Materials and methods

Thirty participants who underwent laparotomy with the age group of 20-65 years were included according to inclusion and exclusion criteria in this study. The intervention was given once in a day, 7 days in a week for a period of 1 weeks. 3-4 cycles of ACBT and AD was given for around 10-15 minutes. Each treatment session lasted for 15-30 minutes including rest periods in between. Both interventions were given once in a day (7sessions) for 1 week. The inclusion criteria for this study were both male and female participants, age between 20 to 65 years, those who are willing to participate in this study, individuals who underwent elective and emergency laparotomy. And exclusion criteria for the study were unstable and complicated abdominal surgery patients. Patients with chronic respiratory disorders and age more than 65 years.

Outcome measures

Chest expansion measurement: It was measured with inch tape at three different levels of the chest. For upper lobe at axillary region, for middle lobe at 4th intercostal and at xiphoid process of the sternum for the lower lobe.

Peak expiratory flow rate: Measured by peak flow meter in L/minutes. Pre and post readings were taken before and after intervention.

Incentive spirometer: Inspiratory capacity was measured using incentive spirometer. Pre and Post readings were taken before and after intervention.

Results

Incentive Spirometer: On comparison of pre and post intervention of ACBT using incentive spirometer and using paired t test showed t value 0.3376 and p value 0.7210 is considered not significant. On comparison of pre and post intervention of AD using incentive spirometer and using paired t test showed t value 0.2444 and p value is 0.8105 is considered not significant. On comparing post interventions of ACBT and AD using incentive spirometry and using paired t test showed t value 0.4882 and p value is < 0.0001 is considered extremely significant

Peak Flow Meter: On comparison of pre and post intervention of ACBT using peak flow meter and using paired t test showed t value 15.639 and p value is < 0.0001 is considered extremely significant. On comparison of pre and post intervention of AD using peak flow meter and using paired t test showed t value 12.464 and p value is < 0.0001 is considered extremely significant. On comparing post interventions of ACBT and AD using peak flow meter and using paired t test showed t value 3.639 and p value is < 0.0001 is considered very significant.

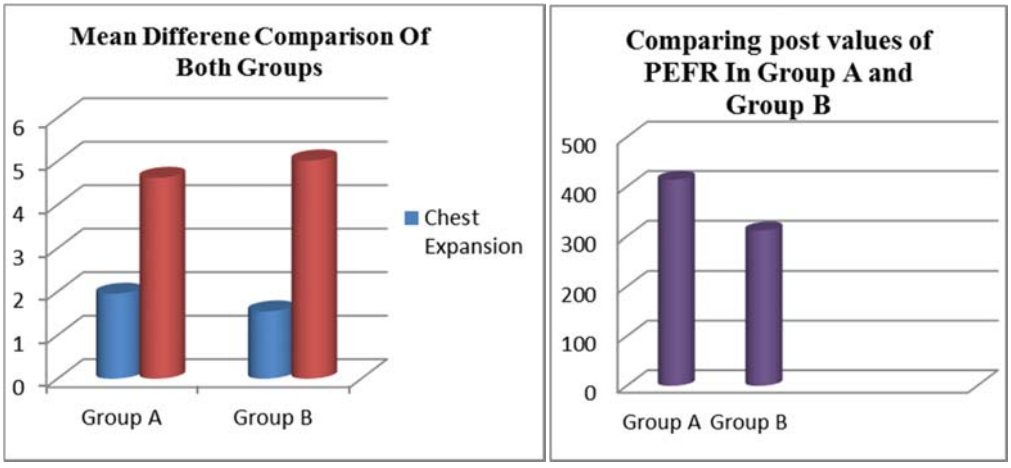
Chest Expansion: On comparison of pre and post intervention of ACBT using chest expansion and using paired t test showed t value 19.271 and p value is < 0.0001 is considered extremely significant. On comparison of pre and post intervention of AD using chest expansion and using paired t test showed t value 8.246 and p value is < 0.0001 is considered extremely significant. On comparing post interventions of ACBT and AD using chest expansion and using paired t test showed t value 3.218 and p value is 0.0033 is considered very significant.

Table 1: pre and post comparison of both groups

	Outcome measures	Mean±SD		t value	p value
		PRE	POST		
Group A(ACBT)	Incentive spirometry	4.406	4.619	0.3608	0.7210
	PEFR	84.422	413.506	15.639	<0.0001
	Chest expansion	0.448	1.952	19.271	<0.0001
Group B(AD)	Incentive spirometry	4.838	5.014	0.244	0.8105
	PEFR	85.517	311.98	12.464	<0.0001
	Chest expansion	0.484	1.547	8.246	<0.0001

Table 2: post values comparison of both the groups

Outcome measures	Group A	Group B	t value	p value
	POST	POST		
Incentive spirometry	4.619	5.018	0.4882	0.6292
PEFR	414.23	311.98	3.639	0.0011
Chest expansion	1.952	1.547	3.218	0.003



Graph 1: Mean difference comparison of both the groups

Discussion

The study shows significant changes in chest expansion, peak expiratory flow rate and inspiratory capacity within a week of ACBT and AD intervention after one week of intervention.

Chest expansion

Breathing exercises can lead to sustained increase in trans pulmonary pressure which helps to distend the lungs and reinflates the collapsed lung segments, Thoracic expansion exercises re-expands the lung tissue and helps in mobilizing and clearing excess bronchial secretions which is explained by the phenomenon of interdependence [1]. It states that expanding forces exerts effective pressure that dilates the airways as trans pulmonary pressure and lung volume increases. Normal airways are maintained by this trans pulmonary pressure. It counteracts airway compression during forced expiration. Interdependence has physiological and pathological significance. Weakening of these forces of interdependence leads to airway dysfunction and causes dysfunction of the airways [11].

In abdominal surgeries various changes occur in pulmonary function and respiratory mechanics, leading to post-operative pulmonary complication and leads to reduction in chest expansion. By using interventions like Active cycle of breathing technique (ACBT) and Autogenic Drainage (AD) there is gradual increase in inspiratory and expiratory reserve volumes from functional residual capacity and a 2 to 3 second breath-holding period. This results in collateral filling among the alveoli and improved ventilation and mobilized secretions. This exercise decreases the atelectasis area and increase ventilation maintains expansion of lungs and prevents collapse due to which chest expansion was improved more in group A and B. Ganeswara Rao Melam *et al*; studied to compare the efficacy of two chest clearance techniques, autogenic drainage and active cycle breathing in COPD patients. Thirty subjects were selected within 40 - 60 years of age and who had moderate chronic obstructive pulmonary disorder. They concluded that that both autogenic drainage and active cycle breathing technique are effective in clearance of secretions [12].

Incentive spirometry

Significant change was observed in incentive spirometry. The result obtained in the study of Group A and B indicates significant difference between pre and post intervention. Incentive spirometry is also known as Sustained Maximal Inspiration (SMI), is a technique which is used to encourage the patient to take maximal inspiration using a device to measure flow or volume. A maximal inspiration sustained with three second hold may increase the transpulmonary pressure. Hence it improve inspiratory volumes and inspiratory muscle performance. It alsore-establish or simulate the normal pattern of pulmonary hyperinflation [13]. With repetitions it may reverse lung atelectasis and maintains airway patency. It can also be done as a part of bronchial hygiene. This device incorporates visual indicators of performance in order to aid the therapist in

coaching the patient to optimal performance. Patient may use this visual feedback to monitor their own efforts [14]. Incentive spirometry is one of the prophylactic breathing therapies used to reduce the risk of such severe complication [15].

Celso R *et al*; conducted the study to evaluate the use of Incentive spirometry (IS) in major surgeries: a systemic review for the preventing postoperative pulmonary complications and recovery of pulmonary function in patients undergoing abdominal, cardiac and thoracic surgeries. They concluded that there was no evidence to support the use of incentive spirometry in the management of surgical patients but still the use of incentive spirometry remains widely used without standardization in clinical practice [16].

Peak flow rate

The result obtained in the study of Group A and B indicates very significant difference between pre and post intervention. PFR is measured as maximum instantaneous expiratory flow that is used as an indicator of airway caliber. Measurement of pulmonary functions can also checked by measuring the peak expiratory flow (PEF). [17] The Peak Expiratory Flow is defined as the highest instantaneous expiratory flow achieved during a maximal forced expiratory maneuver starting at Total Lung Capacity, the forced expiratory maneuver can be of brief duration. It has the advantages of being relatively easy to perform and being measurable with a relatively small and inexpensive instrument [18].

In healthy lungs, the factors determining the Peak Expiratory Flow Rate are the expiratory muscle strength, especially the abdominals.The dimensions of the intra and the extra thoracic airways, the maximum alveolar pressure reaching speed and the ability of the lung to undergo an elastic recoil [19]. Johanne cote MD *et al*; conducted study on compliance with Peak Expiratory Flow Monitoring in Home Management of Asthma. From this study they concluded that short term compliance with PEF measurement is fairly good [13].

C**onclusion:** The present study concluded that Active cycle of breathing control is more effective than Autogenic drainage for improving chest expansion, peak expiratory flow rate and inspiratory capacity in abdominal surgery patients.

References

1. Lamuvel M *et al*. Effect of ACBT and TENS on Pulmonary Function and Pain Perception in Abdominal Surgeries: A Randomized Control Trial. International Journal of Health Sciences and Research (www.ijhsr.org), 2016; 6(6).
2. Laurie *et al*. Abdominal Surgery.
3. Broek R, *et al*; burden of adhesions in abdominal and pelvic surgeries systemic review and met analysis. BMJ. 2013.
4. Valerie LDR *et al*. Risk of Pulmonary Complications after Elective Abdominal Surgery.1996.
5. Cheifetz O, Deborah L *et al* The Effect of Abdominal Support on Functional Outcomes in Patients Following Major Abdominal Surgery. 2010.
6. Abdelaal A, Abdelaal M. International Journal of Advanced Research. 2014; 2(7):784-801.
7. Suja D *et al*. Incentive spirometer after abdominal surgery. 2012; 108:26.
8. Allam Nesma M *et al*. Effect of Combination of Acapella Device and Breathing Exercises on Treatment of Pul Journal of Surgery. Gastrointestinal Surgery. 4:2-1.
9. Sema Savc *et al*. Active cycle of breathing technique and incentive spirometer in coronary artery bypass graft surgery. Fizyoterapi Rehabilitasyon.
10. Brenda BM *et al*. Structure and Function of Mucus Clearance System of the lung. 2013.
11. Melam G. Comparison of Autogenic Drainage & Active Cycle Breathing Techniques on FEV1, FVC & PEFR in Chronic Obstructive Pulmonary Disease. World Applied Sciences Journal. 2012; 20(6):818-822.
12. Wange P *et al*. Incentive spirometry versus active cycle of breathing technique: effect on chest expansion and flow rates in post abdominal surgery patients. International Journal of Research in Medical Sciences. 2016; 4(11).
13. Cote Johanne M *et al*; Compliance with Peak Expiratory Flow Monitotoring in Home management of Asthma. 1998, 968-72.
14. Warren Magnuson G. www.cc.ncbi.nml.niv.gov. [Online].
15. Incentive spirometryafter abdominal surgery Nursing Times / www.nursingtimes.net. 2012; 26:108(26).
16. Celso R *et al*. Incentive spirometry in major surgeries: a systematic review. 2011; 15(5):343-50.
17. Emily MK *et al*. An Evaluation of Peak Expiratory Flow Monitoring: A Comparison of sitting versus Standing Measurements. JABFM. 2010; 23(2).
18. Tepper *et al*. J Allergy ClinImmunol. March; 129(30): S65–S87. 2012; 129(30):S65-S87.
19. Sitalakshmi R *et al*. The Peak Expiratory Flow Rate (PEFR): the Effect of Stress in a Geriatric Population of Chennai- A Pilot Study. Journal of Clinical and Diagnostic Research. 2013; 7(2):409-410.