

Importance of Chest Physiotherapy in Thoracotomy Condition

Shubhra Dubey¹, Durgesh Sharma², Laxmi Barve³
^{1,2,3}Physiotherapist, Raipur, India

Abstract—The aim of study is appraised the beneficial effect of chest physiotherapy in patients who are undergoing thoracotomy surgery in preoperative and post-operative phase. Chest Physiotherapy is the important part for the prevention of post-operative thoracotomy complication such as pain, secretion, breathing difficulty, and postural problem. Pre-operative physiotherapy assessments and counseling is also beneficial for gaining the patient confidence, to maintain lung expansion, prevent wound complication and lung complication. Chest physiotherapy such as deep breathing exercises, postural drainage, huffing and cuffing is beneficial and effective in prevention of post-operative complications.

Index Terms—Chest physiotherapy, post-operative complications, thoracotomy

I. INTRODUCTION

Chest physiotherapy is the term used for physiotherapy treatment that targeted towards issues in the lungs. It is a combinations of techniques to improve lung functions. This techniques may include breathing techniques, percussion, specific positioning for air way inflation and use of assistive devices to assist breathing pattern or secretion removal.

- Thoracotomy is a surgical procedure an incision into the thoracic cavity to gain asses to lung, bronchi heart, esophagus. Thoracotmies are often used to treat or diagnosed a problem with one of these organs. The most common reason to have a thoracotomy I s to treat lung cancer as the cancerous part of the lung can be removed through the incision It can be done either laterally or anteriorly in order to enter the lungs.
- Wedge resection removes a wedge-shaped piece from the area of lung that contains cancer and some healthy tissue around it.
- Segmentectomy removes one segment of a lung.
- Lobectomy removes the lobe of lung that contains cancer.
- Pneumonectomy removes an entire lung.
- Extrapleural pneumonectomy removes a lung, the lining of lungs and heart (pleura), and part of your diaphragm.

Physiotherapy can help patients post-thoracotomy in reducing the length of hospital stay, and improving the general fitness of the patient. Furthermore, physical therapy can clear

the secretion and improve the chest wall mobility for those patients by breathing exercises and encourage them to cough . Pulmonary complications are a major cause of morbidity and mortality during the post-operative period after thoracic surgery. The incidence of post-operative pulmonary complications has been reported to vary between 5% and 80%. The incidence varies between hospitals. Lower rates of complications have been reported in hospitals with a high volume of patients. Higher rates have been reported in hospitals with a lower volume.

A. Chest Complication after Thoracotomy

some common problems occurs in every patient who are undergoing thoracotomy is , pain due to incisions , ICD insitu, retained secretion , reduced air entry , reduced movement of shoulder of operated site, poor posture- tendency to protract the scar leads to scoliosis concave on the scar side, decreased mobility.

B. Pattern of Breathing after Thoracotomy

Respiratory muscle function after thoracic surgery may be affected directly by damage to the muscle itself or to the nerves as a consequence of the incision, or indirectly as a result of changes in the mechanics of the respiratory system. Distortion of chest wall configuration may reduce the chest wall compliance and increase the work of breathing leading to a decrease in the mechanical efficiency of the respiratory muscles. In patients with borderline respiratory muscle function the increased work of breathing, mainly due to the decrease in chest wall compliance after thoracotomy, carries considerable morbidity and mortality. It has been shown that lung resection (segmentectomy, lobectomy, pneumonectomy), particularly in patients over 70 years of age, decreases MIP and MEP. In addition, Maeda et al observed an increase in intercostal/accessory muscle recruitment after thoracotomy and pulmonary resection and interpreted this as indicating diaphragmatic dysfunction. Preoperative respiratory muscle training may prevent postoperative pulmonary complications by increasing both inspiratory and expiratory muscle strength in patients undergoing thoracic surgery. However, the effect of respiratory muscle training on sustained ventilation and maximal oxygen consumption ($\dot{V}O_2$) is limited.

C. Pain after Thoracotomy

Thoracotomy is considered the most painful of surgical procedures and providing effective analgesia is the onus for all anesthetists. Poorly managed thoracotomy pain can result in postoperative pulmonary complications.

D. Decreased in Pulmonary Function after Thoracotomy

The cause of impaired pulmonary function following lung resection is multifactorial, including the removal of lung tissue and alterations in chest wall mechanics due to the surgical incision. A significant decrease in respiratory muscle strength (RMS) 4 and 12 weeks after thoracotomy has been reported.

II. MATERIAL AND METHODS

Total 30 in 2 groups 15 patients in each group in which group 1 is undergoing for pre and post thoracotomy patient undergoing thoracotomy surgery are included in this study who are assessed and educated pre operatively and postoperatively and undergoing in chest physiotherapy.

A. Patients

Inclusive criteria: 1 patient who are undergone for thoracotomy 2 age older than 18 years and within 55 years, 3 patient who are stable

Exclusive criteria: 1 patient who are critical in condition, 2 age elder than 55 years, 3 uncontrolled hypertension, 4 uncontrolled arrhythmia.

B. Method

1) Preoperative physiotherapy

Patients who are educated prior to elective surgery have less anxiety (5), improved pain (6) and patient satisfaction (7). Pre-operative rehabilitation for Thoracic surgery patients has been shown to be beneficial and safe.

Patients is educated about breathing exercises , huffing and coughing techniques and postural awareness and breathing exercises with upper limb mobility to increases chest expansion.

2) Postoperative physiotherapy

Patients that screen in for therapy are assessed either day 0 or day 1 post-operatively and chest physiotherapy is started from day 0 or day 1. The use of chest clearance technique is progressed accordingly the improvement of patient condition.

III. RESULT

A 5 day chest physiotherapy protocol is used for 3 times a day is gives a positive result in patients condition improved the breathing pattern and lungs status compared to the who are not receiving chest physiotherapy. scoliosis posture due to pain is occurs correct after trunk stretching exercises. Chest expansion and breathing pattern is also improved by breathing exercises. Overall we can say that early chest physiotherapy intervention is helpful in early recovery of patient condition and reduces the duration of hospital stay of the patient.

TABLE I

Day -1	Positioning of patient-supported sitting Assisted shoulder movements, ankle toe exercises Early mobilization Huffing and cuffing techniques	2 hrly 10 rep
Day -2 and 3	Deep breathing exercises Trunk bending exercises-side to side Trunk stretching Bed side marching and walking with arm swinging	10 rep with 5 sec hold 10 rep maximum 5 rep with 5 sec hold and relax 25 yard
Day 4 and 5	Increasing walking distance Start stair climbing and static cycling	

Graph-1 is shows reduced pain in patient who are undergoing chest physiotherapy.

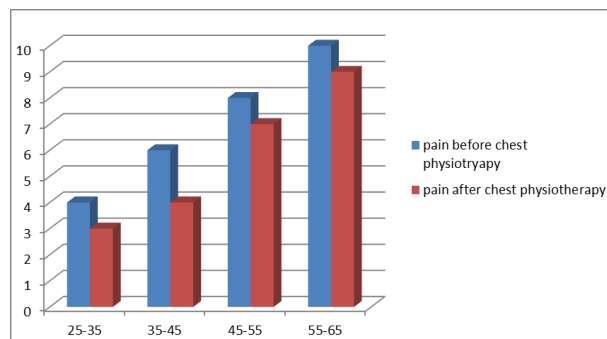


Fig. 1. Reduced pain in patient

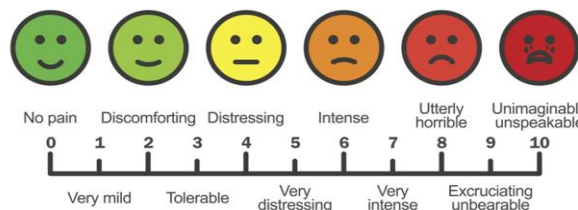


Fig. 2. Pain scale

Pain is assessed pain scale described in Fig. 2.

IV. DISCUSSION AND CONCLUSION

This study provides information on physiotherapy management of patients who undergo an open thoracotomy procedure in Gauteng. Results indicated that physiotherapy management was carried out by the majority of respondents

(82.3%) during hospital stay and less so preoperatively (46.1%) or after hospital discharge (32.6%). This trend is in line with findings reported by Reeve et al.

An encouraging finding of the study was that early mobilization activities (sitting in a chair and walking) were utilized as treatment modality by all respondents who treated patients during hospital stay. A reduction of 131.6 (± 101.8) m in patients' 6-min walk test distance can occur from the day before surgery to five days following an open thoracotomy (Arbane et al. Walking less post-operatively is cause for concern considering the link with PPCs. Agostini et al.

In addition to early mobilization activities, respondents included DBE, cough manoeuvres, upper limb exercises and trunk mobility as part of post-operative physiotherapy treatment. A recent study conducted by Rodriguez-Larrad et al. found that including deep breathing, cough manoeuvres, upper limb and trunk exercises as a physiotherapy treatment regime in patients following open thoracotomy lessened the incidence of post-operative complication of lung collapse and pneumonia.

Preoperative physiotherapy treatment focused mainly on educating patients on supported cough, huff and breathing exercises. Published support for preoperative physiotherapy is limited. Reid et al. in our study we assess that pre-operative education consisting huffing and coughing, DBE, ankle and pump movement, upper limb exercises, is helpful to reduced post-operative complication and hospital stay after thoracotomy.

REFERENCES

- [1] Lawrence VA, Cornell JE, Smetana GW. American College of Physicians. Strategies to reduce postoperative pulmonary complications after noncardiothoracic surgery: Systematic review for the American College of Physicians. *Ann Intern Med.* 2006;144:596–608.
- [2] Fisher BW, Majumdar SR, McAlister FA. Predicting pulmonary complications after nonthoracic surgery: A systematic review of blinded studies. *Am J Med.* 2002;112:219–25
- [3] Dimick JB, Pronovost PJ, Cowan JA, Jr, Lipsett PA, Stanley JC, Upchurch GR., Jr Variation in postoperative complication rates after high-risk surgery in the United States. *Surgery.* 2003;134:534–40.
- [4] Influence of thoracotomy on pulmonary mechanics: association of increased work of breathing during anesthesia and postoperative pulmonary complications. *Ann Surg.* 162:973–980, 1965.
- [5] Diaphragm function after pulmonary resection. Relationship to postoperative respiratory failure. *Am Rev Respir Dis* 137:678–781, 1988.
- [6] Respiratory muscle limitation in patients after pneumonectomy. *Am Rev Respir Dis* 147:744–752, 1993.
- [7] Respiratory muscle strength after lung resection with special reference to age and procedures of thoracotomy. *Eur J Cardiothorac Surg* 10:352–358, 1996.
- [8] Nomori H, Kobayashi R, Fuyuno G, et al. Preoperative respiratory muscle training. Assessment in thoracic surgery patients with special reference to postoperative pulmonary complications. *Chest* 1994; 105: 1782–1788
- [9] Weiner P, Man A, Weiner M, et al. The effect of incentive spirometry and inspiratory muscle training on pulmonary function after lung resection. *J Thorac Cardiovasc Surg* 1997; 113: 552–557.
- [10] Agostini, P., Reeve, J.C., Dramond, S., Steyn R.S. & Naidu B., 2013, 'A survey of physiotherapeutic provision for patients undergoing thoracic surgery in the UK', *Physiotherapy* 99(1), 56–62.
- [11] Agostini, P.J., Naidu, B., Rajesh, P., Steyn, R., Bishay, E., Kalkat, M. et al., 2014, 'Potentially modifiable factors contribute to limitation in physical activity following thoracotomy and lung resection: A prospective observational study', *Journal of Cardiothoracic Surgery* 9, 128.
- [12] Arbane, G., Tropman, D., Jackson, D. & Garrod, R., 2011, 'Evaluation of an early exercise intervention after thoracotomy for non-small cell lung cancer (NSCLC), effects on quality of life, muscle strength and exercise tolerance: Randomised controlled trial', *Lung Cancer* 71(2), 229–234.
- [13] Reeve, J.C., Denehy, L. & Stiller, K., 2007, 'The physiotherapy management of patients undergoing thoracic surgery: A survey of current practice in Australia and New Zealand', *Physiotherapy Research International* 12(2), 59–71.
- [14] Reid, J.C., Jamieson, A., Bond, J., Versi, B.M., Nagar, A., Ng, B.H.K. et al., 2010, 'A pilot study of the incidence of post-thoracotomy pulmonary complications and the effectiveness of pre-thoracotomy physiotherapy patient education', *Physiotherapy Canada* 62(1), 66–74.
- [15] Rodriguez-Larrad, A., Velloso-Ortego, J.M., Ruiz-Muneta, C., Abecia-Inchaurregui, L.C. & Seco, J., 2016, 'Postoperative respiratory exercises reduce the risk of developing pulmonary complications in patients undergoing lobectomy', *Archivos De Bronconeumologia* 52, 347–353.