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Immediate Effect of Respiratory Muscle Training on Peak Expiratory Flow Rate in Post Thoracotomy Individuals

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ABSTRACT

Introduction: Thoracotomy is a surgical procedure to gain access into the pleural space of the chest. It includes: Median sternotomy, Posterolateral thoracotomy & Anterolateral thoracotomy. The risk of post-operative pulmonary complications is relatively high following thoracic surgery; rates have been recorded at between 19% and 59%. Deep breathing exercises induce sustained increase in trans-pulmonary pressure, which increases lung volume, improves ventilation, oxygenation, prevents basal atelectasis, re-inflates collapsed lung regions, and reverses minimal postoperative atelectasis. Respiratory Muscle Training especially has been shown to improve respiratory muscle function and helps to reduce dyspnoea on exertion. Improvements in strength, speed, power and endurance leads to improvement in the performance of MIP & MEP, which in turn leads to increase in strength and endurance of the diaphragm and accessory muscles during respiration.
Aim And Objective: To study the immediate effect of respiratory muscle training on peak expiratory flow rate in post thoracotomy individuals.
Method: Participants were divided into two groups by random allocation. The intervention group received RMT of 2*30 repetition with standard breathing exercises whereas the control group were given only standard breathing exercises. Immediate post-test outcomes were measured on peak flow meter and Rate Perceived Exertion (RPE) as well.
Result: Analysis was done in SPSS 20 Mean Age (61.93±11)). Data was not normally distributed, so non parametric test was used. According to the data there was significant statistical improvement of PEFR in thoracotomy individuals. ($P \leq 0.002$).
Conclusion: There is significant statistical difference of PEFR after Respiratory Muscle Training in post thoracotomy individuals.

Keywords: Peak expiratory flow rate, *Respiratory muscle training, Thoracotomy.*

INTRODUCTION

Thoracotomy is a surgical procedure to gain access into the thoracic cavity. It is performed by surgeons (emergency physicians or paramedics under certain circumstances) to gain access to the thoracic organs, commonly heart, lungs & oesophagus. Thoracotomy includes Median sternotomy, Posterolateral thoracotomy & Anterolateral thoracotomy. The deleterious effect of cardiac surgery on pulmonary function may result in higher morbidity and mortality rates, longer hospital stays and higher expenditure of physical and financial resources. (1) Respiratory dysfunction in cardiac

postoperative are usually multifactorial and may be present, possibly because currently the CABG surgeries are performed in more vulnerable patients (high risk), with a higher tendency to limited functional reserve and often associated with older age [(2)]

The risk of post-operative pulmonary complications is relatively high following thoracic surgery; rates have been recorded at between 19% and 59%. The major respiratory complications are atelectasis, pneumonia and respiratory failure. These occur in 15–20% of the patients and also account for the majority of the expected 3–4% mortality. [(3)]

Studies that have investigated the respiratory muscle performance after Thoracotomy determined that it has a significant deteriorating effect on inspiratory muscle function. This signifies respiratory muscle weakness associated with direct or indirect injury to the muscles during surgery, may lead to respiratory muscle dysfunction and a restrictive ventilatory pattern following Thoracotomy [(4)]

Preoperative inspiratory muscle training (IMT) for a period of at least 2 weeks has been shown to significantly improve respiratory muscle and lung function in the early postoperative period following cardiothoracic or upper abdominal surgery, significantly reducing the risk of postoperative pulmonary complications. Respiratory muscle training enhances lung volumes and capacities by improving the performance of the respiratory muscles. [(5)]

RMT typically consists of taking voluntary inspirations and expirations against a resistive load across the entire range of vital capacity while at rest. In healthy individuals, the most notable benefits of RMT are an increase in diaphragm thickness and strength, a decrease in exertional dyspnea, and a decrease in the oxygen cost of breathing. [(6)]

Respiratory muscle training (RMT) using a threshold device can enhance velocity of inspiratory muscle contraction, decrease inspiratory time, increase exhalation time and allow more time for lung emptying.

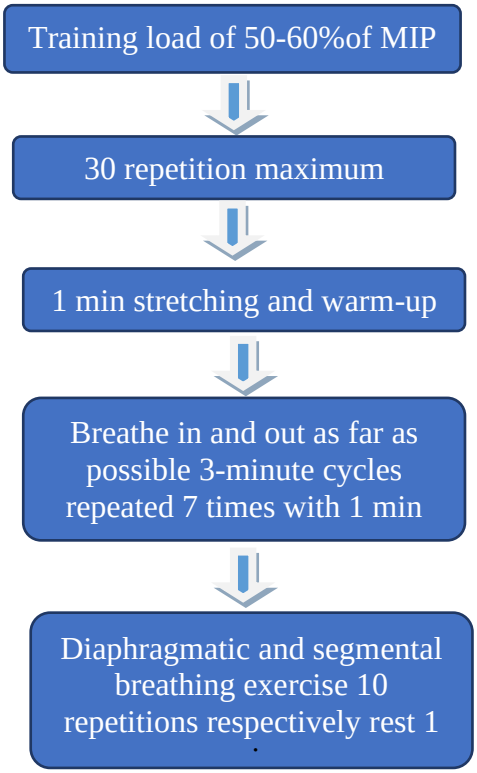
Dynamic hyperinflation of the lung increases inspiratory muscle work and this strengthening of inspiratory muscles decreases the intensity of dyspnea. It is believed that these changes can be explained by the metabore. [(7)]

MATERIALS & METHODS

An experimental study was conducted in the hospitals and clinics of Ahmedabad city in the duration of 2-4 months after the approval from the institutional ethical committee. Convenience sampling was done to select the participants that were to be included in the study. A group of 30 participants were chosen which underwent thoracotomy recently and fulfilling all the inclusion and exclusion criterion were chosen.

Patients with an age group of 30-70year were included. Males and females both were included in the study. Patients with mental disturbances, pregnancy and with a history of systemic disorders were excluded from the study. Any patient with recent surgery other than thoracotomy were also excluded which might include bariatric surgery, orthopaedic surgery, etc. Pre-test measures were recorded for all the 30 subjects i.e., PEFR (peak expiratory flow rate) through peak flow meter after asking the patient to blow in the flow meter as hard as and as fast as they can. It also measures the airflow through the bronchi and thus the degree of the obstruction in the airway. This was further followed by the training protocol which included.

TRAINING PROTOCOL

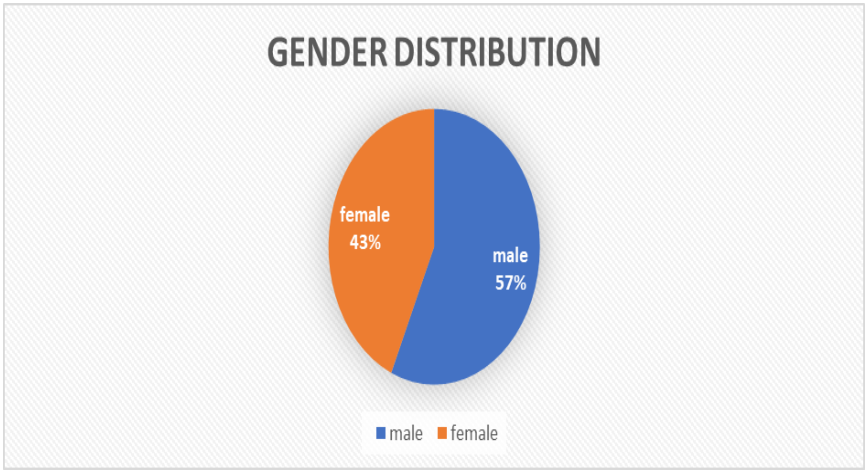


And once the training period was completed successfully PEFR was recorded again by the peak flow meter.

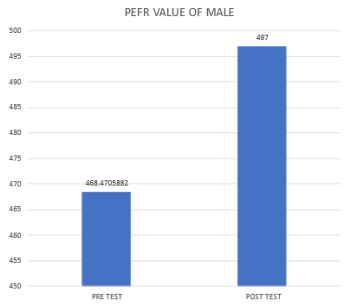
RESULT

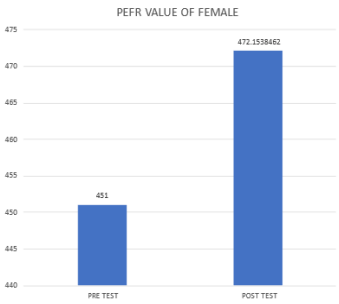
Analysis was done in SPSS 20 Mean Age (61.93±11). Data did not fall according to normal distribution, so non parametric test was used. According to the data there was significant statistical improvement on immediate effect of respiratory muscle training on PEFR in thoracotomy individuals. (P≤0.002).

Mean Difference of pre-test and post-test outcomes suggest that there is statistical variation with positive inclination in both genders. It also shows that male participants have more marked improvement than that of female. Improvement is in both within the group and between the group for both genders.



MEAN DIFFERENCE





DISCUSSION

This study was done to see an immediate effect of RMT on PEFR in thoracotomy individuals. RMT has shown to improve respiratory response post thoracotomy mean age of the participants was 61.93±11 out of which 43% were female and male percentage were higher with 57%. Individuals went under various inspiratory and expiratory exercises with definite protocol. It was observed that there is significant statistical difference in the pretest and posttest outcomes on PEFR. But there was lesser clinical significance noted. Thoracotomy has shown to develop restrictive pulmonary condition, in order to prevent the same Respiratory muscles, respond to training stimuli in the same manner as skeletal muscles i.e., by undergoing adaptations to their structure and function that are specific to the training stimulus.

Structural adaptations are changes in muscle fiber type, fiber cross-sectional area (hypertrophy) and muscle thickness have been demonstrated.

Functional adaptations are improvements in strength, speed, power, endurance performance, peak inspiratory flow, maximal inspiratory and expiratory pressures.

A more recent review has explored the use of RMT in hypoxic conditions. Going in accordance with the study by *Alvares Hernes J et-al* that RMT has shown to prevent and improve fatigue. This correlate with the immediate effect of RMT on PEFR. [8]

According to study by *McConnell* RMT with resistance training is most versatile and least time-consuming resulting in dual conditioning response (strength & endurance). [9]

A systematic review by *Elsevier Health Sciences* suggests that respiratory muscle training is an effective post-operative treatment tool for patients undergoing thoracotomy and there is strong evidence that this training improves respiratory muscle strength, pulmonary function, and functional capacity and reduces patients' hospital stay. [10]

CONCLUSION

The study concludes that there is statistically significant difference of immediate respiratory muscle training on PEFR in thoracotomy individuals. Minimal clinical significance was observed in the study

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Ethical Approval: Approved

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