

Effectiveness Of Incentive Spirometry In Improving Peak Expiratory Flow Rate In Post Abdominal Surgery : An Experimental Study

Biplab Nandi¹, Sucheta Mishra¹, Ujwal Yeole¹, Pravin Gawali¹, Roshan Adkitte¹

¹Tilak Maharashtra Vidyapeeth, Department of Physiotherapy, Pune, Maharashtra, India.
Institute at which research was conducted: Tilak Maharashtra Vidyapeeth, Department of Physiotherapy, Pune, Maharashtra, India.
Year of Acceptance: 2015.

Address of Correspondence

Dr. Biplab Nandi
5th floor, Department of Physiotherapy
Tilak Maharashtra Vidyapeeth
Mukundnagar, Pune, 37.
Email: bips1303@gmail.com

Abstract

Background: Incentive Spirometry is widely used in prevention and treatment of postoperative pulmonary complications after major surgeries. This study was aimed to evaluate the efficacy of incentive spirometer in improving the Peak Expiratory Flow Rate in abdominal surgery patients.

Methodology: A total of 40 patients were selected between 25-55 age group and put in two groups through random sampling. Patients in group B were given IS for 5 days and patients in group A were taught Diaphragmatic Breathing Exercise and both groups were encouraged to perform this every waking hour. PEFR measurements of day 1 and day 5 of both groups were taken.

Conclusion: The PEFR measurement exhibited significantly higher values in IS group. There was a major difference in the improvement among the two groups. The difference in the mean value for Group A and Group B on day 1 and day 5 was 24.00 and 41.25 respectively using statistical test (Two independent t-test) showing p value of 0.021.

Keywords: IS- Incentive Spirometer, PEFR- Peak Expiratory Flow Rate, Abdominal surgery, Diaphragmatic Breathing Exercise.

Thesis Question: Is Incentive Spirometry effective in improving peak expiratory flow rate in abdominal surgery patients?

Thesis Answer: Incentive Spirometry is effective in improving peak expiratory flow rate in abdominal surgery patients.

THESIS SUMMARY

Introduction

Upper abdominal surgical procedures are associated with a high risk of postoperative pulmonary complications. These are defined as pulmonary abnormalities occurring in the postoperative period which produce clinically significant identifiable diseases or dysfunction that adversely affect the patient's clinical course[1]. Pulmonary complications include atelectasis, pneumonia, respiratory failure and tracheobronchial infection. Pulmonary complications are the most frequently occurring complications following upper abdominal surgeries with reported frequency of up to 75% of all patients[2]. Upper abdominal surgeries are associated with decreased lung volumes, adoption of rapid shallow pattern of breathing. Rapid shallow breathing causes uneven ventilation of lungs and this may lead to development of micro atelectasis and if sustained for long enough it may be the starting mechanism for pulmonary inefficiency[3]. It is particularly important to identify patients at risk of

postoperative pulmonary complication as this is the most frequently reported cause of morbidity and mortality in the postoperative period[1]. The risk and severity of complication can be reduced by the use of therapeutic maneuvers that increase lung volume[4]. Physiotherapy is designed to enhance inspiration and is aimed at increasing the abnormally low postoperative functional residual capacity[1].

Incentive spirometry has been routinely considered a part of the perioperative respiratory therapy strategies to prevent or treat these complications. The spirometer is designed to imitate maximum deep inspirations and encourages the patient to take long, deep, slow breathes that increases lung inflation[1]. This promotes increased lung expansion and better gas exchange. When this procedure is repeated on a regular basis, pulmonary complications may be prevented[4].

Objective: To assess the effect of incentive spirometry in improving peak expiratory flow rate in abdominal surgery patients.

There are limited studies that have been done on clinical efficacy of incentive spirometry after abdominal surgery in Indian set up. With this objective in mind this study is planned to evaluate the efficacy of Incentive Spirometry in abdominal surgery patients[3].

Material and Methodology

This is an experimental study. The study was approved by the ethical committee and faculty of physiotherapy department of Tilak Maharashtra Vidyapeeth, Pune. Forty patients were selected through convenient sampling based on inclusion and exclusion criteria and put into one of the two groups through randomisation. The study was conducted in Pune city, Maharashtra. Patients having any type of abdominal surgery both male and female between the ages of 25-55 were included in this study. Neurological patients or patients below the age 25 or above 55 were not included in the study.

Outcome Measure: Peak Expiratory Flow Rate

Procedure:

Patients posted for abdominal surgery were selected and who fulfilled inclusion and exclusion criteria were included in the group. Patients were divided into two groups of Group A – Diaphragmatic Breathing Exercise and Group B – Incentive Spirometry. There were 20 patients in each group. Detailed assessment was done and written consent was taken. The technique and need of this study was explained to every patient.

Group A- Diaphragmatic Breathing Exercise Group (control group)

Patients in group A were taught Diaphragmatic Breathing Exercise in crook lying position. Patients were asked to take deep breath through their nose and exhale through their mouth. During this procedure they were asked to relax their shoulders and upper chest and then inhale. This technique was repeated for 10 times. Patients were then asked to repeat the procedure 10 times during each waking hour.

Group B- Incentive Spirometry Group

Patients in group B were given Incentive Spirometry in crook lying position. They were asked to seal their lips around the mouth piece and inhale as deeply as they can and hold the inhalation for 3 seconds. This was repeated for 10 times. Patients were asked to repeat the technique 10 times during each waking hour.

Postoperative day 1 and day 5 three PEFr measurements were taken of both the groups and highest of the three measurements were recorded.

Result

Data and statistical analysis were performed by using SPSS Software. The result of this study shows that there is no statistical difference for the values of PEFr on Day 1 after surgery in between Group A and Group B. Whereas, there is significant difference for the values of PEFr on Day 5 between Group A and Group B. The improvement in mean PEFr value for Group A during Day 1 and Day 5 is 26% and improvement in mean PEFr value for Group B during Day 1 and Day 5 is 44%.

Discussion

It is well documented that the functions of the respiratory muscles are affected during and after the abdominal surgery. It has been suggested that respiratory muscles dysfunction may be responsible for a number of pulmonary complications including atelectasis and pneumonia. The site of the operation as well as the type of the operation are the most important factors affecting respiratory muscles[5].

There is significant difference in the values of PEFr on Day 1 and Day 5 in between Group A and Group B. The Incentive Spirometer group shows better result.

Table no.1 and figure 1 and 2 describes the Mean PEFr at day 1 of the Group A which is 91.50 and of the Group B which is 94.00 with a p value of 0.644. The mean PEFr at day 5 of the Group A was 115.50 and of Group B was 135.25 with a p value of 0.009. It also shows the Mean difference of the PEFr of both the group at day 1 and day 5 with Group A with a Mean difference of 24.00 and Group B with 41.25 and the p value being 0.021. Two independent t-test used for both the values. The graph describes that there was no significant difference at day 1 in Group A and Group B but as the treatment progressed there is significant difference in the PEFr of both the groups at day 5.

The findings of our study are consistent with various previous studies by Dr. Sanjeev Kumar Khanna in Indian Journal of Basic and Applied Medical Research, December 2013 Vol-3; Paula Agostini et al in Interactive Cardiovascular and Thoracic Surgery 7; Jackie A Thomas in Physical Therapy Journal of the American Physical Therapy Association which confirm the role of Incentive Spirometer in prevention of postoperative pulmonary complications following abdominal surgeries. Hence, the result of this study are supported by previous studies.

Further Scope: This study can be further extended with large sample size and including other major surgeries that affect the pulmonary function of the patients postoperatively. Further study can be done including different age group patients to differentiate the complication and improvement at different age group.

Limitations:

- i. The sample size is small.
- ii. Only one outcome measure ie PEFr
- iii. Only abdominal surgery patients included.

We suggest that incentive spirometry should be used widely for abdominal surgery patients under the supervision of the physiotherapist.

Conclusion

The conclusion of this study is that there is a significant difference in the PEFr values of both groups and Incentive Spirometer shows better result in improving PEFr for abdominal surgery patients.

Clinical Importance

Incentive spirometry is effective in improving peak expiratory flow rate in abdominal surgery patients thus improves pulmonary functions after surgery. It can be used prophylactically to prevent pulmonary complications.

Keywords

Peak Expiratory Flow Rate, Abdominal Surgery, Pulmonary Complications, Diaphragmatic Breathing Exercise, Incentive Spirometry.

Acknowledgement

Author acknowledges Jehangir hospital for support to conduct the study. We extend our gratitude towards patients for their consent and cooperation of the study. We would also like to thank Tilak Maharashtra Vidyapeeth for their support in the study.

Funding: This study is not funded or Sponsored by any financial resources.

Bibliography

1. Guimaraes MMF, El Dib R, Smith AF, Matos D. *Incentive Spirometry for Prevention of Postoperative Pulmonary Complications in Upper Abdominal Surgery; The Cochrane Collaboration; 2009 Issue 3.*
2. Joannel.Thanavaro , Barbara J. *Postoperative Pulmonary Complication: Reducing Risks for Non-Cardiac Surgery; Lippincott Nursing Center.com; July 2013; Vol 38.*
3. Don D Sin. *Postoperative Pulmonary Complication: What Every General Practitioner Ought To Know; BCMJ; April 2008; Vol 50.*
4. Dr. Sanjeev Khanna; *Efficacy of Incentive Spirometer In Improving Pulmonary Functions After Upper Abdominal Surgery; Indian Journal of Basic and Applied Medical Research; Dec 2013; Vol-3; Issue-1.*
5. *Medical Dictionary; The Free Dictionary By Farlex.*
6. Warren G Magnuson; *Critical Care Therapy and Respiratory Care Section; National Institute of Health.*
7. *Lung Expansion Therapy www.ceu.org/cecourses.*
8. Ruben D Restrepo, Richard Wettstien, Leo Wittnebell, Michael Tracy; *Incentive Spirometry; AARC Clinical Practice Guideline; 2011; Vol 56.*
9. *Wikipedia, The Free Encyclopedia.*
10. Paulo Do Nascimento, Norma SP Modolo, Silvia Andrade; *Incentive Spirometry For Prevention of Postoperative Pulmonary Complication In Upper Abdominal Surgery; NCBI; Pub Med; 2013.*
11. Freitas ER, Seares BG, Cardoso JR; *Incentive Spirometry For Preventing Pulmonary Complication After CABG; Cochrane Database Systemic Review; 2012.*
12. Areli Cunha Pinheiro, Michheli Christina Magalhaes Novais, Mansueto Gomes Neto; *Estimation of Lung Vital Capacity Before & After CABG Surgery: A Comparison Of Incentive Spirometry and Ventilometry; Journal of Cardio-Thoracic Surgery; 2011.*
13. Celso R.F Carvalho, Denise M Paisani, Adriana C Lunard; *Incentive Spirometry In Major Surgeries: A Systemic Review; Brazilian Journal Of Physiotherapy; 2011; Vol-15 No-5.*
14. Gerald W Smetana; *Postoperative Pulmonary Complication-An Update on Risk Assessment and Reduction; Cleveland Clinical Journal Of Medicine; 2009; Vol-76.*
15. Paula Agostini, Rachel Calvert, Hariharan Subramaniam, Babu Naidu; *Is Incentive Spirometry Effective Following Thoracic Surgery; Interactive Cardiovascular And Thoracic Surgery; 2008; Vol-7.*
16. Josef Windler, Ralph Thomas Kiefer; *The Efficacy of Postoperative Incentive Spirometry Is Influenced By Device Imposed Work Of Breathing; American College of Chest Physicians; 2001; Vol-119, No-6.*
17. Tom J Overend, Catherine M Anderson, Deborah Lucy, Christina Bhatia; *The Effect Of Incentive Spirometry on Postoperative Pulmonary Complications; American College Of Chest Physicians; 2001; Vol-120.*
18. Gosselink R, Schrever K; *Incentive Spirometry Does not Enhance Recovery After Thoracic Surgery; US National Library Of Medicine; 2000; Vol-28, Issue 3.*
19. Jean M Crowe, Christine A Bradley; *The Effectiveness Of Incentive Spirometry With Physical Therapy For High Risks Patients After CABG; Physical Therapy Journal Of American Physical Therapy Association; 1997; Vol-77.*
20. John C Hall, Richard Tarala, Julien Harris, Jeff Tapper; *Incentive Spirometry Versus Routine Chest Physiotherapy For Prevention Of Pulmonary*

Complications After Abdominal Surgery; 1991; Vol-337.
21. N M Saifakass, I Mitrouska, D Bouros, D Georgopoulos; *Surgery And The Respiratory Muscles; Thorax.bmj.com; 1999; Vol-54.*

Conflict of Interest: Nil
Source of Support: None

Full Thesis and Master Chart available on
www.journalmedicalthesis.com

How to Cite this Article:

Nandi B, Mishra S, Yeole U, Gawali P, Adkitte R. Effectiveness Of Incentive Spirometry In Improving Peak Expiratory Flow Rate In Post Abdominal Surgery : An Experimental Study. *Journal Medical Thesis* 2015 Jan-Apr ; 3(1):15-18.