



International Journal of Allied Medical Sciences and Clinical Research (IJAMSCR)

ISSN:2347-6567

IJAMSCR | Volume 8 | Issue 3 | Apr - Jun - 2020
www.ijamscr.com

Research article

Medical research

Forced expiratory technique in coronary artery bypass grafting individuals

Dr.G.Pavani¹, Dr.K.Chenchu Kishore², Dr. Roopa Lokesh³, Dr. Hema Swaroopa⁴, Dr.M.K. Kishore⁵

¹ Assistant Professor Rajarajeswari College of Physiotherapy, Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore.

² Associate Professor and Incharge Principal Of Josco Institute Of Physiotherapy, Rajiv Gandhi University Of Health Sciences, Karnataka, Bangalore.

³ Professor, Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore.

⁴ Assistant Professor, Department of Physiotherapy, Madhav University, Rajasthan.

⁵ Associate Professor, Rajarajeswari College of Physiotherapy, Rajiv Gandhi University of Health Sciences, Karnataka, Bangalore.

*Corresponding Author: Dr.G.Pavani

Email Id: dr.krish1987@gmail.com

ABSTRACT

The coronary artery disease is due to arterial wall damage, infiltration of macromolecules or platelet activation leading to complete blockage of vessels which results in ischemic necrosis of tissue. Twenty subjects were taken from the Physiotherapy Outpatient Department and were assessed pre-operatively, post-operatively for lung volumes by spirometry. In experimental group, the pre and post treatment shows significant improvement in pulmonary functions, peak expiratory flow rate, pain assessment scale whereas, in control group, the pre and post-operative treatment shows. Significant improvement in pulmonary functions, peak expiratory flow rate and pain assessment scale could be due to deep breathing exercises which is used to maintain sufficient lung volumes by improving ventilation and relief of pain. The present study was undertaken to evaluate the effectiveness of forced expiratory technique in improving pulmonary function, peak expiratory flow rate and pain scale in coronary artery bypass grafting individuals.

Keywords: coronary artery disease, pulmonary functions, forced expiratory technique, VAS, peak expiratory flow rate

INTRODUCTION

Coronary artery disease is an atherosclerotic disease that is multifactor in origin, giving rise to the risk factor concept. Certain living habits promotes thermogenic traits in genetically susceptible persons. A number of risk factors are known to predispose to the condition. Some of these are age, gender, race and family history which cannot be modified, where as other major risk factors such as serum cholesterol, smoking habits, diabetes and hypertension which can be modified the most prevalent type of heart disease is coronary artery disease or ischemic heart disease, accounting for 42% deaths in adults per annum. More than 7, 50,000 persons annually experience significant cardiac symptoms as a result of coronary heart disease. According to SVIMS statistics, 38.65% of people underwent coronary artery bypass grafting from 2007-2008. The disease can be asymptomatic in its most severe form. Thirty to forty percent individuals who present with **CAD** had no prior warning symptom to suggest the presence of underlying disease. The most notable symptoms of **CAD** are chest pain, shortness of breath, unexplained fatigue. Primary prevention can be defined as the prevention of the atherosclerotic disease process and secondary prevention is the treatment of atherosclerotic disease process. Medical management by B-blocker, long acting nitrates and calcium channel blockers. Surgical management is indicated for symptom control and improve survival rate. Among the many treatments available for these problems, **CABG** by direct grafting of obstructed coronary arteries had become widely accepted in the management of coronary artery disease. Most common physical complications occurring after coronary artery bypass grafting alters pulmonary and cardiac mechanics, therefore the pulmonary problems observed after such surgery included those secondary to cardiac dysfunction 14. Post-Operative pulmonary complications have been defined as “any pulmonary abnormalities occurring in post-operative period that produces unidentified diseases or dysfunction that is clinical significant and the adversely affects clinical courses 4”. The overall incidence of post-operative pulmonary complications are about 20.5% in **CABG** individuals 6. the most commonly seen pulmonary complications after coronary artery bypass grafting includes pleural effusion, hemothorax, atelectasis, pulmonary

oedema, diaphragmatic dysfunction and pneumonia. The most frequent problem after median sternotomy is atelectasis, which reduces lung compliance and functional residual capacity. So, much effort is directed at preventing and treating post-operative atelectasis. Some studies conclude that mucus hypersecretion is one of the essential determinants of post-operative pulmonary complications

METHODOLOGY

The study was conducted in SVIMS Hospital, Physiotherapy Department, Tirupati. Referral was obtained from Physiotherapy Outpatient Department (OP), SVIMS Hospital, Tirupati. By using Randomized sampling method, twenty subjects were taken from the Physiotherapy Outpatient Department (OP). After briefing the procedure, the information sheet was given and informed consent was taken. Subjects with Age between 45-65 years who underwent CABG, Medically stable and Pre-operative FVC is of 50-60% were included. Those Subjects who were Hemodynamically unstable, presenting with Wound infection, history of CVA, subjects Who were intubated more than 24 hours and subjects with history Lung disease were excluded.

Procedure

Sample who met the inclusive criteria were randomly assigned into experimental and control group. Study group consist of 20 patients of age ranging from 45 – 65 years. All participating patients gave written informed consent. Treatment protocol for either group commenced of one day after surgery. Samples were assessed pre-operatively, post-operatively for lung volumes by spirometry.

Conventional physiotherapy group: -

This Group consisted of 10 patients who received routine conventional physiotherapy which includes deep breathing exercises, incentive spirometry, and active exercises for both upper and lower limbs 10-times, twice a day with duration of 10-15 minutes for each session.

Forced expiratory technique: -

This group consisted of 10 patients along with routine conventional physiotherapy, forced expiratory technique were incorporated to the patients. The technique is given under supervision for 2 weeks and at the time of discharge patient is

instructed to continue the technique at home. This was unsupervised for 2 weeks with duration of 10-15 minutes for each session, twice a day.

Pain evaluation

The location of post CABG pain is determined by asking each patient to indicate where he/she felt pain and then severity of pain was subjectively evaluated using a numerical rating scale where a score 0 indication of no pain and a score of 10 unbearably severe pain.

Pulmonary function test:

Spirometric measurements were taken with an electrical Spirometer. Spirometer was standardized according to American Thoracic society Recommendations and was performed with the patient in sitting and was performed with the patient in sitting position in a chair using standardized instructions lung volumes (FEV1 and FEV) were measured pre and post- therapy. The best FEV1 and FVC of three trials were recorded.

Peak expiratory flow rates:

Peak expiratory flow rate was performed with the patient in sitting position in a chair using standardized instructions. Flow rates were measured pre and post therapy, the best of three trials were recorded.

STATISTICAL ANALYSIS

Analysis was done for finding the significant impact of the outcomes in experimental and control groups and also between group comparisons was done to observe the change with respect to the treatment protocol. Entire analysis we performed using SPSS 16.0 version and MS-Excel packages. Paired t-test was done to observe the significant between groups. Finding a graphical presentation was used to show the change in each outcome in both experimental and control groups individually and also for overall observations. If the P-value is less than 0.05, there exists a significant difference between pre and post or between two groups.

Table -1: statistical analysis of pre and post pulmonary functions, flowrates, pain assessment of experimental group

Outcome measure		MEAN	S.D	T	DF	SIG(2-TAILED)
Pulmonary functions	Pre	58	1.76383	0.0024	8	0.05*
	post	63	2.94392			
Peak expiratory flow rate	Pre	330	27.4873	0.0009	8	0.05*
	post	362	32.9309			
Pain assessment scale	1 st week	6	1.5634	0.00025	8	0.05*
	4 th week	3	0.8164			

Table-2: statistical analysis of pre and post pulmonary functions, flowrates, pain assessment of control group

Outcome measure		MEAN	S.D	T	DF	SIG(2-TAILED)
Pulmonary functions	Pre	58	1.5634	0.00003	8	0.05*
	post	61	1.0540			
Flow rates	Pre	284	38.0642	0.01538	8	0.05*
	post	310	15.6347			
Pain assessment scale	1 st week	7	1.41421	0.0002	8	0.05*
	4 th week	5	1.7638			

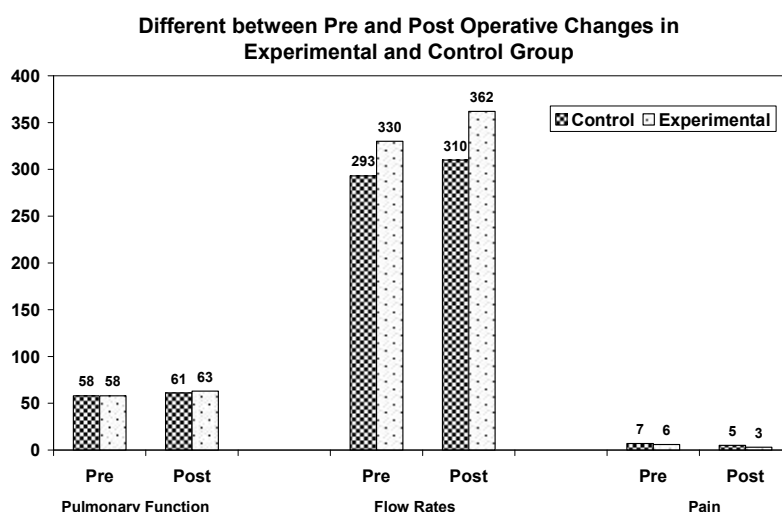
The comparison is done for pre and post values of pulmonary functions, flow rates and pain assessment. The results were to be significant for in all out comes, which means forced expiratory technique as more significant in its impact. The mean and standard deviation were also presented in the table with their significance ($P < 0.05$ for all out come measures).

The comparison is done for pre and post values of pulmonary functions, flow rates and pain assessment. The results were found to be significant in all out comes, which means conventional physiotherapy shown a significant impact. The mean and standard deviation were also presented in the table with their significance ($P < 0.05$ for all out come measures).

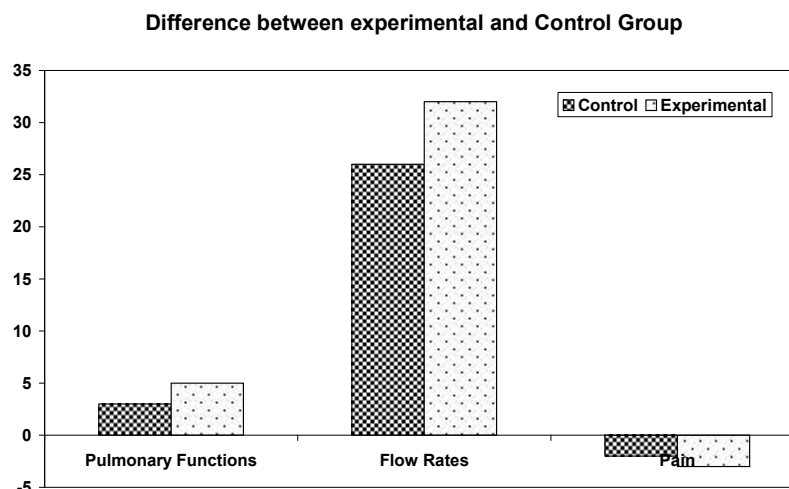
Table-3: Statistical analysis of pre and post pulmonary functions, flowrates, pain assessment of experimental group and control group

Out come measure		MEAN	S.D	T	DF	SIG(2-TAILED)
Pulmonary function	EX	5	1.1800	0.0024	8	0.05*
	CO	3	-0.5093			
Peak expiratory flow rate	EX	32	5.4435	0.0144	8	0.05*
	CO	26	-22.429			
Pain assessment	1 st week	-3	-0.7469	0.00005	8	0.05*
	4th week	-2	0.3496			

The differences were computed from the pre and post therapy values of each out come in two groups. For the comparison of two groups these differences were used and paired t-test was used to observe the significance. The results were found to be significant in pulmonary functions and peak expiratory flow rate out comes ($P < 0.05$) significant and the pain assessment scale was grossly significant.



Graph 1: From above table there is significant change in pulmonary functions and peak expiratory flow rate and pain compare pre and post-operative in both groups.



Graph 2: From above table there is significant change in pulmonary functions and peak expiratory flow rate and gross significant change in pain compared between experimental and control group.

DISCUSSION

The purpose of the study is to know the effectiveness of forced expiratory technique in coronary artery bypass grafting individuals. The result of this study could yield better understanding of effect of forced expiratory technique on physiological variables. From table-I, in experimental group, the pre and post treatment shows significant improvement in pulmonary functions, peak expiratory flow rate, pain assessment scale. This could be due to forced expiratory technique. Following surgery, due to anesthesia and pre-operative process the physiological changes that occur lead to lack of lung infection. This leads to a change in breathing to shallow pattern, impaired mucociliary clearance, decreased cough effectiveness. The net result is retained secretions and alveolar collapse. By training forced expiratory technique in which deep breathing causes filling the lungs with air as completely as possible, result alveolar ventilation. Blow the air out to attempts in removing distal airway secretions. Repeated use of this technique will loosen the secretions from the airways and helps in increasing lung volumes and flow rates. Pryor suggested that forced expiration technique improves mucus clearances after major surgeries¹¹. From table-II, in control group, the pre and post-operative treatment shows. Significant improvement in pulmonary functions, peak expiratory flow rate and pain assessment scale could be due to deep breathing

exercises which is used to maintain sufficient lung volumes by improving ventilation and relief of pain. Incentive spirometer give visual feedback during a sustained maximal inspiration and prevent alveolar collapse. According to Anderson post-operative lung volumes are improved by deep breathing exercises with 3 sec hold. Incentive Spirometer given more frequently is more effective¹. Table-III shows, comparison between treatments of experimental and control groups. Experimental group shows better improvement in pulmonary function, peak expiratory flow rate and pain scale. The addition of forced expiratory technique over the conventional therapy may have accounted for this change. Therefore, the alternate hypothesis is accepted.

Scope for the further research

Further research is needed to quality the evidence obtained in this study about clinically relevant post-operative pulmonary complications. More evidence should be gathered by using more quantitative measures in order to conclusively prove forced expiratory techniques effectiveness in this high risk population. Studies should be done considering all the factors which can influence pulmonary functions postoperatively.

CONCLUSION

The present study was undertaken to evaluate the effectiveness of forced expiratory technique in improving pulmonary function, peak expiratory flow

rate and pain scale in coronary artery bypass grafting individuals. Patients were divided into experimental and control groups. Experimental group was given forced expiratory technique along with conventional therapy. Control group was given only conventional therapy. Analysis was done within the groups and between the groups. The result of the study shows

that there was better improvement in pulmonary function, peak expiratory flow rate and pain scale in experimental group than control group. These shows in the addition of forced expiratory technique in routine physiotherapy management of coronary artery bypass grafting patients will be beneficial

REFERENCES

- [1]. Anderson, Catherine M. The effect of Incentive Spirometer on post operative pulmonary complication. Physiotherapy research international 2001; vol 120;971-978.
- [2]. Bartlett RH, Gazzaniga AB, Gerraghty TR. Respiratory maneuvers to prevent post operative pulmonary complications. Journal of American medical association 1973 ;224 ;1017-1021.
- [3]. Christine Bradley, Jean M Crowe. The effectiveness of Incentive Spirometry with physical therapy for high risk patients after CABG. Physical therapy Journal Mar 1997; vol 77;260-268.
- [4]. Craig DB. Post operatively recovery of pulmonary function. Review article anesthesia and analgesia 1981; 60(1);46-52.
- [5]. Dan Schuller MD and Lee E. Morrow, MD. pulmonary complications after coronary revascularization. Current opinion in cardiology, 2005;15;309-315.
- [6]. Dilworth JP, White RJ. post operative chest infection after upper abdominal surgery; an important problem for smoker. Respiratory Medicine 1992;86;205-210.
- [7]. Elliot TR, Dingley LA. Massive collapse of the lungs following abdominal operations. American journal of surgery 1994;1305-1309.
- [8]. Erik H.J. Hulzebos, Paul J.M. Helder, Nine J. Favie et al. pre operative intensive inspiratory muscle training to prevent post operative pulmonary complications in high risk patients undergoing CABG surgery. JAMA journal oct 2006; vol 296;1851-1857.
- [9]. Hunt J, Mycykt, Thomson D, et al. Respiratory outcomes with early extubation after CABG. Journal of cardiothoracic vascular anesthesia 1997;11;4
- [10]. Konrad, Hewlett AM, Hulands GH. Functional residual capacity during anesthesia spontaneous respirations. British journal of anesthesiology 1995;46;486-494.
- [11]. Pryor J. Physiotherapy for respiratory and cardiac problem. London, Churchill Livingstone 1998;444-446.
- [12]. Stiller k, Montarelloj, Wallace M, Daff M, grant Jenkins. Efficacy of breathing and coughing exercises in the prevention of pulmonary complications after coronary artery surgery; Chest 1994;105;741-747.
- [13]. Torrington and Henderson, Rochelle Wynne, Marie Botti. Post-operative pulmonary dysfunction in adults after cardiac surgery with cardiopulmonary bypass, Clinical care medicine 1988;27;1454-1460.
- [14]. Weissmann, MD. Pulmonary function after cardiac & thoracic surgery. Journal of Anesthesiology and critical care medicine. 1999;88;1272-9.
- [15]. Zin WA, calderia MPR, Cardoso WV et al. Expiratory mechanisms before and after uncomplicated heart surgery. Chest 1989;95;21-8.

How to cite this article: Dr.G.Pavani, Dr.K.Chenchu kishore, Dr.Roopu Lokesh, Dr. Hema Swaroopa, Dr.M.K. Kishore. Forced expiratory technique in coronary artery bypass grafting individuals . Int J of Allied Med Sci and Clin Res 2020; 8(3)629-639:
Source of Support: Nil. **Conflict of Interest:** None declared.