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Study to Compare Health Related and Skill Related Physical Fitness in Post Cardiac Surgery Patients with Age Matched Healthy Individuals

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ABSTRACT

Coronary heart disease (CHD) is one of the most common causes of morbidity and mortality. Although cardiac surgeries are effective treatment for CHD, it causes several pulmonary complications and causes reduction in the physical activity, decrease in muscle strength, endurance as well as the flexibility of the muscles. All these factors lead to a poor health related physical fitness as well as quality of life. Therefore, as the CHD leads to poorer physical fitness, measuring the physical fitness level is important for surveillance and assessing the effectiveness of intervention in cardiac diseases.

Study Objective: To assess the physical fitness in post cardiac surgery patients and compare it with the age matched healthy individuals using Fitness test battery.

Methodology: Fifty subjects (twenty five cardiac surgery patients and twenty five healthy individuals) meeting the eligibility criteria were recruited and a series of health related and skill related physical fitness tests were performed which includes BMI, MIP max and MEP max, Six Minute Walk Test and Peak flow rate, Sit and reach test and Hand grip, Plate tapping test and Balance tests using fitness test battery. The data collected was analyzed by using the student 't' test for comparing each of the components of fitness between the post cardiac surgery patients and age matched healthy individuals.

The data was tabulated, coded and analysed for descriptive statistics using Microsoft Excel Worksheet.

Result: Our study demonstrated the "p" value of each component of fitness being <0.01 which indicates highly significant reduction in all the components of physical fitness of post cardiac surgery patients as compared to the healthy individuals.

Conclusion: Our study revealed, both health related and skill related physical fitness of post cardiac surgery patients is significantly reduced as compared to the age matched healthy individuals.

Keywords: Health related physical fitness, post cardiac surgery patients, MIPmax, MEPmax, Six minute walk test, fitness test battery.

INTRODUCTION

Coronary artery disease is atherosclerosis of the coronary arteries, producing blockages in the vessels which nourish the heart itself. Atherosclerosis occurs when the arteries become clogged and narrowed, restricting blood flow. Without adequate blood flow from the coronary arteries, the heart becomes starved of oxygen and vital nutrients it needs to work properly. Coronary artery disease (CAD) is the most common type of heart disease. It is the leading cause of death in worldwide in both men and women. According to the American Heart Association 427,000 coronary artery bypass graft (CABG) surgeries were performed in the United States in 2014, making it one of

the most commonly performed major operations. CABG surgery is advised for selected groups of patients with significant narrowing and blockages of the heart arteries (coronary artery disease). CABG surgery creates new routes around narrowed and blocked arteries, allowing sufficient blood flow to deliver oxygen and nutrients to the heart muscle.

Although cardiac surgeries are an effective treatment for CHD, it causes several pulmonary complications such as pneumonia and atelectasis and causes reduction in the physical activity, decrease in muscle strength, endurance as well as the flexibility of the muscles. [1] All of these factors in turn lead to poor health related physical fitness.

Physical fitness as per ACSM is defined as the measure of the body's ability to function efficiently and effectively in work and leisure activities, to be healthy, to resist hypokinetic disease and to meet emergency situations.[1]

As per ACSM, Physical fitness components are divided into 2 groups:-

- Health related physical fitness:-
- Skill related physical fitness:-

There is a need for interventions such as assessment of all components of physical fitness to address the risk factors for such cardiovascular diseases. To establish the clinical effectiveness of such interventions, there is a need to develop and validate alternative cost-effective monitoring of health related and skill related physical fitness.

MATERIALS AND METHODS

STUDY DESIGN

This was a cross sectional study following a purposive sampling involving a population of twenty five post cardiac surgery patients recruited from a tertiary care hospital at Navi Mumbai and twenty five age matched healthy individuals. The inclusion criteria adopted was, both male and female post cardiac surgery patient (CABG, Valve replacement surgeries, Atrial and Ventricular septal defect correction surgeries) in the age group 20-70 years of age and age matched healthy individuals were included in the study, excluding the post cardiac surgery patients having ejection fraction less than 30%, resting heart rate more than 140 beats per minute, blood pressure more than 180/100 mmHg, patients diagnosed with cerebrovascular, musculoskeletal, neurologic or cognitive-emotive disorders and patients refusing to participate.

METHODOLOGY

Ethical approval was obtained from the Institutional Ethical Committee. Informed consent was taken from every participant and they were explained about the procedure in the language best understood by the participants. Demographic data was obtained and any past medical or surgical history was noted and all the individuals underwent a series of fitness tests. To rule out general medical risk a Physical activity readiness questionnaire was filled. In the PAR- Q the participants responded to seven simple question. In case of a positive answer, the therapist will address this point in more detail and the subject will be discontinued from the study. After a thorough interview and a PAR- Q scoring, the therapist will perform a clinical examination of the cardiovascular system to rule out any specific medical risk. Participants were subjected to health related and skill related fitness test battery which included Sit and reach test, hand grip test, six minute walk test, peak flow-metry test and evaluation of maximal inspiratory and expiratory mouth pressures and skill related physical fitness tests included plate tapping test for agility and single limb stance test for balance parameters and their specific values were recorded.

STATISTICAL ANALYSIS: The data was tabulated, coded and analyzed using Microsoft Excel Worksheet.

RESULTS

Table: 1 Descriptive Statistics

	Patients		Healthy Individuals		
Variables	Mean	SD	Mean	SD	p value
Age	47.04	13.07	47.78	12.84	0.5
Grip strength(dominant)	16.44	5.93	27.04	7.26	<0.01
Grip strength(non-dominant)	12.17	6.34	23.58	7.21	<0.01
PEFR	168.2	57.48	404.97	32.17	<0.01
MIP max	38.88	15.53	85.68	19.98	<0.01
MEP max	56.8	25.23	114.32	15.74	<0.01
Plate tap test	33.8	9.52	24.54	8.35	0.0007
Single limb stance-dom(EO)	15.53	15.3	43	23.4	<0.01
Single limb stance-dom(EC)	8.38	20.27	28.52	11.36	<0.01
Single limb stance –non- dom(EO)	9.12	10.24	29.37	18.09	<0.01
Single limb stance non- dom(EC)	3.45	1.78	18.76	10.65	<0.01
Sit and reach test	18.76	5.24	23.31	5.41	0.004
6 MWD	245	123.7	521.7	172.4	<0.01

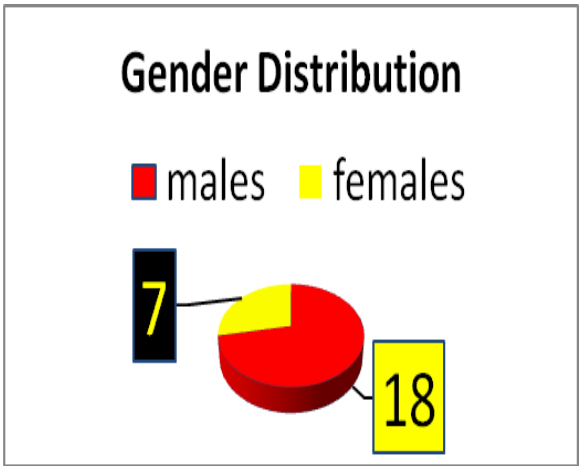

Figure 1: Gender distribution

28% of male and 72% of female post cardiac surgery patients were included in this study.

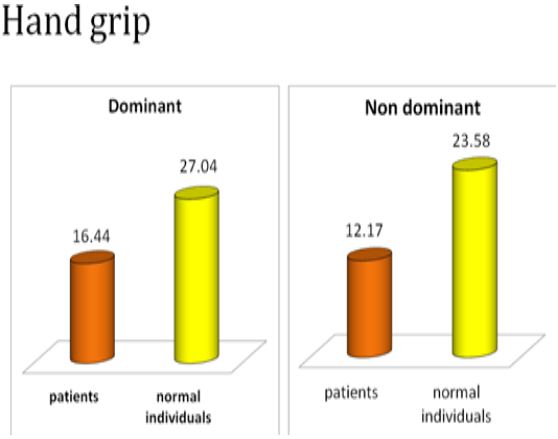

Figure 3: Hand grip strength

Hand grip strength was significantly ($p<0.01$) reduced in post cardiac surgery patients as compared to age matched healthy individuals.

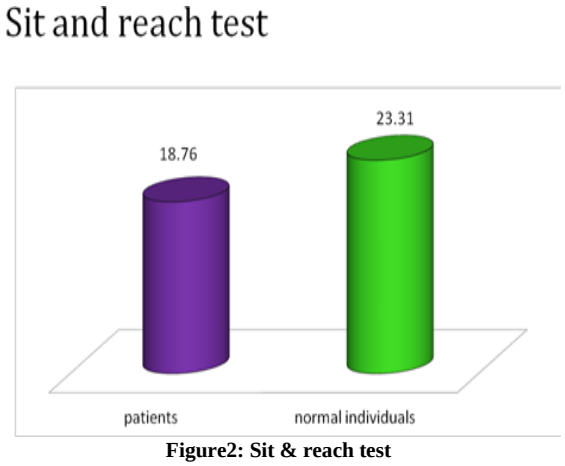

Figure2: Sit & reach test

Flexibility was significantly ($p <0.004$) in post cardiac surgery patients as compared to age matched healthy individuals.

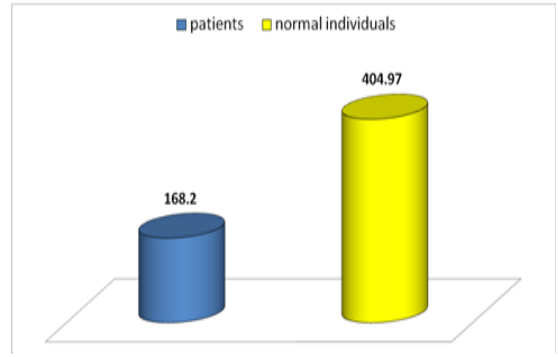

Figure 4: PEFR

Peak expiratory flow rate is significantly ($p<0.01$)in post cardiac surgery patients as compared to age matched healthy individuals.

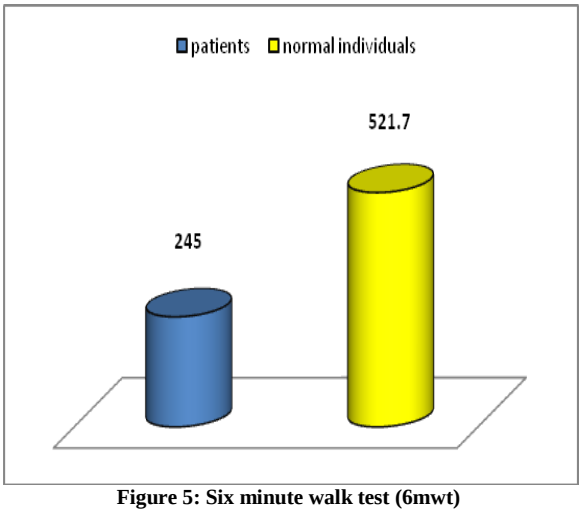

Figure 5: Six minute walk test (6mwt)

Six minute walk distance was significantly ($p<0.01$) reduced in post cardiac surgery patients as compared to age matched healthy individuals

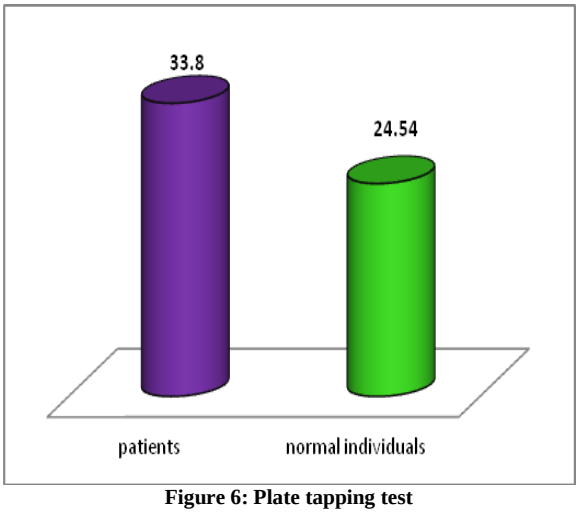

Figure 6: Plate tapping test

Plate tapping time was significantly ($p<0.007$) more in post cardiac surgery patients as compared to age matched healthy individuals

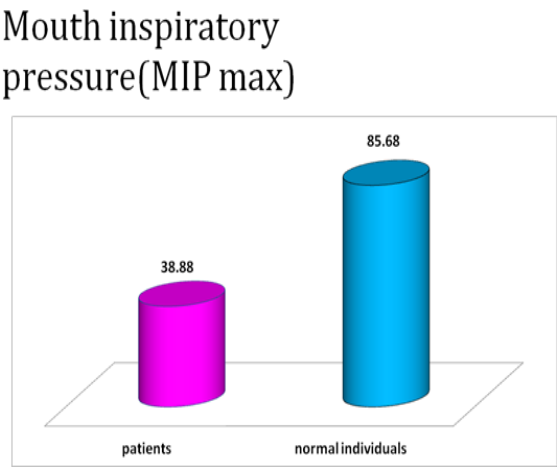

Figure 7: Maximal inspiratory pressure

MIPmax was significantly ($p<0.01$) reduced in post cardiac surgery patients as compared to age matched healthy individuals

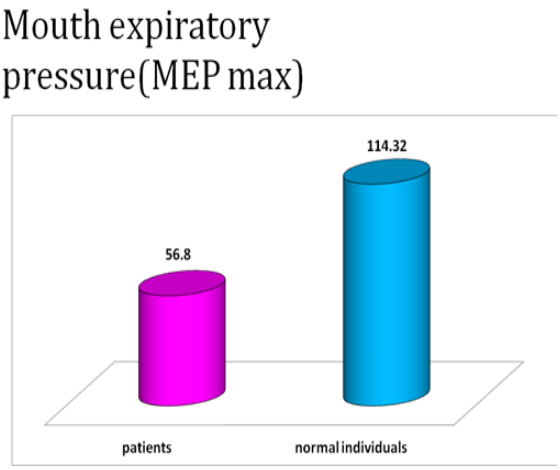

Figure 8: Maximal expiratory pressure

MEPmax was significantly ($p<0.01$) reduced in post cardiac surgery patients as compared to age matched healthy individuals

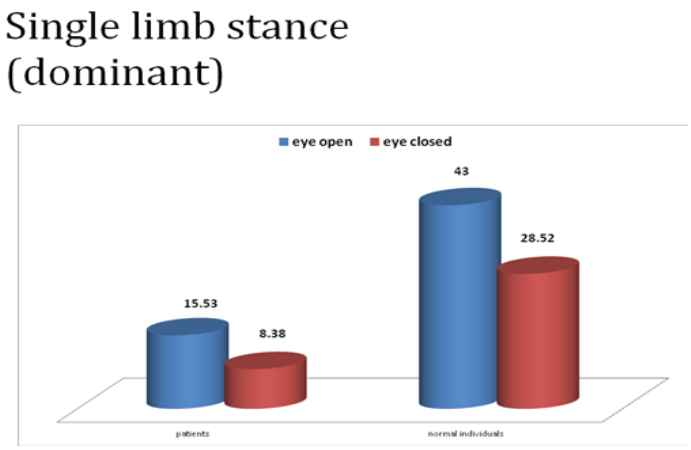

Figure 9: Balance assessment (Dominant)

Single limb stance (dominant) was significantly ($p<0.01$) reduced in post cardiac surgery patients as compared to age matched healthy individuals

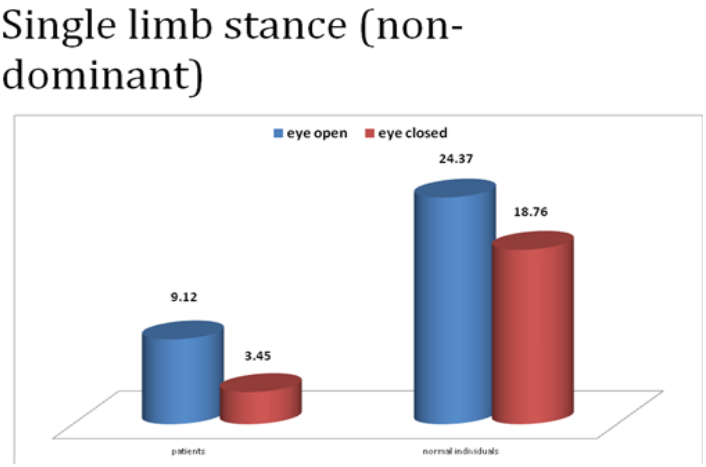

Figure 10: Balance assessment (Non-Dominant)

Single limb stance (non-dominant) was significantly ($p<0.01$) reduced in post cardiac surgery patients as compared to age matched healthy individuals

DISCUSSION

A fundamental objective of this study was to determine the physical fitness of post cardiac surgery patients by a set of simple and objective tests and compare it with the age matched healthy individual.[2] This study shows there is significant decrease in muscle power is often caused by injury or inactivity .[3]As per reversibility principle ,post cardiac surgery there occurs relatively rapid detraining of cardio respiratory system which causes reductions in exercise capacity.[2]Even ageing is a factor which causes reduced fat-free body mass i.e. sarcopenia which reduces the muscle strength in both patients as well as the healthy individuals.[2] I was also observed that the sit and reach test which assesses the flexibility of hamstrings and low back are seen to become less distensible post cardiac surgeries due to decrease in the physical activity and even tightness of various other tissues such as ligaments and tendons affects the range of motion after a period of inactivity post surgery.[2]

It has been noted that patients in acute phase of disease or patients who are generally deconditioned due to cardiac surgeries have balance impairments. [4] The elderly patients have difficulty adjusting postural control during the initial dynamic phase of one leg stance and also there is decrease in the lower limb muscle strength and endurance which affects the unipedal stance. [4]

Post-operative factors for pulmonary complications include immobilization, pain and hyperhydration. [5] A supine position during intubation results in decrease functional residual capacity and upward shift of the diaphragm, relaxation of chest wall and altered chest wall compliance. [5]A combination of these factors result in mismatch of the ventilation- perfusion ratio and in-turn affects the pulmonary function. [5] Also, there is a significant volume displacement between thoracic and abdomen cavities occurring during surgery simply by administration of general anesthesia which affects the diaphragm curvature, which affects the normal respiration. [6] The median sternotomy also has been reported to impair respiratory muscle function as there is alteration of the spinocostal angle which affects the mobility of ribs.[4,6] The decreased mechanical efficiency of the respiratory muscle may also be due to distortion of the chest wall configuration which reduces the chest wall compliance and increase the work of breathing.[4]

CONCLUSION

From the above study we hereby conclude that there is statistically significant reduction in both health related and skill related components of physical fitness of post cardiac surgery patients as compared to the age matched healthy individuals. It clinically implies us to prescribe set of exercises depending on the basis of affected fitness components to maintain and enhance the physical fitness of patients post discharge leading to an improved health related quality of life.

REFERENCES

1. ACSM's introduction to exercise science
2. Essentials of exercise physiology by McArdle J
3. Ching-Huang Hung, Chang-Huang et al. The effects of short term cardiac rehabilitation on post CABG patient's fitness. Int.Conference on Life and engineering, 5, 2012.
4. Barbara Springer et al. normative values for the unipedal stance test with eyes open and eyes closed. Journal of geriatric physical therapy 30 (1):7.
5. Charollete Urell. Lung function, respiratory muscle strength and effects of breathing exercise in cardiac surgery patients ISSN 165 - 6206.
6. R.Stenseth, L.Bjella,et al. Effects of thoracic epidural anesthesia on pulmonary function after CABG. Eur.J.Cardiothoracic Surgery 10:859-865. 1996
7. Kristen Bass et al. Quality of life 3 months after CABG: effects of presurgical physical fitness. Department of nutrition food and exercise.
8. Gordon, Michael Sullivan et al. 6 minute walk: A review of exercise capacity in patients with chronic heart failure. CAN MED ASSO J 132 (4) 1985.
9. William G Herbert. Functional capacity outcomes following CABG surgery. Blacksburg VA 24060
10. Robert J, Kenneth R, et al. Maximal inspiratory and expiratory pressure in adolescents. Chest 86 (4). 10. 1964.
11. Tuffs and Brown. Hand grip strength.TNC-CDAAR-2003.
12. Z.Sshenkman, Y.Shiir ,et al. effects of cardiac surgery on early and late pulmonary function. I.Journal of anesthesiology and intensive care, pain and emergency medicine 41 (9),1193-1199, 1997.
13. N.M.Siafakas, et al. Surgery and respiratory muscles. thorax, 54:458-465. 1999.
14. Ricardo Stein, Cristiana Maia, et al. Inspiratory muscle strength as a determinant of functional capacity early after CABG. Physical medicine and rehabilitation 1685-1691. 2009
15. N.Syabbalo. Assessment of respiratory muscle function and strength. Postgraduate Medical journal74: 208-215. 1998.
16. Unna D, Nevena et al. Quality of life and functional capacity one year after CABG surgery.ACI L8.
17. ATS statement: Guidelines for six minute walk test.AMJ Respiratory critical Care Med 166.111-117. 2002.
18. 18 Katrien Delvaux, et al. Evaluation of the influence of cardio respiratory fitness on diverse health risk factors, independent of waist circumference, in 40 year-old flemish males. Obesity research 8 (11) 2000.
19. .P.Newell, C.T.Kappagoda, et al. Physical training after heart valve replacement. BR. Heart J 44:638-649.1980
20. ACSM's advanced exercise physiology.

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