

# Effects of Nadi- Shodhana Pranayama on Depression, Anxiety, Stress and Peak Expiratory Flow Rate in Post CABG Patients: Experimental Study

Dr. Mayuri Rajesh Shah<sup>1</sup>, Dr. Parita Hardik Kothari<sup>2</sup>

<sup>1,2</sup>Assistant Professor, Dr. D.Y. Patil College of Physiotherapy, Pimpri, Pune

Corresponding Author: Dr. Mayuri Rajesh Shah

## ABSTRACT

**Background:** Physiotherapy plays a major role post CABG. Stress of coronary artery bypass surgery starts from the moment surgery is planned. Heart surgery poses stress to the individual who has to undergo CABG. Any form of relaxation therapy post-operatively reduces post-operative pain and suffering, and lower hospital stay and costs. Pranayama, the formal practice of controlling the breath, lies at the heart of yoga. Practice of pranayama has been known to modulate cardiac autonomic status with an improvement in cardio-respiratory functions. 'Nadi-shodhana Pranayama' rapidly alters cardiopulmonary responses and improves simple problem solving.

**Method:** The study was experimental and was carried out in Cardiovascular and Thoracic Surgery Intensive Care Unit of Dr. D Y Patil Hospital and Research Centre, Pune. The sample size was 30 and type of sampling was Purposive sampling. Age group of 55-75 years, post CABG patients, both gender – males and females, score on DASS-21 scale  $\geq 8-9$ , and patients not on ventilator was the inclusion criteria. Conventional exercises along with nadi-shodhana pranayama were given for total duration of 30min.

**Result:** Paired t test was applied to compare pre and post intervention on DASS-21 scale and Peak expiratory flow rate. The p value was  $<0.05$  which was considered to be statistically significant.

**Conclusion:** The study concludes that Nadi- shodhana pranayama along with conventional physiotherapy is effective in improving lung function and reducing depression, stress and anxiety in population undergone CABG.

**Keywords:** Nadi- Shodhana Pranayama, CABG

## INTRODUCTION

Coronary artery bypass grafting (CABG) is a type of surgery that improves blood flow to the heart. It's used for people who have severe coronary heart disease (CHD), also called coronary artery disease (CAD). CHD is a condition in which a substance called plaque builds up inside the coronary arteries. These arteries supply oxygen-rich blood to your heart. Plaque is made up of fat, cholesterol, calcium, and other substances found in the blood. Plaque

can narrow or block the coronary arteries and reduce blood flow to the heart muscle. If the blockage is severe, angina, shortness of breath and in some cases, heart attack can occur. CABG is one treatment for CHD. During CABG, a healthy artery or vein from the body is connected, or grafted, to the blocked coronary artery. The grafted artery or vein bypasses (that is, goes around) the blocked portion of the coronary artery.

Coronary artery bypass grafting was first performed in 1967. This has become a

common surgery for a prevalent disease. The aim of this surgery is to relieve the symptoms of angina and in certain groups of patients to prolong life. Patients with severe stenosis of all three coronary arteries or severe stenosis of the main stem of the left coronary artery, survive longer (over 5 years) with surgery than with medical treatment. The most important predictor with long term survival is the extent of damage of the left ventricle. Reversed segments of the long saphenous vein are used to form bypass grafts from the ascending aorta to the coronary artery distal to the stenosis. Up to five to six grafts may be required.

Postoperative care occurs in an intensive care unit for the first 24 hours. The majority of patients are fit to leave hospital first week after operation. Operative mortality is now less than 2 percent and at one year after operation over 85 percent of patients are symptom free. Re-operation can be carried out at a low risk but the results are less satisfactory than the initial procedure. Because of the attrition rate of vein grafts, surgeons are now using the internal mammary artery on one or both sides. The patency of the internal mammary at 7 years (95 percent) is superior to that of saphenous vein grafts (70 percent).<sup>[1]</sup>

Despite the improvement in the CABG techniques as well as the postoperative intensive care, impaired pulmonary function is a well-documented complication of cardiopulmonary bypass, resulting in increased morbidity and mortality. However, whether CABG itself is directly responsible for the whole postoperative lung dysfunction is not known. It is indirectly suggested by some studies following off-pump coronary artery bypass, which although an attenuated inflammatory response has been shown, the degree of postoperative lung dysfunction was similar with that of conventional Coronary Artery Bypass Grafting CABG. Namely, for this postoperative pulmonary dysfunction CABG may not be the only factor contributing, but other factors related

to the cardiac operation such as anesthesia, temporary cardiac dysfunction, infused catecholamines, altered mechanical of thoracic cage, etc. could play an important role. The reported increased mortality and morbidity of this early postoperative pulmonary dysfunction after cardiac surgery may be related to the duration of mechanical ventilation, neurological, renal and infectious complications, ICU and hospital stays, and subsequently increased mortality.<sup>[2]</sup>

There are various treatments given in ICU on first week post operatively pharmacologically. However, physiotherapy too plays a major role post CABG. There are various physiotherapy interventions administered immediately post operatively in order to minimize risk of complications in the form of incentive spirometry, chest percussions, vibrations, breathing exercises, positioning, and general mobility exercises.

Stress of coronary artery bypass surgery starts from the moment surgery is planned. Heart surgery poses stress to the individual who has to undergo CABG. It is well known that stress, anger, hostility, anxiety and depression are the components of the personality of patients suffering with Coronary Artery Disease (CAD). Yoga is emerging a useful rehabilitation tool for various chronic lifestyle related ailments. Mind body interventions in the form of meditation is the focus of research at many institutes

Pranayama literally means control of prana. Prana, in Indian philosophy, refers to all forms of energy in the universe. Life force is one part of this energy. Life force in an individual is symbolized by breathing. That is why pranayama is generally considered to mean regulated breathing. A yogi, through pranayama, can, at some stages, control other functions of his body and finally control manifestations of prana even outside his body. As a technique, pranayama can assume rather complex forms of breathing, but the essence of the practice is slow and deep breathing. Such breathing is economical because it reduces

dead space ventilation. It also refreshes air throughout the lungs, in contrast with shallow breathing that refreshes air only at the base of the lungs. Pranayama breathing has been shown to alter autonomic activity. Pranayama training produces a decrease in basal sympathetic tone. Nadi-shodhana pranayama increases parasympathetic activity. Slow and deep breathing itself has a calming effect on the mind and helps an individual to de-stress. This calming effect may also exert profound physiological effects on pulmonary, cardiovascular, and mental functions of the brain. [3]

Meditation is one of yogic therapy that invokes a state of autonomic nervous system that is correlated with reduction in stress reactivity.

Progressive relaxation technique, savasana, and music therapy in anxious patients after CABG, showed significant reductions in both state and trait anxiety after 6 weeks. There is strong evidence that stress reduction is essential the successful outcome of CABG. Most of CABG patients have an average stay of 5-7 days in hospital. [4]

Any form of relaxation therapy post-operatively reduces post-operative pain and suffering, and lower hospital stay and costs. Adding yoga to cardiac rehabilitation has shown to be beneficial in cardiac rehabilitation in CAD.

According to American Heart Association, Yoga has proven benefits for those who have faced cardiac arrests or other heart event. 'The acute emotional stress of such an event certainly has a significant and adverse effect on heart. That's where yoga can be a tremendous benefit to manage the stress.' Half of bypass surgery patients go through depression and anxiety facing emotions. These things come into play when you have got a potentially chronic disease to manage rest of your life.

Since yoga aims at perfection of the body and mind, it is natural whether the progress towards perfection is reflected in objective reproducible changes in physiological variables. In general, yogic

practices have been proposed to reduce heart rate and blood pressure .Yogic asanas and pranayama have been shown to reduce the resting respiratory rate and increase vital capacity, timed vital capacity, maximum voluntary ventilation, breath holding time and maximal inspiratory and expiratory pressures. A study has observed a preponderance of alpha waves in the EEG of yogis, indicating a more relaxed state of mind. Pranayama, the formal practice of controlling the breath, lies at the heart of yoga. Practice of pranayama has been known to modulate cardiac autonomic status with an improvement in cardio-respiratory functions. 'Nadi-shodhana Pranayama' rapidly alters cardiopulmonary responses and improves simple problem solving. [3] Hence the need.

The aim of the study was to evaluate the effects of nadi -shodhana pranayama along with conventional therapy on post CABG patients on anxiety and stress.

The objectives of the study were to find the effects of nadi -shodhana pranayama along with conventional therapy in post CABG patients on DASS-21 and to find the effects of nadi-shodhana pranayama along with conventional therapy in post CABG patients on Peak expiratory flow rate.

## **MATERIALS AND METHOD**

The study was ethically approved from the ethical committee of the institute. The study was experimental and was carried out in Cardiovascular and Thoracic Surgery Intensive Care Unit of Dr. D Y Patil Hospital and Research Centre, Pune. The sample size was 30 and type of sampling was Purposive sampling. Age group 55-75 years, post CABG patients, both gender – males and females, score on DASS-21 scale  $\geq 8-9$ , and patients not on ventilator was the inclusion criteria whereas individuals with any post CABG complications like hemorrhage, acute renal failure, dysrhythmia, cerebrovascular accident etc., patients on Intra-aortic balloon pump, and patients who were unwilling to participate was the exclusion criteria.

The materials used were Incentive Spirometer -Volume type, Depression, anxiety and stress scale-21 (DASS-21), Peak expiratory flow meter, and Consent form. The study duration was for 6 months. Signed consent form was taken prior to conducting the study. Depression, anxiety and stress scale score was recorded. Peak expiratory flow rate was measured by using a pocket peak expiratory flow meter. Vitals were recorded. Conventional exercises were given like, breathing exercises, active range of motion performed five times, thrice daily. Individuals were given Chest physiotherapy which included percussion, vibration. For nadi- shodhana pranayama, individuals were asked to be in Sukhasana (the comfortable posture) and regulate the alteration of breathing. Participant opened the right hand and bent index and middle fingers against the palm. The thumb was used for closing the right nostril while the fourth and fifth fingers will used for the left nostril. The individual then placed the right thumb against the ala at the end of the nostril to close it and similarly pressed the fourth and fifth fingertips against the left nostril. The exercise was started in the 'Sukhasana posture', with relaxed attitude and concentration. Subject exhaled slowly and deeply without closing the nostrils but being ready to do so. Then the participant inhaled slowly and quietly through the left nostril while closing the right. At the end of the inhalation, subject closed both nostrils and held the breath for a while (not more than 1-2 seconds), then kept the left nostril closed and exhaled through the right as quietly as possible. After exhaling completely, participant inhaled slowly and quietly through the right nostril. The participant then closed both nostrils and waited for a while, then opened the left nostril and exhaled slowly and silently. The participant inhaled through the same nostril and continued this for 5 minutes. Then post treatment Peak expiratory flow rate and vitals were measured. Post DASS 21 Score was noted.

## STATISTICAL ANALYSIS:

The data was analyzed using "Instat Graphpad" statistical package software.

30 participants with score of >10 on DASS-21 scale were included in the study where 0 dropouts were observed during the study.

The data was entered into excel spreadsheet, tabulated and subjected to statistical analysis.

Statistical measures such as Mean, Standard deviation (SD), Test of significance such as Paired t- test was used to analyze the data. p value of <0.05 was considered as significant.

## RESULTS

Table 1: Gender distribution

Gender	Distribution
Male	14
Female	16

Table 2: DASS - 21 score:

DASS-21 score	Mean $\pm$ SD	t value	p value
Pre	17.65 $\pm$ 7.1	9.58	<0.01
Post	11.35 $\pm$ 5.3		

Table 3: Peak Expiratory Flow Rate:

Peak expiratory flow rate (PEFR)	Mean $\pm$ SD	t value	p value
Pre	69.5 $\pm$ 10.50	9.77	<0.01
Post	111 $\pm$ 24.6		

## DISCUSSION

The study was conducted to find out the immediate effects of nadi-shodhana pranayama on Depression, Stress, Anxiety and Peak expiratory flow rate in post CABG Patients. The Stress of coronary artery bypass surgery starts from the moment surgery is planned. Heart surgery poses not only the stress to the individual who has to undergo (CABG) but also to his/ her close relatives and well wishers. Anxiety and fear prevails in every thought. Usually every one is very well informed about the surgery being beneficial and pain experienced would be insignificant. It is well known that stress, anger hostility, anxiety and depression are the components of the personality of patients suffering with Coronary Artery Disease (CAD). Presences of these factors also affect the outcome of CABG, psychological distress and uncertainty about future is more disturbing

than the chest pain. Preoperative anxiety is a predictor of poor recovery from cardiac surgery. There is a growing body of empiric evidence that mind-body interventions resulting in personality modification and lifestyle change effectively reduce anxiety and hostile nature. [1]

This study showed significant improvement, that is reduction in Depression, stress and anxiety.

Table 1 showed that 30 individuals who fulfilled the inclusion criteria were selected among which 14 were males and 6 were females. The Depression, Stress, Anxiety was measured by DASS-21 scale, the score was recorded which was more than 20 for every individual which was reduced post treatment to more than 10.

From table2, the improvement in mean value was 17.65 to 11.35 ( $p < 0.01$ ) which is statistically significant. Over the one week period participants were asked to perform the Nadi shodhana pranayama exercises for 5 minutes with each set of movements performed three times a day for 5 days. Study supporting this was conducted by Usha Kiran et al (2011), where a very significant and positive effect was seen on stress and anxiety. Meditation invokes a state of autonomic nervous system that is correlated with a reduction in stress reactivity. There is strong evidence that stress reduction is essential for the successful outcome of CABG. Most of the mind body interventions are focused at reducing the anger episodes in cardiac patients. It also reported a 50% reduction in incidence of post Percutaneous transluminal coronary angioplasty (PTCA) cardiac events associated with decrease in anger and depression in CABG in emergency situation. Preoperative tachyarrhythmias were also significantly reduced. A very significant and positive effect has been shown on anxiety and fear relief before CABG. Meditation can counter act the flight-or-fight response that floods the body due to stress hormones cortisol and also shut-down the parasympathetic system, which normally restores after the alter is

over. [4] Mechanisms contributing to a state of calm alertness include increased parasympathetic drive, calming of stress response systems, neuroendocrine release of hormones, and thalamic generators. [5]

C.C. Streeter et al (2012) reported that it is hypothesized that stress induces imbalance of the autonomic nervous system with decreased and increased sympathetic nervous system activity. It is further hypothesized that yoga-based practices correct under activity of the PNS system in part through stimulation of the vagus nerves, the main peripheral pathway of the PNS reduce allostatic load. Depression and stress amplify medical conditions that are exacerbated by stress, have low heart rate and low activity, respond to pharmacologic agents that increase activity of the GABA system, and show symptom improvement in response to yoga-based interventions. The decreased PNS activity that underlies stress can be corrected by yoga practices resulting in amelioration of disease symptoms. This has far-reaching implications for the integration of yoga-based practices in the treatment of a broad array of disorders exacerbated by stress. [6]

Since yoga aims at perfection of the body and mind, it is natural to ask whether the progress towards perfection is reflected in objective reproducible changes in physiological variables. In general, yogic practices have been proposed to reduce heart rate and blood pressure. Yogic asanas and pranayama have been shown to reduce the resting respiratory rate and increase vital capacity, timed vital capacity, maximum voluntary ventilation, breath holding time and maximal inspiratory and expiratory pressures. Shirley Telles et al (2005) reported that, during meditation, there was a significant reduction in heart rate and Increased PEFr which signifies opening of smaller airways which are normally quiescent during normal breath. In our study, in table 3 and graph 3 we observed a significant increase in PEFr from basal to one week treatment that is the improvement in the mean values which was noted 69.5 to

111 with a difference of 41.5 ( $p < 0.001$ ) which is statistically significant. This may be due to increase utilisation of physiological dead space. Subbalakshmi et al observed a similar effect of significant increase in PEFr following practice of nadi-shodhan pranayama. [3] Slow and deep breathing itself has a calming effect on the mind and helps an individual to de-stress. This study investigated the immediate effect of a type of slow pranayama called as 'Nadishodhana' on resting heart rate, blood pressure, peak expiratory flow rate, and simple problem solving ability in young healthy subjects where a significant improvement in peak expiratory flow rate was observed. It is an effort independent flow and is mainly dependent on lung volume. The 'Nadishodhana Pranayama' involves using of lung spaces, not used up in normal shallow breathing. Therefore, the increased peak expiratory flow rate might be a consequence of small airway opening in lungs. The positive results found in the present study might apply to work places to improve work efficiency and to educational institutes to improve learning ability. A few minutes practice daily may help in setting the mind better on works and studies. The daily practice could also be parts of physical fitness and life style modification programs in maintaining better physical and mental health. Although the present study suggests some applications, further studies with larger number of subjects from different lifestyles need to establish the beneficial effects of pranayama practice. The positive results found in the present study might apply to work places to improve work efficiency and to educational institutes to improve learning ability. A study by Subhalaxmi et al (2004) also supported that the 'Nadi-shodhana Pranayama' rapidly

alters cardiopulmonary responses and improves simple problem solving. [3]

## CONCLUSION

The study concludes that Nadi- shodhana pranayama along with conventional physiotherapy is effective in improving lung function and reducing depression, stress and anxiety issues in population undergone CABG.

The study was carried out in a small sample size. In future, study can be done using different parameters and in a different population.

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