Benefit of Pranayama for Improvement of Pulmonary Function Tests (PFT) in Post Coronary Artery Bypass Grafting (CABG) Surgery Patients

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ABSTRACT

BACKGROUND

Incidence of Coronary Artery Disease (CAD) is increasing day by day. Cardiac rehabilitation is an important aspect of management of Coronary Artery Disease. Anuloma Viloma Pranayama is beneficial to cardiac patients as it increases parasympathetic activity and lowers blood pressure and respiratory rate. This study was designed to assess the benefit of Anuloma Viloma Pranayama as rehabilitation therapy in post Coronary Artery Bypass Grafting (CABG) surgery patients. Parameters of pulmonary function test (PFT) were measured before and after 3 months of performing CABG.

METHODS

The study was carried out in the Department of Cardiothoracic and Vascular Surgery, CARE Hospital, Visakhapatnam, Andhra Pradesh, in collaboration with Department of Psychology and Parapsychology and yoga village of Andhra University. CAD patients admitted to the hospital for CABG procedure were included in the study. Thirty patients were selected for performing pranayama (cases) and 30 patients were taken as controls. The study was approved by the institutional ethics committee of Care Hospital, Visakhapatnam, Andhra Pradesh. Patients who were admitted for CABG were advised to practice pranayama for 3 months along with normal rehabilitative steps from 3rd postoperative day. Pulmonary function test was measured by spirometry. Parameters like Forced Expiratory Volume in 1 second (FEV1), Forced Vital Capacity (FVC), FEV1 : FVC ratio, Peak Expiratory Flow Rate (PEFR) and Maximum Voluntary Ventilation (MVV) were measured. A comparison of pulmonary parameters was done between groups and statistically analysed using SPSS 20 software. P Valve < 0.05 was considered as significant.

RESULTS

Results of the study were analysed and compared between cases and controls. All the parameters of PFT improved significantly in pranayama group 3 months after CABG when compared with their preoperative values. There was also statistically significant improvement of all PFT parameters when compared between pranayama group (cases) and the control group.

CONCLUSIONS

Anuloma Viloma Pranayama is beneficial to postoperative CABG patients. It helps in reducing air way inflammation, air way collapse, and increases chest expansion, air way oxygenation along with improvement of pulmonary function tests.

KEYWORDS

Anuloma Viloma Pranayama, PFT, CABG

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BACKGROUND

Incidence of Coronary Artery Disease (CAD) is increasing day by day. Stress plays an important role. Hence patients who develop CAD need a mind body intervention to have a healthy life.

Cardiac rehabilitation is an important aspect of management of coronary artery disease patients.[1] All patients who have undergone CABG, valve replacement, percutaneous coronary intervention, treatment of myocardial infarction, pacemaker implantation should be enrolled into some form of cardiac rehabilitation programme. Though exercise is the nodal point of all rehabilitation programme, yoga and relaxation therapy is emerging as an effective tool. This is also known as body-mind therapy.[2]

Many works have been done on normal individuals,[3,4,5] athletes,[6] yogis,[6] hypertension,[7] diabetes[8] and coronary artery disease[9] with short exercise, yoga and pranayama with improvement of pulmonary function test.

Anuloma Viloma Pranayama gives benefit to cardiac patients by increasing parasympathetic activity and lowering blood pressure and respiratory rate.[7,10] Study also shows pranayama increases the pulmonary function by reducing inflammation in air way, atelectasis and by increasing oxygenation after 3 months.[11,12,13]

This study is specially designed to assess the benefit of Anuloma Viloma Pranayama as rehabilitation therapy in post CABG surgery patients.

The parameters of pulmonary function test were measured before and after 3 months of performing CABG.

METHODS

The study was carried out in the Department of Cardiothoracic and Vascular Surgery, CARE Hospital Visakhapatnam, Andhra Pradesh in collaboration with Department of Psychology and Parapsychology and Yoga Village of Andhra University. The period of study was from 2011 till 2014.

CAD patients admitted to hospital for CABG procedure were taken into study. The study design was case control study with intention to treat. Thirty patients were selected for performing pranayama (cases) and 30 patients were taken as controls. Patients having knowledge about yoga and pranayama and willing to do pranayama after surgery were preferentially taken into case group. Patients were selected from Visakhapatnam, Vizianagaram, Srikakulam district of Andhra Pradesh and Ganjam districts of Odisha.

All the ethical issues were taken into consideration. Each illegible candidate was fully explained about the benefits and non-harmfulness of pranayama. Informed consent was taken from all cases after properly explaining in their own language. The study is approved by the Institutional Ethics Committee of Care Hospital, Visakhapatnam, Andhra Pradesh.

Study Procedure

Patients who were admitted for CABG in Department of Cardiothoracic Surgery Care hospital were asked about their willingness for participation in the study. So patients got selected as case those who were willing to practice pranayama post operatively. A yoga teacher from Yoga Village of Andhra University was teaching the Anuloma Viloma Pranayama to patients. They were advised to practice pranayama for 3 months along with normal rehabilitative steps from 3rd postoperative day.

Anuloma Viloma Pranayama: This is most commonly performed pranayama. This is also known as Nadi Sodhana Pranayama. This is practiced by alternate nostril breathing. All patients were instructed to practice pranayama as soon as they feel better from third post-operative day onwards.

Control group were not advised to practice pranayama but they were going through the normal rehabilitative steps which include daily walking, diet modification and drug therapy.

Preoperatively all the patient's data were collected by the Dusk data collection form and entered into the master database. In addition to general data, pulmonary function test parameters were noted for both cases and controls.

At the end of three months all patients were followed up and in addition to vital data, PFT was measured. Every month patients were followed up in clinic or telephonically to assure they are performing pranayama and about their health status.

Pulmonary function test was measured by spirometry taking adequate precautions. Parameters like FEV1, FVC, FEV1 : FVC ratio, PEFR and MVV were measured. These tests measure lung volume, capacity, rates of flow and gas exchange.

Inclusion Criteria

Age 30 - 60 years, both sex, elective CABG, no other co morbidity and willingness to practice pranayama.

Exclusion Criteria

Emergency CABG, double procedures like CABG + MVR or CABG + AVR, asthma, chronic obstructive pulmonary disease (COPD), habit of recent smoking (within last one year), difficult to have close follow up and difficult to make understand pranayama.

Statistical Analysis

A comparison of pulmonary parameters were done between groups and statistically analysed using SPSS 20 software. Student t-test and x^2 test were used as measure of significance and p Value < 0.05 was considered as significant.

RESULTS

Parameters	Cases (N = 30)	Controls (N = 30)
Mean Age	51.4 ± 8.6	54.43 ± 5.32
Male : Female	29 : 1	25 : 5
Veg : Non Veg	17 : 13	18 : 12
Smoking☐	15	15
Diabetes Mellitus	15	13
Hypertension	22	25
Myocardial Infarction	19	15
Education Status	Educated	Educated

Table 1. Demographic and Clinical Data of Cases and Controls

☐ No history of recent smoking within one year.

Table I shows the unpaired t-test of mean age with (t-value = 1.64 and p-value = 0.20). Male to female ratio shows x^2 of 2.96 and p value of 0.08. Vegetarian to non-vegetarian shows x^2 of 0.06 and p value of 0.79. The demographic and clinical data of cases and controls were matched with no significant differences.

PFT	Before CABG		After 3 Months of CABG with Pranayama		t Value	P Value
	Mean ± SD	95 % CI	Mean ± SD	95 % CI		
FEV1	1.79 ± 0.73	1.53 - 2.05	2.46 ± 0.55	2.26 - 2.66	4.1	0.000
FVC	1.87 ± 0.87	1.56 - 2.18	2.61 ± 0.53	2.42 - 2.80	3.9	0.000
FEV1:FVC	88.83 ± 6.94	86.3 - 91.3	92.97 ± 6.42	90.7 - 95.3	2.4	0.02
PEFR	4.8 ± 3.06	3.71 - 5.89	9.0 ± 1.83	8.35 - 9.65	6.1	0.000
MVV	40.72 ± 21.26	32.8 - 48.7	98.03 ± 26.29	88.6 - 107.0	9.2	0.000

Table 2. Pulmonary Function Test Results of Cases before and after CABG with Pranayama

Table 2 shows findings of pulmonary function test before and after CABG in cases those who practiced pranayama. FEV1, FVC, FEV1 : FVC ratio, PEFR and MVV parameters are increased in pranayama group which is statistically significant.

PFT	Before CABG		After 3 Months of CABG without Pranayama		t Value	P Value
	Mean ± SD	95 % CI	Mean ± SD	95 % CI		
FEV1	1.65 ± 0.44	1.49 - 1.81	1.65 ± 0.43	1.5 - 1.8	0.25	0.804
FVC	1.72 ± 0.57	1.52 - 1.92	1.72 ± 0.50	1.54 - 1.90	0.04	0.967
FEV1:FVC	81.03 ± 11.80	76.8 - 85.3	86.25 ± 7.45	83.6 - 88.9	1.92	0.064
PEFR	5.14 ± 1.60	4.57 - 5.71	5.32 ± 1.99	4.61 - 6.03	0.42	0.677
MVV	53.08 ± 19.09	46.3 - 59.9	63.57 ± 23.63	55.1 - 72.0	2.01	0.05

Table 3. Pulmonary Function Test of Controls before and after CABG without Pranayama

Table 3 compares pulmonary function test of control group before and after CABG. These patient did not practice pranayama. MVV improved from 53.08 ± 19.09 to 63.57 ± 23.63 L (p = 0.05) which is statistically significant. None of the other parameters were statistically significant.

Table 4 shows very important finding of comparing pulmonary function tests of cases and controls after 3 months of CABG. All the parameters of PFT were increased significantly in cases those who practiced pranayama after CABG surgery when compared to controls. (p < 0.01).

PFT	Cases after 3 Months of CABG with Pranayama		Controls after 3 Months of CABG without Pranayama		t Value	P Value
	Mean ± SD	95 % CI	Mean ± SD	95 % CI		
FEV1	2.46 ± 0.55	2.26 - 2.66	1.68 ± 0.43	1.53 - 1.83	5.19	0.000
FVC	2.61 ± 0.53	2.42 - 2.80	1.72 ± 0.50	1.54 - 1.90	5.88	0.000
FEV1:FVC	92.97 ± 6.42	90.7 - 95.3	86.25 ± 7.45	83.6 - 88.9	2.51	0.003
PEFR	9.0 ± 1.83	8.35 - 9.65	5.32 ± 1.99	4.61 - 6.03	2.53	0.000
MVV	98.03 ± 26.29	88.6 - 107.0	63.57 ± 23.63	55.1 - 72.0	19.90	0.000

Table 4. Pulmonary Function Test of Cases and Controls after 3 Months of CABG

DISCUSSION

Yoga is a method of controlling body, mind and prana. The science of yoga makes use of voluntary regulation of breathing to make respiration rhythmic and to calm the mind to reach the ultimate goal. The practice of deep breathing is an integral part of pranayama and an art of control breath, also to concentrate on breathing which calms and de-stress the mind. This decreases release of adrenaline that in turn decreases sympathetic activity rate, heart rate and blood pressure and heart rate variability.[2,14]

Pulmonary function test of cases before and after pranayama (Table 2) signifies pranayama has a great role in benefiting patients for respiratory parameters. FEV1, FVC, PEFR and MVV shows statistically significant increase after pranayama.

The regular practice of pranayama is a form of adaptation to a repeated stimulus. Breathing is the only autonomic function that can be consciously controlled and it is the key in bringing where the sympathetic and the parasympathetic nervous system comes into harmony.[15] Breath influences the peripheral nervous system i.e. our voluntary nerves and muscles, which will affect the involuntary system.[16] Ajit Pal Singh et al (2013), Yadava. Et al (2009), Upadhyaya RD et al (2008) and Chrnavirut R et al (2006) found significant increase in PFT parameters after pranayama.[17,18,19,4] Regular inspiration and expiration for prolonged period leads the lung to inflate and deflate maximally and strengthens respiratory muscles.[20]

None of the parameters in control group (Table 3) changed after 3 months of CABG except MVV which is increased with p value of 0.05. This could be a benefit of CABG which might have stabilized the cardiorespiratory system to some extent.

The more interesting finding revealed in Table 4 which shows PFT parameters 3 months after CABG in cases (with pranayama) and controls (without pranayama). All the parameters shows statistically significant increase in cases when compared to controls.

Sunita G et al (2013) studied the effect of deep breathing on respiratory parameters in healthy young individuals. The study concluded with greater benefit of reducing respiratory rate, increase in chest expansion and increase in breath holding time.[5]

The role of deep breathing on release of surfactants and consequent change in pulmonary compliance and other lung functions has been extensively studied in many different animals.[21,22,23]

A study done by Shivesh Prakash etal[19] showed better lung function in yogis and athletes in comparison to sedentary individuals. G.K. Pal et al has shown slow breathing over a period of 3 months improved autonomic nervous function while fast breathing did not have any effect.[20] Slow pranayama breathing shows a strong tendency of improving or balancing the autonomic nervous system through enhanced activation of parasympathetic nervous system.

CONCLUSIONS

Anuloma Viloma Pranayama is beneficial to postoperative CABG patients. It should be a part of postoperative cardiac rehabilitation. It helps in reducing air way inflammation, air way collapse, and increases chest expansion, and air way oxygenation along with improvement of pulmonary function tests. By practicing for a prolonged period of time and in larger patient population more and more benefits can be established.

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