

# The Effect of Combination of Flutter and Breathing Exercise on Post Operative Pulmonary Complications in Off Pump CABG Patients: Randomized Control Trial

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**Abstract:** Background: There is high incidence of post-operative pulmonary complications in patients undergoing CABG. Flutter device proved to lower the incidence of postoperative pulmonary complications. Therefore, the study aimed to investigate effectiveness of flutter device and breathing exercises on prevention of postoperative complications in Off pump CABG patients. Methodology: 30 patients underwent Off pump CABG for the first time were included in the study and they were allocated into the experimental and control group. The patients in experimental group received flutter device twice a day for 10 minutes along with breathing exercises which included diaphragmatic and segmental breathing for 10 minutes, 3 sets per day for 3 days after the CABG and patients in controlled group received the breathing exercises. Outcome measures were PFT (FEV1, FVC, FEV1/FVC, PEF), Vitals (HR, RR, BP, SPO2) and Chest X-ray, which was assessed preoperatively and 3 days after postoperative treatment. Result: When within the group comparison was done both the group showed significant improvement in FEV1, FVC, FEV1/FVC and vitals but between the group comparison showed no significant difference in FEV1, FVC, FEV1/FVC, PEF and vitals values. The post-operative Chest X-ray revealed that 13.3% patients had prevention of post-operative complications. Conclusion: The study concluded that the patients who underwent physiotherapy treatment showed 13.33% of prevention of post-operative pulmonary complications in coronary artery bypass graft patients.

**Keywords:** Flutter, Breathing exercise, Off pump CABG, PFT

## 1.Introduction

Off pump coronary bypass or beating heart surgery is form of cardiopulmonary bypass graft surgery performed without heart lung machine. During most bypass surgeries heart is stopped and heart lung machine takes over the work of heart and lungs. The heart is still beating while the graft attachments are made to bypass a block in off pump CABG. Off pump CABG has high mortality and morbidity rates with less hospital stay of the patients and also prove to be cost effective<sup>1</sup>. There is high incidence of post operative pulmonary complication in patients undergoing CABG<sup>2</sup>. The basic mechanism of post operative pulmonary complication is lack of lung inflation that occurs because of change in breathing patterns, prolonged recumbent positioning and diaphragmatic dysfunction, mucociliary clearance is also impaired post operatively which results in decrease in cough effectiveness and increase risk of retend secretions. There are various studies done on prevention on post operative pulmonary complications. These studies included use of various devices such as positive expiratory pressure, Inspiratory muscle training, incentive spirometry, oral high frequency oscillation device are in combination with various cardio pulmonary breathing exercises which proved to lower the incidence of postoperative pulmonary complications<sup>1, 3</sup>. These are the majorly found postoperative pulmonary complications Atelectasis, Respiratory failure, Pneumonia<sup>2</sup>

As there is limited literature available on effect of flutter

device on off pumps CABG. Hence this study aims to investigate Effectiveness of flutter device on prevention of postoperative complications in off pump CABG patients. A Flutter is a device which combines positive expiratory pressure therapy with high frequency oscillations within the airways. It is controlled vibratory system. A flutter therapy is acceptable alternative for breathing exercises.

## 2.Methodology

The study design is randomised controlled trial total of 30 participants (as per the convenience) between the age group of 30 to 50 years were included in the study as per the inclusion and exclusion criteria. The total duration of study was 1 year the primary objective of study was to study the effect of flutter device on prevention of postoperative pulmonary complications in CABG patients.

Study was done in MGM physiotherapy department, Aurangabad. The intervention was given for 3 days twice a day the study was approved by the institutional ethics committee and the participants were briefed about the assessment and treatment protocol and the written informed consent form was obtained from all the participants. The duration of study was one year after the ethical approval of the study. The participants were allocated into two groups based on convenient sampling, the two groups were Group A: Flutter and breathing exercises. Group B: Breathing exercises. The following outcome measures were pulmonary function test, chest X

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ray which was assessed in each patient who underwent CABG surgery from post operative day 1 to day3. The inclusion criterion was Patients age ranged from 40-80 years. Secondary complications (Hypertension, Diabetes mellitus, Asthma, Pulmonary Hypertension, Who underwent OFF PUMP CABG for first time The participants with Malignant disease, Stroke, Acute inflammatory sepsis, Emergency surgeries (Unplanned cardiac surgeries).

**Procedure:**

**Flutter Device**

**Patient Preparation**

Verbal explanation about the importance of this modality and about the programme will be explained to the patient.

Patient will be instructed what is the use of flutter device.

Patient will be given a comfortable position.

**Application Phase:**

- Position the patient so that they are sitting upright with back straight and slightly extended head upward with relaxed breathing controlled technique Have the patient inhaled 2 to 3 times greater than the normal breathe and breathe hold for 2-3 seconds. Place the flutter device mouthpiece in the mouth and have the patient exhale at twice the flow of normal exhalation. Continue the exhalation until lungs reach to functional residual capacity. During exhalation through the flutter device advice the patient to adjust the horizontal tilt of the flutter to the angle and best give sensation of the vibration within the lungs. Following multiple loosening breaths instruct the patients to take very deep breathe, hold it for 2-3 seconds and then forcefully exhale through the device until lungs reach functional residual capacity. After 1 or 2 high volume high expiratory flow

mucus clearance breaths, have the patient do the huff or other effective expiratory maneuver.<sup>6</sup> Frequency: 2 Times/day Duration: 10 minutes.

**Diaphragmatic Breathing Exercise:**

**Patient Preparation:**

Patient should be well oriented, comfortable with loose clothing and proper pillow positioning in a well ventilated room.

Patient position-: patient is positioned in half lying.

Therapist position: bedside near the patient.

**Application Phase:**

- The hand should be placed on the rectus abdominals below the anterior costal margin. Ask the patient to breathe in slowly and deeply through the nose so that the abdomen bulges out and contracts and when the patient expires from the mouth the abdomen falls. Have the patient practice 10 times every session of 3 sets.

**Segmental Breathing Exercise:**

**Lateral Basal Expansion:**

Patient will be positioned in supine lying and later progress to sitting position.

**Application Phase:**

- It was given by placing both hands on lateral aspect of chest wall. During inspiration downward and inward stretch to the chest was given while the muscle moves in the upward and outward direction. During expiration the firm downward pressure was given while ribcage is moved downward and inwards

**3.Results**

**Table 1: Distribution of Patient According to their Age**

Age Group	Group A		Group B		Total	
	N	%	N	%	N=30	%
40-50	3	20	5	33	8	26.66
51-60	5	33	4	26	9	30
61-70	5	33	4	26	9	30
71-80	2	13	2	13	4	13.33
MEAN±SD	3.75±1.5	24.75±9.945	3.75±1.25	24.5±8.34	7.5±2.38	24.99±7.93

The above table shows patients ageing from 51-70 yrs (30%) in both groups (study and control) are more prone to undergo CABG in our study.

**Table 2: Distribution of Patient According to their Gender**

Gender	Group A		Group B		Total	
	N	%	N	%	N=30	%
Female	2	13	6	40	8	26.66
Male	13	86	9	60	22	73.33
MEAN±SD	7.5±7.77	49.5±51.61	7.5±2.12	50±14.14	15±9.89	49.99±33.00

As revealed from the above table males (73.33%) are more likely to undergo CABG in our study.

**Table 3:** Comparison of PFT Values of Group A

PFT Values	Pre	Post	P value	Significance
	Mean $\pm$ SD	Mean $\pm$ SD		
FEV1	1.36 $\pm$ 0.47	0.96 $\pm$ 0.63	0.04	S
FVC	2 $\pm$ 0.86	1.37 $\pm$ 0.79	0.006	S
PEF	2.23 $\pm$ 0.77	1.50 $\pm$ 0.50	0.001	S
FEV1/FVC	67.69 $\pm$ 25.14	61.4 $\pm$ 17.6	0.003	S

**Table 4:** Comparison of PFT Values of Group B

PFT Values	Pre	Post	P value	Significance
	Mean $\pm$ SD	Mean $\pm$ SD		
FEV1	1.68 $\pm$ 0.66	1.46 $\pm$ 0.79	0.44	NS
FVC	2.42 $\pm$ 0.65	1.88 $\pm$ 0.85	0.12	NS
PEF	2.63 $\pm$ 1.2	2.49 $\pm$ 1.29	0.78	NS
FEV1/FVC	67.42 $\pm$ 18.56	70.63 $\pm$ 21.73	0.65	NS

**Table 5:** Comparison of PFT Values of Group A & B Post Treatment

PFT Values	Group A	Group B	P value	Significance
	Mean $\pm$ SD	Mean $\pm$ SD		
FEV1	0.96 $\pm$ 0.63	1.46 $\pm$ 0.79	0.04	S
FVC	1.37 $\pm$ 0.79	1.88 $\pm$ 0.85	0.03	S
PEF	1.50 $\pm$ 0.50	2.49 $\pm$ 1.29	0.01	S
FEV1/FVC	61.4 $\pm$ 17.6	70.63 $\pm$ 21.73	0.26	NS

#### 4. Discussion

This study evaluates the effect of flutter and breathing exercises to prevent the post operative pulmonary complications in off CABG patients. According to statically results our study revealed that patients ageing between (51-70) yrs are more likely to undergo coronary artery bypass graft. Previous studies proved that age is a non-modifiable risk factor for cardiovascular diseases and also specified that co-morbid conditions<sup>10</sup> increase with age which are directly proportional to cardiovascular risk factor<sup>14</sup> Our study concluded male dominance of 73.33% and female of 26.66% who underwent CABG procedure. With reference to previous studies which confirm that male showed more dominance in developing cardiovascular disease over females<sup>17</sup>. Males have higher blood pressure than women through much of life regardless of race and ethnicity. Sex difference in biology arised from difference in sex chromosome it is transcription factor SRY. This review focuses on direct relationship of testosterone and increase blood pressure. Males are more vulnerable for substance abuse, alcohol as compared to females as proved by studies. Stress is also other contributory factor for higher prevalence of cardiovascular disease in males. BMI is a major contributing risk factor in cardio vascular diseases. Our study justifies that patients BMI ranging from 18.5-29.9 i.e. 72% of the total population which underwent CABG procedure fall into normal and class-I obese. Obesity increases risk factor for mortality, morbidity and cost for following cardiac surgery. Obesity has prevalence throughout the world producing significant risk for cardiovascular diseases. Until recently the relationship between obesity and coronary heart disease is direct including hypertension, dyslipidimia, impaired glucose tolerance associated with co-morbidities relating obesity and cardiovascular diseases<sup>12</sup>. Some studies found that obese patients have increase incidence of mortality and morbidity conversely other studies have concluded that

obesity doesn't adversely affect mortality and morbidity of patients after CABG and some found inverse relationship between obesity and adverse outcomes referred to as obesity paradox<sup>13</sup>. Among all the patients in our study some had history of co-morbidities of which 66.6% had hypertension, 16.66% had hypertension and diabetes mellitus. In reference to the studies we have evidence that hypertension and diabetes mellitus are independent risk factor for cardiovascular diseases<sup>16</sup>.

According to data analysis in our study we have evidence that outcome measures i.e. vitals (HR, RR, BP, SPO2) showed that there was significant change found in post operative of HR in both study and control group. And there is significant increase in both study (Flutter and Breathing exercise) and control group (Breathing exercise).

Also the results confirmed that Pulmonary Function Test (FEV1, FVC, PEF, FEV1/FVC) showed there was significant change in post operative FEV1 in both study and control groups. Patients who have undergone CABG are more prone to pulmonary complications and have higher incidence which is associated with impaired oxygenation and inconsistencies with gas exchange, as investigations has shown because of close relation between heart and pulmonary system any change in pulmonary system may affect the cardiac functions<sup>21</sup>. In relevance with other studies which infer that there is reduced FVC, FEV1 in CABG patients<sup>11</sup>.

Our study design compared the post operative pulmonary complications with X-RAY shooted on 3<sup>rd</sup> post operative day. All patients who underwent CABG surgery 30% were diagnosed with pre operative pulmonary complications which include collapse, atelectasis, pleural effusion and pneumonia. As patients were given flutter and breathing exercises according to distribution criteria for consecutive 3 days, 56.6% patients still showed post operative

pulmonary complications, it was found that patients who were in study group showed no significant change in prevention of post operative pulmonary complications as observed from X-RAY reports whereas control group who were treated with breathing exercises proved to prevent post operative pulmonary complications by 13.3% as compared to study group.

## 5. Limitations

This study was done with narrow spectrum of sample size. The treatment was given twice a day for consecutive three days.

## 6. Conclusion

This study shows that the patients who underwent physiotherapy treatment (flutter and breathing exercises) according to our study design showed 13.33% of prevention of post operative pulmonary complications in coronary artery bypasses graft patients.

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