

# Affirmative Outcome after Modified Cardiopulmonary Rehabilitation in Postpump Syndrome with Reduced Ejection Fraction following Coronary Artery Bypass Graft

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## ABSTRACT

In Coronary Artery Bypass Graft (CABG) patients' Postoperative Pulmonary Complications (PPCs) like atelectasis, pleural effusion, pneumonia, pulmonary oedema, and pneumothorax are the leading cause of morbidity. Secondary prevention and Cardiac Rehabilitation (CR) are essential aspects of the post revascularisation care approach. Here, authors presents a case of 56-year-old male, diagnosed with triple vessel disease with reduced ejection fraction, underwent CABG surgery and developed Postpump Syndrome (PPS). There was pleural effusion secondary to the cardiopulmonary bypass machine. Postoperatively, the patient complained of pain at the incision site, cough, and difficulty in breathing. He underwent two weeks of a precise, planned early phase I CR protocol with regular vital monitoring. Post rehabilitation, the two-Minute Walk Test (MWT) and Borg's scale showed improvement in the walking distance sequentially from 7<sup>th</sup>, 11<sup>th</sup>, and 14<sup>th</sup> day postoperatively. There was a decrease in the perception of difficulty in breathing. He showed a tremendous level of recovery in vitals, functional capacity, pain, and quality of life seen postrehabilitation. It can be concluded that exercise-based CR is an important adjunct therapy for secondary complications in post CABG patients.

**Keywords:** Borg's scale, Cardiac rehabilitation, Coronary artery disease, Pleural effusion

## CASE REPORT

A 56-year-old male patient was referred to a Cardiorespiratory physiotherapist in Cardiovascular and Thoracic Surgery (CVTS) Intensive Care Unit (ICU) on the first Postoperative Day (POD 1). He had undergone a pump CABG surgery and an Intra-aortic Balloon Pump (IABP) was inserted. Postoperatively, the patient complained of pain at the incision site, cough, and troubled breathing. The pain was dull aching, diffuse, intermittent, and located in the midline (centrally) of the chest with a Numerical Pain Rating Scale (NPRS) score of 4/10 during rest, and 7/10 during activity [1]. The cough was intermittent and dry. There was diminished chest wall movement on the left side. There was dullness over the right 5<sup>th</sup> intercostal space on percussion. Tactile vocal fremitus was resonant bilateral. On auscultation, there were bilateral crepitations present in lower zones. Postoperative chest X-ray revealed the patient suffers from PPS and developed pleural effusion secondary to Cardiopulmonary Bypass Machine [Table/Fig-1].

**Physical therapy rehabilitation:** On POD 1 patient education, assessment, and evaluation was done followed by physiotherapy treatment. From POD 1 to 3 the patient was on mechanical ventilator support (pressure support/ continuous positive airway pressure, Fraction of Inspired Oxygen (FIO<sub>2</sub>) was 50%, positive end-expiratory

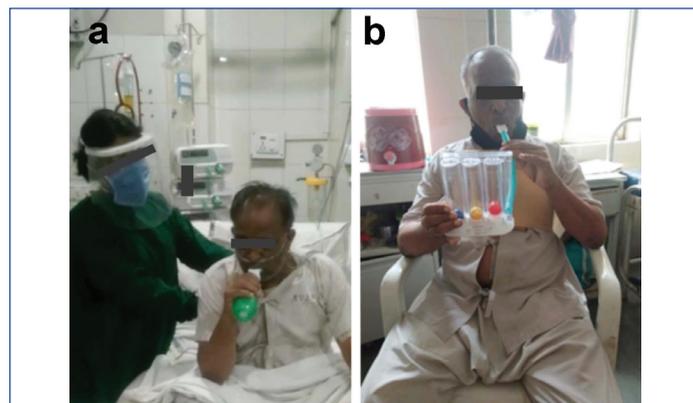
pressure was 5 cm H<sub>2</sub>O) along with IABP in CVTS ICU. For the first three days, nebulisation (levosalbutamol) was done followed by draining of lung segments with appropriate and modified postural drainage positions along with in bed active-assisted Range of Motion (ROM) exercise for both upper and lower limbs.

On POD 4 and 5, the patient was weaned off from the ventilator and IABP and put on oxygen support (10L/min via face mask). In a high sitting position; the use of acapella (green) was taught for active drainage of secretions and incentive spirometer was started [Table/Fig-2a,b]. To alleviate incisional pain chest binder was advised and encouraged for splinted coughing. On POD 6 and 7, active cycle of breathing technique to mobilise secretions from the larger airways, breathing retraining with diaphragmatic breathing exercises were given. Buteyko breathing and pursed lip breathing was incorporated with the existed regimen to provide improvement in a respiratory pattern which increases tidal volume and minute ventilation. Supervised graded ambulation around the bed (20 meters) was initiated.

The patient was shifted to the CVTS ward on POD 8 and was maintained on saturation without oxygen support. Walking distance was increased upto 35 meters on POD 9 along with continuation of



[Table/Fig-1]: Postoperative chest X-ray showing left side pleural effusion.



[Table/Fig-2]: a) Patient using Acapella for active drainage of secretions; b) Patient using incentive spirometer.

previous exercises with increased repetitions and Activity of Daily Living (ADL) training. Graded mobilisation with vitals monitoring continued on POD 11 and 12 along with strengthening exercises for extremities and gait training. The patient was able to walk upto 80 meters without any discomfort on POD 13 and 14 [Table/Fig-3] [2-4].

Outcome measure	POD 7	POD 11	POD 14	Follow-up (after one month)
two Minute Walk Test (MWT) test	42 m	78 m	93 m	-
Borg Rate of Perceived Exertion (RPE)	15	10	6	6
Breath holding test	10 sec	18 sec	25 sec	34 sec
Incentive spirometer	600 cc	>900 cc	1200 cc	1200 cc
General self-efficacy scale	17	22	33	38
Depression (D) Anxiety (A) and Stress (S) scale (DASS 42)	D=20 A=15 S=17	D=17 A=11 S=7	D=13 A=9 S=5	D=5 A=6 S=3

**[Table/Fig-3]:** The values of outcome measures used to evaluate the progress of the patient [2-4].

Before discharge, the patient was given complete instructions for a home exercise programme, energy conservation and pacing strategies, and a patient-tailored exercise training programme. He was followed-up after one month in the CR Outpatient Department.

Postrehabilitation outcome variables such as 2 MWT, showed improvement in the walking distance sequentially from 7<sup>th</sup>, 11<sup>th</sup>, and 14<sup>th</sup> day. There was decrease in the perception of difficulty in breathing, along with improved self-efficacy and psychological well-being. The patient was monitored over a telephonic conversation for appropriate training or assistance and showed improved dyspnoea and fatigue symptoms while performing instrumental activities of daily living.

## DISCUSSION

Cardiac rehabilitation quickens the healing process by preventing or treating postpulmonary problems and bringing the patient back to his pre-morbid condition. The index patient was diagnosed with triple vessel disease with low ejection fraction, for which he underwent CABG. Postsurgery he suffered from PPS and developed pleural effusion secondary to the cardiopulmonary bypass machine. The systemic and local inflammatory reaction leading to PPS caused a delay in the complete recovery and hence, required a modified CR program [5,6]. The early phase I CR protocol was administered with continuous monitoring of patient haemodynamic status with the main focus on reduced ejection fraction.

A Left Ventricular Ejection Fraction (LVEF) of 35% has been linked to lower long-term survival in patients on medical therapy and higher early mortality in CABG patients [7,8]. In this category of high-risk patients, their inclusion in a rehabilitation program is mandatory for better postoperative results [9]. Bjarnason-Wehrens B et al., conducted a systemic review in which they concluded that exercise-based CR was associated with an increase in quality of life and exercise capacity in patients with low ejection fraction [10]. Similarly,

Robu M et al., stated that continued physical training and activity under supervision quickly reintegrates patient back into social-economic life, the idea that exercise could overload cardiac pumps and increase mortality was dropped [11].

In the present case, there was improvement seen in all the outcome measures and perceived level of exertion at the end of the rehabilitation program. The progress was seen in the increasing walking distance motivated the patient to improve his respiratory capacity and stick to the protocol. Therefore, phase 1 CR program that includes supervised graded monitored mobilisation proved beneficial in index patient by reducing skeletal muscle dysfunction secondary to postoperative immobility and apprehension.

## CONCLUSION(S)

The present study concluded that exercise-based CR program is considered an important adjunct therapy for secondary complications in post CABG patients. After rehabilitation, there was a significant improvement in vitals, functional capacity, and quality of life, which can be attributed to the planned intervention in the ICU and ward. The study also emphasises the necessity of encouraging early exercise-based CR in PPS patients with low ejection fraction.

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