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# Positive Outcomes of Comprehensive Exercise Program on Restoration of Functional Level and Quality of Life in a Patient with Rheumatic Heart Disease Undergone Mitral Valve Replacement: A Case Report

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***Authors' contributions***

*This work was carried out in collaboration among all authors. Author LAP carried out the assessment, rehabilitation and follow-up of the patient. Authors MJJ and VDY carried out sequence alignment, and drafted the final manuscript. All authors contributed to the manuscript revision. All authors read and approved the final manuscript.*

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***Case Study***

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## ABSTRACT

Heart disease due to valvular anomaly has increased prevalence along with increasing age. Rheumatic heart disease is a condition in which the heart valves have been permanently damaged post rheumatic fever. The operative management including reparation or substitution with prosthetic valve is the main therapy. Still becoming question mark either rehabilitation program is beneficence for the patient undergoing valvular surgery. We report a patient with severe mitral valve regurgitation, moderate mitral stenosis, moderate tricuspid regurgitation, and severe

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pulmonary artery hypertension secondary to Rheumatic Heart Disease. He underwent Mitral valve replacement surgery and advised post-operative physiotherapy which comprises 2 weeks of phase I cardiac rehabilitation, a home exercise program after discharge, and follow-up after 2 weeks. During follow up patient has a high level of independence, improvement in quality of life, and early return to work.

*Keywords: Mitral valve replacement; rheumatic heart disease; rheumatic mitral stenosis; phase 1 cardiac rehabilitation.*

## 1. INTRODUCTION

Rheumatic heart disease (RHD) affects 33 million people globally and around 3.2 lakh people lost their lives annually. It is still a major cause of cardiovascular death, particularly in countries with limited capital, where RHD is a common cause of high morbidity and mortality [1]. According to World Health Organisation, it results from insult to the heart valves by one or several episodes of rheumatic fever, an autoimmune inflammatory infection in throat due to Group A streptococci [2]. This predominantly, later in life leads to heart valves damage with mitral valve being the most common. The current choice of management following this involves either percutaneous mitral balloon commissurotomy or surgical repair or replacement [3,4].

Because of the evolving disease trend and the anticipated rise in healthcare burden for patient who undergo heart valve surgery, a well-established after-care service is needed to look after the patient's post-surgical issues. Physical and psychological problems, as well as the difficulty in getting to work, are among them. Post-surgical complications like physical, mental or social might delay the recovery process and negatively impact health related quality of life leading to increased risk of mortality and morbidity, readmission and overall increase healthcare cost [5].

In order to promote and implement post-operative rehabilitation in such patients there is an importance of clinical and rehabilitation guidelines. There are rehabilitation guidelines for other cardiac disease. It is still a question mark weather same guidelines and result will be effective in patients with post valvular repair or replacement.

## 2. PATIENT INFORMATION

35 yr old male teacher by occupation came to the local emergency department with a chief complaint of breathlessness, dizziness, loss of consciousness due to which he falls on the floor with similar history twice a month. He underwent emergency treatment and various lab investigations were advised including echocardiography which revealed severe mitral valve regurgitation, moderate mitral stenosis, moderate tricuspid regurgitation, and severe pulmonary artery hypertension secondary to rheumatic heart disease. He was then referred to Acharya Vinoba Bhave rural Hospital Sawangi, Wardha for further management where during his hospital stay there was again an episode of loss of consciousness. The patient then advised surgery for mitral valve replacement. He was admitted to the Cardiovascular and thoracic surgery (CVTS) unit on 12/04/2021 where he was under observation and was operated on 16/04/2021. He was then shifted to CVTS ICU and referred for physiotherapy on a post-operative day 2. The post-operative chief complaint of the patient during physiotherapy assessment and evaluation was pain at the incision site, difficulty in breathing along with, difficulty in resuming activities of daily living (ADL).

## 3. CLINICAL FINDING

On postoperative day-2 (POD-2), he was weaned off from the mechanical ventilator and on 2L $O_2$/min via nasal prongs. The patient was examined in the long sitting position with both shoulders at the same level, hip externally rotated, knees extended and ankles plantar flexed. He was conscious, cooperative, and well oriented to time, date, and place. On inspection, Median sternotomy incision dressing is present on the anterior aspect of the chest. The patient reported pain at the incision site on a visual analog scale of 4/10 at rest 8/10 on activities like upper limb movement and during coughing. On Physical examination vital signs including temperature were normal, pulse rate - 78beats/m, irregularly irregular, blood pressure-110/80 mmHg. On respiratory examination, respiratory rate was 24 breaths/ min with a

regular rhythm,theshape of chest- elliptical, chest expansion was reduced at xiphisternal level, chest excursion- bilaterally symmetrical. On auscultation, air entry was diminished bilaterally in lower zones and occasional crepitations were present.

## 3.1 Timeline

**Table 1. Timeline of the patient from DOA till Follow up**

| | |
|---|---|
| Date of admission: | 12/04/2021 |
| Date of surgery: | 16/04/2021 |
| Date of Physiotherapy Rehabilitation: | 18/04/2021 |
| Date of discharge: | 30/04/2021 |
| Date of follow up: | 12/05/2021 |

## 3.2 Diagnostic Assessment

Pre-operative echocardiography revealed severe mitral valve regurgitation, moderate mitral stenosis, moderate tricuspid regurgitation, and severe pulmonary artery hypertension secondary to rheumatic heart disease. HRCT thorax reveals cardiomegaly with mediastinal Lymphadenopathy.

## 3.3 Chest X-ray

Showing homogenous opacity in bilateral lower lobes, cardiomegaly, prosthetic heart valve in the left lower lung field.

## 3.4 Therapeutic Intervention

### 3.4.1 Physiotherapy management

Physiotherapy was started the next day after surgery. The patient wants to carry out his ADL independently as soon as possible. He wants to carry out activities like bathing, walking, brushing, and dressing on his own without support and with a reduced level of perceived fatigue and pain. Keeping all this in mind therapeutic intervention goals include strategies to decrease dyspnea, increasing lung volume capacity, decrease pain at the incisional site, and improve cardiac function. Before commencing the physiotherapy intervention, the patient was asked to fill the WHO- Quality of life BREF questionnaire.

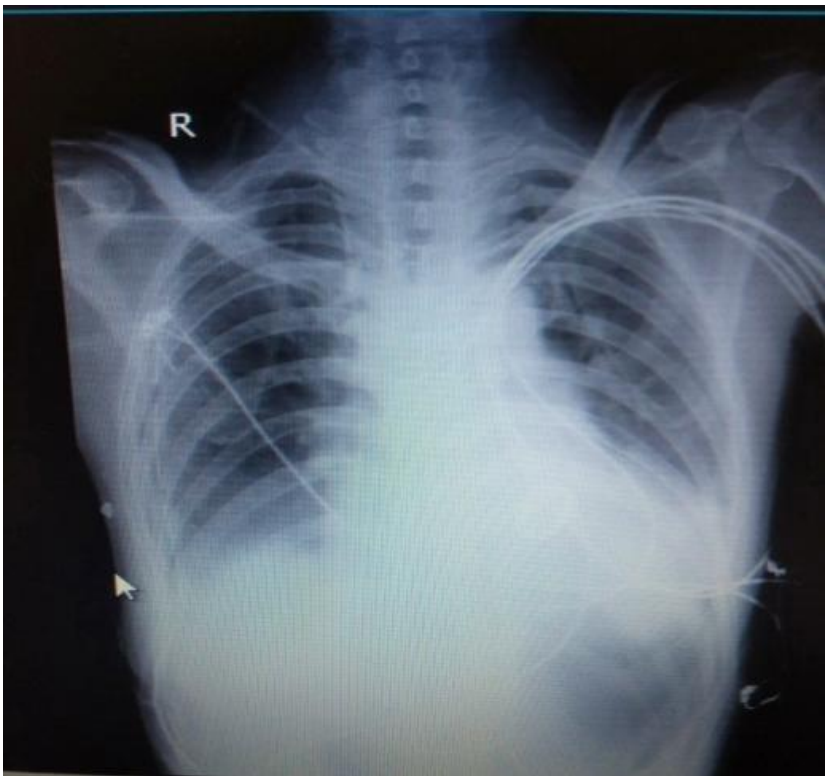


**Fig. 1. Post-operative posterior-anterior view Chest X-ray shows cardiomegaly, sternal sutures, and prosthetic heart valve noted along with patch opacities in left lower lung fields**

**Table 2. Shows blood investigation reports**

| Blood Investigations | Result | Normal range |
|---|---|---|
| C- reactive protein | 10.3mg/L | <6mg/L |
| Creatine Kinase myocardial band (CK-MB) | 25.59IU/L | <24 IU/L |
| Blood Urea | 65.08mg/dl | 10-50 mg/dl |
| Serum creatinine | 1.5mg/dl | 0.7-1.4mg/dl |

Physical therapy intervention was initiated on POD 2 twice a day to ensure that the chest is clear, exercises are performed timely as prescribed and to make the patient comfortable and independent as soon as possible.Therapist educate the patient regarding the appropriate sternal precautions especially during coughing, transferring from supine to side lying position and standing up from chair with more weight on the legs to avoid stress on sternum.

The patient was advised to protect the incision with pillow while coughingto decrease the disruptive forces on the incision. Proper technique of putting sternal vest belt and its importance were taught. To promote airway clearance huffing and coughing techniques were initiated. Diaphragmatic breathing, segmental breathing exercises, Incentive spirometer (900 cc) was started to improve lung volumes and flow rates. The patient was instructed to perform 2 hourly during awake time before lunch or 1 to 1.5 hour after lunch, deep breathing exercises 3 sets, 10 repetitions in each set with 3 seconds of holds has been prescribed.

Inpatient Cardiac rehabilitation with frequency: 2 times a day, intensity: heart rate 20beats per minute from baseline and RPE scale 3- 4, time: 20 to 40 minutes, type: aerobic exercises along with a range of motion exercises for both upper and lower limbs, ankle toe pumps, standing with marching exercises and soon progress to inward walking for 10 minutes with rest pauseswas administered. The home exercise program includes the same protocol provided the patient along with patient was educated and asked to record the pre, post and recovery vitals along with the distance covered and time of walking if increased should be continued within the intensity of RPE- 3-4.Self-monitoring was taught that includes occurrence of any signs and symptoms related to cardiovascular events and the acceptable derangement in vitals as per the guidelines.

## 3.5 Follow Up and Outcome

At the end of 2 weeks of cardiac rehabilitation, the patient was able to perform all activities of daily living and doesn't complain of any pain or breathlessness. Follow up after 2 weeks, he was well motivated and was willing to continue the prescribed protocol.After one month of discharge, the patient came back to rehabilitation OPD with the improvement in symptoms of dyspnea, fatigue while doing the instrumental activity of daily living**.**Patient was very much satisfied with the prescribed protocol. Patient perceived the treatment positively and willing to continue the same under supervision but transportation facility was the issue. The patient was able to do activities of daily living comfortably without fatigue and can able to walk for 10 to 20 minutes with less fatigue, 2 to 3 times/day. The patient developed the self-esteem and positive outlook towards life. He also gradually started resuming his work of teaching.

**Table 3. Shows outcome measures**

| Outcome measures | Pre-treatment | Post-treatment | Follow up (4$^{th}$ week post discharge) |
|---|---|---|---|
| VAS | On rest: 4/10<br>On Activity: 8/10 | On rest: 1/10<br>On Activity: 3/10 | No complaints of pain |
| New York Heart Association Functional Classification grade | Grade IV | Grade II | Grade I |
| WHO-QOL BREF Questionnaire | 70 | 86 | 97 |
| Spiro metric measurement (Inspiration) | 600cc | 1200cc | 1200cc |

## 4. DISCUSSION

Rheumatic heart disease causing symptoms either pre-operatively or post-operatively adversely decline patient's quality of life irrespective of choice of treatment either repair or replacement. The clinical guideline for such patients emphasizing the importance of rehabilitation post valvular operation is still rare [6,7]. The goal of cardiac rehabilitation is to improve an individual's exercise capacity, exercise efficiency, exercise tolerance, self-management, and improve quality of life.In the aspect of rehabilitation, we started phase-1 Cardiac rehabilitation on POD 1 in the hospital and continue till discharge under the supervision and monitoring, eventually transitioning to a home-based program on the day of discharge along with follow up every 2 weeks for 2 months [8]. Further follow up has been maintained telephonically as the patient was unable to come for regular physical follow up. Prescription of exercise on the basis of HR max using karvonen formula to get the best physiological response to achieve cardiopulmonary endurance was a challenge as it requires supervision and monitoring throughout the session. To get the best result 3 to 4 times per week for at least 3 months, supervised exercise session will be required so long term effect of the study could not be assessed.

In this case, our management focused in line with the previous studies which states that cardiac rehabilitation increases exercise capacity and quality of life, and facilitates return to work, with minimal risk of significant adverse effects. Initiation of early physiotherapy post-operatively soon led to improvement in the patient's activities of daily living. Several studies on this aspect are reflected including evaluation of functional capacity post valvular operation also shows positive changes in ejection fraction and decline of New York Heart Association dyspnea grades [9,10]. Our study will pave path for implementation of Cardiac Rehabilitation programs at most hospitals and community centers, as well as awareness about their efficacy among such patients would result in higher participation and improvement of functional parameters and quality of life[11,12].

## 5. CONCLUSION

This case report aims to highlight the significance of prompt diagnosis; treatment and most importantly rehabilitation to get the patient back to his functional state. A tailor made scheduled exercise program including walking with intensity RPE-3-4, 5-6 times a week, minimizes complications after surgery and improve the functional level.Complete instruction for a home exercise program and in energy conservation and pacing techniques was given before discharge that includes, patient-tailored exercise training program and follow up after one month to Cardiac Rehabilitation OPD. There was a tremendous level of recovery in vitals, functional capacity, and quality of life was seen post-rehabilitation which we mainly assume to be because of planned intervention in ICU and the ward in our patient. The study further signifies the importance of encouraging early exercise-based cardiac rehabilitation in the management of such patients.

## CONSENT

A proper informed consent was taken from the patient prior.

## ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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