Case study

Positive outcomes of goal directed Cardiac rehabilitation for a patient with Rheumatic heart disease undergone Mitral valve replacement: A Case study

Abstract

Rheumatic heart disease is one of the principal contributors that have a negative influence on a patient's quality of life and makes it challenging for them to perform their daily activities. The disorder predominantly impairs the function of heart valves, specifically the mitral valve, resulting in stenosis that can be managed by repair or replacement of the valve. The purpose of treatment is to improve the patient's quality of life. As an adjunct to that, cardiac rehabilitation and exercise therapy are used. A patient with mitral stenosis and mitral regurgitation due to rheumatic heart disease is discussed. The patient's mitral valve was replaced after a week of her admission to the hospital. She was given scheduled physiotherapy for aweek of phase I cardiac rehabilitation and was prescribed home exercise after her discharge.

Key Words:

Rheumatic heart disease, Mitral stenosis, Mitral valve replacement, Cardiac Rehabilitation

Introduction:

Rheumatic fever (RF) and Rheumatic heart disease (RHD) remain serious public health concerns in most underdeveloped countries, as well as in affluent economies on occasion(1).A pharyngeal beta-haemolytic streptococcal infection can lead to rheumatic heart disease, which is a systemic immune response. The highest incidence occurs in poor nations. Every year, it affects the lives of 250,000 young people all over the world. Rheumatic heart disease affects about 15 million individuals(2).

After acquiring the illness, the rheumatic process causes inflammation in layers of the heart, with the endocardium being the most impacted. Rheumatic heart disease is caused by the inflammation and thickening of heart valves secondary to rheumatic fever(3).In such cases, the mitral valve is the most frequently engaged heart valve. Valve stenosis is characterized by leaflet thickening, commissural fusion and chordal shortening. Chest pain or discomfort, shortness of breath, irregular heartbeat and early fatigue are all symptoms of heart valve damage linked with rheumatic heart disease.

Calcification of the mitral annulus, rather than the pathology of the valve leaflets and chordae tendineae, can induce mitral stenosis. The calcification of the annulus directly correlates to the calcification of the aorta and aortic valve, which has lately been linked to atherosclerosis rather than rheumatic fever(4). Mitral stenosis is a restriction in blood flow in the left side of heart caused by mechanical obstruction. (5).It is addressed on a primary level with medical therapy or valve repair. Mitral valve replacement using prosthetic material may be beneficial

for patients with severe mitral regurgitation, immobile leaflets, calcification, or significant subvalvular scarring.

Due to Prolong surgery and median sternotomy incision the pulmonary mechanics are changed, with lower lung compliance, higher airway resistance, and more labour of breathing. To conquer all such complications physical therapy is advised to the patient from the same day of surgery which improves the quality of life of the patient, allows the patient to perform his daily living activities independently. Physiotherapy management aims to increase the respiratory threshold of the patient and improve cardiac function post-surgery.

PATIENT'S INFORMATION

A 46-year-old female farmer by occupation resident of Balaghat came to the local emergency department with chief complaints of breathlessness, chest pain along with burning sensation fromthe past three months. The patient complains of dizziness and cough, along with suffocation.The patient was referred for echocardiography and ECG which revealed mitral stenosis secondary to RHD. The patient had a history of similar complaints 18 years ago to which she was prescribed medical treatment.The patient has advised surgery for mitral valve replacement. She was admitted to the cardiovascular and thoracic surgery (CVTS) unit on 08/10/2021 where she was observed and operated on 08/10/2021. The patient was then shifted to CVTS ICU and referred for physiotherapy 2nd-day post-operation. Post-operation the patient complained of pain at the site of incision, difficulty in going to supine from sitting position, difficulty in breathing along with its difficulty in resuming activities of daily life.

CLINICAL FINDINGS

Post-surgery on the 3rd-day patient was shifted from mechanical ventilator to 4l O2/min via nasal prongs. On examination in long siting at bed side with both shoulder at same level, hips rotated externally with knees in extension and ankles in plantar flexion. The patient was in state complete consciousness, co-operative and well oriented to time, place and date. She had body built of ectomorph type. Inspection revealed presence of median sternotomy incision dressing on anterior aspect of her chest. Patient complained of pain at the site of incision during rest as well as while movement of upper limb and coughing. In physical examination

vital noted were as follows: her temperature was normal, pulse rate-m76beats/min, irregularly irregular , blood pressure – 110/60mmHg , respiratory rate was 22 breaths /min with regular rhythm , chest appeared elliptical shaped, at xiphisternal level chest expansion was slightly reduced. On Auscultation, in lower zones air entry was reduced and less frequent crepitation was noticed.

Timeline

Table 1. Timeline of the patient from DOA till date of discharge

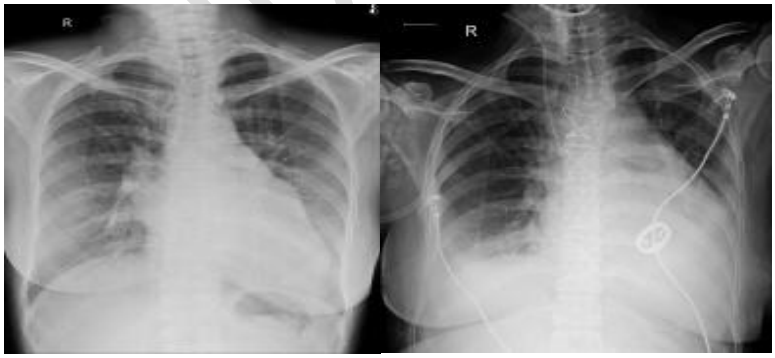
Date of admission	01/10/2021
Date of surgery	08/10/2021
Date of Physiotherapy Rehabilitation	09/10/2021
Date of discharge	14/10/2021

Diagnostic Assessment

Pre-operation, echocardiography revealed left ventricular enlargement and right ventricular hypertrophy which indicated mitral valve regurgitation with moderate mitral stenosis secondary to rheumatic heart disease.

Chest X-ray

On pre-operative investigations, chest X-rays revealed bilateral collapse and altered cardiothoracic ratio cardiac silhouette, and reduced air entry. Post-operative chest X-ray shows improved air entry and increased lung expansion.



(A) **(B)**

Figure 1 (A) PRE-OPERATIVE CHEST X-ray (B)post-operative chest X-ray

TREATMENT

Chest Physiotherapy was started on the same day of surgery.The patient expected to resume her daily living activities. She wants to achieve the capability to perform activities bathing doing household work independently as soon as possible.Considering all these things therapeutic intervention aims to reduce breathing difficulties, pain at the site of incision and improve cardiac functions. The patient was asked to complete the WHO-Quality of Life BREF questionnaire before beginning the physiotherapy session.

To avoid sternal stress, the therapist educates the patient on proper sternal precautions, particularly while coughing, moving from supine to side-lying posture, and rising from a chair with extra weight on the legs(6).To reduce the disruptive pressures on the incision, the patient was recommended to cover it with a cushion while coughing. The proper methods for putting on a sternal vest belt, as well as its significance, were explained. Huffing and coughing procedures were used to enhance airway clearing. To enhance lung capacities and flow rates, diaphragmatic breathing, segmental breathing exercises, and an incentive spirometer (900 cc) were implemented. The patient was directed to conduct deep breathing exercises 3 sets, 10 repetitions in each set, with 3 seconds of holds, twice a day during awake time.

In holistic cardiac rehabilitation, supervised exercise training is useful in increasing functional capacity, lowering symptoms, and enhancing the quality of life in this patient group.Cardiac rehabilitation programs have some major goals. A thorough cardiac rehabilitation program should have specific core components. By lowering cardiovascular risk, reducing disability, promoting active and healthy lifestyle changes, and encouraging active and healthy lifestyle changes, these aspects should help people maintain good habits after rehabilitation.

Tailor made Cardiac rehabilitation program strategized for the patient:

Intensive care unit (ICU) stay (phase I) Cardiac rehabilitation is administered as quickly as feasible as an important part of treatment for someone who has been hospitalized to the hospital with a cardiac condition (or is due to be admitted). It comprises initial lifestyle recommendations such as quitting smoking, increasing physical activity (including sexual activity), improving food, reducing alcohol use, and finding work.According to the study, cardiac patients benefit from training in terms of physical performance, psychological functioning (anxiety, depression, and well-being), and social adaptation and function. It shows a decrease in mortality, morbidity, recurrent occurrences, and readmissions to health facilities.It's also been revealed that it improves the patients' physical capacity to exercise (8). As a result, in cardiac rehabilitation, exercise training is an essential therapeutic intervention.

Follow up and outcome:

The patient was able to conduct a few activities of daily life without considerable help after one week of cardiac rehabilitation, and complaints of discomfort or shortness of breath were decreased. The patient gained self-confidence and a good attitude on life.

Table 1. Outcome measures and Pre-Rehabilitation

Outcome Measure	**Pre-Rehabilitation**	**Discharge**
Numerical Pain Rating Scale	On rest : 5/10 On activity : 7/10	On rest: 1/10 On activity: 3/10
New York heart association	Grade IV	Grade II
Functional classification WHO-QOL BREF Questionnaire n grade	70	86
Incentive Spirometric measurement (inspiration)	600cc	1200cc

DISCUSSION

RHD is a tremendous burden in poor nations, where it is one of the primary causes of cardiovascular illness and mortality among young people(9).MS mostly affects a younger population in developing nations like India, with the majority of symptomatic MS patients presenting before the age of 30, and our findings are consistent with prior studies(9–11).it consistently affects the quality of life of patients regardless procedure of intervention. As per the World Health Organization, rehabilitation in patients with cardiac illness entails a wide range of activities aimed at healing the underlying disease, such as improving the patient's physical, mental, and social state, and allowing them to function regularly in society(12).

In 147 patients who had a valvular replacement, Sibilitz et al. found an increase in VO2 masks after 4 months of intervention in the form of physical exercise and psychological counseling as compared to a control group (13). In a randomized controlled experiment, Newell investigated physical training in people recovering from a single heart valve replacement. Patients were allocated to a test or control group two weeks after surgery at random. Each patient took a submaximal exercise test at the outset of the trial, which they repeated after 12 and 24 weeks. Individual data revealed that both groups improved their "cardiorespiratory fitness" throughout the first 12 weeks(14).

Cardiac rehabilitation is a comprehensive treatment for heart disease patients that includes health education, cardiovascular risk reduction counselling, physical activity, and stress management. Cardiac rehabilitation has been found to reduce mortality, morbidity, and unplanned hospital admissions, as well as improve exercise capacity, quality of life, and psychological well-being, and it is now recommended in global guidelines.(15).

CONCLUSION

Cardiac rehabilitation is a proven effective treatment for those who had undergone cardiac surgeries. The present single-case study also supports the available evidence on the

efficacious improvement in the general condition of the patient through cardiac rehabilitation. Outcome measures showed improvement in the overall quality of life of the patient as well as lung capacity of the same. Thus, tailor-made phase I cardiac rehabilitation can be aptly used in patients who underwent valve replacement surgeries.

Informed consent: A proper informed consent was taken from the patient prior.

REFERENCES

1. Kumar RK, Tandon R. Rheumatic fever & rheumatic heart disease: the last 50 years. Indian J Med Res. 2013 Apr;137(4):643–58.

2. Dass C, Kanmanthareddy A. Rheumatic Heart Disease. In: StatPearls [Internet]. Treasure Island (FL): StatPearls Publishing; 2021 [cited 2021 Oct 21]. Available from: http://www.ncbi.nlm.nih.gov/books/NBK538286/

3. Rheumatic Heart Disease [Internet]. [cited 2021 Oct 21]. Available from: https://www.who.int/news-room/fact-sheets/detail/rheumatic-heart-disease

4. Carabello BA. Modern Management of Mitral Stenosis. Circulation. 2005 Jul 19;112(3):432–7.

5. Omran AS, Arifi AA, Mohamed AA. Echocardiography in mitral stenosis. J Saudi Heart Assoc. 2011 Jan;23(1):51–8.

6. Patel LA, Yadav VD, Jain MJ, Wadhokar OC. 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. J Pharm Res Int. 2021 Oct 15;379–84.

7. Cardiac Rehabilitation [Internet]. Physiopedia. [cited 2021 Oct 23]. Available from: https://www.physio-pedia.com/Cardiac_Rehabilitation

8. Lalonde F. AACVPR Guidelines for Cardiac Rehabilitation and Secondary Prevention Programs. J Am Osteopath Assoc. 2012 Nov 1;112:753–4.

9. Bhardwaj P, Chaudhury S, Aneja A, Jetley V, Walia TS, Mujawar S. Assessment of quality of life before and after successful percutaneous transvenous mitral

commissurotomy in patients with severe mitral stenosis. Ind Psychiatry J. 2019;28(1):51–7.

10. Arora R, Kalra GS, Singh S, Mukhopadhyay S, Kumar A, Mohan JC, et al. Percutaneous transvenous mitral commissurotomy: immediate and long-term follow-up results. Catheter Cardiovasc Interv Off J Soc Card Angiogr Interv. 2002 Apr;55(4):450–6.

11. Kothari SS, Ramakrishnan S, Juneja R, Yadav R. Percutaneous transvenous mitral commissurotomy in patients with severe mitral stenosis and acute rheumatic fever. Pediatr Cardiol. 2006 Jun;27(3):347–50.

12. Rio P, Ismail M, Arso I. Rehabilitation Program in a Patient Undergoing Mitral and Aortic Valve Replacement Surgery. ACI Acta Cardiol Indones. 2017 Oct 31;3:57.

13. Sibilitz KL, Berg SK, Hansen TB, Risom SS, Rasmussen TB, Hassager C, et al. Effect of comprehensive cardiac rehabilitation after heart valve surgery (CopenHeartVR): study protocol for a randomised clinical trial. Trials. 2013 Apr 22;14(1):104.

14. Newell JP, Kappagoda CT, Stoker JB, Deverall PB, Watson DA, Linden RJ. Physical training after heart valve replacement. Heart. 1980 Dec 1;44(6):638–49.

15. Dalal HM, Doherty P, Taylor RS. Cardiac rehabilitation. BMJ. 2015 Sep 29;351:h5000.