

Clinical Response to Aerobic Exercise After Mitral Valve Replacement: A Case Report

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Abstract

Background: Patients recovering after Mitral Valve Replacement (MVR) may continue to experience dyspnea, fatigue, and activity limitation. Case reporting may describe individual responses during phase II cardiac rehabilitation.

Objective: To describe the clinical response of one patient after MVR during a rehabilitation program that included aerobic exercise.

Methods: This single case report involved a 55-year-old woman approximately two weeks after MVR. Four rehabilitation sessions were conducted on 13, 16, 20, and 23 October 2025. Aerobic exercise lasted 30 minutes and was accompanied by breathing exercise and therapeutic communication. Outcomes included physiological variables, Borg score, HRS A, MMT, and functional observations.

Results: Blood pressure changed from 141/74 to 117/64 mmHg, heart rate from 83 to 95 beats/minute, respiratory rate from 18 to 20 breaths/minute, and SpO₂ from 96% to 99%. Borg score decreased from 2 to 1 and HRS A from 14 to 10, whereas MMT remained 4/5. The patient remained independently ambulatory but reported fatigue during activity lasting more than 15 minutes. No adverse events were reported during the four sessions.

Conclusion: This case describes individual changes during phase II cardiac rehabilitation that included aerobic exercise. The findings do not establish treatment efficacy, an isolated effect of aerobic exercise, or improvement in cardiovascular endurance.

Keywords

Cardiac Rehabilitation; Exercise; Heart Valve Diseases; Case Reports; Heart Valve Prosthesis Implantation

Introduction

Mitral Valve Replacement (MVR) is a surgical treatment for severe mitral valve disease when repair is not feasible or is unlikely to provide an adequate result. Mitral stenosis and mitral regurgitation produce different but clinically important hemodynamic disturbances. Mitral stenosis restricts left atrial to left ventricular flow and may increase pulmonary venous and pulmonary arterial pressures, whereas mitral regurgitation produces systolic backflow into the left atrium and may contribute to chamber remodeling and progressive functional limitation. The clinical consequences of these disorders can include dyspnea, fatigue, reduced exercise tolerance, and impaired daily activity.^{1,2}

Recovery after valve surgery does not necessarily restore physical capacity immediately.³ Postoperative pain, reduced thoracic mobility, deconditioning, altered breathing patterns, muscle weakness, and apprehension about physical exertion may limit activity during early recovery.⁴ Cardiac rehabilitation is therefore used to support gradual restoration of physical function and participation.³ Exercise based cardiac rehabilitation after valve surgery has been associated in controlled studies with improvements in exercise capacity, although the certainty of evidence and magnitude of benefit vary across populations and intervention models.^{3,5}

Exercise prescription during cardiac rehabilitation requires individualization because exercise tolerance depends on the underlying valve disease, ventricular function, pulmonary pressures, symptoms, medication, and recovery stage.⁶ This is particularly relevant when residual structural abnormalities remain after surgery or when the patient has evidence of pulmonary hypertension or right sided valve disease.⁶ Monitoring of heart rate, blood pressure, respiratory rate, oxygen saturation, and symptoms can support clinical decision making.^{2,7}

Aerobic exercise is a central component of many cardiac rehabilitation programs because it provides a controlled stimulus to cardiovascular and peripheral systems.⁵ Nevertheless, the present case does not provide serial objective measurements such as six-minute walk distance or peak oxygen uptake that would allow cardiovascular endurance to be quantified longitudinally. The clinical value of this report therefore lies in describing the observed response to a real-world rehabilitation program rather than demonstrating an isolated treatment effect.

Evidence describing exercise-based rehabilitation after valve surgery has largely been generated from group studies, while detailed case level descriptions can illustrate how clinical findings, exercise dosing, monitoring, and concurrent rehabilitation components are integrated in an individual patient.³ The CARE framework emphasizes transparent reporting of patient information, clinical findings, timeline, diagnostic assessment, intervention, outcomes, patient perspective, and consent, while TIDieR emphasizes sufficiently detailed intervention descriptions to support replication.^{8,9}

This report therefore aims to describe the clinical response of one patient after MVR to aerobic exercise delivered within phase II cardiac rehabilitation, with emphasis on hemodynamic response, perceived dyspnea, anxiety, muscle strength, and functional activity. The report is intended to document an individual clinical course and does not seek to establish causal effectiveness or improvement in cardiovascular endurance.

Methods

Study design and reporting framework. This was a descriptive single case report prepared with reference to the CARE case reporting framework.⁸ The case was managed at the Integrated Heart Center, Dr. Wahidin Sudirohusodo Hospital, Makassar, Indonesia. Because the report concerns one patient, no inferential statistical analysis was undertaken.

The patient was a 55-year-old woman approximately two weeks after MVR who was receiving phase II cardiac rehabilitation. The available case record states that she had previously undergone cardiac surgery for a valvular condition in 2010. At the time of physiotherapy assessment, she could walk independently without an assistive device but reported fatigue when activity continued for more than 15 minutes. The clinical rationale for selecting this case was the presence of residual activity limitation during early rehabilitation. The source materials do not document a defined recruitment period, formal eligibility or exclusion criteria, or whether the case was representative of other patients treated during the same period. These items require author confirmation if such information exists.

Data were obtained from anamnesis, physical examination, physiotherapy assessment, and available diagnostic investigations. The examination included static and dynamic observation, palpation, passive physiological joint movement, range of motion, MMT, hemodynamic measurements, Borg Scale, METs, NYHA functional class, HRS A, and Barthel Index. Baseline findings included blood pressure 141/74 mmHg, heart rate 83 beats/minute, respiratory rate 18 breaths/minute, SpO₂ 96%, Borg score 2, METs 5, NYHA class II, HRS A 14, Barthel Index 19, and MMT 4/5. Most joint range of motion was reported as within normal limits. The patient was independently ambulatory but had limitations with moderate to vigorous activities such as stair climbing and carrying loads.

Chest radiography was reported to show infiltrates in the lower fields of both lungs, dilatation of the right and left descending pulmonary arteries, cardiomegaly, right ventricular enlargement, and left atrial enlargement. Four sternotomy wires and a mitral valve device were also described. Echocardiography was reported as showing severe mitral stenosis and severe mitral regurgitation attributed to rheumatic heart disease, moderate to severe tricuspid regurgitation, a high probability of pulmonary hypertension, and reduced right ventricular systolic function. Left ventricular systolic function was reported as preserved, with ejection fraction 57% by Teichholz and 55% by biplane measurement. The supplied record does not provide the exact dates of these investigations or a documented clinical clearance statement explaining how each finding informed exercise prescription. These details require author confirmation.

The principal intervention was aerobic exercise within phase II cardiac rehabilitation. The source record reports a frequency of two sessions per week and 30 minutes per session. The intensity was originally described as 40% to 50% of maximum heart rate, but the reported target range of 116 to 124 beats/minute is mathematically consistent with 40% to 50% of heart rate reserve. Using the reported resting heart rate of 83 beats/minute and an estimated maximum heart rate of 165 beats/minute, heart rate reserve is 82 beats/minute. The target range is therefore $83 + (0.40 \times 82) = 115.8$ and $83 + (0.50 \times 82) = 124$ beats/minute, corresponding approximately to 116 to 124 beats/minute. This calculation corrects terminology without adding a new clinical measurement.

Documented outcomes included blood pressure, heart rate, respiratory rate, oxygen saturation, Borg Scale score, HRS A score, and MMT, together with independent walking and fatigue after more than 15 minutes of activity. METs and NYHA class were available at baseline, but no post intervention values were provided. Borg assessment was based on the patient's numerical rating of perceived dyspnea or fatigue during activity. METs were used as an estimate of functional capacity based on activity performance, and NYHA class was assigned according to activity related cardiac limitation. HRS A was obtained by summing responses to anxiety related symptoms, and the Barthel Index was used to assess activities of daily living. MMT assessed the deltoid, pectoralis major, biceps brachii, triceps brachii, quadriceps, gluteus maximus, hamstrings, and gastrocnemius soleus. The exact version or standardized administration protocol for several instruments was not available. Because no serial objective endurance measure was available, cardiovascular endurance was not designated as a demonstrated improved outcome.

Data analysis. Data were analyzed descriptively because the report concerns a single patient. Absolute pre to post changes were calculated where two values were available. No p values, confidence intervals, effect sizes, or inferential tests were calculated.

Results

The baseline patient characteristics and clinically relevant findings are summarized in Table 1.

Table 1. Baseline patient characteristics and clinical findings.

Characteristic	Documented finding
Sex	Female
Age	55 years
Indication for MVR	Severe mitral stenosis and severe mitral regurgitation associated with rheumatic heart disease
Date of MVR	29 September 2025
Rehabilitation status	Phase II cardiac rehabilitation
Baseline NYHA class	II
Baseline METs	5
Baseline Borg score	2
Baseline HRS A	14
Baseline Barthel Index	19
Baseline MMT	4/5
Functional status	Independent walking without an assistive device; fatigue after activity lasting more than 15 minutes

Patient characteristics and baseline clinical findings. The case involved one 55 year old woman approximately two weeks after MVR who was participating in phase II cardiac rehabilitation. MVR had been performed for severe mitral stenosis and severe mitral regurgitation associated with rheumatic heart disease. The patient was independently ambulatory but reported fatigue during activities lasting more than 15 minutes and difficulty with moderate to vigorous activities such as stair climbing and carrying loads. Baseline findings included NYHA class II, METs 5, Borg score 2, HRS A 14, Barthel Index 19, and MMT 4/5. The identifiable name and geographic address contained in the source case have been removed from this revision to protect privacy.

Diagnostic findings. Available radiographic findings included bilateral lower lung infiltrates, dilatation of the right and left descending pulmonary arteries, cardiomegaly, right ventricular enlargement, left atrial enlargement, four sternotomy wires, and a mitral valve device. Echocardiography documented severe mitral stenosis and severe mitral regurgitation associated with rheumatic heart disease, moderate to severe tricuspid regurgitation, high probability of pulmonary hypertension, reduced right ventricular

systolic function, and preserved left ventricular systolic function with reported ejection fractions of 57% by Teichholz and 55% by biplane measurement.

The temporal relationship between these diagnostic tests and the exercise sessions was not documented in the supplied case record. The record also does not provide session level findings that would allow the diagnostic abnormalities to be directly linked to changes in exercise dose. The documented chronology is presented in Table 2. MVR was performed on 29 September 2025. Four rehabilitation sessions were conducted on 13, 16, 20, and 23 October 2025, with the final assessment performed on 23 October 2025. The exact baseline assessment date was not available.

Table 2. Clinical timeline and documented rehabilitation sessions.

Date or time point	Clinical event
29 September 2025	Mitral Valve Replacement performed
Baseline assessment	Exact date not available; baseline physiological, symptom, functional, and diagnostic data documented
13 October 2025	First documented rehabilitation session
16 October 2025	Second documented rehabilitation session
20 October 2025	Third documented rehabilitation session
23 October 2025	Fourth rehabilitation session and final evaluation
Follow up	Not available

The documented pre to post physiological outcomes are presented in Table 3.

Table 3. Pre to post physiological outcomes.

Parameter	Before	After	Absolute change
Blood pressure	141/74 mmHg	117/64 mmHg	-24/-10 mmHg
Heart rate	83 beats/min	95 beats/min	+12 beats/min
Respiratory rate	18 breaths/min	20 breaths/min	+2 breaths/min
SpO ₂	96%	99%	+3 percentage points

Other documented clinical outcomes are summarized in Table 4.

Table 4. Other documented clinical outcomes.

Outcome	Before	After	Absolute change
Borg score	2	1	-1
HRS A	14	10	-4
MMT	4/5	4/5	No change

Other clinical outcomes. Borg score decreased by 1 point from 2 to 1. HRS A decreased by 4 points from 14 to 10. MMT remained 4/5. The patient remained independently ambulatory but continued to report fatigue during activities lasting more than 15 minutes. METs was reported only at baseline as 5, and NYHA class was reported only at baseline as class II. Therefore, the available data do not demonstrate a pre to post change in objective cardiovascular endurance. Adverse events and follow up. According to the author confirmation, no adverse events or exercise limiting symptoms occurred during the four documented sessions. Session level safety data were not available. No post intervention follow up was documented.

Discussion

The principal finding of this single case was that a phase II cardiac rehabilitation program that included aerobic exercise was followed by measurable changes in hemodynamic and symptom related outcomes. These findings describe the clinical course observed in one patient and should not be interpreted as evidence of the efficacy of aerobic exercise.

Exercise based cardiac rehabilitation after heart valve surgery has been studied in randomized trials and systematic reviews, with evidence suggesting improvements in exercise capacity and physical function. However, the magnitude and certainty of benefit vary, and the available evidence does not permit this single case to establish a causal treatment effect.^{3,5,7} The present report adds case level detail about an individual early rehabilitation course but cannot separate the contribution of aerobic exercise from breathing exercise, therapeutic communication, natural postoperative recovery, and other aspects of routine care.

The exercise intensity terminology required correction. The original manuscript described 40% to 50% of maximum heart rate, but the reported target of 116 to 124 beats/minute corresponds to 40% to 50% of heart rate reserve using the reported resting heart rate of 83 beats/minute and estimated maximum heart rate of 165 beats/minute. This distinction is important because percentage of maximum heart rate and percentage of heart rate reserve are not interchangeable prescriptions.

The structural cardiac findings also influence interpretation. The case record describes severe mitral stenosis and severe mitral regurgitation related to rheumatic heart disease, moderate to severe tricuspid regurgitation, high probability of pulmonary hypertension, and reduced right ventricular systolic function. These findings indicate a clinically complex postoperative context in which exercise prescription should be individualized and physiological responses should be monitored closely.^{2,7}

The changes in heart rate and respiratory rate are compatible with an acute physiological response to physical activity, but the available data do not establish a training adaptation.¹⁰ The change in blood pressure is a two point comparison and cannot establish a sustained blood pressure response. The increase in SpO₂ from 96% to 99% should also be interpreted cautiously because the source does not document measurement conditions, timing relative to exercise, or device. It is therefore more appropriate to report the observed values than to describe the change as improved oxygenation or proof of exercise tolerance.

The decrease in Borg score from 2 to 1 provides a modest descriptive change in perceived dyspnea. Because the score was available only at baseline and final assessment, the temporal pattern across the four sessions cannot be evaluated. The same limitation applies to HRS A, which decreased from 14 to 10. Therapeutic communication and breathing exercise were delivered alongside aerobic exercise, so the change in anxiety or perceived dyspnea cannot be attributed to aerobic exercise alone.

Cardiovascular endurance should not be described as improved on the basis of the present data. METs was reported only at baseline, and the patient continued to experience fatigue after more than 15 minutes of activity at the end of the documented period. No serial six minute walk distance, peak oxygen uptake, or other objective exercise capacity measure was available. Contemporary evidence commonly uses six minute walk distance and peak oxygen uptake to quantify exercise capacity in valve rehabilitation research.^{5,7}

The absence of change in MMT from 4/5 to 4/5 is consistent with the limited observation period and the absence of a resistance focused outcome. The functional observation of independent walking is clinically relevant, but independence in walking should not be equated with restored cardiovascular endurance.

The strengths of this report are its documentation of multiple clinical domains, quantitative pre and post measurements, identification of concurrent interventions, and explicit recognition of design limitations. Important limitations include the single patient design, absence of a comparator, incomplete session level data, absence of an objective serial endurance measure, unclear timing of diagnostic investigations relative to exercise, incomplete intervention detail, absence of documented explicit stopping or modification criteria despite confirmation that no adverse events occurred, and lack of documented follow up. Selection and reporting bias are also possible because the case selection process and recruitment context were not described.

From a clinical reporting perspective, the value of this case is its description of an individual rehabilitation response rather than proof of a treatment effect. Future case reports should document exact baseline assessment timing, exercise content and progression, achieved intensity, monitoring data, adverse events, patient perspective, and follow up.¹ Larger prospective studies should use objective exercise capacity outcomes such as six minute walk distance or peak oxygen uptake and should distinguish the contribution of aerobic exercise from other rehabilitation components.⁵

Conclusion

In this single case, a phase II cardiac rehabilitation program that included aerobic exercise was accompanied by changes in blood pressure, heart rate, respiratory rate, SpO₂, perceived dyspnea, and anxiety, while MMT remained unchanged at 4/5. The patient was able to walk independently but continued to experience fatigue during activity lasting more than 15 minutes. These observations indicate an individual clinical response during the documented rehabilitation period. They do not demonstrate improved cardiovascular endurance because no serial objective endurance measure was available, and they do not establish a causal or isolated effect of aerobic exercise because breathing exercise, therapeutic communication, routine recovery, and other aspects of rehabilitation were present. The findings support individualized monitoring during rehabilitation after MVR, particularly in a patient with residual structural and pulmonary vascular abnormalities.⁶ Future studies should provide serial objective exercise capacity measurements, detailed session level intervention data, longer follow up, and designs that allow the effects of individual rehabilitation components to be examined.

Patient Perspective

A publishable patient perspective was not specifically documented. The author confirmation indicates that the patient provided relevant experiences, but no specific statement suitable for publication was available. No patient quotation has therefore been reconstructed.

Author Contribution

Najwa Fadila Bagenda: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing Original Draft, Writing Review and Editing.

Salki Sadmita: Conceptualization, Methodology, Investigation, Data Curation, Formal Analysis, Writing Review and Editing.

Muhammad Ismail: Conceptualization, Methodology, Supervision, Writing Review and Editing.

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Conflict of Interest Statement

The authors declare that they have no conflicts of interest related to this study.

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Ethics Statement

Ethical approval information, including the institutional review board or ethics committee determination, approval number, exemption, or waiver, was not available in the source documentation. Written informed consent for publication of the patient's clinical information should be confirmed before submission in accordance with the requirements of the target journal.

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