



## MANAGEMENT OF PHYSIOTHERAPY IN MITRAL VALVE REPLACEMENT E.C. MITRAL REGURGITATION RELATED TO AEROBIC CAPACITY: A CASE STUDY

Suwendra Ria<sup>1</sup>, Komalasari Dwi Rosella<sup>2</sup>, Susilo Ridwan Andi<sup>3</sup>

<sup>1,2</sup> *Physiotherapy Departement, Faculty of Health Science, Universitas Muhammadiyah Surakarta, Indonesia*

*Jl. A Yani Tromol Pos I. Pabelan. Kartasura. Surakarta. 57169*

<sup>3</sup> *Physiotherapy Cardiovascular, Dr. Moewardi's Hospital, Indonesia*

\*corresponding author: Ria Suwendra, Email: [riasuwendra@gmail.com](mailto:riasuwendra@gmail.com)

### Abstract

**Introduction:** A mitral regurgitation (MR) is the second most common single native valvular disease and accounts for 31.6% of valvular heart disease patients with degenerative etiology as much as 61.3%, rheumatism 14.2%, endocarditis 3.5%, inflammation 0.8%, congenital 4.8%, ischemic 7.3%, miscellaneous 8.1%.<sup>2</sup> In patients who undergoing surgical intervention for severe MR, the most common etiologies being MVP (20%-70% of cases), ischemic MR (13%-30% of cases), rheumatic disease (3%-40% of cases), and endocarditis (10%-12% cases).

**Case presentation:** A 44-year-old housewife patient complained of pain in the area around the operation of Dr. Moewardi's hospital, Surakarta, especially when coughed and sneezed and body rotation involved movement in the chest area. Found muscle spasm in the area intercostals muscles, scapula, levator scapula, and pectoralis major. On auscultation there was a clicking sound coming from a mechanical valve, no cardiac murmur was heard, percussion was resonant. laboratory test Fasting Blood Sugar 148 mg/dl, and other results look normal. Blood pressure was 108/46 mmHg, SPO<sub>2</sub> was 98%, temperature was 36.8°C, respiratory rate was 20 bpm, heart rate was 70 bpm. Vital examinations were performed before performing the strength test.

**Management and outcomes:** Performed massage with efflurage technique to reduce spasm in the accessory muscles of respiration. The patient underwent a physiotherapy rehabilitation program using a 6 minutes walking test with telemetry. The exercise phase lasts about 20-60 minutes with the brisk walking exercise method. Borg Scale – RPE Category Scale was used to measure the perception of fatigue and dyspnea symptoms during exercise. Exercise is given 10 times in 2 weeks with one session of 60 minutes

**Discussion:** Physiotherapy technique as effleurage is an effective technique used to increase blood flow, reduce muscle tightness and relieve muscle tension. And walk brisk were able to reduce the fatigue symptom of patient and increase the capability of tolerance activity. Although the aerobic capacity was not altering as well.

**Conclusion:** The regular exercises can significantly improve the quality of life in patient with post surgery mitral valve replacement.

**Keyword:** MR, brisk walking, aerobic capacity



## Introduction

Mitral disease is an abnormality or dysfunction in the form of mechanical damage or abnormalities in the structure or function of the mitral valve which causes pressure overload or volume overload due to the mitral valve of the heart failing to open or close completely so that it interferes with cardiac output (Fadilah, 2017). Mitral regurgitation (MR) is the most common clinical valvular heart disease encountered in both population studies and community-based studies in the United States.<sup>1</sup> In the Euro heart survey of valvular heart disease. Heart valve disease is caused by rheumatic fever, or congenital monocuspid, bicuspid, or tricuspid valves that cause both types of abnormalities (i.e. stenosis or regurgitation) due to degenerative processes (Syahrian, 2017). MR is the second most common native valvular disease and accounted for 31.6% of valvular heart disease patients with degenerative etiology as much as 61.3%, rheumatism 14.2%, endocarditis 3.5%, inflammation 0.8%, congenital 4.8%, ischemic 7.3%, others 8.1%.<sup>2</sup> In patients undergoing surgical intervention for severe MR, the most common etiology was MVP (20%-70% of cases), ischemic MR (13%-30% of cases), rheumatic diseases (3%-40% of cases), and endocarditis (10%-12% of cases) (D. Ramli, 2018). Mitral Valve Replacement is a cardiac surgical procedure performed to replace a mitral valve that cannot be repaired and is replaced with an artificial heart valve. Mitral valve replacement is performed to overcome the lack or obstruction of blood vessels due to mitral disease, both mitral regurgitation and mitral stenosis. The operation can experience a decrease in physical capacity and functional ability, this can affect the patient's quality of life (Fadilah, 2017). Postoperative complications include decreased physical activity and spasm of the muscles around the surgical site. Physiotherapy plays a role in restoring the patient's exercise tolerance, maintaining and increasing cardiovascular levels by giving exercise. In the implementation of therapy, good cooperation between physiotherapists and patients is needed so that the program that is prepared can run as it should.

## Case Description

The patient was a 44-year-old and a housewife, had pain around the operation of Dr. Moewardi's hospital after treated by mitral valve replacement. The patient seemed weak after surgery. The patient complained pain especially when coughed and sneezed as well as body rotation involved movement of the chest area. Patients described pain by numeric rating scale (NRS) in the 7 of 10. Other complaints were also found as weakness and feelings of worry to carry out activities so that patients tend to carry out activities with the assistance of the family such as eating, drinking, and taking things. The patient underwent surgery because he often felt short of breath and tired even at rest, then worsened during activities since 2.5 years ago. The patient did not do any therapy except to rest and reduce daily activities and only sleep, and often felt a fever. Not given any form of therapy, in the end the patient decided to go to the local hospital for an examination after the first 3 months. When examined by a doctor, the patient was referred to a cardiologist and was diagnosed with mitral valve regurgitation and then recommended for valve surgery. The patient has a history of diabetes mellitus for 7 years. Taking metformin 500 mg on a regular basis. There was a family history of diabetes mellitus. The investigation revealed that a housewife in a weak condition came to the cardiac rehabilitation installation. Found muscle spasm in the area as muscles of intercostals, scaleni, levator scapula, and pectoralis major. On auscultation there was a clicking sound coming from a mechanical valve, no cardiac murmur was heard, percussion was resonant. Laboratory test Fasting Blood Sugar 148 mg/dl, and other results appear normal. blood pressure 108/46 mmHg, SPO2 98%, temperature 36.8°C, respiratory rate 20 bpm, heart rate 70 bpm, height 165 cm, and weight 53 kg. Vital examinations were performed before performing the strength test. The 6 minutes walking test was successfully carried out with a distance of 307 meters and MET worth 5.57 METS. Borg Scale – RPE Category Scale of 14.

### **Management and Results**

A case study was conducted to this study and had been approved from Health Sciences Faculty, Universitas Muhammadiyah Surakarta (1299.6/C.8-III/FIK/VIII/2021)

The physical examination found muscles spasm in the area muscles of intercostals, scaleni, levator scapula, and pectoralis major. A massage therapy with efflurage technique applied to reduce spasm in the respiratory muscles. The spasm occurred due to the body's response not to move in the chest area caused by the incision. There were spasm in accessory muscles of respiration and occurred the shortness condition of patient for a long time, leaving secondary post operative problems. After massage reported the muscles spasm was reduced

The patient had fatigue and dyspnea during exercise that measured by the BORG scale. The categories of borg as shows in table 2. The score of BORG demonstrated reduce (14 to 11) after done for therapy, 10 times during 2 weeks, 60 minutes was performed every session. The BORG reported had good reliability and as well VAS appropriated applying in different clinical group and setting (PERKI, 2019). Originally RPE was validated against heart rate. With time, RPE has since been researched extensively in a variety of different conditions and population groups. Borg RPE scores were positively associated with heart rate in adults during exercise sessions using the Wii Fit Plus. Skinner et al, found no significant differences in any of the physiological and perceptual variables in work intensity when the work load was presented in a random order and compared with those obtained during the progressive exercise test (Nishimura RA, 2017).

The six minutes walking test was used to measure aerobic capacity with telemetry. The vital signs have done before the test enrolled and patient did the strength test as well. The six minutes walk test is commonly test used for measuring or increasing aerobic capacity. The 6MWT can be used in preschool children (2-5 years), children (6-12 years) adults (18-64 years), elderly adults (65+) with a wide range of diagnoses (Stevenson LW, 2017). The test was initially designed to help in the assessment of patient with cardiopulmonary issues. Gradually, it was introduced in numerous other conditions. It evaluates the functional capacity of the individual and it provides valuable information regarding all the systems during physical activity, including pulmonary and cardiovascular systems, blood circulation, neuromuscular units, body metabolism, and peripheral circulation (Stevenson LW, 2017)

The results of six minutes walk test confirmed to evaluate the dose of exercises. The exercises did about 20-60 minutes, a dose of 60 %, applied for maximum 900 meters within once time of exercise. The exercise doses based on the six minutes walking test as performing as follows (PERKI, 2019)

**Table 1.** Exercise dose based on 6 minutes walking test

Mileage 6MWT (meters)	Street Dose		
	60%	70%	85%
120 m	360 m	420 m	510 m
150 m	450 m	525 m	640 m
180 m	540 m	630 m	770 m
210 m	630 m	735 m	900 m
240 m	720 m	840 m	1030 m
270 m	810 m	945 m	1160 m
300 m	900 m	1050 m	1290 m

350 m	1050 m	1225 m	1490 m
400 m	1200 m	1400 m	1700 m

---

The heart rate (HR) was one of important factor should be concerned when gave the exercise. HRR of 60% intensity, which used 134 bpm, thus the exercise was effective. The principle of overload was a principle in providing exercise as well, notably the patient could not be fatigue of exercises, must considered with tolerance dose of patient. The maximum limit of HR was evaluated, then did not exceed a maximum dose of 176 bpm. The intensity of physical exercise (ie; brisk walking) was carried out 4-5 times/week, with the range of HR were 68-74 times/minute (40-60%).

The home rehabilitations were arranged by physiotherapist to maintain and as well increase the physical fitness of the patient. Those were walking around home with distance around 600-900 meters for 30-60 minutes per day. The patient also explained how to measure the pulse during exercise manually as reminder to stop exercising. The patient was asked to stop when he felt chest pain, tightness, and felt an airway obstruction such as choking. Education on the importance of doing exercises at home on a regular basis was also explained when the patient went home after doing therapy, as well as controlling food and improving lifestyle. Within 2 weeks confirmed the aerobic capacity has not increased significantly. But the general condition of patient revealed better. Tolerance to physical fatigue was also increasing, meaning that patients did not get tired easily when carried out daily activities, as seen from the decreasing by borg scale – RPE (Rating of Perceived Exertion) category scale.

Likewise the cooperation of family members was needed to facilitate altering the physical ability of patient and forward to better quality of life.

**Table 2.1** Borg Scale – RPE Category Scale

<b>Rating</b>	<b>RPE Scale</b>
6	No exertion
7	Extremely light
8	
9	Very light
10	
11	Light
12	
13	Somewhat hard
14	

15	Hard
16	
17	Very hard
18	
19	Extremely hard
20	Maximal exertion

## Discussion

The fatigue complaints was the one problem that limited the exercise to reach 60% of intensity. Likewise the patient felt dyspnea when peaked the zone of 60% (PERKI, 2019). Therefore, the increase in aerobic capacity using telemetry did not show any change. According to the Cardiovascular Rehabilitation Guidelines written by the Indonesian Cardiovascular Specialist Association (PERKI) in 2019 to achieve a physiological effect on an exercise it takes at least 1 month of treatment. The authors conducted a trial by giving exercise to patients for 2 weeks whether there was a physiological effect and it was found that there was a decrease in the number of activity tolerance scales in the Borg Scale - RPE as describes in table 2. Although the aerobic capacity it is still not significant. Notably, the spasm of muscles of intercostals, scaleni, levator scapula, and pectoralis major. Massage is a technique of applying hand pressure to soft tissues, usually muscles, or ligaments, without causing movement or changing the position of the joints to relieve pain, resulting in relaxation (Hindriyati, 2017). One of the massage techniques is massage effluarage. According to research conducted by Titik Hindriyati, 2017 whose research aims to determine the effectiveness of massage with the efflurage technique on the abdominal and pelvic muscles during labor, the results when giving efflurage with additional breath control can reduce contraction pain. Research conducted by Rahma Liana Yunitasari, 2019 performed myofascial release on respiratory muscles such as the intercostalis muscle, upper trapezius muscle with the friction transfer technique. As a result, the muscles will relax and reduce spasm so that the breathing can be maximal (Ahmed & Halim, 2018).

Researchers used the efflurage massage technique because the patient was postoperative, there were still incisions in the sternum area. This technique was also the most feasible given the limited field conditions. In Indonesia, rarely applied of efflurage massage technique for muscle spasms in the area of the accessory muscles of breathing, therefore further research is needed on this matter.

After doing massage with efflurage technique, the patient's spasm is reduced. Efflurage is regularly used to reduce muscle spasm. Efflurage is a gentle technique that involves long, directional strokes performed with flattened hands and fingers. Efflurage is an effective technique

used to increase blood flow, reduce muscle tightness and relieve muscle tension. The measurement of exercise capacity is integral to the assessment of patients with cardiopulmonary disease. The 6-min walk test (6MWT) provides information regarding functional capacity, response to therapy, and prognosis across a range of chronic cardiopulmonary conditions (Emruallah Hayta, 2017). The 6MWT is a useful measure of functional capacity targeted at patients with a minimum of moderately severe impairment. The test has been widely used for preoperative and postoperative evaluation and for measuring the response to therapeutic interventions for pulmonary and cardiac disease.

Cardiac rehab professionals at Salford Royal NHS Foundation Trust used Gentle walking is the best way to start, even to postoperative patient and if it's just for two minutes every day until it feels easier, then increase the time, and later the speed. Aim to be exercising for 15–20 minutes at a time by weeks four to six. It's relate to research about Effect of comprehensive cardiac rehabilitation after heart valve surgery (open heart): study protocol for a randomised clinical trial have an impact on the organization of and clinical guidelines for future rehabilitation after heart valve surgery. The limitations of the trial and methods used are similar to those of other trials including physical exercise and physical testing, which are time-of-day, and day-to-day variation in exercise testing.

## **Conclusion**

A good management of exercise in post surgey mitral valve replacement could give positive effect to physical fitness of patient, which could increase the physical ability thus the patient was ready to back to their family. The encouragement from family members and educate them are important sould do, then could facilitate the condition of patient better and back to have a good quality of life.

## **Acknowledgement**

We would like to thank to a great participants who involved in this study. The special thank to our advisor Lect. Dwi Rosella Komalasari, M.Fis.,Sp.Vest for her guidance during this.

## **Reference**

- Ahmed, E., & Halim, et all. 2018. Acute Effect of Pectoralis Minor Muscle Myofascial Release on Ventilatory Function in Patients with Chronic Obstructive Pulmonary Disease, 15(1), 14–19. <https://doi.org/10.5829/idosi.wjms.2018.14.19>
- D. Ramli and Y. Karani. 2018 “Anatomi Dan Fisiologi Kompleks Mitral.” J. Kesehatan. Andalas, vol. 7, no. 0, pp. 103–112. doi: 10.25077/JKA.V7.I0.P103-112.2018.
- Emruallah Hayta, Özge Korkmaz. 2017. “Cardiac Rehabilitation Improves the Reliability of the 6 Minute Walk Test in Patients After Coronary Artery Bypass Graft Surgery”

- Fadilah, Nur. 2017. "TERAPI LATIHAN PADA PASIEN PASCA OPERASI MITRAL VALVE REPLACEMENT"
- Glaser N, Jackson V, Holzmann MJ, Franco-Cereceda A, Sartipy U. Aortic valve replacement with mechanical vs. biological prostheses in patients aged 50-69 years. *Eur Heart J* 2016;37:2658-2667
- Hindriyati, Titik. 2017. "Effect Of Massage And Relaxation Of Breathing Againsts The Duration Of The Phase I Stage Of Labor Active In The Maternity Hospital Jambi City"
- Nishimura RA, Otto CM, Bonow RO, et al. 2017 AHA/ACC focused update of the 2014 AHA/ACC guideline for the management of patients with valvular heart disease: a report of the American College of Cardiology/American Heart Association Task Force on Clinical Practice Guidelines. *J Am Coll Cardiol* 2017;70:252-289
- Stevenson LW. 2017 ACC Expert Consensus Decision Pathway on the management of mitral regurgitation: a report of the American College of Cardiology Task Force on Expert Consensus Decision Pathways
- Stevenson LW. 2017 ACC Expert Consensus Decision Pathway on the management of mitral regurgitation: a report of the American College of Cardiology Task Force on Expert Consensus Decision Pathways. *J Am Coll Cardiol* 2017; 70 : 2421–2449.
- Syahrian, Andri. 2017. *Karakteristik Pasien Operasi Jantung Katup Aorta dan Mitral di RSUD Dr. Soetomo periode 2013 - 2017*