

## Rehabilitation Program in a Patient Undergoing Mitral and Aortic Valve Replacement Surgery

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### Abstract

Heart disease due to valvular anomaly has increased prevalence along with increasing age. The operative management including reparation or substitution with prosthetic valve is the main therapy. Still becoming question mark either rehabilitation program is beneficence for patient undergoing valvular surgery. We report a patient with heart failure due to valvular heart disease and underwent double valve replacement surgery. Cardiac rehabilitation phase 1 and phase 2 was done. Patient feel physical condition is much better than before.

**Keywords:** rehabilitation; valvular heart surgery; heart failure

### Intisari

Penyakit jantung yang terkait kelainan katup memiliki prevalensi yang meningkat seiring peningkatan usia. Penanganan secara operasi termasuk perbaikan atau penggantian dengan katup prostetik merupakan terapi utama. Masih menjadi tanda tanya apakah program rehabilitasi bermanfaat bagi pasien yang menjalani operasi katup. Dilaporkan pasien dengan gagal jantung yang disebabkan oleh penyakit katup jantung dan menjalani pembedahan penggantian dua katup. Rehabilitasi jantung fase 1 dan fase 2 dilakukan di rumah sakit dan di rumah secara terprogram. Pasien merasa kondisi fisik jauh lebih buger dibanding sebelumnya.

### INTRODUCTION

Heart disease due to valvular anomaly has prevalence of 2.5% in USA with prevalence 0.7% in population in population aged 18-44 year old and increasing 13.3% in population aged > 75 year old.<sup>1</sup> Symptomatic valvular heart disease can affect quality of life. Operative management, either replacement or reparation is the first choice of treatment. Clinical guideline that emphasizing the importance of rehabilitation post valvular operation is still rare. The current guideline is come from randomized trial done in coronary heart disease or congestive heart failure. It is still a question mark either similar result will be found in population undergoing valvular operation.

### CASE PRESENTATION

A male aged 42 year old with body mass index 23.4 kg/m<sup>2</sup> has chief complaint of dyspnea on effort since 5 years before entering hospital. He also complaining of orthopnea, paroxysmal nocturnal dyspnea, and extremity swelling. No complaint of chest pain, syncope, and dizziness. An echocardiography examination done show all chamber dilatation, mitral valve has hockey stick appearance, thickened with Wilkins score 10, MVA planimetry 0.9 cm<sup>2</sup>, MVA PHT 0.5 cm<sup>2</sup>, MVmeanPG 14.66 mmHg, and MV max PG 21.15 mmHg. The aortic valve has calcification in all cusps with AVA planimetry 1.1 cm<sup>2</sup>, AVA VTI 1.3 cm<sup>2</sup>, AV mean PG 16.54 mmHg, and AV max PG 28 mmHg. The

aortic valve also has regurgitation with ARPHT 498 ms. Tricuspid valve examination shows severe regurgitation with TVG 82 mmHg. Interventricular septum has paradoxical movement with ejection fraction 55%, TAPSE 15, diastolic function could not be measured because patient has atrial fibrillation. Surgical conference done decided to do double valve replacement and tricuspid valve repair on this patient.

An aortic and mitral valve replacement surgery was done on October 2016. The aortic and mitral valve was replaced with mechanical prosthetic valve, aortic valve with Sorin no.23 and mitral valve with Sorin no.27, and De Vega procedure was done to tricuspid valve. The surgery run well with aortic cross clamp time 147 min, cardiopulmonary bypass time 187 min, and ischemic time 141 min.

The patient then admitted to Intensive Care Unit for 2 days. Echo evaluation shows mild hypokinetic of the left ventricle with ejection fraction 45%, TAPSE 14 mm, prosthetic mitral valve show good movement, no perivalvular leakage, MVA VTI 2.1 cm<sup>2</sup>. Aortic valve evaluation shows a good movement, no perivalvular leakage, only mild regurgitation found, AVA VTI 1.75 cm<sup>2</sup>. Tricuspid valve examination shows severe regurgitation with TVG 78 mmHg, homodynamic measurement at that time found CO 9 l/min, CI 5.3L/min/m<sup>2</sup>, and SVR 530 dynes sec cm<sup>-5</sup>. Patient then moved to ICCU for 7 days.

Cardiac rehabilitation phase started in this patient since day 3 in ICCU. Physical exercise start from moving legs and arms actively in day 3 to 6, sitting exercise on day 7 to 9, standing and walking exercise on day 10 in ICCU. No complication on surgical wound, hemodynamic was stable, and no post operative infection. UFH was given on day 3 intravenously concomitant with oral warfarin 2 mg, UFH was stopped once INR achieved.

Before discharge, an exercise called six minutes walk test (6MWT) was done in order to determine exercise prescription in phase 2.

In 6MWT, the patient can walk as far as 400 m in 5 minutes, no chest pain, borg scale was 10. From this result, we calculate VO<sub>2</sub> Max was 3 METS (10.5 ml/kg/min). Clinical data and 6MWT result shows the patient were in moderate risk stratification to do the exercise in phase 2 cardiac rehabilitation program.

Phase 2 rehabilitation program take place in rehabilitation polyclinic in Sardjito hospital. The patient do 3 times a week supervised exercise with 4 weeks duration, total 12 times supervised exercise. The exercise intensity based on risk stratification on in 6MWT, so 65% from initial maximum walking distance were given, so the walking distance is 1300 m in 30 minutes, divided into 2 doses, each 15 minutes. Duration during first 2 weeks exercise is 2 times 15 minutes with 5 minutes break time in between, with walking exercise where walking distance will be increased progressively as much as 5-20% each week. In the first meeting, the patient able to walk 650 m in 15 minutes without complaint, then the next exercise walking distance increased step by step. In each session, education about oral anticoagulant as thrombosis prevention in prosthetic valve also given.

In the last session of supervised exercise, treadmill evaluation was done and the result was negative ischemic response, normal hemodynamic response, average fitness, and aerobic capacity was 7.23 METS (25.3 ml/kg/min). For continuation of phase 2 exercise program in patient house, patient is in moderate risk stratification, so given 60% intensity which is 4.78 METS. Heart rate exercise target calculated using Carvonon method as much as 60%-70% is 140 to 150x/min. Patient was advised to do exercise program as many as 3 to 5 times a week by jogging with speed 3.9 km/30 min or cycling with target 7.8 km/30 minutes. Patient feel physical condition is more fit compared with before exercise, and the dyspneu diminished. Patient also was given education about routine

daily activity that can be done actively in house as part of phase 3 rehabilitation program, and also given education about consumption of anticoagulant and monitoring as secondary prevention of valvular thrombosis.

## DISCUSSION

According to WHO, rehabilitation in patient having cardiac disease is several activities done in order to help improving the underlying disease, including increase physical, mental, and social condition, in order to make patient able to function normally in society. A RCT by Landry et al reporting 20 patient post aortic valve replacement shows increase in maximum oxygen uptake ( $VO_2$  maks) upto 5.0 ml/kg/min (23%) after physical exercise ( $p \leq 0.01$ ).<sup>2</sup> An observational study by Habel-berge found from 19 womens undergoing mitral valve replacement, there is  $VO_2$  average increase as much as 4.0 mL/kg/min.<sup>3</sup> Newell et al. found similar result from randomized trial with 24 patients undergoing mitral or aortic valve replacement, an increase in cardiorespiratory fitness found in 12 and 24 weeks after operation in group undergoing physical exercise.<sup>4</sup> Evaluation of functional capacity post valvular operation done by Niemela et al also shows increase in ejection fraction of left ventricle and decrease of New York Heart Association Class with physical exercise.<sup>3</sup> Sire et al. also found increase in functional capacity as much as 38% in 6 months post operation in 44 patients undergoing physical examination. Jaraith et al also found increase in  $VO_2$  maks as much as 25% after 3 months physical exercise.<sup>5</sup> A study by Sibilitz et al in 147 patients undergoing balbular replacement after intervention in form of physical exercise and phycsicological consultation found increase in  $VO_2$  maks after 4 months intervention compared with control (24.8 mL/kg/min vs 22.5 mL/kg/min,  $p = 0.045$ ).<sup>6</sup>

Cardiac rehabilitation consisted of 3 phases, phase 1 is rehabilitation during hospitalitation,

phase 2 is outpatient rehabilitation, and phase 3 is long term rehabilitation. In patient undergoing valvular replacement operation, physical rehabilitation phase 1 can be started as early as possible, which is 48 hours after operation if no complication found. Before rehabilitation phase 1 started, clinical assessment which include disease history, medical condition, risk factor, and intervention that have been done, also comorbid during hospitalization need to be assessed.

## CONCLUSION

A male, 42 year old diagnosed with chronic heart failure due mitral stenosis and regurgitation, aortic stenosis and regurgitation, and tricuspid regurgitation. This patient undergone double valve replacement of aortic and mitral valve and also tricuspid repair. Initial assessment of phase 2 rehabilitation done before hospital discharge reveal aerobic capacity 3.0 METS (10.5 ml/kg/min). Supervised rehabilitation program conducted progressively in 12 meetings result in improvement of arobic capacity become 7.23 METS (25.3 ml/kg/min). Rehabilitation program shown to increase functional capacity and fitness in this patient.

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