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EFFECT OF EARLY MOBILIZATION IN PEDIATRIC PATIENT AFTER ATRIAL SEPTAL DEFECT CLOSURE: A CASE STUDY

Fitri Dwi Jayanti¹, Umi Budi Rahayu², Purnomo Gani Setiawan³

¹Student of Physiotherapist Profession Education, *Universitas Muhammadiyah Surakarta, Indonesia*

²Faculty of Health Sciences, *Universitas Muhammadiyah Surakarta, Indonesia*

³physiotherapist of RSUP dr Kariadi Semarang, *Indonesia*

*Corresponding author: Fitri Dwi Jayanti, Email: fitridwijayanti89@gmail.com

Abstract

Introduction: Congenital Heart Disease (CHD) is a congenital disease since the child was born due to the formation of a less than perfect heart. Atrial Septal Defect (ASD) is one of the common CHD. ASD occurs because the partition separating the right and left atriums is damaged, which causes blood rich in oxygen and carbon dioxide mixed. Valve repair surgery in ASD is recommendation and safe treatment procedure with low mortality rate. Bed rest after surgery can lead to prolonged immobilization according to the recovery period of each individual. The usual treatment for physiotherapy is early mobilization to reduce the disorder.

Case Presentation: A 6-year-old child was referred to RSUP Semarang with complaints of discomfort and dyspnea during activities. In December 2019 the family took the child to one of the doctors in Salatiga, and the doctor diagnosed that the child had congenital heart disease and was advised to have an examination. The results of catheterization and echocardiogram examination showed that the child had ASD II.

Management and Outcome: Treatments provided such as mobility in bed, range of motion (ROM) exercises, transfers, ambulation and walking exercises. The measuring instrument used is 6 Minute Walk Test (6MWT) which is done when the patient is able to walk and use how long the patient stays in the hospital.

Discussion: Early mobilization following surgery in Intensive Care Unit (ICU) is effective to prevent the risk of bed rest and prolonged stay in ICU as well as prevent deep vein thrombosis, pneumonia, pressure ulcers (decubitus) and can improve functional mobility. An important element for the recovery of patients post-cardiac surgery, is not the type of early mobilization but rather interventions that start from the best time according to the patient's condition to prevent the harmful effects of a long bed rest.

Conclusion : Early mobilization given postoperatively can prevent the risk of worsening due to long bed rest, long stay in the hospital and can improve functional mobility. Early mobilization and breathing exercise can produce positive effects for patients post cardiac surgery.

Keyword: Atrial Septal Defect, early mobilization, physiotherapy, breathing exercise, 6MWT



Introduction

Congenital Heart Disease (CHD) is a congenital disease since the child was born due to the formation of a less than perfect heart. CHD has 2 types: cyanotic and asyanotic. Atrial Septal Defect (ASD) is one of the most common asyanotic CHD ⁽¹⁾. ASD is a congenital heart disease that allows blood flow between the two parts of the heart, the right atrium and the left atrium to be mixed. Usually the right atrium and the left atrium are separated by a partition called the interatrial septum. If the septum is damaged or does not exist, then the blood rich Oxygen and Carbon Dioxide will be mixed. ASD is one of common congenital cardiac defects and 6-10% of all congenital cardiac defects ⁽²⁾.

Valve repair surgery on ASD is a recommendation and safe treatment procedure with low mortality rate⁽³⁾. However, the risk factor of bed rest after surgery remains. Prolonged bed rest is a well-established contributor to postoperative complications. Bed rest after surgery contributes to dysfunction of multiple organ systems. Immobility impairs oxygen transport including lung and tissue oxygenation; increases risk of deep vein thrombosis and pulmonary thromboembolism; and contributes to loss of muscle mass and strength ^{(4), (5)}.

Systemic complications that occur in postoperatively can increase the duration of ventilation and sedation mechanisms and can lead to muscle weakness, leading to a long period of treatment in the ICU and decreased mobility. The other effects that can occurs is immobility can lead to decreased protein synthesis, increased proteolysis, and lead to loss of muscle mass and strength, then resulting in decreased ability perform activity daily living is known that the possible consequences of immobility can persist for months or even years after treatment, can prevent the patient from returning fully their activity daily living, as well as may increase the risk of entering the hospital back. Therefore, additional treatment are required after cardiac surgery⁽⁶⁾. The physiotherapy treatment is early mobilization and breathing exercise to reduce the disorder⁽⁵⁾. In addition, education is provided before surgery.

Early mobilization after surgery has many benefits including increased ventilation, muscle strength and increased functional capacity⁽⁷⁾. Treatments provided such as mobility in bed, range of motion (ROM) exercises, transfers, ambulation and walking exercises⁽⁸⁾. Measurements taken to determine functional capabilities are 6 Minute Walk Test .

Case Presentation

A 6-year-old child was referred to RSUP Semarang with complaints of discomfort and

dyspnea during activities. In December 2019 the family took the child to one of the doctors in Salatiga, and the doctor diagnosed that the child had congenital heart disease and was advised to have an examination.

The first examination was conducted cardiac catheterization to detect heart conditions with the result that the child had Atrial Septal Defect II. Then a second examination was conducted with echocardiography and the results were obtained that the patient was diagnosed with ASD sekundum with mild mitral regurgitation.

Physical examination obtained anthropometry status, weight 17 kg, height 114 cm, composmetic consciousness, Blood pressure 110/65 mmHg, pulse frequency 110 x / min, breath frequency 20 x / minute, oxygen saturation 98-99 %. Length stay patient in hospital from 07 March 2021 until 15 March 2021 and have operation treatment on 09 March 2021.

Management and Outcome

Physiotherapy begins before surgery or pre-operation treatment where an explanation of the treatment will be given after surgery including breathing exercise and coughing⁽⁹⁾. Treatment is given at H+1 after surgery with a record of the patient's condition is stable (postoperative patients are at ICCU)⁽¹⁰⁾. There is no standard treatment or guidelines for patients treated in the ICU. According to Vural et al, chest physiotherapy and pulmonary exercise, ROM exercises, positioning and sitting can be administered immediately to patients in the ICU when the hemodynamic state is stable^{(10),(11)}.

Table 1 treatment goal and physiotherapy plan ^{(12),(13),(14),(15),(16)}

<i>Goal</i>	<i>Plan</i>
Clear of excess pulmonary secretion	<ul style="list-style-type: none"> • Coughing • Cupping
Provide ventilator support	<ul style="list-style-type: none"> • Breathing exercise • Pursed lip breathing
Prevent complication from bed rest	<ul style="list-style-type: none"> • Passive limb movement • Active assisted limb movement • Active limb movement (active ROM)
Increased functional capacity (functional mobility)	<ul style="list-style-type: none"> • Gradual mobilization <ul style="list-style-type: none"> ➤ Right side lying ➤ Left side lying ➤ Sitting with leaning on bed ➤ Sitting on the edge of the bed ➤ Sit to stand ➤ Walking

Table 2 physiotherapy treatment each day pre-operative to post operative

	physiotherapy treatment
Pre-operative	Education to patient and family about effect of surgery and treatment after operation. Education how to breathing for less the pain
Post operative day 1	Passive exercise all of the limb and transfer side lying to left and right Chest physiotherapy (cupping for clear of excess pulmonary secretion) Sitting with head up at less 30 ^o
Post operative day 2	Passive exercise or active assisted exercise for all limb and transfer ambulation Pursed lip breathing Chest physiotherapy Sitting with head up more than 60 ^o
Post operative day 3	Active exercise Pursed lip breathing Chest physiotherapy (if the patient have secret) Sitting out of bed with support
Post operative day 4	Active exercise Pursed lip breathing Sitting out of bed Sitting to stand
Post operative day 5	Active exercise Pursed lip breathing Walk while holding on to something
Post operative day 6	Active exercise Pursed lip breathing Walk alone
Post operative day 7	Active exercise Pursed lip breathing 6 Minute Walk Test for measuring functional ability before discharge form hospital

Treatment given twice a day in the morning and evening with therapist and family. Before doing treatment therapist must check the vital sign of patient. The measuring instrument used is 6MWT^{(17),(18)} which is done when the patient is able to walk and use how long the patient stays in the hospital⁽⁷⁾.

Results

A total of 7 postoperative sessions and 1 preoperative treatment physiotherapy session conducted on H+1 postoperative up to H+7 patients have been allowed home. Treatment is given in the morning with a physiotherapist and in the afternoon with the family for limb movement (twice a day) and every 2 hours changing position to side lying left or right.

6MWT is performed when the patient is able to walk without interruption. Obtained results of 180 meters where the normal value according to Oliveira et al, explained that if the mileage of 6MWT in patients to be performed heart surgery ≥ 300 meters. The result in patients who have

performed heart surgery is ± 280 meters where the postoperative heart decreases by 1/2 from before surgery and will slowly increase^{(17),(18)}.

Discussion

Based on the treatment obtained results that early mobilization has benefits for patient after cardiac surgery compared to total bed rest as in the study Ramos et al⁽⁶⁾. So that the patient can immediately experience an increase in functional activity. However, there is no definite basis for how long the treatment is administered (the right dose)⁽¹⁹⁾.

Zang et al, found that early mobilization of bed rest in ICU is effective to prevent the risk of worsening and long stay in the ICU as well as prevent deep vein thrombosis, pneumonia, pressure pain (decubitus) and can improve functional mobility⁽²⁰⁾. Zhang et al, reviewing the effects of early mobilization on patients with ventilators found that early mobilization may shorten the duration of ventilator use⁽²¹⁾.

Early mobilization contribute to decrease oxidative stress and inflammation. Moderate exercise in limb can increase protein that can against oxidative stress that can make maintaining muscle mass in the critically ill condition⁽²²⁾. Breathing exercises are a common treatment given at the beginning of the early mobilization protocol. Anaesthesia, types of surgery, surgical trauma and existing health problems play a role in decreased lung volume, decreased cough activity and respiratory muscle fatigue. Changes in lung function above can cause complications as well as atelectasis, which are generally given treatment and prevention with various techniques chest physiotherapy⁽²⁰⁾.

An important element for the recovery of patients post-cardiac surgery according to Herkner et al, is not the type of early mobilization but rather interventions that start at the best time according to the patient's condition to prevent the harmful effects of a long bed rest⁽²³⁾. In pediatric patients J for H+1 is transferred and breathing due to fever, for the next day the patient is given general ROM exercise, transfer (right tilt, left tilt, sitting leaning, sitting on the edge of the bed with legs swing and standing exercises) as well as ambulation and walking exercises performed gradually.

Length stay at hospital at Almashrafi et al, 30.5% patient stay at hospital ≥ 11 days after surgery, while 17% experienced prolonged ICU length of stay (≥ 5 days). The factors associated patient stay long in hospital such as body mass index, the type of surgery, cardiopulmonary bypass machine use, packed red blood cells use, non-elective surgery and number of complications⁽²⁴⁾. 6MWT result in patients who have performed heart surgery is ± 280 meters where the postoperative heart decreases by 1/2 from before surgery and will slowly increase.

Conclusion

Early mobilization given post operative can prevent the risk of worsening due to bed rest, long stay in the hospital and can improve functional mobility. Early mobilization and breathing exercise can

produce positive effects for patients post cardiac surgery. Early mobilization in the patients with ventilators may shorten the duration of use the ventilator.

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