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Patent Ductus Arteriosus Ligation Procedure in a 5 Year Old Girl

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ABSTRACT

Patent Ductus Arteriosus (PDA) is a congenital heart defect in which the closure of the ductus arteriosus is delayed after 72 hours. The incidence is frequent in the neonatal period and increases with the life expectancy of preterm infants. The clinical symptoms of PDA vary from asymptomatic to clinical heart failure, so PDA is often detected incidentally by echocardiogram. Reported a case of a 5 year old girl who has been known to suffer from PDA from echocardiography examination with a diameter of 3mm PDA. The patient has no complaints other than a continuous sound of heart sounds. Chest X-ray was examined with cardiomegaly results. The patient was treated with surgical ligation. The patient's condition after surgery is stable and there are no complaints.

1. Introduction

Patent Ductus Arteriosus(PDA) is the most common congenital heart defect in the neonatal period, with an increased incidence mainly due to increased survival of preterm infants. Delay in ductal closure is inversely related to gestational age at birth, with an incidence varying from 20% in preterm infants over 32 weeks of gestation, to 60% in those less than 28 weeks of gestation.1 In term infants, the incidence of PDA is reported to be around 1 every 2000 births.

The arterious duct is an important component in fetal circulation which forms a connection between the pulmonary artery and the aorta. After birth, the duct closes within 48 hours. The diagnosis of persistent PDA is made if closure fails after 72 hours. The PDA condition increases pulmonary blood flow and left atrial and ventricular volume, and results in a redistribution of systemic blood flow. The clinical complications depend on the degree of left-to-right shunt through the duct. Some of the complications of PDA include congestive heart failure, pulmonary hypertension, endarteritis and ductus arteriosus aneurysms.

To date, controversy remains about the indications for appropriate treatment, varying from prophylaxis from pregnancy to treatment only when PDA is shown to be significant. The closure of the PDA at a later date can be achieved using medical means, or surgical procedures for patients who have failed or have contraindications.

The purpose of this case presentation is to explain the pathogenesis, clinical symptoms and management of PDA so that it can make a diagnosis quickly and manage it appropriately.

2. Case Report

A 5 year old girl treated with the chief complaint had a known PDA and planned ligation. Children have a history of fever, recurring colds and coughs and are more easily tired than their peers when playing since the age of 3 years. One month before being admitted to the hospital, the child complained of fever, coughed cold and was taken to a doctor. During the examination the doctor found abnormal heart sounds so the child was consulted to a cardiologist and an echocardiography was performed on November 21, 2016 with the results of the solitary site, all PV to LA, AV - VA concordance, intact IAS and IVS, LV EF 72%, good valve, PDA diameter 3 mm, left to right shunt, left arch (Fig 1). Currently there are no complaints. There is no history of intermittent and bluish breastfeeding as a baby.

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Fig 1. Echocardiogram

On physical examination, the child appeared mildly ill with a pulse rate of 100 x / minute, breath rate 20x / minute, temperature 370C, body weight 15 kg, with good nutritional status. Physical examination of the skin, eyes, neck, lungs, abdomen and extremities did not reveal any abnormalities. On cardiac examination, examination of the heart showed no visible ictus cordis, palpable ictus in the left midclavicle line of the V intercostal space, on auscultation there was a regular heart sound, continuous noise 3/6 degree, upper left sternal line, radiating down the left subclavian.

In laboratory examinations with the aim of operating tolerance obtained hemoglobin 11.6 g / dl, leukocytes 8100 / mm3, platelets 518,000 / mm3, hematocrit 37%, count type 0/0/1/38/60/1, PT 9.3 seconds, APTT 41.2 seconds, urea 19 mg / dl, creatinine 0.5 mg / dl, instant blood sugar 98 mg / dl, sodium 138 mmol / l, potassium 3.9 mmol / l, chloride 106 mmol / l, calcium 9 , 7 mg / dl, with impression within normal limits.

The patient is referred to the Thoracic Surgery Department and planned for ligation. Other preparations for the procedure include an electrocardiogram (EKG), chest X-ray examination and repeat echocardiography.

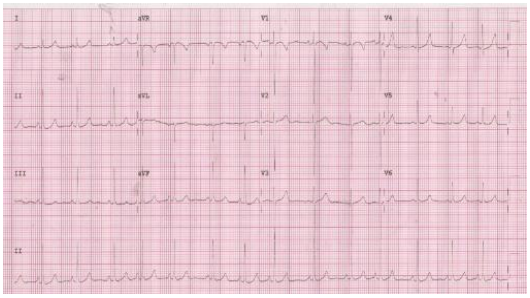

Fig 2. Electrocardiogram

Figure 2 shows a 12 lead ECG with sinus rhythm interpretation, QRS rate 90x / minute (72-135), RAD axis, normal P wave, PR interval 0.14 seconds (normal 0.14 - 0.16 seconds), QRS duration 0.06 seconds (normal 0.06-0.075 seconds), RVH (-), LVH (-), ECG impression within normal limits.

Interpretation of chest X-ray examination (Fig. 3), namely cardio thoracic ratio (CTR) 55%, immersed heart apex, normal pulmonary segment, normal aortic segment, increased pulmonary vascular streak, no finding of infiltrates, cardiomegaly impression, increased pulmonary vascular markings.

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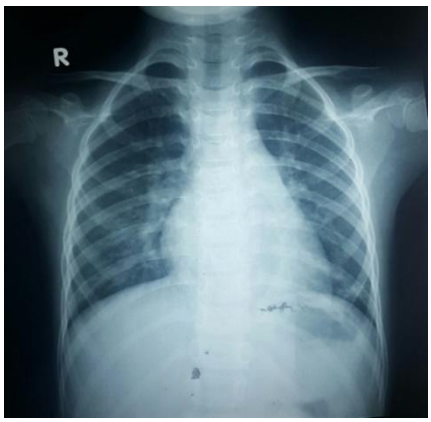

Fig 3. Chest X-ray

Echocardiography showed solitus site results, IAS intact, LV dilatation, EF 64%, PDA 3-4 mm, Left arch, TAPSE 1.7, MPAP 20 with a solitary site conclusion, PDA 3-4 mm, LV dilatation, LV and RV good function (Fig 4).

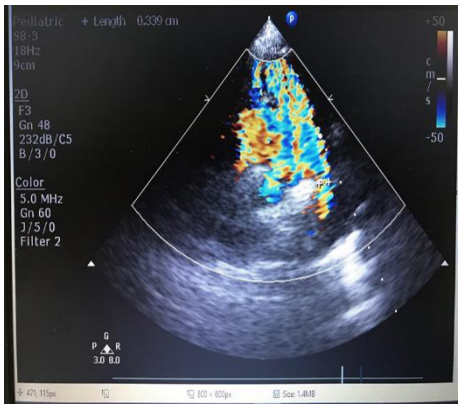

Fig 4. Pre ligation echocardiogram

On day 8 of treatment, a 2-hour PDA ligation was performed (Fig. 5). Postoperatively, the patient only complained of pain in the area of the operation with vital signs within normal limits. On examination of the heart no heart sounds were heard. Postoperative laboratory tests showed hemoglobin 11.4 g / dl, leukocytes 15,800 / mm3, platelets 345,000 / mm3, hematocrit 35%, blood sugar at 111 mg / dl, sodium 137 mmol / l, potassium 4.3 mmol / l, chloride. 107 mmol / l, calcium 9.9 mg / dl, impression within normal limits. The patient received ampicillin 4x400 mg iv, chloramphenicol 4x300 mg IV, ranitidine 2x40 mg IV, ketorolac 4x10 mg IV.

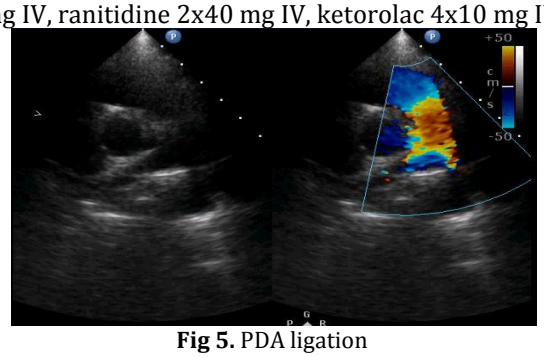

Fig 5. PDA ligation

On the 9-11 days of treatment, complaints of pain in the area of the operation had decreased, the patient was able to finish the diet given with gradually increased calories according to tolerance. Vital signs and other physical examinations are within normal limits. Post ligation echocardiography examination revealed solitus sites, PDA residual no, no pericardial effusion, 60%

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EF, goog LV and RV function (Fig 6). On the 11th day of hospitalization, the patient was allowed to go home.

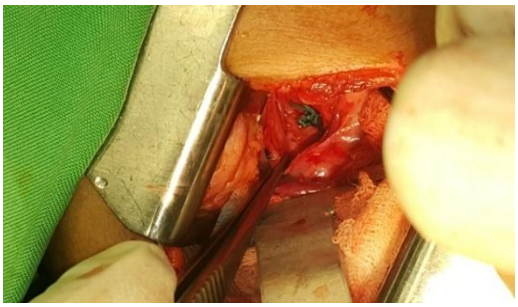

Fig 6. Post ligation echocacardiogram

Two weeks after the control patient was treated at the Pediatric Cardiology clinic of RSUP M Djamil Padang. The patient had no complaints and the suture wound was fine and dried up.

3. Case Discussion

Patent Ductus Arteriosus(PDA) is failure to close the ductus arteriosus after 72 hours of birth. PDA cases are often found incidentally called silent PDA with an incidence of 1 in 500 births

Based on the history, there is a history of recurring cold cough fever and more fatigue when playing since the age of 3 years. Clinical symptoms of PDA are often asymptomatic when the duct is small, because most patients can compensate well, but can also cause respiratory tract infections and activity intolerance if the duct size is large. Respiratory tract infection occurs due to left to right shunt through the ductus arteriosus which results in pulmonary oversirculation and overload of left heart volume. Increased pulmonary flow from the duct shunt results in an increase in the volume of pulmonary fluid resulting in decreased pulmonary compliance and lead to activity intolerance as in this patient.

Risk factors for PDA are genetics, prematurity, and infection at conception. The risk factors for PDA in these patients are not clear because the patient was born at term and there was no history of infection in the mother's pregnancy. The incidence of PDA in term infants is approximately 57 per 100,000 live births, whereas in preterm infants it is very high. The patient was born at term.5,6

The main physical finding on PDA is a continuous bruits, in the upper left sternal line. The noise often radiates down the left subclavian, and a thrill may be found. In the patient, there was a palpable ictus cord in the left midclavicle line of the V intercostal space, on auscultation of the heart there was a 3/6 degree continuous sound, in the upper left sternal line, radiating down the left subclavian.

On the EKG, there is an impression of cardiomegaly. Chest X-ray also revealed cardiomegaly, CTR 55% with implanted apex and increased pulmonary vascular streak. Chest X-rays may be normal on small PDAs, whereas on moderate to large PDAs, varying degrees of cardiomegaly and increased pulmonary vascular markings can be found. 7

Echocardiography results on 21 and 31 November 2016 showed a dilated left ventricle and a PDA with a diameter of ± 3-4 mm, with a left to right shunt. Echocardiography is the procedure of choice in diagnosis. Echocardiography also identifies and evaluates other cardiac defects in which the dimensions of the left atrium and left ventricle indicate indirectly the size of the shunt left to right, the bigger the shunt, the greater the dilatation of the heart chambers. Research conducted by Przemko Kwinta, et al. Concluded that echocardiography has a sensitivity of 94% and a specificity of 73% in diagnosing PDA.

The treatment options for PDA are medical and definitive therapy, namely closure of the PDA, both surgical and non-surgical. Medical therapy is a prostaglandin inhibitor (PG) such as Indomethacin, which has been used for closure of PDA since the late 1970s.10,11 Indomethacin resulted in functional closure within 48 hours in 79% of treated infants, compared with 28% in the control group. Unfortunately, the use of indomethacin has side effects such as kidney problems, gastrointestinal and pulmonary bleeding and disrupting platelet function. Smaller studies have

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shown an increase in necrotizing entero colitis (NEC) associated with indomethacin, but this has not been demonstrated by larger randomized studies and meta-analyzes.2

Based on the PDA management algorithm where the child is 5 years old without pulmonary hypertension, the treatment option is definitive therapy, namely closure of the PDA. PDA closure can be surgical and non-surgical. Closure with a transcatheter can use a coil or Amplatzer.12 Cardiological intervention in PDA with transcatheter has been known for 20 years. Some pediatric cardiologists use the technique without surgery with satisfactory results. At the State Heart Institute of Malaysia during 1999, PDAs were closed using Umbrella, coil and ADO in 294 cases with satisfactory results. At the Harapan Kita Heart Hospital, Jakarta, 46 cases have been closed using a coil and 81 cases of ADO. The Pediatric Cardiology Division RSCM until early April 2005 had closed using 5 coils and 81 cases of ADO, and only 1 case failed because the PDA was too large. 13

At RSUP M Djamil, due to insufficient facilities, this patient was subjected to surgical ligation. The goal of closing the PDA in this patient is to minimize the risk of complications in the future because although it is asymptomatic, there is a significant left-to-right shunt that has resulted in an enlarged heart. PDA ligation surgery is a good option if medical management fails or is contraindicated.14 Cotton et al. compared surgical ligation to medical treatment for PDA symptoms in 25 infants, and found no difference in mortality or NEC, but infants in the surgical group required less respiratory support.1 Although generally associated with greater pain and morbidity than the transcatheter method, surgical ligation is a safe and effective procedure. The perfect closure rate of surgical ligation in published reports has a range of 94-100%, with a mortality of 0-2% .3 Hawkins et al. Study comparing the cost and effectiveness of ligation and transcatheter concluded that ligation measures have the same safety and effectiveness, long length of stay. short and applicable in many patients when compared to transcatheter given the availability of this tool. 15

Things that need to be monitored during the post-ligation treatment period are subjective complaints such as pain, nausea and vomiting to complications of ligation including bleeding, pneumothorax and infection, although the incidence is quite rare. In this patient, during the post-ligation treatment period, there were no such complications. On auscultation the patient's heart was not found noisy and supported by the results of a post-ligation echocardiogram in which the PDA was completely ligated. The outcome reported after closure of the PDA is excellent even in some patients with Eisenmenger syndrome. Eliminating shunts decreases pulmonary blood flow which in turn lowers pulmonary artery pressure. 3

4. Conclusion

Patent ductus arteriosus (PDA) is a congenital heart disease in which there is failure to close the ductus arteriosus persistence after 72 hours of age. A proper history and physical examination supported by the results of theecocardiography can make the diagnosis correctly. The management of PDA includes medical and closure of the PDA both surgically and non-surgically. The choice of definitive surgical or non surgical therapy is based on size, complications that have occurred and the availability of resources at the hospital. The success rate for closing PDAs is quite high. Postoperative complications need to be recognized and managed appropriately.

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