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Open Repair of Patent Ductus Arteriosus in Older Children and Adults in Afghanistan: A Case Series

Fahima Negin MD[1], Sheba Azim MD[1], Mohammad Sharif Oria MD[1], Zabiullah Ebrahimi BSc[1], Megan Olejniczak MD[2]

[1]Department of Anesthesiology, Kabul University of Medical Sciences, Kabul, Afghanistan.

[2]Department of Anesthesiology, University of Minnesota Medical School, Minneapolis, MN

Corresponding author: Mohammad Sharif Oria

Email: sharif.oria@gmail.com

ABSTRACT

Patent ductus arteriosus is a common birth defect, indicative of 5-10% of congenital heart anomalies, commonly come to attention in infancy. We present 20 cases of PDA in older children and adults that were surgically repaired in Kabul, Afghanistan. All patients had a detectable murmur and experienced symptoms. All cases were operated using general endotracheal anesthesia. Surgery was performed via a left thoracotomy with intermittent apnea as required for surgical exposure. A remarkable revealing of our series is that we encounter adult PDA patients regularly.

Keywords: Congenital Heart Disease, PDA, Adulthood, Surgically

Introduction

Patent ductus arteriosus (PDA) is a common birth defect, representing 5-10% of congenital heart anomalies and affecting about 1 in every 2000 live births[1]The size of a PDA can range from very large to <1mm, and consequently, the clinical findings associated with a PDA can vary considerably in 1991, Houston *et al.* presented a study in which they assessed children and adults with no typical PDA murmur on auscultation and no evidence pulmonary hypertension. [2]Large, hemodynamically significant PDAs usually come to attention in infancy. When a PDA is discovered in adulthood, it is often an incidental finding in asymptomatic patients. It has been anticipated that one-third of adults with unrepaired, hemodynamically significant PDAs will die of heart failure, pulmonary hypertension, or endocarditis by age 40 [2]. Percutaneous closure is the treatment of choice in North America and Europe. In other parts of the world, percutaneous devices are not available, and open surgical repair is required.

Methodology

The study design was descriptive, case-series. Sampling method was non-probability, consecutive. In this series, all cases at all ages & both sexes who had PDA & underwent PDA surgical repair in Heart Institute of Kabul University of Medical Sciences (KUMs), Afghanistan were included (20 cases).

Results

Table 1 shows the patient characteristics of the series. The age of the subjects ranged from 8 years to 32 years with an average age of 15.85 years. All patients had a detectable murmur and presented because they experienced symptoms including fatigue, dyspnea, and palpitations. Two patients also had unrepaired atrial septal defects (ASDs). Only one patient presented with symptoms suggestive of heart failure. No patient had a known history of endocarditis or endarteritis. All patients had a normal pulse pressure, and none had evidence of left heart enlargement on transthoracic echocardiogram. Cardiac catheterization was not available and calculation of Qp: Qs was not performed.

Table 1. Characteristics of the patient (n=20)

Age (avg, range)	15.85 (8-32)
Female gender (n, %)	17 (85%)
Underweight	19 (95%)
Fatigue	20 (100%)
Dyspnea	20 (100%)

Palpitations	20 (100%)
JVD[1]	1 (5%)
Edema	1 (5%)
ASD	2 (10%)
Room air SpO2 (%) (avg, range)	96 (94-98)
SBP[2] (mmHg)	113 (98-135)
DBP[4] (mmHg)	70 (50-85)
Pulse pressure (mmHg)	43 (30-50)

[1]JVD=JugularVeinDistention[2] SBP=SystolicBloodPressure[3] [DBP]=Diastolic Blood Pressure

The patients were candidates for planned surgical operations and informed consent was obtained from the patient's parents for surgery and general anesthesia. In general, patients received 1mg midazolam and 0.5mg morphine as premedication, as well as 2mg metoclopramide for prevention of postoperative nausea and vomiting. Anesthesia was induced with 2mg/kg Propofol and 5-10 mg atracurium. Following placement of an age-appropriate endotracheal tube, anesthesia was maintained with 2-3% sevoflurane in 100% oxygen. A second peripheral Intravenous cannula was then placed, and patients were positioned right lateral decubitus. Patients were ventilated with two lung ventilation, 100% oxygen using pressure control ventilation to achieve a tidal volume of 10 ml/kg. Surgery was performed via a left thoracotomy with intermittent apnea as required for surgical exposure. Following PDA ligation, a chest tube is placed, and the surgical incision is closed. After the surgery, patients are extubated in the operating room and monitored in the intensive care unit overnight. Most patients are discharged from the hospital on postoperative day 3 or 4.

Only one patient experienced a postoperative complication: a 16-year-old female had a persistent pneumothorax after surgery and remained in the hospital for 20 days. She underwent a redo thoracotomy to evaluate for bronchopleural fistula, but none was found. Therefore, she remained hospitalized with a chest tube in place until the pneumothorax resolved.

Discussion

PDA is a common congenital cardiovascular abnormality. In several cases, however, a PDA may be of little to no hemodynamic significance. With the increasing usage of echocardiography, the diagnosis of very small, clinically silent PDAs is to be expected to increase. Most researchers agree that PDAs, especially with hemodynamic significance or associated IE, should be closed to recover the hemodynamic profile and prevent recurrent IE. Treatment of the very small or clinically silent PDA is more controversial, with several authors revealing routine closure regardless of size [3, 4, 5, 6].

The significance of a PDA can be described by the degree of pulmonary over circulation (Qp: Qs ratio) as shown in table 2 or by signs of pulmonary and left heart overload. While Qp:Qs calculations were not available for the patients in our series, all PDAs would be classified as "small" based on the available data.

Table 2: The clinical severity grading of the PDA in adult

Minimal	Absent	-	-
<1.5:1	Continuous	-	-
1.5-2.2:1	Continuous	+	+
>2.2:1	Systolic + Diastolic	+/-	++

In the United States, surgical closure of PDA is reserved for patients with large or calcified PDAs or those presenting with complex geometry that is not amenable to percutaneous closure. Small PDAs are routinely closed with percutaneous devices. The argument in favor of closing small PDAs has centered on the increased risk of endocarditis and endarteritis associated with unrepaired PDA[7, 8] as well as the decreased risk of morbidity associated with percutaneous rather than open procedures[9]. Before the introduction of catheter-based techniques in the 1970s, surgical ligation was the gold standard for PDA

closure and is associated with a mortality rate of <0.5%[2]. Few anesthesiologists practicing in the United States will encounter open PDA repair for adult patients. A notable detection of our series in Afghanistan is that we meet these patients routinely and care for them with very good outcomes.

The findings of this study are representative of the patients admitted to the Heart Institute of KUMs. The authors would like to suggest a further multicenter study on this topic to estimate natural history, treatment outcomes, and the potential adverse effects of an untreated PDA.

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