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Adult Patent Ductus Arteriosus: Successful Surgical Therapy in a Rare Presentation of a Missed Finding

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ABSTRACT

Delayed clinical presentation of patent ductus arteriosus (PDA) in adults is very rare. The clinical presentation in adults consists of either aortic or pulmonary valve endocarditis. We report the case of 34-year-old patient with a known history of rheumatic heart disease in childhood and chronic heart failure for 5 years who presented with acute heart failure and no evidence of PDA at prior echocardiography. Blood cultures grew *Staphylococcus epidermidis*, and echocardiography showed infective endocarditis of both aortic and pulmonary valves in the context of a large and severely inflamed PDA. Cardiopulmonary bypass and deep hypothermic circulatory arrest were used to interrupt the PDA from within the pulmonary artery because of inability to ligate the severely inflamed and calcified PDA prior to bypass. Combined pulmonary and aortic valve replacement and high-dose inotropic support were used. Dialysis was used for renal failure. The patient recovered and was discharged 10 days postoperatively. Six months later the patient was asymptomatic, and renal failure had resolved. The history and surgical management are discussed with an updated review of the literature.

CASE REPORT

A 34-year-old man with 1-week history of chest pain, palpitations, and fever was admitted for treatment of acute exacerbation of chronic heart failure. Earlier evaluation by echocardiography had shown a moderately dilated left ventricle and aortic valve regurgitation. The patient was an active smoker. He was initially managed with digoxin and furosemide. Repeat transthoracic echocardiography (Figure) showed a severely dilated left ventricle and a flail aortic valve–right coronary cusp with mobile vegetation attached. An eccentric jet along the anterior mitral leaflet was present and consistent with severe aortic regurgitation. Mild to moderate mitral regurgitation was present. Moderate tricuspid regurgitation was noted. No vegetations were seen in the atrioventricular valves. All 4 chambers were dilated above the upper limit of normal. Pulmonary arterial pressure was elevated (peak, 60 mm Hg; mean, 32 mm Hg). The creatinine concentration was 4 mg/dL. The pulmonary valve leaflets were destroyed, multiple vegetations extending into the main pulmonary artery. A large patent ductus arteriosus (PDA) (10-mm diameter) with left to right shunt was visualized at transthoracic echocardiography.

The patient was referred to the cardiothoracic surgeon (H.S.). Surgery consisted of attempted ligation of the PDA prior to bypass. However, there was significant difficulty visualizing the PDA. When found, the PDA was severely inflamed and calcified and could not be clamped safely. Cardiopulmonary bypass and antegrade crystalloid cardioplegia were established. Intraoperative echocardiography confirmed the findings. The patient was cooled to 14°C to protect the pulmonary artery at the time of manipulation. Longitudinal incision of the pulmonary artery revealed that the entire main pulmonary artery was filled with vegetations. The PDA was ligated from within the pulmonary artery while circulatory arrest was performed for 2 to 3 minutes. Further sutures were applied from the outside on the aortic side. All the vegetations were removed together with the destroyed pulmonary valve leaflets. A size 23 Carpentier-Edwards prosthetic valve was placed. The pulmonary artery was closed. Aortotomy was performed. The aortic valve right and left coronary cusps were ruptured and occupied by vegetation. The noncoronary cusp was completely intact. The aortic valve was excised and replaced with a size 25 metallic St. Jude prosthesis (St. Jude Medical, St. Paul, MN, USA). After weaning from bypass, the heart was in sinus rhythm, mean pulmonary arterial pressure was 20 mm Hg, and mean systemic pressure was 70 mm Hg. Bleeding from the PDA started suddenly just prior to closure. The bleeding could not be controlled, and bypass was reestablished. Bleeding from the friable PDA surface was visualized. Hemostasis was achieved with additional interrupted pledgeted sutures on both the aortic and the pulmonary sides. The patient then was weaned off bypass, and the sternum was closed after bilateral chest tube placement.

On return to the intensive care unit, the patient received immediate dialysis for one week after which his renal function returned to normal. He was extubated within 48 hours and discharged 9 days later. He was well for 8 months with use of a single diuretic and gradually improved and returned to daily activities. His postoperative echocardiographic findings showed improved cardiac function.

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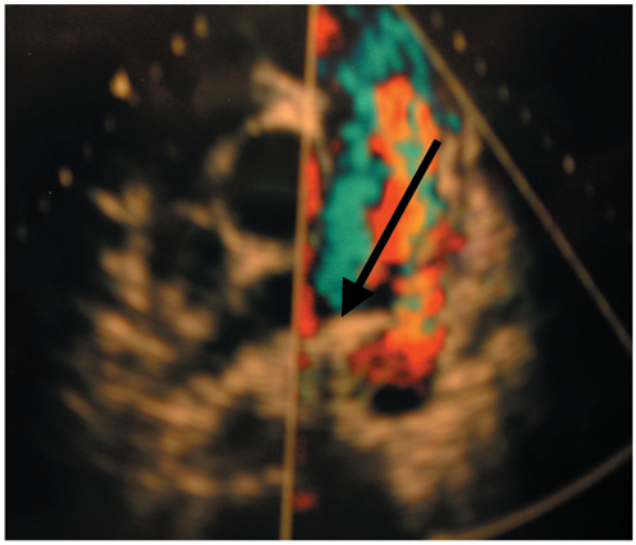

Transthoracic echocardiogram. Arrow indicates 10-mm patent ductus arteriosus with left to right shunt.

DISCUSSION

PDA is an open communication usually between the upper descending thoracic aorta and the proximal portion of the left pulmonary artery caused by persistent patency of the fetal ductus arteriosus [Kirklin 1993]. PDA with infective endocarditis is reported at a rate of 0.45% per patient per year. The usual site for infection is the intima of the pulmonary arterial wall opposite the PDA. Infected pulmonary arterial emboli and delayed aneurysm can occur [Shah 1999, Bilge 2004].

The natural history of adult PDA is not well described because of lack of large series of patients. If PDA is found, however, the mode of presentation is heart failure most of the time. Subacute endocarditis occurs mainly as a complication of small PDA and less often with a moderate-sized ductus [Lloyd 1994]. Subacute endocarditis rarely occurs when the ductus is large. After the advent of antibiotics, few patients died of this cause, but they remained subject to recurrent episodes of infective endocarditis. Also in patients with a moderate-sized ductus, congestive heart failure can be a cause of death from the third and fourth decades of life onward. In patients with large PDA who survive infancy, death usually is due to acute or chronic right heart failure secondary to the development of severe pulmonary vascular disease by the second or third decade of life [Campbell 1968, Kirklin 1993, Lloyd 1994].

Several case reports in the literature have documented management of infective endocarditis of either the pulmonary or the aortic valve in the context of adult PDA [Lloyd 1994, Whitlark 1994, Bilge 2004]. To the best of our knowledge, we report the first case of both pulmonary and aortic valve endocarditis in the context of PDA. With advances in echocardiography, detection of pulmonary valve endocarditis usually is not difficult [Kramer 1977].

Significant challenges, including renal and liver dysfunction occurring with congestive heart failure and systemic or pulmonary emboli and multisystem disorders, are not uncommon [Moreillon 2004]. A multidisciplinary medical team approach is necessary when organ dysfunction exists. In this case both the pulmonary and the aortic valves were involved with large friable vegetations of the aorta and pulmonary artery. Cases of ligation or division of the duct without cardiopulmonary bypass have been described, but there is risk of embolization during manipulation of either great vessel. The mainstay of management is surgical excision of the destroyed valves, removal of all the vegetation, and replacement of the affected valve.

Many techniques exist for management of PDA and the concomitant valve defect [Campbell 1968, Stejskal 1992]. They include (1) PDA ligation via thoracotomy and aortic valve replacement via median sternotomy, (2) PDA closure by aortic valve replacement by the endopulmonary approach, and (3) PDA resection with a segment of pulmonary arterial wall and intrapericardial dissection and ligation with deep hypothermic circulatory arrest.

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