Large patent ductus arteriosus in an adult complicated by pulmonary endarteritis and embolic lung abscess

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Abstract

Patent ductus arteriosus (PDA) is failure of the duct between the aorta and the pulmonary artery to close, comprising approximately 5-10% of congenital heart defects. First described by Galen in the 3rd century, Gross carried out the initial successful surgical repair in 1939. Early childhood detection and safe operative correction mean that adulthood PDA is now rarely encountered in the Western world. However, its association with a significantly reduced life expectancy has been highlighted by several studies in the past.

Introduction

Patent ductus arteriosus (PDA) is failure of the duct between the aorta and the pulmonary artery to close, comprising approximately 5-10% of congenital heart defects. First described by Galen in the 3rd century, Gross carried out the initial successful surgical repair in 1939. Early childhood detection and safe operative correction mean that adulthood PDA is now rarely encountered in the Western world. However, its association with a significantly reduced life expectancy has been highlighted by several studies in the past.

Case Report

A 34-year old builder presented to his family doctor in an acute condition with shortness of breath. He described a 2-month history of malaise, lethargy, rigors and progressive exercise limitation. There was no past medical history of any risk factors for cardiac disease or endocarditis. Physical examination revealed him to be febrile at 38.3°C; he weighed 95 kg and was 193 cm tall. Blood pressure was 120/60, with 100% oxygen saturations and a regular pulse at 72 beats/min. Auscultation of his chest revealed a harsh, grade 3/6 continuous murmur which was loudest at the second left intercostal space; there were no signs suggestive of volume overload, ventricular failure, or raised pulmonary pressures. Chest X-ray demonstrated mild cardiomegaly with normal pulmonary vasculature, and electrocardiogram revealed normal sinus rhythm with no features of ventricular strain or atrial enlarge-
diameter of 15 mm; aortic and pulmonary ends of the PDA measured 25 mm and 5 mm, respectively. Following isolation of the recurrent laryngeal nerve, cardiopulmonary bypass (CPB) was instituted via aorto-bicaval cannulation. Cardiac arrest was achieved via antegrade cold blood cardioplegia with pre-emptive systemic cooling to 24°C, in anticipation of the potential need for circulatory arrest.

In contrast to ligation of simple non-infected PDA, the surgeon’s initial priority was to safely evacuate vegetation from the MPA, thus preventing further systemic or pulmonary embolization. This was achieved via incision of the MPA and inspection of the lumen, which revealed no obvious vegetation but a hypertrophic tunica intima, consistent with endarteritis. The pulmonary orifice of the PDA was then easily oversewn from within the lumen, with maintenance of a clear bloodless field via placement of a vascular clamp towards the aortic end of the PDA. The presence of a large aortic PDA orifice determined our decision to perform the remaining division and repair under hypothermic circulatory arrest.

The patient made a completely uneventful recovery, being discharged to his referring hospital on day 6 with normal blood indices for continuing intravenous antibiotic therapy. Two years following surgery he presents no cardiac, respiratory or systemic symptoms. TTE shows no residual shunt with good ventricular function, reduction in ventricular dimensions, and chest X-ray shows complete resolution of the previously noted changes.

Discussion

Endocarditis associated with PDA is rare. There are less than 30 reported cases of pulmonary endarteritis associated with PDA in the adult, and overall incidence has dramatically decreased over the last 30 years. Large shunts with diameters greater than 4.5 mm seem to be most susceptible, and infection of small clinically silent PDA is extremely rare and virtually non-existent. Improving echocardiographic technology has increased detection of these small, hemodynamically insignificant silent PDA, and their optimal management, particularly in adults, remains controversial. Some groups recommend immediate closure as prophylaxis against future infection, whereas others maintain that the incidence of endarteritis and secondary mortality to this is too low to justify intervention.

Detection of PDA via TTE is easy in children but can prove difficult and sometimes impossible in adults due to interference of the lung and the increased size of the thoracic cage. Diagnosis rests upon showing the presence of an abnormal turbulent mosaic flow pattern within the pulmonary artery that must be proven to be originating from the descending aorta; this is because several other disorders, such as aortopulmonary septal defect, rupture of the sinus of Valsalva into the pulmonary artery, and pulmonary stenosis are also known to cause this flow pattern. TOE has been shown to be significantly more sensitive in detection of adult PDA than TTE, with no obvious difference in specificity between the two modalities.

In this case, TTE suggested the diagnosis which was then confirmed by both CT and TOE. However, there was inconsistency within and between modalities with regards to the presence of vegetation within the MPA, a diagnostic dilemma that has been previously reported. Such anomalous findings are thought to arise from inter-observer variation in technique and the multiplanar nature of echocardiographic imaging. These findings emphasize the importance of a multimodal imaging approach in assessing adult PDA, as previously advocated in other reports, particularly when infection is suspected.

Open surgical division or ligation has traditionally been an extremely successful and safe method of PDA closure and there are large studies demonstrating excellent closure rates with low mortality (<2%). Comparable results are now achievable using transcatheter devices and they are now the first-line closure
method in many centers; however, their use is contraindicated by the presence of infection. Historically the majority of surgical repairs have been via a postero-lateral thoracotomy. However, newer techniques including video assisted thoracoscopic and muscle sparing approaches are emerging. The need to explore the MPA and evacuate vegetation determined our decision to perform a median sternotomy, a manoeuvre that would have been impossible to carry out safely via thoracotomy.

A wide variety of surgical repair techniques, including ligation, patch closure\(^\text{17}\) and balloon occlusion method\(^\text{18}\) have been utilized in treating adult PDA, influenced mainly by the size, shape, calcification and friability of the PDA encountered. The use of CPB is not always necessary\(^\text{19}\) but makes repair less hazardous. Successful repair is also feasible without cardioplegic arrest of the heart, or during electrical ventricular fibrillation.\(^\text{20}\) After over-sewing the pulmonary orifice, we employed hypothermic circulatory arrest as we felt it best facilitated the safe, secure repair of a large aortic defect.

## Conclusions

Adult PDA can be complicated by pulmonary endarteritis and more rarely by septic embolus to the lung. Radiographic detection of vegetation within the PDA can prove difficult but has important implications with regards to operative strategy, and emphasizes the need for a multimodal imaging approach in PDA assessment. Prophylactic closure of large PDA is mandatory with surgery being favored. However, optimal management of small silent PDA amenable to safe transcatheter occlusion remains unclear, as its behavior characteristics in the modern era are not well defined.

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