

## Transcatheter occlusion of patent ductus arteriosus in adults

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*Patent ductus arteriosus (PDA) may escape clinical detection and persist into adulthood. For the purpose of PDA occlusion a new transcatheter technique with double Rashkind umbrella was developed. We present two successful closures of PDA in adult patients with this device. The two years follow-up findings testify to the favourable clinical course, with disappearance of the continuous murmur and a normal colour flow echocardiographic examination.*

*Key words:* ductus arteriosus, patent therapy; catheterisation

### Introduction

Isolated patent ductus arteriosus (PDA) occurs in 1 in 2000 live, fullterm birth, accounting for approximately 5% to 10% of all types of congenital heart defects. PDA is very common in premature infants, and infants born at high altitude have an increase incidence. There is female preponderance with a ration ranging from 2:1 to 3:1.<sup>1</sup>

The clinical significance of the PDA is determined by magnitude of the shunting through the PDA. The direction of the flow will depend upon relative pulmonary and systemic vascular resistance. Normally, the pulmonary vascular resistance drops quickly after birth. Therefore, blood flows from the aorta into pulmonary

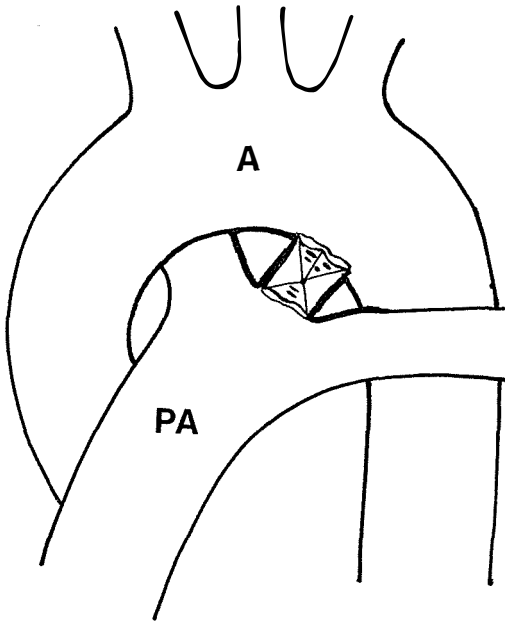
arteries.<sup>2</sup> PDA is closed either surgically<sup>3</sup> or by percutaneous transcatheter technique. First successful percutaneous closure of PDA was reported by Postman in 1963.<sup>4</sup> Since then numerous techniques have been developed over the years, but only the Rashkind double umbrella closure of PDA has been generally accepted (Figure 1).<sup>5,6</sup>

### Case reports

#### Case 1

A 18-year-old woman presented with dyspnea on effort. A clinical diagnosis of PDA had been made at the age of 5, however, her parents refused surgical correction at that time. Chest radiograph showed increased pulmonary vascularity and a prominent aortic arch. Cardiac catheterisation showed conical shaped PDA 10 mm long and 5 mm in diameter without pulmonary hypertension. After diagnostic catheterisation, a 0.035 inch, 300 cm long Amplatzer

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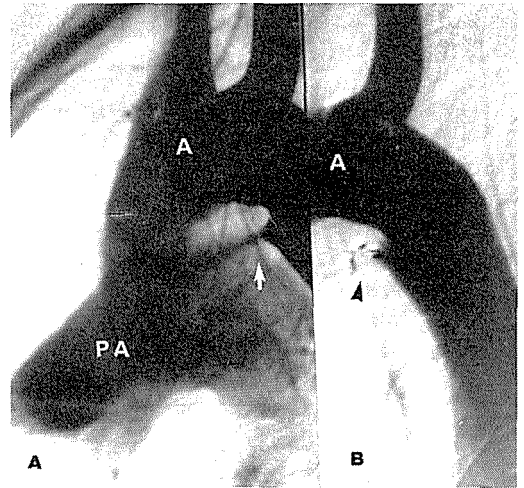


**Figure 1.** Rashkind PDA occluder system in position in the ductus arteriosus. PA = pulmonary artery, A = aorta.

guide wire was introduced from the pulmonary artery through the PDA into the thoracic aorta. The delivery catheter was advanced into the thoracic aorta and PDA was closed by 12mm Rashkind double umbrella (Figure 2). During the 2-years follow-up, patient has been free of symptoms.

### Case 2

A 30-years old woman was admitted to the hospital due to accidentally diagnosed PDA. She was symptoms free. On auscultation, a continuous machinery murmur in the 2<sup>nd</sup> and 3<sup>rd</sup> left interspace was heard. She had no signs of heart failure. The 12-lead ECG showed normal sinus rhythm. The chest x-ray film showed no abnormalities. However, the transthoracic echocardiogram in modified parasternal short axis view of the base of the heart revealed colour flow Doppler signal streaming into the main pulmonary artery. A continuous flow into the pulmonary artery was recorded by continuous wave Doppler examination. Both findings are



**Figure 2A.** Lateral angiogram showing typical funnel shaped ductus (arrow). PA = pulmonary artery, A = aorta.

**Figure 2B.** Lateral angiogram showing device in position (arrow) with hinge point at the pulmonary artery (PA) end, distal limbs nicely flexed and no residual shunting. A = aorta.

characteristic for PDA without pulmonary hypertension. The diagnostic catheterisation was performed and 1cm long conical shaped PDA was shown by aortography. At the pulmonary end it was 5mm wide and at the aortic end 10mm. The pressures in the right heart and in the pulmonary circulation were in normal limits. After diagnostic catheterisation the PDA was closed by double Rashkind umbrella by transcatheter technique. The typical murmur of PDA disappeared immediately after the procedure. Three days after transcatheter closure of the PDA the control echocardiogram was performed and there was no colour flow Doppler signal of PDA. The patient was examined two years after the procedure in six months intervals clinically and by echocardiography. She has been free of symptoms and echocardiogram has been in normal limits.

### Discussion

PDA may escape clinical detection and persist into adulthood. If adults do not develop signi-

ficant pulmonary vascular disease, they tend to have an unpredictable progression of left ventricular failure.<sup>7</sup> Surgical or transcatheter occlusion of PDA is indicated in adulthood, too.

Although mortality of surgical correction of PDA is low, significant morbidity, including excessive bleeding, injury to the recurrent laryngeal or phrenic nerves, and complications of general anaesthesia, can occur in a small percentage of patients. To circumvent these problems, transcatheter closure of PDA was developed. Transcatheter occlusion is a successful mode of treatment for PDA with a low incidence of complications. Overall success rate is cca 96 % including reocclusions.<sup>8</sup>

Results reported by McManus (2) and McNamara (3), as well our data suggest that transcatheter closure of PDA with Rishkind double umbrella is a efficacious procedure in providing complete permanent ductus closure even in adult patients. The clinical course suggests that PDA closure is complete immediately after the procedure. After two years follow-up our patients have been free of symptoms and colour flow Doppler studies have been in normal limits.

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