Mycotic aneurysm of the pulmonary artery

A report of 2 cases

T. H. Goh¹

From the Department of Medicine, University of Malaya, Kuala Lumpur, Malaysia

Isolated mycotic saccular aneurysm of the left pulmonary artery as a result of acute bacterial endarteritis complicating persistent ductus arteriosus is described in 2 children aged 13 years and 7 years. Successful resection of the aneurysm was accomplished in the first child. The second child had associated aortic incompetence and succumbed from cardiac failure while awaiting operation.

Aneurysms of the main pulmonary artery are uncommon. Deterling and Clagett (1947) in their survey of 109,571 necropsies from various centres recorded 8 cases only of pulmonary artery aneurysms. They further reviewed 35 proven cases at necropsy from the published reports and one of their own. In 21 per cent of cases the pulmonary artery aneurysms were associated with persistent ductus arteriosus, and mycotic aneurysms were found in 4 cases. Kauffman, Lynfield, and Hennigar (1967), in reviewing 9 cases of multiple mycotic pulmonary artery aneurysms associated with congenital heart diseases (including one case quoted by Deterling and Clagett, and one of their own), noted 6 cases associated with persistent ductus arteriosus, 5 of which had aneurysm of the trunk of the pulmonary artery besides multiple peripheral aneurysms. Another case associated with ventricular septal defect also had an aneurysm of the trunk of the pulmonary artery. Isolated case reports (Jelinek and Owen, 1958; D'Arbela *et al.*, 1970; Shull, Kapadia, and Zuberbuhler, 1970) have also drawn attention to the frequent association of pulmonary artery aneurysm with persistent ductus arteriosus. In the University Hospital, Kuala Lumpur, out of the 86 cases of persistent ductus arteriosus seen during the period 1968 to 1972, 2 cases of mycotic pulmonary artery aneurysm were encountered and form the basis of this report.

Case reports

Case 1

A 13-year-old asymptomatic Indian girl was admitted because of a history of 10 days of fever, chills, rigors with

Received 23 October 1973.

¹ Present address: Department of Paediatrics, University of Malaya, Kuala Lumpur, Malaysia.

sweating, dyspnoea, and praecordial chest pain on exertion. She was previously diagnosed as having a persistent ductus arteriosus and was awaiting operation. On physical examination, no cutaneous stigmata of subacute bacterial endocarditis were noticed. Her pulse rate was 110/min regular, collapsing with a blood pressure of 130/50 mmHg. Examination of the heart revealed left ventricular hypertrophy. The typical continuous murmur of a persistent ductus arteriosus was heard maximally over the second left intercostal space. The second sound was of normal intensity. Her lungs were clear and there was no hepatosplenomegaly. Right loin tenderness was present. A provisional diagnosis of persistent ductus arteriosus with subacute bacterial endocarditis and urinary tract infection was made.

Investigations revealed a Hb of 9.1 g/100 ml and the peripheral blood film showed normochromic, normocytic red blood cells. Her total white cell count was 15,900/mm³, with a differential count of neutrophils 82 per cent, lymphocytes 12 per cent, monocytes 5 per cent, and eosinophils 1 per cent. No malarial parasites were found. Her erythrocyte sedimentation rate was 73 mm/hour. Electrocardiogram revealed left ventricular hypertrophy. Urinalysis showed a persistent pyuria, and culture revealed a mixed growth of organisms. Her Mantoux test was negative. Blood cultures grew *Staphylococcus pyogenes* sensitive to penicillin, streptomycin, and cephaloridin.

Right heart catheterization three months previously had revealed a pulmonary artery pressure of 48/30 mmHg and a significant step-up in oxygen saturation at pulmonary artery level. The catheter passed through the ductus into the descending aorta. Aortic pressure was 120/50 mmHg. Pulmonary to systemic blood flow ratio was 2.7 to 1. Radiological examination of the chest showed cardiomegaly with increased pulmonary blood flow to both lungs with prominence of the main pulmonary artery and multiple infiltrates in both lung fields. She was treated for bacterial endocarditis but the infection was difficult to control. After a stormy period her temperature eventually was controlled and she improved. Subsequent chest films taken about two months

(a)

(b)

FIG. 1 (a) *Chest radiograph shows a dense shadow in the region of the main pulmonary artery segment.* (b) *Biplane aortic angiogram shows a saccular aneurysm of the left main pulmonary artery.*

(a)

(b)

FIG. 2 (a) *Chest radiograph indicates development of a dense shadow in the region of the main pulmonary segment.* (b) *Biplane pulmonary angiogram shows a saccular aneurysm of the proximal left main pulmonary artery.*

after admission showed complete resolution of opacities in the lung fields but showed development of a dense shadow in the region of the main pulmonary artery (Fig. 1a). A mycotic aneurysm of the main pulmonary artery was suspected. Biplane ascending aortic angiography showed a persistent ductus arteriosus and a large saccular aneurysm measuring 4.5 cm diameter arising from the area near the origin of the left main pulmonary artery (Fig. 1b). Peripheral pulmonary arteries were normal. After a period of convalescence, the patient underwent operation under complete cardiopulmonary bypass and hypothermia. A large persistent ductus arteriosus of 1.5 cm diameter and 0.8 cm in length, with a small haematoma in the periductal tissue was found. There was an aneurysm at the origin of the left main pulmonary artery, 4 cm in diameter, arising from the superior aspect of the artery and lying within the fibrous pericardium. There was complete fusion of the serous pericardium all over the heart. The persistent ductus arteriosus was divided and the aneurysm of the pulmonary artery was dissected free and excised. Sections from the wall of the resected aneurysm showed a fibromuscular wall with scanty elastic tissue and fresh adventitial haemorrhage. The patient had a stormy post-operative course but recovered completely and is at present back to normal activities. Postoperative chest film showed the pulmonary blood flow to be normal with slight prominence of the main pulmonary artery and adjacent pleural thickening.

Case 2

A 7-year-old boy was first seen in a district hospital. He was said to have intermittent fever, palpitations, and breathlessness for the past 18 months and was referred to the University Hospital for further management of a persistent ductus arteriosus. On physical examination, he was small for his age, febrile, and moderately anaemic. His pulse was 140/min, regular and collapsing with a blood pressure of 140/80 mmHg. There was left ventricular hypertrophy, and a continuous murmur was heard maximally over the second left intercostal space. The pulmonary component of the second sound was accentuated. The lung fields were clear. Hepatosplenomegaly was present but there was no evidence of cutaneous emboli.

Investigations revealed a Hb of 7.3 g/100 ml, packed cell volume 24 per cent, and a normochromic blood picture. Total white cell count was 8,400/mm³ with a differential count of neutrophils 78 per cent, lymphocytes 22 per cent, and the erythrocyte sedimentation rate was 44 mm/hour. No malarial parasites were found. The electrocardiogram showed a sinus tachycardia and left ventricular hypertrophy. Initial chest radiograph showed mild cardiomegaly with increased pulmonary blood flow to both lungs with prominent main pulmonary artery. A chest radiograph taken a week later showed development of a dense shadow in the region of the main pulmonary artery and a pulmonary infiltrate extending into the left upper lung (Fig. 2a). The pulmonary infiltrate cleared subsequently. Blood cultures were persistently negative. Mantoux test was negative.

Sputum and gastric lavage cultures for *Mycobacterium tuberculosis* were negative. Right heart catheterization studies demonstrated a small step-up in oxygen saturation at pulmonary artery level, consistent with the diagnosis of a small persistent ductus arteriosus. The ductus was not crossed. Pulmonary artery pressure was 58/22 mmHg and right brachial artery pressure was 120/84 mmHg. Biplane pulmonary angiography demonstrated a small persistent ductus arteriosus and a saccular aneurysm of the proximal left pulmonary artery (Fig. 2b). The peripheral pulmonary arteries were normal.

A clinical diagnosis of persistent ductus arteriosus with subacute bacterial endarteritis and mycotic aneurysm of the left pulmonary artery was made and the patient was started on parenteral penicillin, streptomycin, followed by cephaloridine to which he responded. Six weeks later, on re-examination the pulse was found to be collapsing and the brachial blood pressure was 130/50 mmHg. An early diastolic murmur was heard at the left sternal edge. The clinical impression of moderately severe aortic regurgitation was confirmed by ascending aortic cineangiography. Aortic pressure recorded was 136/44 mmHg. He developed cardiac failure but responded well to therapy. He was scheduled for elective surgery for ligation of the ductus and excision of the pulmonary artery aneurysm. However, six months later the patient was readmitted to the district hospital with progressive cardiac failure and succumbed. Necropsy was not performed.

Discussion

Mycotic aneurysm of the main pulmonary artery is an uncommon complication of persistent ductus arteriosus with subacute bacterial endarteritis. It is usually saccular and is less common than peripheral pulmonary artery aneurysms (Wagenvoort, Heath, and Edwards, 1964), but when present it is usually associated with multiple peripheral pulmonary artery aneurysms (Kauffman *et al.*, 1967). In the cases reported above, isolated saccular aneurysms developed at the origin of the left pulmonary artery.

A congenital defect in the pulmonary artery has been postulated in those cases associated with persistent ductus arteriosus, with pulmonary hypertension playing a contributory role in many instances (Shull *et al.*, 1970; Williams *et al.*, 1971). In the cases reported above, only mild pulmonary hypertension was present. However, the development of the aneurysms following on subacute bacterial endarteritis makes it probable that these are mycotic aneurysms.

Previously, surgical resection of pulmonary artery aneurysm was fraught with high morbidity and mortality (Ross, Feder, and Spencer, 1961), but with the introduction of the pump oxygenator, surgical resection of the aneurysm can now be accomplished easily (Mustard, 1971; Williams *et al.*, 1971). In those cases treated conservatively common

causes of death were rupture of the pulmonary artery aneurysm (Deterling and Clagett, 1947; Kauffman *et al.*, 1967; D'Arbela *et al.*, 1970) and congestive cardiac failure (Kauffman *et al.*, 1967).

The author wishes to express his gratitude to Dr. H. O. Wong for her encouragement, advice, and helpful criticism in the preparation of this report; to Dr. K. L. Lam for permission to report Case 2; to Professor N. K. Yong who operated on Case 1; to Dr. K. Prathap for the pathological report, and to the Medical Illustrations, Medical Faculty, University of Malaya, for Fig. 1 and 2.

References

- D'Arbela, P. G., Mugerwa, J. W., Patel, A. K., and Somers, K. (1970). Aneurysm of pulmonary artery with persistent ductus arteriosus and pulmonary infundibular stenosis. *British Heart Journal*, **32**, 124.
- Deterling, R. A., and Clagett, O. T. (1947). Aneurysm of the pulmonary artery. Review of the literature and report of a case. *American Heart Journal*, **34**, 471.
- Jelinek, J. E., and Owen, T. K. (1958). Bilateral pulmonary artery aneurysms associated with persistent ductus arteriosus. *British Medical Journal*, **1**, 815.
- Kauffman, S. L., Lynfield, J., and Hennigar, G. R. (1967). Mycotic aneurysms of the intrapulmonary arteries. *Circulation*, **35**, 90.
- Mustard, W. T. (1971). Surgery for patent ductus arteriosus. In *The Natural History and Progress in Treatment of Congenital Heart Defects*, p. 57. Ed. by B. S. Langford Kidd and J. D. Keith. Charles C. Thomas, Springfield, Illinois.
- Ross, R. S., Feder, F. P., and Spencer, F. C. (1961). Aneurysms of the previously ligated patent ductus arteriosus. *Circulation*, **23**, 350.
- Shull, W. K., Kapadia, S. B., and Zuberbuhler, J. R. (1970). Aneurysm of the main pulmonary artery. Association with patent ductus arteriosus and ostium secundum defect. *American Journal of Diseases of Children*, **119**, 507.
- Wagenvoort, C. A., Heath, D., and Edwards, J. E. (1964). *The Pathology of the Pulmonary Vasculature*, p. 267. Charles C. Thomas, Springfield, Illinois.
- Williams, T. E., Schiller, M., Craenen, J., Hosier, D. M., and Sirak, H. D. (1971). Pulmonary artery aneurysm. Successful excision and replacement of the main pulmonary artery. *Journal of Thoracic and Cardiovascular Surgery*, **62**, 63.

Requests for reprints to Dr. T. H. Goh, Department of Paediatrics, University of Malaya, Kuala Lumpur, Malaysia.