

CASE REPORTS

TRAUMATIC AORTO-PULMONARY FISTULA

BY

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Aorto-pulmonary fistulae other than patent ductus arteriosus are classified as (a) *congenital*, the defect being in the aortic septum and (b) *acquired*, implying pre-existing disease, usually of the aorta. The genesis, natural history, and symptomatology of these lesions are described and the previously recorded cases reviewed by Morgan Jones and Langley (1949), Dadds and Hoyle (1949), and Gasul *et al.* (1951).

The object of this paper is to describe a case of aorto-pulmonary fistula in a previously intact circulation caused by a needle which had presumably penetrated the chest wall.

Case Report

A male African child, aged 12, was brought to Baragwanath Hospital, Johannesburg, by his mother on 22/3/49. His only complaint was of substernal pain, reputedly occurring for the first time in recent weeks. Its site was indicated unhesitatingly as mid-line, just below the manubrio-sternal junction. The pain was described as constant, unaffected by effort, and not sufficiently severe to prevent sleep. The mother stated that the child, although active, was less so than previously. He had had, she said, no illness in the past.

The boy weighed 24 kg.; his height was 1.25 m. He was a bright, intelligent, quiet child, in no sense distressed. He had no congenital deformity. He was afebrile and not cyanosed; his fingers were not clubbed. Neck veins were not engorged but carotid pulsation was vigorous. He had no oedema. All palpable arterial pulses were bounding; pistol shot sounds were audible over the brachial, femoral, and carotid arteries. The heart rate was 100, the rhythm regular. Brachial blood pressure was 110/50, popliteal 130/60. The chest was symmetrical. There was a hyperactive left ventricular impulse. A vibrant thrill, palpable over the entire præcordium, was maximal over that part of the sternum and adjacent intercostal spaces (on both sides) between the levels of the third and fifth costal cartilages. A continuous murmur, audible over the whole chest wall, was loudest where the thrill was most intense. Both thrill and murmur had the semblance of being superficial and were accentuated in diastole. Over the third right costo-sternal junction, *where there was a scar 1 mm. in diameter*, the Gibson murmur had a rougher and more rasping quality than elsewhere. Exclusively over the scar just referred to the thrill was particularly intense, the sensation transmitted to the palpating finger being reminiscent of that created by a dentist's drill.

The hæmoglobin value was 12.5 g. per 100 ml., the leucocyte count 9000 with differential figures in the accepted normal range. Clinical examination was otherwise negative. Serial blood cultures were sterile. The cardiographic pattern was that of right bundle branch block.

Radioscopy showed the heart to be hyperactive; its chambers were not recognizably enlarged. The pulmonary artery and its major branches were a little prominent. Their pulsation, like that of the aorta, was vigorous but there was no true hilar dance, nor was there visible pulsation beyond the hila. The vascular pattern in the lungs was dense but not strikingly so.

A linear foreign body, resembling a needle or pin, approximately 3 cm. long, was visible within the cardiovascular shadow. The blunt end was deep to the third right costo-sternal articulation; its point was backwards and to the left at an angle of approximately 30 degrees to the sagittal plane. Fixed at its parasternal (blunt) end, the object moved, pendulum-like, in a vertical plane, synchronously with cardio-aortic pulsation; its upward movement coincided with systolic distension of the great vessels, its downward with ventricular diastole. Its arc of movement was approximately 1.5 cm.

At this stage, after deliberate consideration of the anatomical position of the needle and of the possibility of its presence being coincidental with a congenital lesion, the diagnosis of traumatic aorto-pulmonary

fistula was alone acceptable. It was accordingly decided to submit the patient to thoracotomy. Both the boy and his mother were questioned but neither was able to offer any explanation of how the needle came to enter the chest.

Hæmodynamic Studies. On 11/4/49, under local anæsthesia, a No. 6 cardiac catheter was advanced, under fluoroscopic control, as far as the pulmonary artery, just proximal to the foreign body. No attempt was made to advance the catheter beyond this point. Pressure records and blood gas analysis were as listed under the first date in Table I.

TABLE I
PHYSIOLOGICAL DATA (at rest)

| Date | Pressure, mm. Hg * | | | Oxygen consumption (ml. per min) | Oxygen capacity (ml. per 100 ml.) | | |
|---------|--------------------------------|--------------|------------------|-------------------------------------|--------------------------------------|---|--|
| | R.V. | P.A. | F.A. | | | | |
| 11/4/49 | 18 (Mean) | 25 (Mean) | — | 220 | 16·2 | | |
| 9/6/52 | 41 12 | 36 16 | 145-150 70-75 | 228 | 17·6 | | |
| | Oxygen content (ml. per litre) | | | | | Estimated pulmonary blood flow (l. per min.) | Estimated volume of aorto-pulmonary shunt (l. per min.) |
| | S.V.C. | R.A. | R.V. | P.A. | F.A. | | |
| 11/4/49 | 114 | 114 | 118 | 135 | 156 | 10·5 | 5·3 |
| 9/6/52 | 121 | 122 | 132 | 150 | 167 | 13·4 | 8·3 |

* All pressures recorded at 45 degrees inclination of trunk. Reference level 5 cm. behind sternal angle. Corresponding antero-posterior diameter of chest 15·5 cm. R.V., Right ventricle; P.A., Pulmonary artery; F.A., Femoral artery; S.V.C., Superior vena cava; R.A., Right atrium.

Thoracotomy. This was undertaken by Mr. L. Fatti, whose record of the operation was as follows. "On 7/5/49, through an anterior transverse incision, the heart was exposed at the level of the root of the great vessels; these were pulsating vigorously. On opening the pericardium the pulmonary artery was found to be adherent to the sternum, but the adherent area was small and easily separable; a brown stain, about 1 mm. in diameter, was then seen in the front of the pulmonary artery, just above the region of the pulmonary valve, and the needle could be felt inside. It was firmly held in the wall of the pulmonary artery, projecting inwards towards the aorta and moving up with systole. Its distal portion could not be felt; it disappeared into a violent vortex where the two great vessels communicated.

"The roots of the aorta and pulmonary artery formed a common trunk and the groove between the two vessels had disappeared. The communication extended from the origin of the right pulmonary artery to the upper limit of the ventricular septum, its vertical diameter being about 3·7 cm. and its transverse diameter slightly less; the walls of this common trunk were tense and pulsated actively in ventricular systole. Apart from the attachment of the pulmonary artery to the sternum there were no adhesions.

"Attempts were made to insert a finger or an instrument in the gap between the ventricular wall and the inter-arterial channel, in the hope of clamping the latter; but no gap could be found or made, and the valves of the two vessels were felt to close just below the open communication. It was too hazardous to remove the needle as the arterial wall was so tense and active and the operation was abandoned."

Subsequent Progress. The patient was under observation until October, 1953. Because of adverse domestic circumstances he had lived in hospital much of the time. Nevertheless, although still a bright, cheerful, uncomplaining boy his condition had deteriorated. His capacity to walk was unlimited but to run 50 yards caused moderate distress. His venous pressure had risen (Table I) and his heart had enlarged (Fig. 1), while the estimated volume of blood shunted through the fistula had increased (Table I).

Summary

An account is given of a case of aorto-pulmonary fistula, caused by a needle which had penetrated the anterior chest wall. The patient was subjected to thoracotomy but the defect, which was immediately above the ventricular septum, was so large that its closure was impracticable.

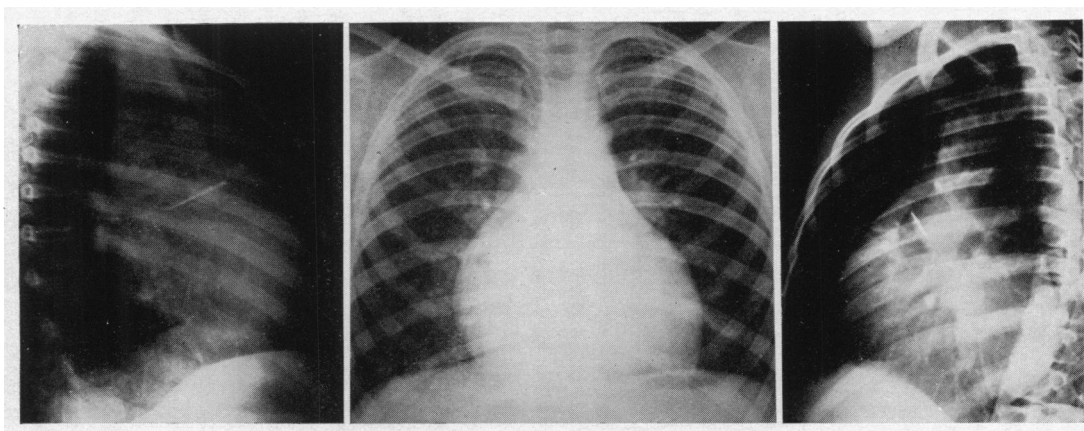


FIG. 1.—Teloradiograms, dated 6/12/52, showing enlargement of heart, dominantly of the left side. The lung fields are moderately pleonæmic. In the P.A. film the needle is seen in the third right intercostal space near the sternal margin.

Reproductions of the original films do not satisfactorily reveal the needle. The heart was then not recognizably enlarged.

Physiological data pertaining to circulatory dynamics at the time when the patient was first seen and again three years later are included. These and the patient's diminished capacity for effort indicate a progressive impairment of the circulation.

I am indebted to Dr. Margaret Findlay for the X-ray films and to Mr. L. Fatti for his notes of the operation.

References

- Dadds, J. H., and Hoyle, Clifford (1949). *Brit. Heart J.*, **11**, 390.
 Gasul, B. M., Fell, E. J., and Casus, R. (1951). *Circulation*, **4**, 251.
 Jones, A. M., and Langley, F. A. (1949). *Brit. Heart J.*, **11**, 325.