Aorto-right atrial fistula

A rare complication of aortic dissection

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The consequences of rupture of an aortic dissection into the interatrial space include the development of an aorto-right atrial fistula. A case of aorto-right atrial fistula with successful surgical repair is described, and the typical clinical features of this syndrome are outlined. The pathogenesis of this complication is also discussed.

The complications of aortic dissection include occlusion of the vessels arising from the aorta, haemopericardium, pleural effusion, and the development of aortic incompetence. Among the less common complications is haematoma of the interatrial septum (Yacoub, Schottenfeld, and Kittle, 1972). Rarely, such a haematoma may rupture into the right atrium thereby giving rise to an aorto-right atrial fistula (Dulake and Ashfield, 1964; Kuipers and Schatz, 1963; Temple, Rainey, and Anabtawi, 1966).

This report describes such a case in which surgical repair was successful.

Case report

The patient, a man, aged 54, presented in June 1966 after the sudden onset of central chest pain radiating into his right arm, back, lower abdomen, and legs. On admission, he was initially hypotensive, but subsequently his blood pressure rose to 220/110 mmHg before hypotensive treatment was instituted. The abnormal cardiac findings included a collapsing pulse, a continuous murmur at the right sternal edge, and an early diastolic murmur at the left lower end of the sternum. All peripheral pulses were present and equal. Electrocardiogram showed sinus rhythm with a normal PR interval, a mean QRS axis of -30° , and complete right bundle-branch block. Chest x-ray showed cardiac enlargement with dilatation of the ascending aorta. A mass miniature chest x-ray performed in 1960 had shown a similar appearance. There was no other past history.

He recovered quickly from this initial attack, but after discharge from hospital he noted chest pain on severe exertion. Cardiac catheterization was carried out and confirmed aortic dissection extending from the aortic valve region to below the diaphragm. There was no evi-

dence of a left-to-right shunt from oxygen saturation data nor from aortography.

In 1972, he began to notice increasing exertional dyspnoea in addition to angina. The heart size had increased on chest x-ray. An electrocardiogram now showed the development of first-degree atrioventricular block in addition to the previously noted right bundle-branch block. In view of his clinical and radiological deterioration, operation was recommended.

At operation in November 1972, there was an aneurysm of the ascending aorta measuring 25 cm in diameter. A transverse intimal tear 5 cm in length was situated 1.5 cm above the left and non-coronary sinuses. The lower part of the dissection displaced the commissure between the left and non-coronary cusps resulting in prolapse of these cusps. There was a fistula measuring 3 to 4 mm in diameter into the right atrium from the false lumen of the aorta (Fig. 1).

The aneurysm was excised leaving a 3 cm cuff of aortic wall around the fistula for its repair thus avoiding damage to the conducting tissue by sutures placed in the edge of the fistula. The aortic valve was resuspended and the false lumen obliterated distally. The ascending aorta was replaced by a 35 mm woven 'dacron' tube. The post-operative course was uneventful and at follow-up 6 months later he was symptom free with evidence of decrease of heart size on chest x-ray.

Discussion

This complication of aortic dissection can be explained by considering the anatomy of the aortic root. The aorto-atrial space is bounded on one side by the right atrium and tricuspid valve ring and on the opposite side by the non-coronary aortic sinus and membranous interventricular septum (Fig. 2). The space is filled by loose areolar tissue and communicates with the interstitial tissue among the loosely arranged bundles of the interatrial myo-

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FIG. 1a

FIG. 1b

FIG. 1 Operative view (a) and explanatory drawing (b) of the aortic aspect of the aortic valve, showing the false lumen of the dissection with forceps in the fistula into the right atrium. NC, non-coronary cusp; LCC, left coronary cannula; RCC, right coronary cannula.

cardium in this area. As a continuation of the aorto-atrial space surrounds the aorta, it is easy to see how a dissecting haematoma might spread to involve the interatrial septum and how, once there, there is little to prevent its expansion.

The situation of the atrioventricular node and

bundle in the interatrial septum and the membranous septum (Fig. 2) makes it inevitable that any degree of spread of the haematoma in a ventricular direction will cause some degree of atrio-ventricular block. Indeed, of the reported cases of haematoma, there is evidence of block in all but 4

FIG. 2 Necropsy specimen from a previously reported case of haematoma of the interatrial septum (Yacoub et al., 1972) showing the haematoma (H) and illustrating the anatomical considerations discussed in the text. RA, right atrium; P, pericardial reflexion; NCC, non-coronary cusp; CS, coronary sinus; MS, membranous septum; TV, tricuspid valve.

(Yacoub *et al.*, 1972). Our case developed a prolonged PR interval in the latter stages, which persisted postoperatively, as well as having right bundle-branch block. One case has been reported (Perryman and Gay, 1972) of rupture into the right ventricle. Spread of the haematoma towards the base of the heart gives rise, in a proportion of cases (Yacoub *et al.*, 1972), to haemopericardium as the aorto-atrial space is separated from the pericardial space only by a thin layer of visceral pericardium (Fig. 2).

That aorto-right atrial fistula is a rare complication of aortic dissection is perhaps to be attributed to the early lethal nature of the disease when it affects the ascending aorta (Lindsay and Hurst, 1967). Kuipers and Schatz (1963) in a review of several cases of aortic dissection mentioned one in which rupture into the right atrium had occurred before the death of the patient. Dulake and Ashfield (1964) reported a similar case in which aorto-right atrial fistula was diagnosed before the patient died in intractable cardiac failure. Repair was thought at that time not to be feasible.

The first successful repair of an aorto-right atrial fistula secondary to aortic dissection was reported by Temple *et al.* (1966). In that case atrioventricular block was not reported, neither before nor after operation, and it is therefore likely that the haematoma had not extended far in a ventricular direction before rupturing into the right atrium. In our patient, the atrioventricular bundle was already involved and it was necessary to take the special measures described to avoid damaging the conducting tissue further.

Both in our case and in that described by Dulake and Ashfield (1964), the possibility of rupture of a haematoma of the interatrial septum into the right atrium was not considered until fairly late in the course of the disease. The clue to the diagnosis lies in the presence of a continuous murmur, together with the electrocardiographic findings of a conducting tissue disturbance in a patient suspected of having aortic dissection.

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