RIGHT ATRIAL MYXOMA

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After thorough clinical study, a residue of cardiac disorders remains undiagnosed. Many such cases fall into the group of obscure cardiomyopathies for which there is no specific therapy. Before a patient is assigned to this category, it is essential that treatable conditions are recognized. Among such diseases are intracardiac tumours, mainly atrial myxomas, approximately 75% of which are said to be left-sided;[20] as fewer than 25 right-sided atrial myxomas appear to have been recorded in the English literature,[3,15] these proportions may be incorrect. The condition may be more common than these figures indicate and this case is reported because of the presence of atypical as well as some characteristic features.

CASE REPORT

A 44-year-old White man was admitted to the Salisbury Central Hospital on 3 January 1964. He complained that an attack of diarrhoea and vomiting 2 weeks previously had been followed by painful swelling of both legs, tachycardia, severe central chest pain, dyspnoea, cough and haemoptysis.

In 1957, after a brief episode of tachycardia and dyspnoea following exertion, he was found to have a cardiac murmur. The diagnosis of acute rheumatic carditis was made and he received digoxin for 1 year and oral penicillin for 18 months. Dyspnoea and tachycardia recurred intermittently, but had been mild during 1963 and he had been able to play tennis. Proteinuria was a constant feature, but urological studies, including an intravenous pyelogram, had been negative. His wife subsequently stated that changes in posture, e.g. bending forward, had caused facial flushing and dyspnoea.

Physical examination showed a ruddy orthopnoeic man, with extreme, uncountable tachycardia and a blood pressure of 120/105 mm.Hg. The fingers were not clubbed. The jugular veins were not pulsating but were distended to 4 cm. above the sternal angle. There were crepitations at the lung bases. No cardiac murmurs could be heard or demonstrated on phonocardiographic tracings. The liver edge was palpated 9 cm. below the right costal margin, but there was no ascites and the spleen was not palpable. Both calves were hot, swollen and tender and the right ankle was very oedematous.

An electrocardiogram showed atrial fibrillation with a ventricular rate of approximately 200 beats per minute, right bundle-branch block, right axis deviation of the terminal QRS vector and ST depression in V5 and V6 (Fig. 1). An X-ray

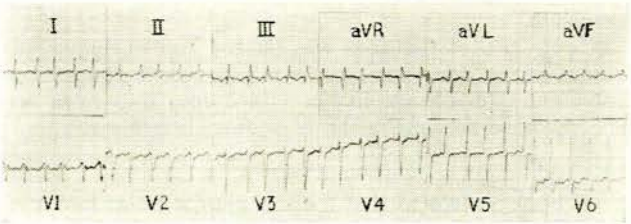

Fig. 1. Electrocardiogram taken on admission (3 January 1964).

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film of the chest (Fig. 2) showed marked cardiac enlargement with bilateral basal congestion, especially on the right, and right upper lobe consolidation. The haemoglobin was 16 G/

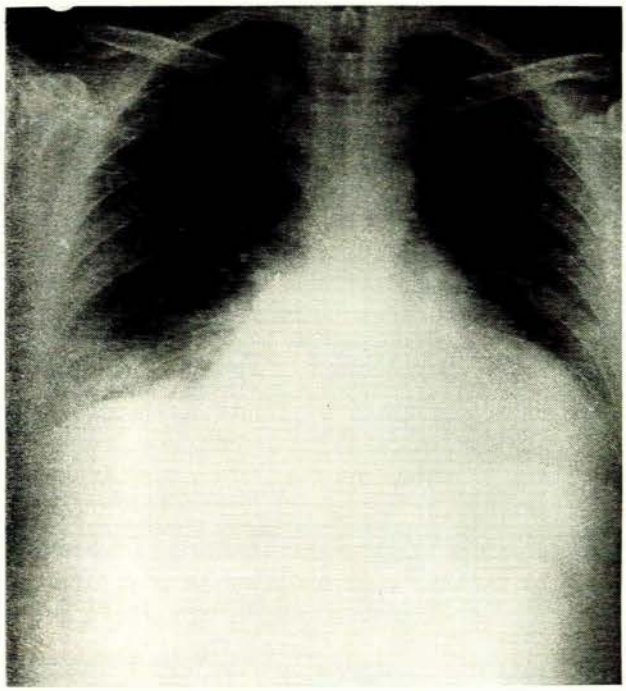

Fig. 2. PA radiograph of chest, showing generalized cardiac enlargement and increased markings at right lung base.

100 ml. and the leucocytes 7,300/cu.mm., with 76% neutrophils, 19% lymphocytes and 5% monocytes. The erythrocyte sedimentation rate was 9 mm. in the first hour (Westergren). No atypical or immature cells were seen in a blood film. The serum cholesterol was 106 mg./100 ml., serum albumin 3·1 and globulin 2·8 G/100 ml., urea 23 and creatinine 1·4 mg./100 ml. The serum lactic dehydrogenase was 800 units (normal up to 400). The urine had a specific gravity of 1028 and contained protein (200 mg./100 ml.) and no glucose; microscopy showed rare epithelial and red blood cells and occasional leucocytes, granular and hyaline casts and was sterile on culture.

The diagnoses of atrial fibrillation, cardiac failure, deep venous thrombosis in the legs and pulmonary infarction were made and the patient was given acetyl-digitoxin (Acylanid), 2·0 mg. orally, followed by a maintenance dose of 0·2 mg. daily. As this dose failed to decrease the cardiac rate, it was temporarily increased to 0·4 mg. a day for 1 week, with no effect. Anticoagulant therapy was commenced on admission (warfarin sodium, 50 mg. orally) and the prothrombin time was kept at approximately twice that of the control with an average daily dose of 7·5 mg.

During the illness several unsuccessful attempts were made to restore sinus rhythm, using 1·0 G procainamide (Pronestyl) by intravenous infusion, the subcutaneous injection of 0·5 mg. neostigmine on one occasion and 1·0 mg. on another and 100 mg. antazoline intravenously.

Although the legs improved slightly, haemoptysis and chest pains recurred intermittently, the dyspnoea became worse and his heart increased in size. On 21 January, the serum lactic dehydrogenase was 720 units, glutamic oxalacetic transaminase 56 Frankel units and alpha-hydroxybutyric dehydrogenase 400 units (normal 100 - 250). That day 10 mg. metaraminol (Aramine) was administered by slow intermittent injection into an intravenous infusion over a 10-minute period, with continuous electrocardiographic monitoring, but there was no pressor response or change in cardiac rhythm. Ten minutes later he had a generalized convulsion; independent atrial activity was noted on the electrocardiogram, with AV dissociation (Fig. 3a). He became unconscious, stopped breathing and cardiac activity progressively decreased (Fig. 3b). Despite assisted respiration and external cardiac massage, objective cardiac

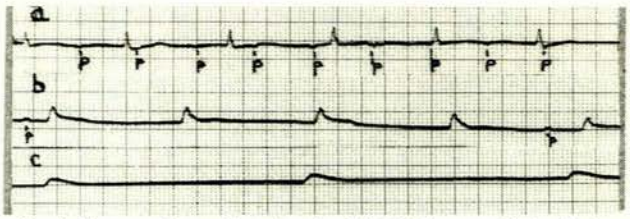

Fig. 3. Electrocardiographic strips (lead II) (21 January 1964): (*a*) immediately after convulsion; (*b*) 10 minutes later; (*c*) final tracing, with rare ventricular contractions.

activity ceased 25 minutes after the convulsion (5 minutes after Fig. 3c had been recorded).

Necropsy was performed 16 hours after death. There was marked generalized cyanosis and postmortem lividity and moderate oedema. The right pleural cavity contained 300 ml. of clear brown fluid. The right lung was deeply congested, with scattered emphysema and an infarct, 40 mm. in diameter, was located in the middle lobe sub-pleurally. The left lung was also congested and emphysematous.

The heart (Fig. 4) was grossly enlarged (850 G) and globular. The right atrium contained a pendunculated tumour 65

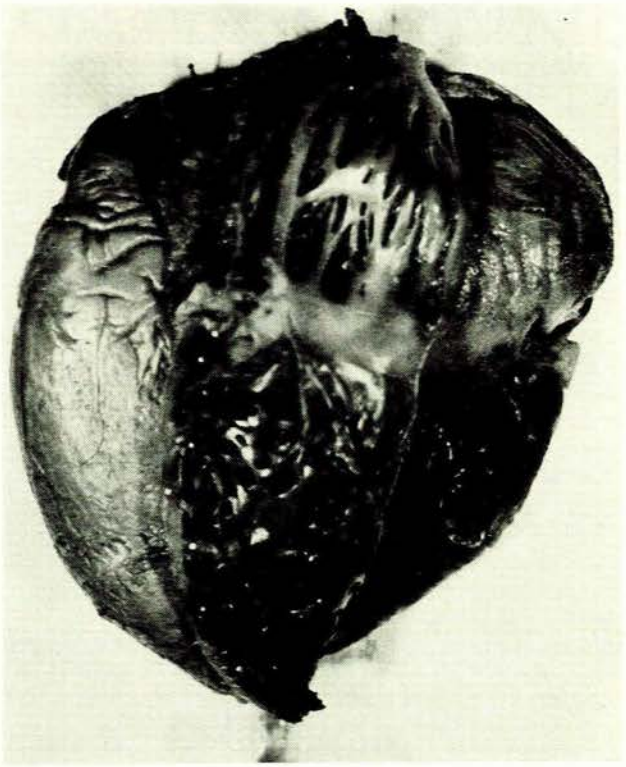

Fig. 4. The right atrium and ventricle have been cut open and their cavities are displayed, the former filled by the tumour (note ridged surface).

mm. in diameter, attached by its stalk close to the origin of the superior vena cava. The tumour protruded slightly through the tricuspid valve and had a smooth surface ridged by the musculae pectinatae; there was no adherent blood clot. The right atrium and ventricle were dilated and their walls were

respectively 4 and 6 mm. thick. The left ventricular wall was hypertrophied (20 mm.) and there were no valvular lesions. The kidneys each weighed 400 G and were congested. The liver was markedly enlarged and had a nutmeg appearance.

Microscopically, the atrial tumour showed the structure of a simple myxoma, with homogeneous, slightly eosinophilic stroma containing scattered stellate cells and capillaries. It was completely encapsulated and no sarcomatous changes were seen. There was no significant evidence of atheromatous change in the coronary arteries and the left ventricular myocardium was hypertrophied. The kidneys showed no parenchymal disease, but gross congestion was present. The hepatic appearances were those of chronic cardiac cirrhosis.

DISCUSSION

It seems likely that the initial symptoms were due to paroxysmal atrial fibrillation, and the presence of cardiac murmurs and systemic disturbance caused one of his physicians to diagnose acute rheumatic carditis and another to consider ventricular septal defect. Chronic passive venous congestion presumably accounted for the proteinuria and may even have predisposed to deep venous thrombosis in the legs. After 4½ years of ill-health he improved, but scrupulously avoided bending forward because he knew that this would produce a bursting feeling in the head and flushing of the face. Suddenly, initiated by an acute diarrhoeal illness, he developed thrombophlebitis in the legs and pulmonary embolism. Presenting with this and being found to have atrial fibrillation, a large heart, and no murmurs, and in the absence of evidence of ischaemic heart disease, cardiomyopathy of unknown origin was tentatively diagnosed. Digitalization having failed to control the atrial fibrillation and what was taken to be right heart failure, and with progressive deterioration, it appeared essential to restore sinus rhythm. Other methods having failed, metaraminol succeeded, but this was complicated by ventricular asystole, associated with impaction of the tumour in the tricuspid valve ring.

Angiocardiography has been proposed as the definitive diagnostic method to demonstrate the presence of right atrial myxoma ;[15] it has been used to show such a tumour in a patient initially thought to have the carcinoid syndrome.[1] However, this technique cannot differentiate myxomas from lipomas, which are said to constitute 12% of cardiac tumours,[6] or from right atrial ball-valve thrombi, of which condition 27 cases have been described.[12] Other findings, more specific for myxoma, are therefore important.

Myxoma of either atrium may produce intermittent atrioventricular valve obstruction or a syndrome suggestive of subacute bacterial endocarditis and have an intractable clinical course.[2] The characteristic feature of right atrial myxoma is progressive right heart failure, usually refractory to medical therapy, without evidence of underlying pulmonary disease or left heart failure.[15]

Intermittent obstruction of the tricuspid valve is sometimes initiated by change in posture ; some of the features may be syncope, acute dyspnoea and changing cardiac murmurs.[3] Sudden death and the occurrence of cardiac arrhythmias with change in body position have also been reported.[8] The condition may be mistaken for tricuspid stenosis,[3] constrictive pericarditis,[7] rheumatic heart disease[4] and acute pulmonary embolism.[4] In one case chronic pericarditis or cardiomyopathy was suspected from the form of the venous pulse, which was thought to exclude tricuspid valve obstruction.[7] An analysis of this feature was impossible in the present case because of the atrial fibrillation. Among auscultatory abnormalities noted have been a pleuro-pericardial friction rub[4] and a 'presystolic' murmur caused by regurgitation of blood from right ventricle to atrium, due to mechanical delay of tricuspid valve closure by the tumour.[3] A low-pitched diastolic murmur along the lower sternal border and variability of murmurs were the most characteristic auscultatory features found by Morrissey *et al.*,[15] but in 3 of the 18 cases they reviewed, there were no murmurs at all.

Signs of constitutional disturbance, such as fever, anaemia, loss of weight and a high erythrocyte sedimentation rate have often been reported,[5,17] and were commonly found when 45 cases of left atrial myxoma, 40 previously unpublished, were analysed by Goodwin ;[9] these features were associated with signs suggestive of mitral valve disease and pulmonary hypertension with dyspnoea and heart failure. The association of fever and elevation of the serum gammaglobulin in some patients suggests systemic reaction to degenerative changes in the myxomatous tissue,[15] but the abnormal proteins are only part of the picture and quantitatively not striking.[10] All 6 of Goodwin's personal cases had clubbing of the fingers.[11] None of these 'systemic' features were found in the present case.

When constitutional disturbance is associated with embolism, particularly with left atrial myxoma (in which this occurs in the systemic circulation) differential diagnosis from subacute bacterial endocarditis becomes extremely difficult.[5] The emboli may consist of adherent thrombus or of detached fragments of tumour, in the latter case possibly giving the erroneous impression that the myxoma is malignant.[16] As the present patient had leg-vein thrombosis, we believe that this caused the pulmonary embolism, right atrial myxoma being an uncommon source.[13,18] The serum enzyme tests had been in keeping with pulmonary infarction except for the elevated alpha-hydroxybutyric dehydrogenase, which has been thought to be more specific for the myocardium than for other tissues ;[14] it is only rarely, and then usually slightly, elevated in pulmonary infarction or embolism.[21]

While it has been claimed that arrhythmias are not infrequent,[16] atrial fibrillation was found in only 6 of 40 cases[9] (only one of which was right-sided[10]) and in 1 of 16 patients with right atrial myxoma.[15] Its occurrence in the present case was thus unusual, and unfortunate in that its correction was associated with the mechanism of his death. There was no obvious explanation for the mild left ventricular hypertrophy, but this may have been due to a combination of poor coronary artery filling caused by the low pulse pressure leading to ischaemia, and the arrhythmia, idiopathic atrial fibrillation having been shown to be associated with left ventricular hypertrophy.[19]

SUMMARY

The features of right atrial myxoma are reviewed in the light of a case with several unusual features, including atrial fibrillation (with death resulting from correction of the arrhythmia) and unexplained left ventricular hypertrophy.

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REFERENCES

1. Ashman, H., Zaroff, L. I. and Baronofsky, I. (1960): Amer. J. Med., **28**, 487.
2. Barlow, J. B. (1961): Méd. dans le Monde. **37**. 51.
3. Barlow, J. B., Fuller, D. and Denny, M. (1962): Brit. Heart J., **24**, 120.
4. Catt, K., Denborough, M. A., Grigg, L. and Sloman, G. (1962): *Ibid.*, **24**, 525.
5. Cohen, A. I., McIntosh, H. D. and Orgain, E. S. (1963): Amer. J. Cardiol., **11**, 802.
6. Crockett, J. E., Decker, D., Reed, W., Dunn, M., and Leger, L. (1964): *Ibid.*, **14**, 394.
7. Emanuel, R. W. and Lloyd, W. E. (1962): Brit. Heart J., **24**, 796.
8. Fawcett, R. E. M., and Ward, E. M. (1939): *Ibid.*, **1**, 249.
9. Goodwin, J. F. (1963): Lancet, **1**, 464.
10. *Idem* (1964): Personal communication.
11. *Idem* (1965): Amer. J. Cardiol., **15**, 81.
12. Hahne, O. H. and Climie, A. R. W. (1962): Amer. J. Med., **32**, 942.
13. Kendall, D. and Symonds, B. (1952): Brit. Heart J., **14**, 139.
14. Konttinen, A. and Halonen, P. I. (1962): Amer. J. Cardiol., **10**, 525.
15. Lekisch, K. (1957): Ann. Intern. Med., **46**, 982.
16. Lyons, H. A., Kelly, J. J., jnr., Nusbaum, N. and Dennis, C. (1958): Amer. J. Med., **25**, 321.
17. MacGregor, G. A. and Cullen, R. A. (1959): Brit. Med. J., **2**, 991.
18. Morrissey, J. F., Campeti, F. L., Mahoney, E. B. and Yu, P. N. (1963): Amer. Heart J., **66**, 4.
19. Neufeld, H. N., Wagenvoort, C. A., Burchell, H. B. and Edwards, J. E. (1961): Amer. J. Cardiol., **8**, 193.
20. Prichard, R. W. (1951): Arch. Path., **51**, 98.
21. Rosalki, S. B. and Wilkinson, J. H. (1964): J. Amer. Med. Assoc., **189**, 61.