

## MYXOMA OF THE LEFT ATRIUM SUCCESSFUL SURGICAL REMOVAL UNDER HYPOTHERMIA

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Myxoma of the atrium generally occurs as a polypoid tumour attached to the left side of the atrial septum in the region of the fossa ovalis. Pathologically it is smooth and shiny, with a soft, gelatinous consistency, and microscopically is seen as a structureless matrix with scanty scattered cells, usually lying singly. The histology of the tumour removed from our case showed the following characteristics. It was composed of a mucoid matrix containing much old and recent haemorrhage and areas of structureless fibrin. Lying in groups and strands, and especially in association with thin-walled blood vessels, were "lepidic," stellate, and fusiform cells of a myxoma. This contained much intracytoplasmic foamy material giving the histochemical reactions of a mucin. The tumour weighed 60 g.

Myxomata may arise as a result of myxomatous degeneration in a thrombus, or they may represent true new growths. A review of recent observations on their pathology and varying clinical picture has been published by Brewin (1948).

It is inevitable that a significant number of myxomata will be encountered in the course of the many hundreds of mitral valvotomies performed yearly, and it is important that the surgeon should have a precise knowledge of the problems and steps involved in their successful removal. At the same time, every effort should be made to diagnose these cases pre-operatively, when a planned operation for removal of the myxoma can be carried out with reduced hazard of dissemination of tumour emboli.

### Case Record

A man aged 25 was admitted to hospital under the care of Dr. R. O'Meara, in August, 1956. He then had a right-sided hemiplegia. This cleared quickly. Though auricular fibrillation was not present it was felt that an embolus was responsible.

Examination at that time showed a thrill and a short, rather sharp apical systolic murmur, and a split-second sound was audible at the apex; a diastolic murmur was heard with difficulty only after the patient had been exercised. Screening showed moderate enlargement of the left atrium, and the heart shape suggested mitral stenosis. He was referred to the cardiac clinic of Southampton Chest Hospital for an opinion regarding surgery and, indeed, whether this was a case of mitral stenosis at all.

When seen in October, 1956, by Dr. W. Somerville, he had signs which suggested mitral stenosis. A diastolic murmur with pre-systolic accentuation was present. The mitral first sound was classified as grade III. An opening snap was evident. A short systolic murmur was heard. He was in regular rhythm. Serial x-ray films showed that the cardio-thoracic ratio had increased from 52% to 57% over the course of a year. In view of these findings and the history of an embolus, cardiectomy was advised.

At operation, on December 4, the lungs had the appearance and the feel of typical "mitral lungs." The carotid vessels were taped and the pericardium was opened, reveal-

ing pericardial fluid in excess. The atrial appendage was opened without clamps. Exploration of the mitral valve showed it to be perfectly normal, but in the region of the medial commissure a plunging soft tumour was felt. It was thought to arise from the atrial septum, but no detailed assessment was attempted for fear of dislodging some tumour or clot. The atrium was closed and the patient was returned to the ward. Heparin was given immediately in an attempt to prevent a clot embolus, though it was realized that this would in no way prevent a tumour embolus. Heparin was continued for three days, and then was changed to phenindione ("dindevan").

Open cardiac surgery, under hypothermia, was planned for December 15. This time interval was decided upon to allow the patient to recover as fully as possible from the previous cardiectomy, and to have an operative field not too obliterated by adhesions. The patient was well until the ninth post-operative day, when he suddenly developed a left facial paresis. At this time his prothrombin index was 37%. It was felt that this was a tumour embolus, but of course dislodged clot was also a possibility. It must have been very small, as the paresis had gone by the following day.

The second operation was undertaken, as planned, on December 15. The temperature was brought down to 83.3° F. (28.5° C.) by surface cooling (Dr. E. S. Machell). The patient was placed in the supine position and a bilateral approach was used through the bed of the fourth rib on both sides, with transection of the sternum. The right innominate and the left common carotid vessels were encircled with rubber slings for compression when the circulation was restored at the conclusion of operation. The superior and inferior venae cavae were occluded, and after 30 seconds a clamp was placed across the transverse sinus, occluding the aorta and pulmonary artery. The right atrium was opened widely.

With the right atrium open, the septum was seen to be bulging to the right. It was obvious that this was due to the tumour mass. Entry into the left atrium was effected by stabbing through the fossa ovalis, then cutting down to its lower margin and extending this incision upwards just beyond its rim. The finger was then slipped in and the incision extended upwards.

The tumour, having a gelatinous consistency, flowed through the defect. Portions of the tumour which presented at the septum were sucked away. It was found that a sucker was the most effective way of picking up the tumour. A finger was then slipped through the septum around the pedicle of the myxoma. At this stage it was too big to deliver itself into the right atrium, but when the presenting portion of the tumour had been removed it slipped through into the right atrium, and the pedicle could be held between the fingers. The pedicle, with a small surrounding portion of the septum, was excised. The left atrium was sucked out, and one additional large fragment of the tumour was obtained. It was then explored with the finger and no remaining tumour or clot could be felt. The cavity was flushed out with saline and this was aspirated. There appeared to be no remaining particles of tumour or clot, and the septal closure was completed under saline to exclude air.

On completion of the septal closure a clamp was applied across the atrial incision and the superior vena-caval sling was removed. The carotids were occluded and the transverse sinus clamp was removed. The inferior vena-caval sling was then released, after which carotid occlusion was maintained for 20 seconds. The total occlusion time had been nine minutes, at a temperature of 83.3° F. (28.5° C.).

During the closure of the septum marked bradycardia was present, but the rhythm was regular. Just as the atrial closure was being completed, ventricular fibrillation supervened. Cardiac massage was instituted immediately and adrenaline was injected into the left atrium. When the heart was pink it was defibrillated, but for the next hour it had to be assisted by massage almost continuously. In spite of repeated electrical defibrillation and injection of adrenaline, calcium

chloride, methylamphetamine hydrochloride, and atropine, cardiac rhythm was not permanently restored until the temperature had reached 86° F. (30° C.), as a result of continuous irrigation of the pleural cavities with warm saline. At this level the E.C.G. showed sinus rhythm. The pericardium was then closed and the heart was observed for a further 40 minutes. During this time the rhythm remained regular, and this was confirmed by the E.C.G. Two hours later the patient was fully conscious and co-operative, with no sign of cerebral damage. The pulses were all present post-operatively.

### Discussion

Clinical discussions tend to emphasize a history of multiple peripheral emboli, and although there was only one embolic episode in our case, its presence, in the absence of established atrial fibrillation, should have raised suspicion of a myxoma. The diastolic murmur is not surprising in association with a pedunculated tumour arising from the septum. On the other hand, syncope from obstruction of the mitral orifice, as in ball-valve thrombus, is unlikely, since the tumour is jelly-like and can easily be forced through the mitral orifice.

When a tumour of this nature is encountered during the exploration of the mitral valve it is important, in view of the friable nature of the mass and the hazards of a cerebral embolus, that a minimum of intra-atrial manipulation be

carried out. In addition, it is desirable that the tumour should be removed immediately, since in the cases described by Brock (1956) there was bilateral cerebral embolism by the time of the second operation. In our case a further cerebral embolus occurred on the ninth day in spite of post-operative heparinization. Heparin was used in view of the finding of massive clot adherent to the tumour in Brock's case, and the danger of clot embolus was again confirmed in our case, as patches of clot were intermingled with the tumour (Fig. 1).

The correct approach to the tumour as it lies against the atrial septum is through the right atrial chamber (Brock, 1956): the successful outcome fully justifies the validity of this concept (Fig. 2).

The right atrial chamber lies above and to the right of the left atrium, which is inaccessible

placed between the right atrium and the vertebral column. On the other hand, recent experiences with right atrial surgery in the closure of atrial septal defects has emphasized the safety and ease of approach to the dependent left atrium through an incision in the septum.

Since most cases of mitral stenosis are operated upon in the antero-lateral or lateral position, it is necessary to turn the patient on his back and extend the incision across the sternum along the fourth right rib bed. However, it is reasonable to dissect out and snare the cerebral vessels, which are accessible in the lateral position, in order to avoid a tumour embolus during subsequent surgical manipulations.

The safest approach through the septum is via the fossa ovalis, and this should be opened by plunging the point of the scissors through it. The upward extension of the incision must be done with great care, and before this is completed the fingers should be slipped through the septum to assess how far cephalad it can be carried. If carried too far the transverse sinus will be opened and an uncontrollable haemorrhage will result. The tumour may be too large to deliver through the septal incision, as in our case. If the tumour is hooked with a finger around the pedicle and is made to present, a great deal of it can be sucked away until it is small enough to slip through the defect. In excising the pedicle it seems advisable to lift it up and excise a small portion of the septum with the pedicle. The table should be tilted slightly to the left so that when the left atrium is flushed before closure all the air can escape without being loculated beneath the septum.

Hypothermia is necessary to cover the period of circulatory arrest, and a difficulty arises in the use of surface cooling with an open chest. This means that the wound would generally have to be closed during induction of the cooling unless a blood stream method of cooling is available (Brock and Ross, 1955). This latter method has the great advantage, in this type of case, of permitting cooling to be carried out after the chest has been opened, and it has the additional advantage of facilitating rapid re-warming before closure of the chest. Resuscitation of the heart in our case was greatly hampered by lack of prompt re-warming facilities. Diathermy re-warming is effective in cases with good circulation, but a surface re-warming loses its efficiency when there is circulatory failure.

### Summary

Myxoma of the atrium is likely to be encountered in the assessment and surgery of cases diagnosed as mitral stenosis.

In order to avoid the hazard of tumour emboli, the myxoma should be removed with a minimum of manipulation, and the cerebral vessels should be snared before re-establishing the arrested circulation.

It appears to us that the most satisfactory approach is via the right atrium, with an incision in the septum under conditions of hypothermia.

Blood-stream cooling avoids delay in removal of the tumour and postponement of a definitive operation, and re-warming carried out by this method facilitates rapid resuscitation of the heart.

Details of the successful surgical removal of a left atrial myxoma are given.

### REFERENCES

- Brewin, T. B. (1948). *Guy's Hosp. Rep.*, 97, 64.  
Brock, R. C. (1956). *Ibid.*, 105, 382.  
— and Ross D. N. (1955). *Ibid.*, 104, 99.

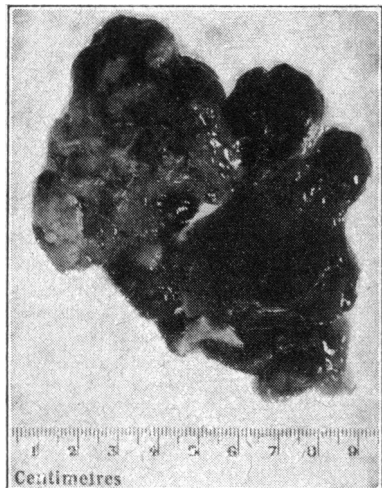


FIG. 1.—Photograph of tumour, with patches of clot.

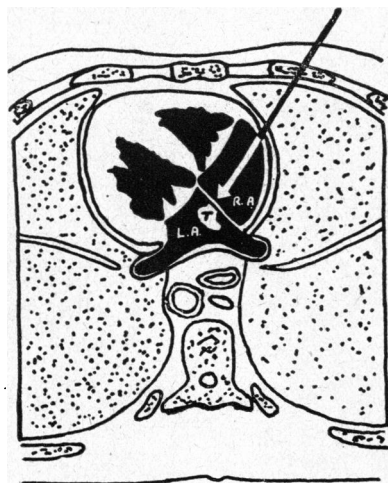


FIG. 2.—Diagram showing approach to the left atrium through the right atrium. T=myxoma; R.A.=right atrium; L.A.=left atrium. (After Brock, 1956.) Reproduced by permission of *Guy's Hospital Reports*.

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