

INSTRUMENTAL TRANSATRIAL MITRAL VALVOTOMY

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In stenosis of the mitral valve a satisfactory splitting of the lateral and medial fusions of the cusps can only be achieved in most patients by some form of splitter. By means of the parallel spread of two blades the cusps are separated along their line of fusion through the fibrous tissue, which is usually weaker than the cusp tissue itself. This method has been found to produce less damage to the heart wall than the use of the finger, with which counter pressure is applied, albeit unconsciously, against the thumb lying on the ventricular side of the atrio-ventricular groove. This may cause bruising of the myocardium and even ventricular rupture. The use of any form of knife or guillotine has long been abandoned owing to the danger of cutting into the cusp outside the line of fusion. This may produce a permanent mitral regurgitation which may have a more serious prognosis than the original stenosis for which the operation was performed.

Many surgeons have come to use the mechanical valve splitter in every patient in whom the fusion fails to yield to gentle finger pressure, and it is likely that this routine use of such an instrument will become universal since the percentage of effective openings of the valve is much higher than when the finger alone is used. To obtain a fall of the left atrial pressure to normal levels, the width of the opening of the valve should vary according to the size of the heart and the patient, but at least 3.5 cm. should be obtained, and preferably more than 4 cm. This figure is double the width of the forefinger at the level of the distal interphalangeal joint. The mobility of the cusp that follows such a separation is such that re-fusion would be unlikely to occur unless movement is prevented by an extreme degree of calcification or fibrosis.

A further advantage of the splitter is that, in addition to the lateral fusion, the medial fusion is almost always well separated, a procedure which is particularly difficult to undertake with the finger

as no convenient point of counter pressure can be found.

A splitter can be inserted into the mitral valve from either the ventricle or the atrium. It is well recognized that a procedure undertaken via the atrium, provided it is equally effective, is better tolerated by the heart than a transventricular procedure owing to the less fundamental reflexes produced by trauma in the atrium.

Dubost (1954) designed a splitter to be inserted blindly into the mitral valve via the left atrial appendage, but owing to its size it is not possible to guide its passage through the valve with the finger, nor can the degree of regurgitation be palpably controlled during a graded split in a regurgitant patient without withdrawing the instrument each time.

Logan and Turner (1959) proposed passing a splitter through the apex of the ventricle with the finger in the atrium, and the positioning of the instrument they devised can be satisfactorily controlled by the finger. Tubbs (personal communication) modified this instrument to give a wider opening (up to 5 cm. if necessary) and utilized the same technique. Both these instruments have been used widely with success.

The use of an instrument which can be passed into the atrium and the action of which can still be controlled by the finger inserted through the atrial appendage would appear to offer some advantages. The instrument can be inserted through the atrial wall on a level with the valve, and the mechanism for producing a parallel opening of the blades can then be simple and evenly progressive. This permits the use of a lighter construction and the retention of some degree of "feel" of the resistance of the tissue being separated. Closure of the atrial incision is no problem, and any leakage can be controlled from within the atrium by the intra-atrial finger. When the chordae tendineae are fused they may be damaged during the insertion, spreading, or

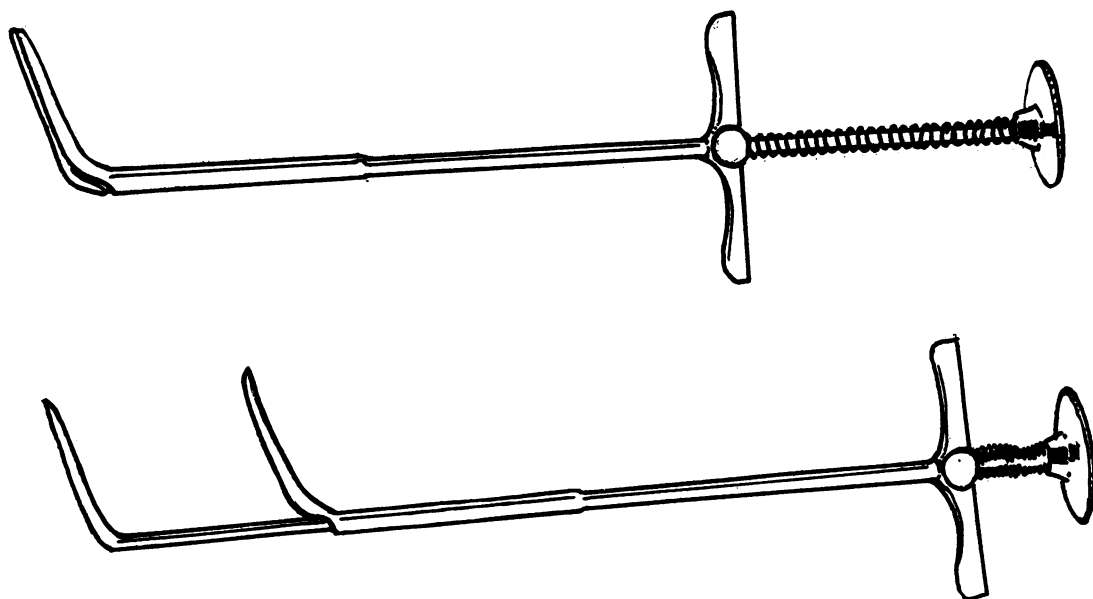


FIG. 1.—*Transatrial mitral valve splitter, shut and open.*

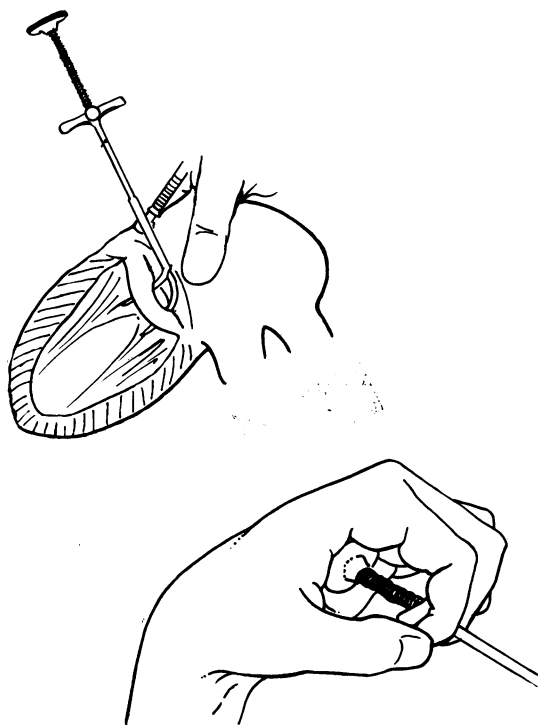


FIG. 2.—*Demonstration of the action of transatrial mitral valve splitter.*

withdrawal of a transventricular instrument, or when cross-fusion of the chordae is present, difficulty may occur in engaging the blades in the stenosed valve opening. With the transatrial instrument such an event is unlikely, and the fused chordae can usually be split slowly with the finger after the cusps have been separated. Traumatic stimulation of the ventricle is avoided, giving a relative freedom from ventricular arrhythmias, and there is no ventricular scar to become a possible source of subsequent weakness, particularly in patients with a severe degree of myocarditis.

THE INSTRUMENT

The transatrial splitter* (Fig. 1) consists of two parallel blades 25 mm. in length sliding on each other; they are opened by a simple pull on one end and a push on the other. There is a certain amount of lateral movement of the blades on each other to allow for any curvature of the valve opening. The width of the blades is 3 mm. and when lying together they will enter the smallest stenotic valve opening. The shaft is 3 mm. in diameter, requiring an atrial incision of the same size. The stem is marked in centimetres so that the degree of split is indicated.

* Obtainable from Messrs. Chas. F. Thackray, Park Street, Leeds 1.

METHOD OF USE.—The normal exposure of the heart for mitral valvotomy is used. A purse-string suture is inserted in the narrow area of the atrium between the centre of the base of the appendage and the atrio-ventricular groove. This corresponds in position to the end of the antero-lateral commissure between the two mitral valve cusps. The suture can be inserted into a Rummel tourniquet or any other form of tightening device.

The finger is then introduced into the atrium through the appendage with purse-string control, and the valve is examined. A 3 mm. incision is made within the circumference of the purse-string suture, and the valve splitter, held in the left hand, is introduced through the incision into the atrium and the purse-string is tightened. The closed blades of the instrument are directed through the stenosed opening of the valve by the finger in the atrium, and then the blades are slowly separated to the requisite distance (Fig. 2). If some degree of regurgitation was originally present, the blades can be withdrawn intermittently into the atrium to check that this is not increasing. The spring on the handle will cause the blades to close automatically between each manœuvre. When the requisite split has been obtained, the splitter is removed and the atrial incision closed with the purse-string suture, any bleeding being controlled by the finger from within the atrium during the suturing.

The usual precautions against cerebral embolism have to be taken in passing and opening the splitter in the presence of calcific thrombi on the edges of the valve cusps or of intra-atrial clot. Alternatively, the splitter can be inserted along-

side the finger through the appendage, but this may cause some leakage of blood around the finger and the angle of the splitter to the valve is not quite so comfortable for manipulation as when a separate atrial incision is made.

When no appendage is available to pass the finger into the atrium, as in operations for re-stenosis, and the finger has to be introduced directly through the atrial wall, the use of a second tiny atrial incision to pass the splitting instrument instead of an additional ventricular incision simplifies what is frequently quite a difficult technical procedure. On four occasions the instrument was inserted blindly with successful splitting of the valve after attempts to insert the finger through a friable atrial wall had had to be abandoned because of the impending development of uncontrolled haemorrhage.

The instrument has been used in 115 patients, including 10 re-operations. Three patients developed cerebral embolism, all ultimately fatal, during the course of the operation; this may possibly have been due to the use of the splitter, but the figure of 3% is no higher than the incidence of this complication in series where finger-fracture alone has been used. Two other patients died post-operatively of causes unrelated to the operative technique, giving a total mortality rate of 4.4%. There has been no case of rupture of the cusp or chordae tendineae, or of development of regurgitation of any serious consequence.

REFERENCES

- Dubost, C. (1954). *Presse méd.*, **62**, 253.
Logan, A., and Turner, R. (1959). *Lancet*, **2**, 874.