

## A NEW APPROACH TO MITRAL VALVOTOMY

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The past decade has witnessed the acceptance of mitral valvotomy as one of the great operations of surgery, and tens of thousands of sufferers from mitral stenosis have benefited all over the world. The mortality has been low—in favourable cases about 1% and in the more serious grade-III and grade-IV cases 5-10%. Striking benefit has resulted in about 70% of cases, and it is exceptional for no improvement to be experienced, even in the more advanced and often neglected stages of the disease.

Unfortunately the ever-increasing occurrence of cases of restenosis of the mitral valve has tended to damage the reputation of the operation. The risk of restenosis has loomed so large in the minds of some physicians that many widely respected authorities hold that mitral valvotomy should only be performed in younger individuals, e.g. under the age of 40, when the indications are urgent and compelling. They advise waiting for the reason that all too frequently restenosis may be anticipated. Thus the striking advantages accruing from the relief of mitral obstruction is being denied to many patients.

The fact that restenosis does occur cannot be disputed; the initial complacency of the surgeon has been severely jolted and these cases have often been surgically embarrassing. Analysis of the causes of restenosis is difficult and not entirely satisfying. In many cases continued rheumatic activity is doubtless the responsible factor. Perhaps simple deposition of fibrin upon the rough edges of the valve may explain some of the recurrences. Certainly at a second operation the valvar cusps usually feel thicker and more rigid than they did at the first operation. However, the most important factor involved in the recurrence of mitral stenosis is probably the inadequacy of the original mitral valvotomy. Occasionally the valve is found to be so grossly deformed that it is clearly impossible to anticipate restoration to a near-normal state. If the valvar leaflets are adequately mobilized, partially separated commissures may easily fibrose and adhere once again.

Most experienced surgeons have recognized their inadequacies and have striven to improve their techniques and obtain as wide a separation of the fused valvar cusps as possible without compromising the competence of the valve. The early technique of finger fracture or separation of the fused commissures through a transatrial approach was, in resistant cases, soon improved by the addition of cutting techniques with the aid of cutting instruments introduced alongside the operating finger. These techniques are, in general, somewhat difficult and not entirely satisfactory, and even in experienced hands they do not always yield the maximal possible orifice.

It is difficult to assess and compare the degree of valvar opening obtained in different series of cases, because the site of the surgeon's efforts is not visualized and any measure-

ments reported are merely rough estimates. Clearly the degree of completeness of the valvar separation must vary considerably in different hands and also in different patients. In some cases, with considerable valvar distortion and possibly calcification, it has proved impossible to obtain an opening of adequate size. In many cases the chordae tendineae are thickened and shrunken and the papillary muscles contracted, and in these it is obviously almost impossible to obtain a normal valve opening.

Despite the improvement in the techniques of the closed operation some surgeons have been so dissatisfied with the degree of opening obtained that they have turned to the more hazardous and complex open approach with the aid of extracorporeal circulation. Under direct vision it is certainly possible to incise the commissures completely if the pathological process permits. The main objection to such an approach is its unnecessary complexity and extravagance, apart from the higher mortality ensuing from the perfusion itself and the dangers of air embolism.

## THE EXPANDING DILATOR

A new approach has recently been advocated which extends the scope and efficiency of the closed operation and will probably forestall the widespread adoption of open techniques for mitral valvotomy. This is the employment of an expanding dilator inserted into the valve orifice from below through a small incision in the left ventricle and opened in the plane of the commissures after being accurately guided into position by a finger inserted through the auricle. This technique was originally recommended for cases of mitral restenosis, where adequate separation of the leaflets may be almost impossible to achieve otherwise. However, the wide separation of the valvar leaflets obtained by this technique has been so impressive that it is rapidly becoming employed regularly as the technique of choice in mitral valvotomy. To surgeons who have battled with the intricate manœuvres involved in obtaining a maximal orifice in cases where finger fracture has proved inadequate, the remarkable simplicity and efficacy of the new technique is most gratifying. Complete separation of both commissures can regularly be obtained without great difficulty. The degree of valvar separation that can be achieved almost always surpasses the best hitherto attainable.

I make so bold as to predict that with the proper employment of the transventricular technique the incidence of cases of restenosis will decline sharply and fewer cases will obtain only partial improvement because of a relatively poor and inadequate valvotomy. Although the new operation involves a ventricular incision as well as an auricular one it does not appear to have increased the risks of closed operations. I have now performed the operation in 16

cases without mortality and without producing any significant mitral regurgitation. Even in cases with considerable valvar thickening and even calcification I have been amazed at the satisfactory degree of valvar separation that regularly results. The frequent persistence of the apical diastolic murmur after transatrial valvotomy has been puzzling and disappointing. Since adopting the transventricular technique I have not found this to happen, but not enough time has elapsed to be dogmatic on this point.

In my opinion the only definite indication for open operation is in the case thought to be one of pure mitral stenosis in which the presence of extensive intra-auricular blood clot is suspected, though it cannot always be anticipated. Fortunately it is usually possible in the closed technique to wash out any intra-auricular clot that may be present by deliberately allowing a small bleed to occur from the incised auricle. When more certain techniques are available for the repair of mitral incompetence there will doubtless also be a place for open operation in cases of mitral stenosis thought to be associated with significant mitral regurgitation.

The use of an expanding dilator was first described and practised by Dubost<sup>1</sup> in 1954. He inserted the instrument through the appendix of the left auricle after preliminary palpation of the valve with the finger. The fact that the procedure was done blindly and without accurate positioning of the instrument before the expanding blades were opened destroyed its appeal for most cardiac surgeons. Several surgeons appear to have independently modified Dubost's technique to the transventricular one here described. Belcher<sup>2</sup> quotes a personal communication to this effect from Andrew Logan, and the modified technique is also practised by Tubbs, Gerbode, Brock, Cooley<sup>3</sup> and Conklin.<sup>4</sup> In order to meet the need that was felt for a dilator of wider calibre than the finger, Beck has used forcible dilatation from above by means of tape wrapped around his index finger and this technique was practised at Cape Town by Walter Phillips. However, the insertion of the bulbous finger through the atrium may be difficult and even dangerous.

#### Technique

The dilator that I use is the one designed by Tubbs (Fig. 1). Brock's two-bladed aortic dilator is also quite satisfactory.

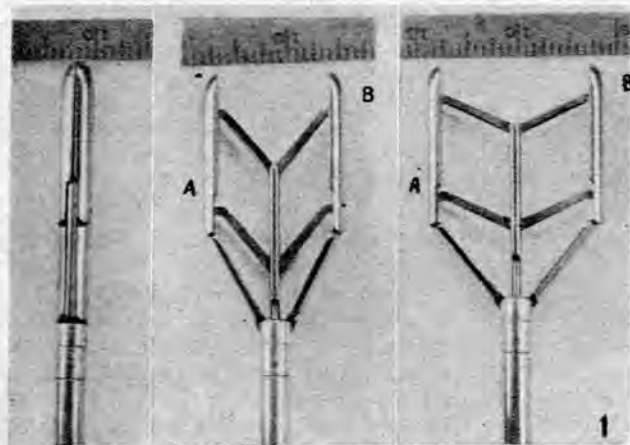


Fig. 1. The Tubbs expanding dilator closed, and opened to 3.5 cm. and 4.5 cm. The included scale is in inches.

The blades of the Tubbs dilator can be opened to a maximum of 4½ cm. and the degree of separation can be controlled by a small thumb screw. The instrument is designed to minimize the chances of entanglement with the chordae tendineae, but I have not personally encountered this possible difficulty.

The approach is made through a left lateral or antero-lateral thoracotomy. The lung is retracted and the pericardium widely opened anterior or posterior to the left phrenic nerve. The appendix of the left auricle is incised before the application of the auricular clamp in the hope that any intra-auricular clot present will be washed out and not released into the circulation. The base of the appendix is then clamped and the appendicular incision enlarged and any trabeculae divided. I do not always use a purse-string suture. If the appendix is fibrosed, as it frequently is in second operations, and therefore does not afford a convenient approach, then the approach must be made directly through the left atrial wall and one must use a purse-string suture and stay sutures on either side of the incision. The ungloved index finger of the right hand is then introduced into the auricle and the mitral orifice palpated. Attempts are made to split both anterior and posterior commissures by simple pressure with the finger, and if satisfactory and complete splitting is obtained this will suffice. In my experience this happy state of affairs only occurs in about 5% of cases, and nearly always one has to proceed with the transventricular insertion of the dilator. A site free from major coronary vessels is chosen near the apex of the left ventricle. The intracardiac finger is passed into the left ventricle to ensure that no papillary muscle inserts at this site. A purse-string suture of number-one 'mersilk' on an atraumatic needle is inserted and held in a Rumel-Belmont tourniquet. A small 1 cm. incision is made in the centre of the purse-string suture; this need not enter the left ventricular cavity. The closed dilator, which has been set beforehand at an opening of 3.0-3.5 cm. is then gently inserted into the incision and pushed through into the cavity of the left ventricle and introduced through the mitral orifice under guidance of the right intra-auricular index finger. Care must be taken to see that the whole expanding portion of the instrument is completely inside the left ventricle. There is usually no need to tighten the purse-string suture, for the instrument itself satisfactorily plugs the incision in the left ventricle. The blades are then forcibly opened in the plane of the commissures so that the two blades respectively press against the anterior and posterior commissure. The instrument is closed and withdrawn, the purse-string suture is tightened, and the degree of opening of the valve assessed by the right index finger. If complete separation of both commissures has not taken place the instrument, which is now set to open to 4.5 cm., is again introduced and forcibly opened. The plane of the valve is such that the anterior commissure is lower than the posterior one and frequently the effective opening spread of the instrument is not the shortest distance between the blades but the oblique distance between the posterior blade and the left angle of the opened anterior blade (A to B in Fig. 1). Thus with a blade separation of only 3½ cm. it is sometimes possible to obtain an opening of 5.0-5.5 cm. Somewhat surprisingly, it is found that the plane of separation of the cusps remains confined to the commissures, and the

leaflets are not damaged. Naturally some caution must be exercised if any degree of regurgitation is encountered initially or starts after the initial dilatation. The intracardiac finger is withdrawn as the auricular clamp is applied and the atrial and ventricular incisions are sutured. The pericardial incision is only partially closed, to avoid any danger of tamponade. The left lung is reinflated and the chest wall is sutured after insertion of a water-seal drainage tube.

The transventricular technique can be combined with atrial exploration from the right side, as described by Cooley,<sup>3</sup> but this entails a bilateral thoracotomy. There are certain merits to the right-sided approach, which avoids any adhesions present on the left. This was first recommended by Bailey, particularly in second or third operations. In common with many other surgeons, I have experienced difficulty in obtaining a satisfactory orifice from this approach. I have not yet employed the right-sided atrial approach combined with the transventricular dilatation,

but I am impressed with its possibilities. The main objection would be the necessity for a bilateral thoracotomy.

#### SUMMARY

The new technique of transventricular valvotomy by means of Tubb's expanding dilator is described. The author finds that this technique results in far wider valvar separation than the older techniques. The fact is stressed that the main cause of mitral restenosis is inadequate mitral valvotomy.

#### ADDENDUM

Since submission of this article 20 further cases have been subjected to mitral valvotomy and in only 1 was finger-fracture alone satisfactory. There was no mortality attributable to the technique employed. However, 2 of these patients have had cerebral emboli.

#### REFERENCES

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