

SURGICAL PROGRESS IN THE TREATMENT OF MITRAL STENOSIS

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Mitral valvotomy has been practised in Johannesburg since 1951. Mitral stenosis, for which this operation is performed, is found extremely commonly in thoracic-surgical practice and we ourselves operate on 1 case a week, on an average. The accepted criteria for operation have not altered during this time yet, in spite of the high percentage of dramatic cures as well as a currently low mortality, a large number of 'late cases' are still being sent to us for surgery. Where is the delay? Why is it that we are still seeing patients for the first time in their fifth and sixth decades, with fibrillation and in failure? A review of the progress of our techniques and experiences will suggest an answer to these questions.

In our first 50 cases, reviewed in 1953,¹ we had 7 deaths—a mortality of 14%. This was not at that time a very alarming mortality when the grave state of many of the patients at the time of operation is considered, yet this is a mortality which, 7 years later, is quite unacceptable.

FACTORS INFLUENCING RESULTS

Consideration of a few important aspects of valvotomy will help to elucidate some of the factors which influence the results.

1. Age Incidence

Fig. 1 gives an analysis of the ages of all cases seen in 1954 and 1955. In 1955 nearly half the patients were in their 5th decade. The mortality rose with age. In each age group there was no mortality below the age of 30 and 7% between 30 and 40, but in 1955 there was a high mortality above the age of 40, compared with no deaths in this decade in 1954. What factor brought about this change? Was it related to the greater number of older patients? Was there some alteration in technique to account for this? There is no doubt that the fact that there were more patients over 40 in 1955 was a predisposing cause. The poorer myocardium in these older patients, with the consequently greater incidence of fibrillation and clot formation, does provide an important hazard; yet this is only a small contributory cause for the raised mortality. What then about the technique?

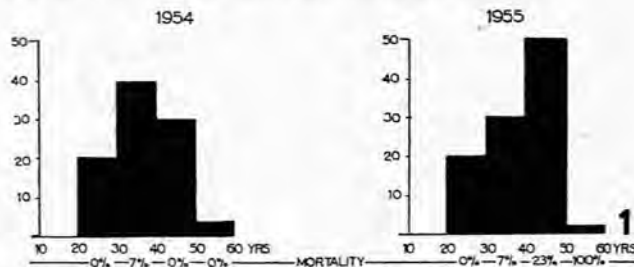


Fig. 1. Age incidence and mortality in series of mitral valvotomies in 1954 and 1955.

2. Use of the 'Knife'

In the earlier series of cases finger fracture of the fused commissures was practised. While this often resulted in an orifice of adequate size, in many instances a dangerous amount of force was required and equally frequently little improvement was effected. Even with a small increase in valve area, dramatic symptomatic improvement could be expected, but these cases soon returned with recurrent symptoms. It was realized that a wider opening would have to be the aim in all cases. Whereas a valve diameter of $\frac{1}{2}$ inch increased to $\frac{1}{2}$ or $\frac{3}{4}$ inch may enable an almost bedridden patient to return to full normal activity, the benefit is short-lived, depending upon a number of factors, not the least of which are the recurrence of true stenosis through persistence of the rheumatic process (not in those days routinely controlled by continuous antibiotics) and rigidity of the valve cusps. Because many of these cusps are grossly thickened and calcified, with much adherence of the chordae tendinae and papillary muscles, nothing less than maximum mobilization will provide a sufficiently large orifice.

If force alone was inadequate, other methods had to be employed. For this an assortment of cutting, sawing, and distracting tools was devised. That which we have come to call the 'knife' is a small-bladed instrument devised by Brock and attached to the tip of the index finger. While in theory this instrument seemed to combine simplicity with effectiveness, in actual practice it was both

dangerous and cumbersome. The danger lay in the fact that an incision off the line of fusion would produce incompetence which, at its best, would detract from the benefit the patient may otherwise have enjoyed and, at its worst, would cause early death. The instrument was cumbersome because it severely diminished the degree of tactile sensation so essential to its safe application. In spite of these drawbacks the 'knife' was used with increasing frequency (Fig. 2) — by 1958 in about 60% of the cases.

3. Mitral Incompetence

With the use of the 'knife' the number of incomplete valvotomies gradually diminished, but at first the incidence of incompetence increased (Fig. 3), though often only by a slight degree. Whenever it was felt that incompetence had been caused, the operation was abandoned, even though valvotomy was incomplete, or else attention was

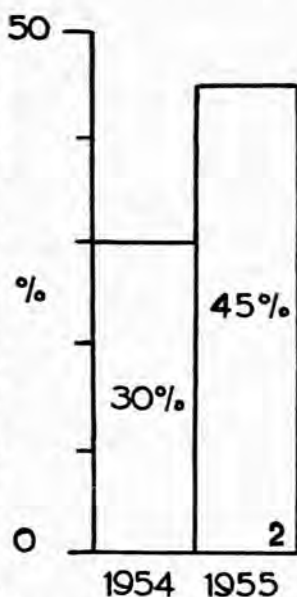
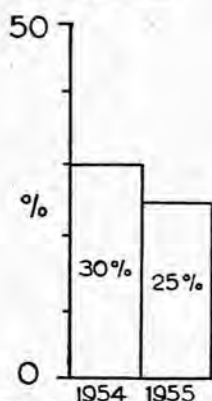


Fig. 2. Use of 'knife' in mitral valvotomies in 1954 and 1955.

Incidence of
MITRAL INCOMPETENCE
(PRE - OP)



MITRAL INCOMPETENCE
INDUCED or WORSENERD

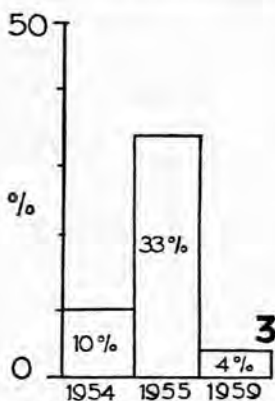


Fig. 3. Incidence of mitral incompetence, pre-operatively, and after operation, 1954, 1955 and 1959.

directed to the remaining commissure. However, in a few cases, the induced incompetence was of severe degree and in 1955 3 patients died as a direct effect of this. During the following 3 years our technique and our results improved but, with the ever-present fear of induced incompetence occurring, the strain on the surgeon was considerable.

4. Ultimate Size of Orifice

The size of the orifice ultimately obtained is dependent upon the state of the valves (thickness, rigidity due to

calcification, and the amount of subvalvular fusion of the chordae tendinae and papillary muscles) as well as the skill and technique of the surgeon.

It is customary to estimate valve size in terms of surface area, but where the valves are thickened and rigid the length of separation of the commissures can be more reliably assessed. Rigid valves, separated for the whole length of the commissure, may function as a long narrow slit. The benefit from such a valvotomy would be limited, yet pressure from the finger using a force far greater than that of the blood stream may separate these 2 cusps widely. A wholly misleading evaluation of the functional result would ensue.

The surgeon's aim is to open the valves along the lines of fusion and mobilize them as much as possible. More he cannot do. He must therefore attempt a complete separation and measure the length of the resultant commissures. Naturally, with supple cusps a completely normal orifice may result; with thickened valves it would be guesswork to estimate valve area. Varying degrees of success must therefore be anticipated, and, although it would be naive to expect no failures, these are now becoming rare. The partial failures are not the fault of the surgeon but rather the fault of the disease. Whether the scarring process will continue in the absence of further rheumatic activity after valvotomy, is uncertain. There may therefore be justification for a plea to have patients subjected to operation at an earlier age, after which attempts should be made to prevent re-stenosis by use of prophylactic antibiotics and steroids.

The argument that patients should 'earn' their valvotomies is not really valid. Why should these patients necessarily lead a restricted life for years with all the associated frustrations and the ever-present danger of fibrillation and embolization before they can 'earn' their relief? It is not suggested that asymptomatic cases should be operated upon, although the fact that radiological and ECG changes in themselves indicate a greatly narrowed orifice must be borne in mind. It will be obvious from Fig. 4 that, of the cases operated upon in 1954, half had inadequate openings, while only 5% had completely opened commissures. In 1954 the mortality was low and the incidence of aggravated or induced incompetence was only 10%, but the ultimate recurrence rate will be 50% at least. In the following year the valves were more satisfactorily opened, due to the more effective and frequent use of the 'knife'. The mortality and morbidity were higher, but the recurrence rate may well be only 12%. It must be noted that in those days a repeat operation carried greater risks.

THE EXPANDING DILATOR

Fortunately the ensuing 3 years showed a progressive overall improvement but there was still cause for dissatisfaction. However, a new era dawned in 1959. In February 1959 one of us (D.A.) introduced the Tubbs modification of an expanding dilator, first used by Brock for pulmonary valvotomy, but for long used by Logan of Edinburgh and Dubost of Paris for mitral valvotomy. By the beginning of 1959 its popularity in Britain had become universal, to the exclusion of the cutting instruments.

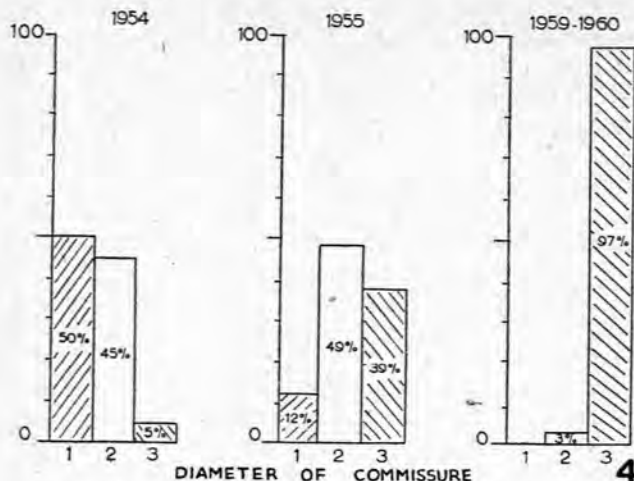


Fig. 4. Size of orifice (as measured by diameter of commissure) after mitral valvotomy, 1954, 1955 and 1959-1960. (Size of commissure: 1 = $\frac{1}{8}$ " - $\frac{1}{4}$ ", 2 = $\frac{3}{8}$ " - $\frac{1}{2}$ ", and 3 = $\frac{1}{2}$ " and greater.)

Technique

The Tubbs dilator* has spreading blades which can be set to open at varying diameters up to 4.5 cm. With the usual approach followed by assessment of the valve with the right index finger in the left atrium, a manual attempt at commissurotomy is first made. In a few cases this is successful. In the majority recourse is had to the dilator. The instrument is inserted through the apex of the left ventricle and in a retrograde manner guided through the mitral orifice on to the right index finger. One opening of the blades across the valves is generally sufficient. The commissures split along the lines of fusion and the procedure is over in a matter of seconds. A further assessment is made with the exploring finger and on occasion a few final touches are made to the mobilization.

It has been our custom to set the blades to open to 3.5 cm. and, while this is insufficient to cause incompetence, it generally leaves a small portion of one of the

commissures still fused. The finger may complete the opening, or the dilator, reset at a slightly larger size, may be used. Further reference to Fig. 4 will confirm the gratifying results we have been able to obtain since 1959.

Results
It will be seen from Table I that among the 83 patients operated upon between January 1959 and June 1960 there

TABLE I. FIGURES FOR FIRST AND REPEAT MITRAL VALVOTOMIES AND MORTALITY, FROM JANUARY 1959 TO 30 JUNE 1960

Method	Cases	1st MV	Repeat MV	Mortality
Digital pressure and/or Brock's 'knife'	21	14	7	0
Dilator	62	49	13	1*

* 1st valvotomy, due to subacute bacterial endocarditis.
MV = mitral valvotomy.

was only 1 death which occurred several weeks after successful valvotomy. This was found at autopsy to be due to subacute bacterial endocarditis of the mitral valve with multiple septic infarcts.

While a number of patients had a minor degree of incompetence before operation, only 3 had any induced incompetence afterwards and in all of these the blades were set at 4 cm. or more.

The dilator was not used in 21 cases. Some of these were in the early part of 1959 before the dilator was put into use; in the others it was not needed.

There has been no mortality in 20 repeat operations (Table I), in 2 of which a minor degree of incompetence was produced. This incompetence is more likely due to the wide setting of the blades than to disruption along misplaced cuts from the previous operation. Nevertheless this possibility is seen as the only hazard in the use of this instrument for the performance of a repeat valvotomy.

SUMMARY

While the family physician may have had some justification for delaying surgery for his patients in the past, current results described in this paper would indicate that this is unnecessary and indeed unwise.

We thank our registrars, Mr. L. du Plessis and Dr. G. W. Schepers, who operated on some of the patients in this series.

REFERENCES

- Adler, D. and Fuller, D. (1953): *S. Afr. Med. J.*, **27**, 1176.
- Barnat, I. (1960): *Ibid.*, **34**, 289.

* Recently described by Barnat.*