Commissurotomy for mitral stenosis is generally thought to be one of the simplest, easiest, and most widely performed procedures in cardiac surgery. There are, however, some cases of mitral stenosis in which there is shrinkage of the auricular appendage or intraauricular thrombi. These cases make a surgeon's digital insertion through the auricle difficult. There are also other cases of mitral stenosis that, despite the easy digital insertion via the auricle, have severe pathological changes of the stenotic valve. Some are so involved at both commissures, that they prevent us from performing a complete or satisfactory commissurotomy. Thus, the procedure has inadequate results. The cases where digital manipulation alone gives us an adequate opening of the stenotic valve are few. In the conventional procedure of so-called "finger fracture valvuloplasty", the opening is usually obtained only up to the size in which the index finger is easily permitted. In these cases, only the anterolateral commissure is usually fractured and the subsequent opening is about 2 cm. in its diameter.

The pathological nature of the stenotic valve, particularly at both commissures, is not always consistent with the severity of the clinical manifestations or the severity of the stenosis.

The future prognosis of the valvuloplasty depends upon various factors. This is, however, influenced mostly by the size of the opening following the commissurotomy.

As supplementary measures to the finger fracture method, many surgeons, throughout the world, have devised a large variety of knives and valvular dilators for the purpose of opening the stenotic mitral valve. None achieved in making the ideal device.

Generally speaking, valvulotomy with a sharp knife is not without the danger of incising or damaging the valvular cusps, for this is a closed technique. In comparison, the regular valvular dilators are safer, for those are not sharp and are forcibly, but evenly, applied against the stenotic valvular opening. The weakest points, which are at both commissures, therefore, are more safely torn.

Most valve dilators have been metal instruments until 1953 when C. S. Beck successfully originated a new device and maneuver. He wrapped a length of wet cotton tape around the distal phalanx of his finger, and covered this "dilator" with a second glove; re-introducing the finger into the auricle, he passed it forcibly through the mitral orifice. The valvular orifice was adequately opened to the valvular annulus at both commissures and no regurgitation was produced. In 1953 and 1954, he employed this technique and procedure in about 200 cases of mitral stenosis with satis-
factory results. Recently Péretz-Alvarez reported that he successfully applied this procedure in 78 cases of mitral stenosis. He also reduced the use of sharp valvulotomes in his series. The author has also employed Beck's procedure in over 20 cases with good results.

The procedure is simple and good. It is true, however, that this, too, has some technical limitations. For instance, in cases with a very small auricle or old clots in the auricle, the finger alone can be passed but not the finger which is wrapped with tape. At times, there are such occasions that several separate digital dilatatory manipulations are required. Each time the finger must be removed from the auricle and more cotton tape wrapped around the finger tip before re-insertion. It would be desirable to eliminate the difficulties of increased separate finger manipulations and the skillful selection of the appropriate size of taped finger for each occasion by the new invention of devices.

The author has devised a new method to avoid such technical difficulties as mentioned above.

**CUFF-RING DILATOR**

The ring, which consists of two layers of Latex rubber sheets, is made to fit the distal phalanx of the index finger. Two layers of the rubber sheets are glued together at the proximal and distal 1/3 of the ring. The middle 1/3 space is connected to a tiny rubber tube of approximately 30 cm. in length. This small tube is to be later used for insufflation of the middle 1/3 space of the ring as the cuff. The diameter of the ring is larger at the proximal portion and smaller at the distal portion, so that the whole ring fits well to the distal phalanx of the index finger. (Fig. 1) Through the small tube for insufflation purpose, sterile saline solution is...
injected to inflate the cuff. (Fig. 2) We have named it "Cuff-ring dilator". At first, the index finger is inserted through the auricular appendage and simple conventional finger fracture of the stenotic valvular orifice is tried. If the fracture is inadequate or difficult, the finger is removed from the auricle. The Cuff-ring dilator is applied at the distal phalanx of the index finger, and this dilator is covered with a second glove. This index finger is reinserted into the auricle. The finger insertion is done without any additional difficulties. After the insertion, the open end of the small tube of the insufflation cuff is connected to a syringe which holds 2 cc of sterile saline solution. After the cuff is inflated with a small amount of the saline solution, the open end of the small tube is clamped outside the auricle. With this inflated cuff-ring dilator, the stenotic valvular orifice is opened to the valvular annulus at both commissures. If the resulting opening is not adequate, the cuff is further inflated with the injection of more saline solution and fracture manipulation.
is carried out until a satisfactory opening is obtained. (Fig. 3). When an adequate opening is obtained, all the saline solution in the cuff is drained out through the small insufflation tube and the cuff is completely deflated. Then, the index finger is removed from the auricle, the same size as when it was inserted. We have employed this method since 1960 and have markedly improved the results of valvulotomy since that time.

CLINICAL RESULTS

We divided the results into 3 groups. The group in which the valvular opening was more than 3.0 cm² was named “extensive fracture dilatation”. The group in which the subsequent opening was smaller than 3.0 cm² was named “moderate fracture dilatation”. The group in which the finger insertion was impossible, or manipulation of the finger fracture was impossible, was called “Fracture dilatation impossible”.

During the period from 1955 to May 1960 inclusive, 90 cases of mitral valvulotomies without using the afore-mentioned technique were performed. Results were: 43 cases (47.7%) of extensive fracture dilatation, 38 cases (42.3%) of moderate fracture dilatation, and 9 cases (10.0%) of fracture dilatation impossible.

During the period from June 1960 up to the present inclusive, 177 cases of mitral valvulotomies, were done using our method. The results were: 147 cases (83.0%) of extensive fracture dilatation, 29 cases (16.4%) of moderate fracture dilatation, and 1 case (0.6%) of fracture dilatation impossible.

There was marked improvement with our method. Among cases of extensive fracture dilatation, there were 8 cases of subsequent regurgitation after the procedure but all were very slight except in two cases. (Tab. 1)

<table>
<thead>
<tr>
<th>Table I</th>
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<tbody>
<tr>
<td>Valvular opening</td>
</tr>
<tr>
<td>No. of cases</td>
</tr>
<tr>
<td>before May 1960 (without dilator)</td>
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<tr>
<td>since June 1960 (with dilator)</td>
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<tr>
<td>Total</td>
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Using our dilator device, in some instances, results were improved so that the severely stenotic valve, although unable to have finger fracture, was able to have a moderate fracture dilatation. The stenotic mitral valve, which was only partially opened with the finger alone, was also opened wide enough to belong to the group of extensive fracture dilatation, by using our procedure. There are, however, a few cases where no subsequent dilatation was possible at all, even with our method. In these cases, other methods such as transventricular commissurotomy or open heart
surgery may be indicated.

In view of the fact that, with the use of the cuff-ring dilator, satisfactory results can be obtained except in a few special cases, the author believes that this device is an excellent supplementary instrument for finger commissurotomy.

SUMMARY

Characteristics of this new devised cuff-ring dilator are as follows:

1) Finger insertion or removal through the auricle, with this device, does not cast any problem even when the auricular appendage is small.

2) Inside the auricle, the size of dilator can be changed as wished with the proper filling of the cuff as many times as wanted and can be tried for dilatatory manipulation.

3) Latex rubber is used for this device and the filled cuff, therefore, is strong enough not to lose the proper shape against the stenotic orifice or to break. With this device one can apply strong, blunt force against the orifice and the fracture dilatation of hard adhesions and fusion of the valve at both commissures can be adequately performed.

4) Upon dilatatory manipulation of the stenotic valve, there is no damage at the cusp or no production of subsequent regurgitation.

5) The use of this dilator is simple and easy. The device is cheap and is durable enough to withstand frequent boiling for sterilization.

6) With this device, we have obtained marked improvement of valvulotomy and of the subsequent future prognosis.

REFERENCES
