**Abstract**

**Introduction:** The management of rheumatic mitral stenosis has been impacted by the development of percutaneous mitral commissurotomy (PMC). Such approach, despite its great interest in our context, is hardly available in sub-Saharan Africa. Our purpose is to report on our first PMC experiment, and thereby assess the short-term results.

**Patients and Methods:** The study involved a group of sixteen symptomatic patients with tight mitral stenosis and favorable valve anatomy assessed by transesophageal Doppler echocardiography; and who underwent the PMC procedure. Mitral dilatation was performed under local or general anesthesia by femoral venous and trans-septal access using an Inoue balloon in a cardiac catheterization lab.

**Results:** Sixteen patients were involved. More than the half (62.5%) were aged between 18-28 years. There were more female with a sex ratio of 0.3. Most patients had class II (mild) dyspnea under the New York Heart Association grading guidelines. The average diameter of the balloon was 27 ± 1.2 mm. Postoperative imaging outlined increased mitral valve area (from 0.69 cm² ± 0.09 to 1.53 ± 0.13 cm²), a decrease in mean gradient (MG), pulmonary artery systolic pressure (PASP) of 16 ± 5.4 mmHg to 5.32 mmHg ± 2.9 mmHg, and 69 ± 18.6 to 52 ± 24.9 respectively. None of our patients had significant postoperative mitral regurgitation. At 3-month control, all patients showed significant improvement on the functional plan; echocardiographic data were stable.

**Conclusion:** The PMC has become a first-line treatment of mitral stenosis. Patient selection is still of paramount importance; it must be based on well codified and functional clinical/pathological criteria. In view of our results, mitral dilatation is an alternative to surgical treatment, especially in countries with limited surgical capacity.

**INTRODUCTION**

Rheumatic mitral stenosis remains a frequent heart disease in sub-Saharan Africa, particularly in Senegal where its prevalence is about 12% of rheumatic heart diseases [1]. The treatment has been modified by the development of percutaneous mitral commissurotomy (PMC) [2,3]. It is an alternative to surgery in some patients where an Inoue balloon is inflated across the stenotic mitral valve to release the fused commissures. Selection of patients is crucial, as it anticipates on the immediate results of the PMC. Evaluation and patient selection rely on Doppler Ultrasound and TOE (transoesophageal echocardiography). They both require an accurate analysis of mitral valve morphology [4,5]. Our purpose was to report on our first PMC experiment and then assess the short term findings.

**PATIENTS AND METHODS**

We analyzed all patient records with pure tight mitral stenosis, and who underwent mitral dilation conducted between June 2014 and November 2015 at the Heart Clinic of Fann University Hospital in Dakar.

**Study Populations**

The study involved a group of 16 patients suffering from symptomatic tight mitral stenosis with favorable anatomy; they received a PMC treatment. Patients were selected to undergo PMC procedure, on condition that they met the clinical and echocardiographic criteria as follows [6,7].

- Tight MS (Mitral Stenosis), mitral valve area <1.5 cm² with bi-commisural fusion;
- Symptomatic patients (NYHA Class ≥ 2);
- No severe mitral regurgitation;
- No left atrial or left auricular thrombus.
Patient selection

A Doppler Ultrasound was performed before and after the procedure in all patients. Transesophageal echocardiogram was performed before or per procedure. The severity of MS and morphology of the mitral valve apparatus were thoroughly assessed and so was transmitial gradient. The mitral valve area was determined by planimetry. Pulmonary arterial pressure was measured by the tricuspid regurgitation jet based on the Bernoulli equation. Bertrand Cormier’s score (Table 1) was assessed for all patients [8].

Mitral Expansion Technique

All patients were treated with balloon dilatation in catheterization lab at Fann Hospital in Dakar. The hospital has a functional modern equipment operated by an experienced interventional cardiologist team. Locating the trans-septal puncture site under TEE guidance is the first step in the treatment. This also helps search for atrial communication or a patent foramen ovale. Once the site has been identified, trans-septal puncture is performed. The Inoue balloon is the most frequently used device (Figure 1).

Twelve patients underwent AG (angiographic) dilatation under TEE and fluoroscopic guidance; and the others were treated under local anesthesia with fluoroscopic guidance. Femoral arterial and venous access was used. Pig tail probe was inserted into the aorta, top of the sigmoid curve for identifying the site when performing atrial septum puncture. The Inoue balloon was used in all cases. After trans-septal catheterization, a rigid pig tail guide was inserted into the left atrium. The femoral entry point and the atrial septum were dilated using a rigid 14F dilator, then the balloon was inserted into the rigid left atrium. The balloon diameter was selected according to the patient’s size (according to Inoue, 24 mm ≤1.47m; 26 mm from 1.47 to 1.60 m; 28 mm 1.6-1.8 m; 30 mm> 1.8 m). The balloon was sequentially inflated; the distal part was inflated with 2cc diluted contrast media, past the mitral valve; then the balloon port at the tip of the catheter was inflated; the device was removed at the orifice level; finally the central portion of the balloon was inflated. The first inflation was generally performed 4 mm below maximum, then the size was increased by 1 mm at each inflow until reaching the final size. Criteria for ending treatment: valve area greater than 1cm² / m² body surface area, uni- or bi-commissural aperture; or otherwise occurrence of a significant mitral regurgitation.

Statistical analysis

We determined the profile of patients, mitral valve areas before and after procedure, average trans-mitral gradients and pulmonary arterial pressures (pre- and post-dilatation). Entry and data analysis were made using the Excel software.

RESULTS

The average age was 24 ± 6.77 years. The most representative age range is between 18-28 years (62.5%). The sex ratio was 0.3, predominantly female, 12 women and 4 men. Most patients had at least a stage II dyspnea (NYHA). The electrocardiogram showed a sinus rhythm in ten patients and six in complete arrhythmia by atrial fibrillation. Frontal chest radiography showed a cardiothoracic index average of 0.57 ± 0.06. The average diameter of the balloon was 27 ± 1.2 mm. At pre-dilatation, mean mitral valve area was 0.69 ± 0.09 cm² vs. 1.53 ± 0.13 cm² in post expansion. In all cases, there was an increase in the mitral valve area during post treatment (Table 2). Estimation by Doppler echocardiography showed that the average gradient (GM) increased from 16 ± 5.4 mmHg to 5.32 mmHg ± 2.9 (Figure 2).

With post procedure Doppler ultrasound, there was a decrease in pulmonary pressures (PASP) assessed by tricuspid regurgitation flow from 69 mmHg ± 18.6 to 52 mmHg ± 24.9. Figure (3) shows the curves of PASP before and after dilatation. All patients had moderate grade I and II mitral regurgitation in immediate post procedure. Hemodynamic success was observed in all patients. Two patients had complications respectively anterior and posterior commissural punctures without hemodynamic consequences. We did not notice any major complications (systemic embolism, haemopericardium, severe mitral regurgitation or death). The results were similar at three months with a mean mitral valve area of 1.5 cm², an average gradient of 4.5 mmHg, and PASP of 44 mmHg.

COMMENT

Currently, in the northern countries, there are advanced facilities for performing interventional cardiology action in good safety conditions. However, there are very few cases of severe rheumatic fever in these countries. On the other hand, this disease is endemic in Senegal; in Sub Saharan Africa, where few patients who can afford it are still now evacuated to European

Table 1: Cormier’s Score.

<table>
<thead>
<tr>
<th>Echocardiographic Group</th>
<th>Mitral Anatomy Valve</th>
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</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Pliable non-calcified anterior mitral leaflet and mild subvalvular disease (ie chordae &gt;10mm long)</td>
</tr>
<tr>
<td>Group 2</td>
<td>Pliable non-calcified anterior mitral leaflet and severe subvalvular disease (ie thickened &lt; 10mm long)</td>
</tr>
<tr>
<td>Group 3</td>
<td>Calcification of mitral valve of any extent, as assessed by fluoroscopy whatever the state subvalvular apparatus</td>
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Figure 1 The case of a patient hosting the Inoue balloon inflated through the mitral valve.
and improve the selection of patients [10]. Our patients were relatively young with an average age of 24 years in contrast to the literature where the average age is around forty especially in the northern countries [11-13]. In developing countries, and Senegal in particular, rheumatic mitral stenosis occurs most often in young people who generally have a low socioeconomic status and who access to late support. As in other groups, there were more women [11,13,14]. This shows that it is the preferred indication (young woman in childbearing age). The experience gained in several tens of thousands of patients [11,15-17] shows that valve area increased after a successful procedure and is accompanied by a fall in the average gradient and pulmonary pressures. As a result functionally, patients fully recovered in the medium term. In our study, we found an increase in the mitral valve area, averaged 2.6 times, compared to the initial figure. As in the study of Bennis [18], the estimation of trans-mitral mean gradient (GM) increased from 16 ± 5.4 mmHg to 5.3 ± 2.9. As found in the literature [18], all patients showed a drop in PASP (69 mmHg ± 18.6 to 52 ± 24.9 mmHg). Patients with persistently high PASP were offered medical treatment. Percutaneous mitral dilation is not a simple technique without complication. The impact of complications varies depending on the operators’ experience [3,10,11,16]. In our series, we did not notice any major complications. This may be explained by the experience of some operators, but also by the small size of our study population. In view of these results, this technique should be implemented in Africa where there is a major demand without surgical solution.

CONCLUSION

In light of these results, the PMC now has a place in the treatment of mitral stenosis. It should not be opposed to prosthetic mitral valve replacement, yet it should be considered a first step in well selected patients. This patient selection remains important based on well codified and functional clinical/pathological criteria. Complications related to the procedure are rare and acceptable with a trained team compared to the risk of thoracotomy. In view of our results, this technique should be promoted in Sub-Saharan Africa because surgical means are limited. Cardiothoracic surgery is often lacking, and sometimes costly.

REFERENCES


