Percutaneous Balloon Mitral Commissurotomy in Pregnant Women in Dakar: Report of Two Cases and Literature Review

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Abstract

In the countries where rheumatic fever is endemic, mitral stenosis (MS) is the commonest reported heart disease that is revealed by pregnancy or that is aggravated by it. Regarding the treatment of symptomatic MS in pregnant women, Percutaneous Balloon Mitral Commissurotomy (PBMC) is the gold standard. We report our experience of PBMC in two pregnant women: the case 1 was a 22-year-old pregnant woman who was on 21 weeks. The pregnancy revealed a severe MS with mitral valve area (MVA) = 0.7 cm² and mean gradient (MG) = 22 mm Hg. The case 2 was aged 28 years old with a pregnancy of 26 weeks. She was diagnosed with MS for a couple of years before. She became symptomatic at the beginning of the pregnancy. Then the MS became severe (MVA = 1.08 cm² and MG = 27 mm Hg). Both of them were treated by PBMC through the right femoral vein; we used the trans-septal approach with Inoue-balloon n°28. The early results were good in the 2 cases and the patients discharged from hospital on post operative day 1.

INTRODUCTION

Rheumatic MS is the commonest organic valvular disease in the developing countries [1]. It is known that pregnancy is a clinical factor of decompensation of this disease. During pregnancy, there is an increase in cardiac output due to hypervolemia, increase in heart rate and stroke volume and decrease in peripheral vascular resistance [1]. The MS that is so far asymptomatic starts to induce cardiac decompensation. Therefore, there is a high risk of acute pulmonary edema and maternal-fetal death [2]. In case of failure to medically treated symptomatic MS during pregnancy, the percutaneous mitral commissurotomy with Inoue balloon appears to be first-line indication. Surgical valvuloplasty is a risky approach because of fetal and maternal mortality rates that are high after cardiopulmonary bypass (CPB) [3]. In this work, we report our preliminary experience of PBMC in two pregnant women on 21 and 26 weeks respectively. In addition we have reviewed the literature regarding this subject.

CLINICAL CASES

Case 1

GF was a 22-year-old pregnant woman on 21 weeks. She was suffering from dyspnea on exertion class 2-3 of the New York Heart Association (NYHA). Then the obstetrician suggested her doing cardiac investigations. We noticed 2 miscarriages in her previous medical history. The clinical examination found normal blood pressure (105/63 mm Hg), normal heart rate (90 bpm); the heart sounds were regular. There were loud S1, loud P2 and a diastolic murmur at the apex. There was not cardiac decompensation and the obstetrical exam was normal. The electrocardiogram (ECG) found atrial fibrillation, bi-atrial and
ventricular hypertrophy. Trans Thoracic Echography (TTE) (Figure 1) showed severe MS class 2 of Bertrand Cormier [MVA = 0.7 cm^2; MG = 22 mmHg]; the mitral leaflets were thickened and not calcified but with bi-commisural fusion. There was a mild regurgitation. There was severe pulmonary artery hypertension (PAH) as the pulmonary artery systolic pressure (PASP) was 88 mmHg. Left ventricle ejection fraction (LVEF) was 66%. The Trans oesophageal Echography (TOE) showed the above findings. In addition, there was not thrombus in the left atrium (LA) and auricle (Figure 2). The subvalvular apparatus chordae were preserved. We indicated treatment by PBMC and we prescribed preoperative checkup. Meanwhile the patient was taking aspirin 100 mg daily. Biology was normal. Then we performed PBMC through the right femoral vein and trans-septal approach with Inoue balloon n°28 (Figures 3,4). We protected the fetus from x rays with lead apron on abdomen and pelvis. The procedure was guided by TOE. The scopy lasted 5 minutes 48 seconds. The early postoperative echogram showed improvements in the MS parameters: MVA rose from 0.7 to 1.66 cm^2; MG dropped from 22 to 4 mmHg; the PASP steadily decreased from 88 to 51 mmHg. However, the regurgitation became moderate (veinacontracta = 4 mm) and there was iatrogenic atrial septal defect (ASD) of 5 mm. There were not pericardial effusion and left atrium thrombus. On postoperative day 1, the patient was hemodynamically stable. She discharged from hospital and we set an appointment with the obstetrician.

Case 2
AN was aged 28 years old and was diagnosed with MS. When she became pregnant, she realized that her clinical state started to worsen. She consulted her cardiologist on week 26 in a context of dyspnea on exertion class 2 of the NYHA. We did not notice any disease in her previous medical story. There was not cardiac decompensation. On auscultation, loud S1 and diastolic murmur were heard at the apex. Fetal and obstetrical examinations were normal. The ECG showed sinus rhythm with bi-atrial hypertrophy. The chest x-rays was normal. The TTE showed severe MS [MVA = 1.08 cm^2]; the leaflets were thickened with limited opening but were not calcified. The TOE (Figure 5) measured a MG of 27 mmHg. The left auricle was free from thrombus and contrast. There was a moderate PAH as the PASP was 39 mmHg. The biology was normal. PBMC through the right femoral vein and trans-septal approach with Inoue balloon n°28 was performed. The method of fetal protection from the x rays was the same than in the case 1. The procedure was TOE-guided. The scopy lasted 11 minutes 32 seconds. In the postoperative echogram, the MSA rose from 1.08 to 1.7 cm^2 and the MG dropped from 27 to 6 mm Hg (Figure 6). There were 2 mild commissural regurgitations and iatrogenic ASD of 3.7 mm. There were not LA thrombus and pericardial effusion. The clinical examination was good on postoperative day 1 and the patient discharged from our department with a suggestion to see her obstetrician.

DISCUSSIONS
This work reports the inaugural experience of PBMC in

![Figure 1](image1.png) TTE parasternal short axis trans-mitral view showing a severe mitral stenosis with bi-commisural fusion (MVA = 0.7 cm^2).

![Figure 2](image2.png) TOE 45° view centred on the left auricle: the auricle and the left atrium are free from thrombus.

![Figure 3](image3.png) Per-interventionnal radioscopy showing the Inoue balloon on the time of inflation in the mitral valve.

![Figure 4](image4.png) Per-interventionnal TOE 145° view showing the Inoue balloon on the time of inflation in the mitral valve.
pregnant women with symptomatic MS in Senegal. Since the first report of percutaneous mitral commissurotomy by Inoue in 1984 [4], the use of this procedure has been increased in the world [1]. In the case 1, the MS was revealed pregnancy whereas it was aggravated by the pregnancy in the case 2. Both of the patients were symptomatic despite the medical treatment. Mitral valve replacement and surgical commissurotomy that require CPB could not be performed as the fetal mortality after CPB can reach 20 to 30% [2,5] in addition to postoperative maternal mortalities [5]. In this situation, PBMC was justified. According to Cormier et al., the contraindications of PBMC include LA thrombus (to exclude by TOE), mitral regurgitation ≥ 2/4, severe aortic valve disease, severe tricuspid valve disease, diffuse calcification, and absence of bi-commissural fusion [6]. So, both of the 2 patients had clinical and echographic profiles compatible with PBMC. Regarding the timing, the ESC guideline [6] recommends to ideally perform it on the second semester of pregnancy if the patient is symptomatic or if the PASP is ≥ 55 mmHg in spite of medical treatment (class IIAc). Anyway before the procedure, it is recommended to prescribe medical treatment such as beta blockers although they have side effects that include bradycardia, hypoglycemia and intrauterine restriction [7,8]. The risk of fetal irradiation exists but this does not contraindicate the procedure as numbers of studies showed good fetal prognosis when protective methods are well conducted [9,10]. There is a relative contraindication of transesophageal echocardiography (TEE) in pregnancy due to the fact that it may carry unnecessary risks of termination of the pregnancy. Furthermore, the need for patient sedation in order to tolerate the TEE probe has led to most institutions performing this procedure under fluoroscopy only. However, according to the 2014 recommendations of the European Association of Cardiovascular Imaging, TEE is useful for guidance of trans septal puncture. As our team was not experienced at the time of the procedure, the TEE guidance made the trans septal puncture easier and this reduced the time of radioscopy.

Overall, the early postoperative clinical and echographic outcomes were good in all of the patients. So it is understandable to see in the literature that PBMC has become the first-line treatment of symptomatic MS that is refractory to medical management during the pregnancy [11,12]. To illustrate the efficiency of the procedure, Zairi et al. [3], in a series of 12 patients have set echographic criteria for success of PBMC as following: MVA ≥ 1.5 cm² and mitral regurgitation ≤ 2/4. Theirs findings were brilliant as they succeeded in all the patients. All of them presented improvement of their dyspnea. Furthermore they got complete release of 2 commissures in 5 patients (41.67%) and 1 commissure in 6 patients (50%). Regarding the complications, it is clear that their incidence widely depends on the experience of the performing team. Standing only on 2 cases, we cannot give genuine statistics. However, taking into account the outcomes of Ben Farhat [13,14] we could see that severe MS occurred in 2.3%. During the follow up re-stenosis of mitral occurred in 16.67% on year 1; 25% on year 3; 33.33% on year 5 and 41.67 % on year 7. In fact the main goal of PBMC during pregnancy is not to obtain perfect results but it aims to get improved hemodynamic situation that will allow pregnancy to continue until deliverance. Afterward mitral valve replacement is to be performed as a definitive treatment.

CONCLUSION

PBMC is the first-line treatment of symptomatic and medically refractory MS in pregnant women if the anatomy of mitral valve is favorable. The procedure is efficient to get clinical improvement and does not lead to many complications if the performing team is well trained and experienced. We strongly recommend this procedure in our context of endemic rheumatic fever to improve maternal and fetal mortalities.

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