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Percutaneous Balloon Mitral Valvotomy During Pregnancy

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Abstract: Rheumatic mitral valve stenosis continues to be the most frequently encountered clinically significant valvular abnormality in pregnant women. We retrospectively studied the fetal outcomes of patients with severe rheumatic Mitral Valve Stenosis (MS) admitted to hospital with heart failure and underwent Percutaneous Balloon Mitral Valvotomy (PBMV) during pregnancy. We identified all of the pregnant cases with rheumatic MS from February 1st 1994 till February 1st 2011 who underwent PBMV from medical records in the tertiary referral center of Madani Heart Hospital in Tabriz, Iran. Follow up was done by phone call and office visit. During this period 24 pregnant patients with mean ages of 29.45±5.05 (19-38) had undergone PBMV for severe MS. Fourteen patients could not be reached and were lost to follow-up. PBMV had been performed during second trimester of pregnancy in 20 cases (83.3%) and during third trimester in 4 patients (16.6%). The success rate of PBMV was 100%. Pulmonary artery pressure reduced from 58.88±21.97 to 38.50±8.87 ($p<0.05$), peak and mean transmitral valve gradient reduced 25.20±9.71 to 11.03±3.61 ($p<0.0001$), 14.18±7.60 to 5.00±1.39 ($p=0.004$), respectively. We conducted follow up in 10 patients with good fetal outcome in all except in 2 infants who died during follow up with intractable heart failure. Twenty patients were in normal sinus rhythm at the time of procedure (83.3%) and 4 of them (16.7%) had arterial fibrillation. PBMV during pregnancy could be recommended as a relatively safe procedure for mother and fetus.

Key words: Fetal outcome, percutaneous balloon mitral valvotomy, pregnancy

INTRODUCTION

Normal pregnancy is associated with 40-50% increase in cardiac output and decrease in systemic vascular resistance (Goldust *et al*., 2012; Norrad and Salehian, 2011). The increase in blood volume and tachycardia during pregnancy, leads to pulmonary capillary congestion. Thus heart failure and pulmonary edema can occur, especially in peripartum period. (Bennis *et al*., 2007; Goldust *et al*., 2013a). The hemodynamic changes of pregnancy leads to increase in left atrial pressure and development or worsening of symptoms including dyspnea, decrease exercise capacity, pulmonary edema and orthopnea and paroxysmal nocturnal dyspnea (Lotti *et al*., 2013; Selamet Tierney *et al*., 2007). Also with high left atrial pressure, risk of atrial fibrillation increases. Mortality of pregnant women with minimal symptoms is less than 1% with fetal or neonatal mortality rate of 12-13% (Goldust *et al*., 2013b; Mangione *et al*., 2007) Therefore, women with severe mitral stenosis or NYHA Class III or IV, should be advised against pregnancy until corrective intervention are performed. During pregnancy medical therapy is directed toward minimizing reduction of volume over load with bed rest and diuretic therapy (Fawzy, 2007; Goldust *et al*., 2013c). Optimal heart rate control with beta blocker, calcium channel blockers, digoxin or DC shock is recommended in atrial fibrillation rhythm. Balloon mitral valvuloplasty is preferred for refractory symptoms despite optimal medical therapy and is a safe and effective option (Sakal *et al*., 2006). However, using it, during pregnancy remained limited. We evaluated the results of this technique with maternal and fetal out come during 17 years in 24 pregnant women with rheumatic mitral stenosis.

MATERIALS AND METHODS

This was a retrospective analytics study. The authors analyzed the data from 24 pregnant women whom underwent percutaneous mitral balloon valvloplasty during seventeen years in Tabriz Shahid Madani

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Hospital. This study was approved by ethic committee of Tabriz University of Medical Sciences. Written consent was obtained from all the patients. These patients have a history of previous rheumatic mitral stenosis. Another inclusion criterion for these patients was complete follow-up data from procedure to at least 17 years after diagnosis. We based our review on medical records. Data collection during of follow-up; were age and age of pregnancy during procedure, clinical outcomes, including hemodynamic measurements, survival rates, complications, pulmonary artery pressure, arterial fibrillation rhythm, peak and mean trans mitral valve gradient and also mitral valve area. Long-term follow-up information was available in 10 of the total patient population (41.7%). We reviewed all of the pregnant cases with rheumatic MS since 1994 till 2011, who underwent PTMC during second trimester of pregnancy because of pulmonary edema or intractable heart failure despite optimal medical therapy, in tertiary referral center of Madani heart university hospital, in Tabriz , Iran. Follow up was done by phone call and clinic visit. Data are expressed as mean values±SD or proportions. A paired t test was used to investigate the time-dependent variables and Student t test to compare 2 groups. A p-value <0.05 was accepted as significant. SPSS 16 software (SPSS, Chicago, Illinois) was used for statistical analysis.

RESULTS

During this period 24 pregnant women who were symptomatic despite optimal medical therapy with mean age of 29.45±5.05 (19-38), underwent PBMV in our center. PBMV were done in 14 cases (83.3%) during second and 4 patients (16.6%) in third trimester. The success rate of PBMV was 100% and pulmonary artery systolic pressure reduced from 58.88±21.97 to 38.5±8.8 ($p<0.05$), peak and mean transmitral valve gradient (TMVG) dropped from 25.20±9. 7 to 11.03±3.61 ($p<0.0001$) and 14.18±7.6 to 5.00±1.39 ($p = 0.004$), respectively. Fourteen patients were lost to follow up but in 10 patients fetal outcome was good. There were only 2 infant deaths (1.4%), because of intractable heart failure. Also Mitral Valve Aread (MVA) increased from 0.92±0.15 (1.1, 0.6) to 1.57±0.16 (1.2, 1.8) cm^2 ($p<0.05$). Complete data are shown in Table 1. Mean long-term follow-up were 1 to 204 mouths. All children in this followed up period had uneventful development for their respective ages and also didn't show any clinical abnormalities. Amount of Contrast using was registered in 10 cases with mean of 59.00±20.24 cc (MAX: 100, MIN: 40).

Table 1: Hemodynamic results before and immediately after PTMC

	Pre PTMC	Post PTMC	p-value
PCWP	29.60±6.82	16.09±7.43	<0.05
MVA	0.92±0.15	1.57±0.16	<0.05
PAP	58.88±21.97	38.50±8.77	<0.05
PTMVG	25.20±9.71	11.03±3.61	0.0001
MTMVG	14.18±7.60	5.00±1.39	0.004

DISCUSSION

Mitral stenosis is a very common valvular disease in developing countries. It is also a common valvular heart disease in pregnant women (Sivadasanpillai *et al*., 2005). Physiologic increment of cardiac output during pregnancy, especially in the middle of second trimester, with the increasing of heart rate, leads to development or worsening of symptoms during pregnancy without intervention, maternal mortality even for patients with NYHA functional class I and II and in severe MS is 0-4% and significantly increases to 6-8% in those with NYHA functional class of III and IV (Aggarwal *et al*., 2005; Horstkotte *et al*., 2005; Weiss, 2005). The perinatal mortality is between 15-20%. All of our patients in this study were in functional class IV despite full medical treatment so intervention in form of PBMV or mitral valve replacement was needed. Surgery during pregnancy carries high risk of fetal death due to hypothermia induced uterine contractions and reduction of placental flow (Stiefelhagen, 2004). Decrement of systolic PAP immediately after PBMV and also increment of MVA let pregnant women carry out pregnancy without major complications for both mother and fetus (Iung *et al*., 1994) on 100 pregnant patients with severe mitral stenosis, found that PBMV is safe for mother and fetus (Iung *et al*., 1994). In this study, also hemodynamic parameters of mothers immediately improved in patients with acceptable echocardiographic score after PBMV. However, PBMV is recommended for patients with suitable anatomy, it is now the accepted procedure during pregnancy depending on precise assessment of commissure morphology and clinical status of patients (Iung *et al*., 1994; Subbarao *et al*., 2004). The risk of fetal radiation may be minimized by shielding of mother's abdomen and pelvis. With these precautions PBMV can be safely performed. Shirodaria *et al*. (2004) reported optimal long term results in pregnant patients who underwent PBMV during the second trimester of pregnancy. Congenital heart disease occurs in 0.8% of newborn infants around the world. It is responsible for many neonatal death of newborns from mothers suffering from any type of cardiac disease with poor functional class and left heart obstruction to flow (which restricts cardiac output and thus flow to the

placenta) and is amplified by any other obstetric risk factors. Radiation and low cardiac output of mothers maybe the underlying causes of heart failure in some newborns (Routray *et al*., 2004).

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