

Balloon Mitral Valvotomy in Juvenile Rheumatic Mitral Stenosis: Comparison of Immediate Results with Adults



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Aims	The objective of the study was to study and compare the clinical, echocardiographic and haemodynamic profile of juvenile rheumatic mitral stenosis (age ≤ 20 years) with severe mitral stenosis in adults, both before and immediately after balloon mitral valvotomy and also to evaluate the safety and efficacy of the procedure in juvenile patients.
Methods	Forty juvenile patients aged 20 years or younger were analysed with 40 consecutive adult patients who underwent balloon mitral valvotomy using Accura balloon in our institution. The procedure was successful in all the patients. The clinical, echocardiographic and haemodynamic parameters were compared pre- and post-balloon mitral valvotomy in both the groups.
Results	New York Heart Association functional class was comparable in both the groups (II and III, 62.5% and 37.5% Vs 60% and 40%). Atrial fibrillation was not seen in the juvenile group whereas 25% of the adult group had atrial fibrillation ($p < 0.001$). Mitral valve deformity was comparable (Wilkins Score – 8.57 ± 0.67 vs 8.6 ± 0.67 , $p = \text{NS}$). Mitral valve area index by 2D echo was $0.62 \pm 0.097 \text{ cm}^2/\text{m}^2$ in the juvenile group and $0.621 \pm 0.097 \text{ cm}^2/\text{m}^2$ in the adult group ($p = 0.72$) and was larger in the juvenile group (1.38 ± 0.19 vs $1.29 \pm 0.18 \text{ cm}^2/\text{m}^2$) after the procedure (p value < 0.03). Mitral valve gradient (19.85 ± 7.31 mm hg vs 14.63 ± 5.33 mm hg, P value < 0.001) and mean PASP ($70.15 \pm 1 + .2$ mm hg vs 60.10 ± 19.32 mm of hg, P value < 0.02) was higher in the juvenile group before balloon mitral valvotomy, after balloon mitral valvotomy the values were 7.45 ± 2.57 vs 5.78 ± 2.24 mm of hg, ($P < 0.003$) and 40.48 ± 10.30 vs 41 ± 15.62 respectively ($p = 0.85$). The mean value for left atrial pressure was comparable in both the groups both pre- and post-balloon mitral valvotomy (P value 0.076 and 0.54 respectively). There was no significant difference in the procedural success (95% vs 100%, p value < 0.15).
Conclusion	Balloon mitral valvotomy is safe and effective in young with rheumatic mitral stenosis and provides better immediate results compared to adults.
Keywords	Valvular heart disease • Valvuloplasty • Safety • Accura balloon • Atrial fibrillation

Introduction

Severe rheumatic heart disease is rarely seen in children and adolescents except in developing countries where rheumatic fever is still endemic. Rheumatic mitral stenosis in India

commonly affects children and young adults less than 20 years old (Juvenile Mitral stenosis) [1–3]. Mitral stenosis is often associated with frequent episodes of pulmonary oedema requiring therapeutic intervention [1–5]. Until the mid–1980s, surgical closed or open valvotomy was the only

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available treatment. However, mitral valve surgery in children and adolescents has its own disadvantage as re-intervention may be necessary 10 to 15 years later. In adults, balloon mitral valvotomy yielded similar results to those obtained after open mitral valvotomy [6,7] and better results than those obtained after closed mitral valvotomy [6]. Therefore balloon mitral valvotomy appears to be an attractive alternative in that particular setting where mitral valve is pliable with minimal calcifications. Although this procedure has been extensively used in adult and elderly patients, there is not much published data in juvenile patients.

Thus the purpose of this study was to evaluate the immediate results of balloon mitral valvotomy in patients 20 years or younger and to compare these results with those obtained in the adult population.

Methods

Study Population

Clinical Characteristics

Forty consecutive juvenile patients with severe rheumatic mitral stenosis who underwent balloon mitral valvotomy in our institution between October 2011 and November 2012 were included in the study. Forty consecutive patients aged >20 years were taken in the study as control group. The baseline characteristics of both groups are shown in Table 1. Mean age was 16.98 ± 3.22 years (range 10-20) in the juvenile group vs 40.1 ± 11.48 years (range 24 to 68) in the adult group. There were more patients with atrial fibrillation in the adult population. Patients were equally symptomatic in both groups prior to the procedure.

Echocardiographic Evaluation

All patients underwent a 2D Echo-Doppler examination before the procedure. Mitral valve structure was assessed using Wilkins score [8] which showed no significant difference between the two groups ($p = 0.87$) (Table 1).

Mitral valve area was determined by 2D echo planimetry. Mitral regurgitation was assessed by colour Doppler using Helmake classification [9] which is based on a scale of 1 to 4 according to the degree of jet extension into the left atrium. Any clots in the left atrium or the left atrial appendage were ruled out by transoesophageal echocardiography. Echo-Doppler examination was repeated 24 hours after the procedure to evaluate mitral valve area, to assess the severity of mitral regurgitation and other parameters.

Mitral Valvotomy Procedure

After obtaining an informed consent from the patient or the parents, the procedure was performed under local anaesthesia. Right and left heart catheterisation was performed. Intracardiac pressures were recorded in all patients before and after the procedure. Transseptal puncture was performed using a Brockenbrough needle (Medtronic, USA) and Mullins sheath (Medtronic, USA). Optimal size of Accura (Vascular Company Limited, Doddaballapur, Karnataka, India) balloon was decided according to the height of the patient ($\text{height (cm)}/10 + 10 \text{ mm} = \text{recommended balloon size}$). Diluted contrast was used to inflate the balloon. Serial dilations starting with balloon size 2 to 4 mm less than the recommended balloon size and upgraded till optimal result obtained.

Statistical Analysis

Descriptive statistical analysis has been carried out in the present study. Results on continuous measurements are presented as mean \pm standard deviation and results on categorical measurements are presented in number (%). Significance is assessed at 5% level of significance.

Student "t" test (two-tailed, independent) has been used to find the significance of study parameters on continuous scale within each group. Chi-square/2x2, 2x4, 2x5 Fisher exact test has been used to find the significance of study parameters on categorical scale between two groups. Student

Table 1 Baseline characteristics.

	Juvenile group (N = 40)	Adult group (N = 40)	P - Value
Age (yrs) mean \pm SD	16.98 \pm 3.22	40.1 \pm 11.48	<0.001
Females	24 (60%)	22 (55%)	NS
Atrial fibrillation	0 (0%)	10 (25%)	<0.001
NYHA Functional Class			
\geq II	25 (62.5%)	24 (60%)	NS
\geq III	15 (37.5%)	16 (40%)	NS
Left Atrial enlargement	31 (77.5%)	35 (87.5%)	<0.001
Bi - Atrial enlargement	9 (22.5%)	5 (12.5%)	<0.001
Wilkins Score	8.57 \pm 0.67	8.6 \pm 0.67	0.87
Body surface area	1.25	1.4	0.0001

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