

Study of Percutaneous transvenous mitral commissurotomy outcomes in valves with different Echocardiographic features

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ABSTRACT



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Background

Percutaneous transvenous mitral commissurotomy (PTMC) is now a standard treatment for suitable mitral stenosis. However all procedures are not always successful or optimal. Despite having so much experience on the procedure the prediction as which types of valves give good results after PTMC is not very much defined.

Methods

Initial sixty patients of PTMC of Shahid Gangalal hospital (18male, 42 female), age ranging from 13 to 65 years, mean age 29.9 ± 11.5 years, were studied retrospectively. Their echocardiography data before and after balloon dilatation of mitral valve were collected. The appearance of mitral valve on echocardiogram before PTMC was scored for leaflet thickening, leaflet mobility, subvalvular thickening and calcification. They were categorized into low scoring group A if they scored 8 or low, and high scoring group B if they scored above 8 according to Wilkins score.

Results

Results were classified as successful and optimal (if valve area $> 1.5 \text{ cm}^2$) or suboptimal (if valve area $\leq 1.5 \text{ cm}^2$). High scoring leaflet deformity with more than 8 was associated with suboptimal results while low score group had successful outcomes and their difference was significant statistically.

Conclusion

Patients with high severity scoring of mitral valve disease had poor outcome in comparison to those with low score.

KEYWORDS

PTMC, Echocardiographic features, valves, outcomes

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BACKGROUND

Percutaneous transvenous mitral commissurotomy (PTMC) is now the standard and promising approach for the management of rheumatic mitral stenosis¹⁻¹⁰. Since the result of the procedure varies, patient selection is very important for the successful procedure¹¹⁻¹⁶. Valve features appear to affect the result of the procedure¹⁷⁻¹⁸.

Among various features, calcified valve do not seem to yield satisfactory result and there are chances of tearing the valve resulting in severe mitral regurgitation. So identifying the valve suitable for the procedure is of utmost importance. The purpose of the study is to find whether severity of the valve can predict the outcome of the procedure.

METHODS

We retrospectively studied the initial 60 consecutive patients (18 men, 42 women) who had undergone PTMC at Shahid Gangalal National Heart Centre, a tertiary care center in Kathmandu. This was an observational study and took about 6 months to complete the cases. The mean age of the patient was 29.9 ± 11.5 years; age ranging from 13-65 years. Doppler echocardiography was done before the procedure. Mitral valve features were scored by Echocardiography and analyzed under following headings: (a) leaflet thickening (b) leaflet mobility (c) subvalvular thickening and (d) calcification. Each feature was given 0-4 scores according to their severity; 4 representing severe deformity and 0 representing normal, see table 1. Adding all the scores of 4 features represented the total echocardiographic score. So, 0 would represent absolutely normal valve whereas 16 represented severely immobile calcified valve. Mitral valve area was measured by planimetry method.

So we analyzed and noted 6 variables of valve – 4 valve features scores as we mentioned above (summing it into 0-16 according to Wilkins criteria^{19,20}, assessed at echocardiography) and 2 Mitral Valve Area (MVA) measurements before and after procedure. And hemodynamic study performed before and after procedure were also studied.

Mitral regurgitation was also graded as trivial, mild, moderate and severe according to severity.

Table 1: Wilkins grading of mitral valve²⁰

Grade	Mobility	Thickening	Calcification	Subvalvular thickening
1	Highly mobile valve with only leaflet tips restricted	Leaflets near normal in thickness (4–5 mm)	A single area of in-creased echo brightness	Minimal thickening just below the mitral leaflets
2	Leaflet mid and base portions have normal mobility	Midleaflets normal, con-siderable thickening of the margins (5-8 mm)	Scattered areas of brightness confined to leaflet margins	Thickening of chordal structures extending to one-third of chordal length
3	Valve continues to move forward in diasto-le, mainly from the base	Thickening extending through the entire leaflet (5–8 mm)	Brightness extending into the mid-portions of the leaflets	Thickening extended to distal third of the chords
4	No or minimal forward movement of the leaflets in diastole	Considerable thickening of all leaflet tissue (>8-10 mm)	Extensive brightness throughout much of the leaflet tissue	Extensive thickening and shortening of all chordal structures extending down to the papillary muscles

PTMC was approached from right femoral vein in all patients, except in one who had collapsed right femoral vein and it was performed from the left femoral vein. The inter-atrial septum was punctured and crossed by Brockenborough needle with the help of Mullins sheath. The hemodynamic study included LA pressure before and after the procedure and was studied only as a part of the procedure.

Swan Ganz catheter was used to measure left atrial pressure approaching from the left femoral vein. Dilatation of mitral valve was performed by Inoue balloon in all cases. Gradual balloon dilatation technique was performed until the indentation caused by fused commissure disappeared. All had relief in symptoms after the procedure, No one had worsening of the symptoms immediately after the procedure. All the patients were studied the next day for resulting mitral valve area and mitral regurgitation.

To find out whether echocardiographic features predicted the outcome of PTMC, mitral valves score of 8 and below vs score of above 8 were compared and analyzed as 2 separate groups A and B. Resulting mitral valve area were analyzed with chi square test and p value calculated. Successful procedure with optimal results with $MVA > 1.5 \text{ cm}^2$ vs those with $MVA \leq 1.5 \text{ cm}^2$ were analyzed in 2X2 chi square test.

RESULT

The mean age of the patients were 29.9 ± 11.5 years with eldest of 65 years and youngest. 13 Out of the 60 patients (70%) were female and 30% were male. The age of the two groups were similar.

Other than 6 variables assessed at echocardiography we also assessed 2 hemodynamic examination of pulmonary artery pressure measured before and after procedure. Echocardiographic variables included pre and post procedure mitral valve area. The mean valve area of all patients measured by planimetry in the cross sectional echocardiographic short axis images before dilation was 0.9 ± 0.27 cm square. After dilation, the mean area increased to 1.67 ± 0.47 cm square.

In the group A (less than 8 score) the mean area before dilatation was 0.86 ± 0.25 cm square; and after dilation, it was 1.79 ± 0.27 cm square. In group B, (score of more than 8) the mean mitral valve area was 0.84 ± 0.17 cm square before dilation; and after dilation it was 1.47 ± 0.20 cm square. Increment in group A was 0.93 cm square and increment in group B was 0.63 cm square. The difference in increment in group A vs group B was significant with p value of <0.025 .

Table 2 shows demographic data mitral valve area, left atrial size, echocardiographic scores for leaflet mobility, leaflet thickening, leaflet calcification and subvalvar thickening, valve area for each patient before and after dilation in group A and group B patients.

Mean grade of regurgitation by color Doppler was 0.54 grade before dilatation and 0.93 grade after dilatation, which is about one grade up and is acceptable. No patient developed severe regurgitation.

Table 2

	Features of the valve and PTMC results before and after	Group A	Group B
1	Age distribution in years	24.50	31.86
2	Female sex distribution in %	61.11	71.42
3	Mean of total valve score out of 16	7.583	9.048
4	Calcium score (out of 4)	1.836	2.286
5	Mobility score (out of 4)	1.78	2.0
6	Thickening score (out of 4)	1.91	2.46
7	Subvalvar apparatus score (out of 4)	2.028	2.298
8	Left atrial size in cm	4.80	4.74
9	Pre-procedural valve area in cm square	0.91 ± 0.25	0.85 ± 0.17
10	Post-procedural valve area in cm square	1.8 ± 0.27	1.47 ± 0.20

DISCUSSION

This study showed that the outcome result of PTMC procedure inversely correlated with the severity in echocardiographic features of mitral valve. The greater the severity in valve deformity, the greater the chances of having suboptimal outcome. Similarly, valves with near normal features tend to give optimal outcome. The other studies have shown that mobility calcification and degree of fibrosis determined the result of the procedure. Although study²⁰ showed that the outcome of the procedure is not related to the initial size of the valve, our study showed that the final result has some correlation with the initial mitral valve area; this is especially true in group A cases. In the group A the valve size after the procedure doubled the initial size. In low scoring group A mitral valve opened easily acquiring greater orifice area. However, the doubling of the valve size did not happen in group B because they had calcified and thick valve apparatus. The gain is not as much in group B because of the severity of valve. Out of 4 different features, calcification of the valve appeared to be more important and determinant of the final outcome. Other outcomes studied were pre and post pulmonary pressure and trans-mitral gradient. Pulmonary pressure and trans-mitral gradient both dropped after the procedure. These were not analyzed statistically because of unavailability of data in all patients.

Although group A patients had better outcome in increment in valve area, group B also had increase in MVA. But all patients expressed that they had symptomatic relief after the procedure.

LIMITATION OF THE STUDY

This analysis was done retrospectively so it has its own limitations. Method of assessment of the valve could be subjective and variation in the assessment was possible. Intra-observer and inter-observer variability could not completely be eliminated. Number of dilation of the balloon in different patients varies. This could have affected the opening of valve orifice.

CONCLUSION

This study shows that the PTMC results correlated with the echocardiographic features of mitral valve. Low scoring on the severity of valve feature had better opening of the orifice after the procedure. This fact can help in choosing the patient for ballooning. The study showed that low scoring group had higher increment than the group with high scoring group. This also suggests that it is advisable to subject the patient for procedure at an early stage for better results.

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