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Valvular Heart Disease/RHD

Predictors of development of moderate-to-severe, and severe mitral regurgitation following percutaneous transseptal mitral commissurotomy using Accura balloon – The need to look beyond MGH (Wilkins) score



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Background: Despite the years of experience in percutaneous transseptal mitral commissurotomy (PTMC), development of mitral regurgitation (MR) remains a dreaded complication, the incidence of which has been described between 1.4% and 7.5%. The aim of present study is to find out predictors of the development of moderate to severe mitral regurgitation (MR) following PTMC using Accura balloon technique at our Institute.

Methods: We retrospectively studied 1638 consecutive patients with rheumatic MS who were subjected to PTMC using Accura balloon between January 1, 2013 to December 31, 2014. Inclusion criteria for the study were symptomatic MS with NYHA functional class II or more with mitral valve area (MVA) ≤ 1.5 cm with less than concomitant grade 2 MR and severe MS with mild aortic regurgitation in sinus rhythm or AF. Exclusion criteria were patients with concomitant moderate MR or aortic regurgitation (AR) of grade II/IV or more, and presence of left atrial (LA) thrombi assessed by TEE done on day of the procedure in patients with AF, h/o CVA, or RV dysfunction, and within a week of scheduled procedure if otherwise. Patients were divided into two groups according to the development of moderate to severe MR or not: *Group A* (patients without MR/mild MR post PTMC) and *Group B* (patients who developed significant grades of post-PTMC MR). According to the severity of MR, we divided our patients into two groups (*Group A*, patients without MR/Mild MR, and *Group B*, patients with higher grades of hemodynamically significant moderate-severe and severe MR). There were no significant baseline differences between both groups with regards to their clinical characteristics, echocardiographic measurements other than MV scoring, and number of inflations.

Transthoracic echocardiographic and Doppler examinations were done within a week before intervention and within one day after the procedure. We studied mitral valve morphology using the Massachusetts General Hospital score by Wilkins et al., and also included other parameters such as severity of IAS bulge toward RA, and irregular thickening of leaflet, and presence of calcified nodules on mitral valve leaflets. PTMC using Accura balloon was done with the standard trans-septal technique. We also measured mitral valve area (MVA), transmitral mitral valve gradient (MVG), pulmonary artery systolic pressure (PASP) and presence and severity of pre- and post-PTMC MR. Severity of MR was determined by expressing the ratio of maximal jet area to left atrial area in the

same view using color flow mapping and graded from one to four according to standard ACC/ESC criteria and other quantitative measures such as vena contracta or PISA in cases of ambiguity. Development of new moderate to severe MR was defined as the increase of $\geq 2/4$ grades of MR. Echo Doppler classified MR as whether due to leaflet tear (partial or complete), and commissural MR, and chordal rupture (partial or complete). Multiple stepwise logistic regression analysis was performed for variables found positive on univariate analysis to determine the most important predictor(s) of developing moderate to severe MR. Data were collected using SPSS version 16 and “*p*” values were considered significant if it were < 0.05 .

Results: 40 patients (%) developed moderate-to-severe MR, and 21 patients (%) severe MR, with 13 patients needing immediate surgery for hemodynamic instability and 14 more undergoing surgery within 48 hours to 24 months, latter especially commissural MR. Thus the incidence of postprocedure moderate-to-severe MR and severe MR in our study was 2.1% and 1.2%, respectively, and 3.3% overall.

A tear of the AML in 10 patients (incomplete in 4) and a tear of the posterior leaflet occurred in 4 patients (incomplete in 3). Thus 7 patients developed flail leaflet. 2 patient had total chordal rupture (needing immediate surgery) with 6 patients developing partial chordal tears, none of which was sent for surgery. The majority of the remainder of 25 patients developed various grades of significant commissural MR, 8 of whom were sent for surgery. On analysing *Group B* patients, female (v/s male) gender, presence of calcific nodules on leaflets, presence of AF in the patient before PTMC, higher degree of IAS bulge causing a lower site of IAS puncture and irregular thickening of valve leaflet (all with $p > 0.05$), were all significantly higher than *group A* patients and were associated with the development of severe post-PTMC MR. There was a trend towards more MR in patients with previous PTMC/CMV done ($p = 0.12$), and higher age of the patient ($p = 0.81$).

Conclusion: Using the Wilkins score and the other anatomical variables, we found that the best predictive factor with multiple regression analysis for the risk of significant MR after BMV with Accura balloon is the combination of irregular thickening of leaflet and presence of calcific nodules, in presence of bulging IAS with predictive percentage of 85.7%. Higher grades of subvalve fibrosis tended to give a poorer MVA post PTMC, but were not associated with higher grades of post-PTMC MR.

Percutaneous mitral commissurotomy in patients with significant mitral valvular calcium: Procedural success and one month outcomes



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Aim: To study the procedural success of percutaneous mitral commissurotomy (PMC) and one month outcomes in patents with mitral valvular calcification.

Methods and results: Over a period of 13 months we enrolled 103 patients who underwent PMC in our institution. All patients were screened for fluoroscopic calcium and divided into two groups: group 1 without significant calcium (no calcium or calcium seen in cine fluoroscopy) and group 2 with significant calcium (calcium seen in high fluoroscopy). There were 85 patients in group 1 and 18 patients in group 2 and procedural success was 91.8% and 72% respectively in two groups ($P = 0.034$). Confidence interval of procedural success in calcific group was 51.5–92.9%. In this study, the presence of mitral calcium detected by echocardiography or cine fluoroscopy did not influence the immediate success of PMC. There was no procedural death and none developed severe mitral regurgitation (MR) or required mitral valve surgery within one month post procedure. Other parameter that influenced procedural success was Wilkins score >8 . All patients except two improved symptoms to New York Heart Association (NYHA) I/II at one month follow-up.

Conclusion: PMC success rate in patients with significant fluoroscopic calcium is inferior to those without significant calcification. Still the success rate in calcific group is good without additional complication.

Prevalence and prognostic significance of left ventricular myocardial late gadolinium enhancement in severe aortic stenosis



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Background: Myocardial fibrosis occurs in aortic stenosis (AS) as part of the hypertrophic response. It can be detected by late gadolinium enhancement (LGE), which is associated with an adverse prognosis in the form of increased mortality and morbidity.

Objectives: To assess the prevalence of LGE patterns using cardiac magnetic resonance (CMR) in severe AS patients and to study the prognostic significance of LGE pertaining to mortality, arrhythmic risk, heart failure/hospitalization and LV ejection fraction $\geq 20\%$.

Methods: Patients were enrolled into the study from June 2012 to November 2014. All the patients underwent CMR and various patterns of enhancement were studied. These patients if symptomatic were advised aortic valve replacement (AVR) and others were managed conservatively. All patients were followed up and watched for outcomes like mortality, heart failure/hospitalization for cardiovascular cause, fall in left ventricular ejection fraction (LVEF) $\geq 20\%$ and arrhythmia.

Results: A total of 109 patients (mean age $- 57.7 \pm 12.5$ yrs) underwent CMR with 63 males. These patients were followed up for a mean of 13 months. Among 38 patients who underwent AVR, 6 died (5 – cardiovascular cause, 1 – non cardiovascular). 71 patients were managed conservatively out of which 18 died (17 – cardiovascular cause, 1 – non cardiovascular cause). LGE patterns were seen in 46 patients (43%); midmyocardial enhancement was seen in 31.1% of cases (33 patients). No LGE pattern was seen in 57% (63 patients). Basal and mid regions were maximally involved with mid myocardial enhancement in 66% & 68.3% respectively. LV ejection fraction ($p = 0.002$), peak aortic systolic velocity ($p = 0.01$) and peak aortic systolic gradient ($p = 0.02$) were the main predictors of LGE. Main predictors of primary outcome were NYHA class [OR $- 13.4 (2.8-26.1)$, $p \leq 0.001$], age $- 62 \pm 9.6$ yrs ($p = 0.001$), EF simpson- $50.9 \pm 13\%$ ($p \leq 0.001$), LGE [OR $2.8 (1.27-6.47)$, $p = 0.01$], number of segments involved [2.37 ± 2.1 , $p \leq 0.001$] & CMR LV mass (151.73 ± 32 g,

$p = 0.007$). LGE truly predicted heart failure/hospitalization for cardiovascular cause [OR $- 3.8 (1.2-11.9)$, $p = 0.01$] and fall in LVEF [OR $- 5.8 (1.5-22.5)$, $p = 0.005$]. Patients with LGE had 2.87 times risk of adverse outcomes and patients with more than 3 segment LGE involvement had again increased chances of adverse outcomes.

Conclusions: LGE was detected by CMR in 43% of patients with severe AS. It predicted recurrent heart failure, hospitalization for cardiovascular cause and fall in LV ejection fraction. Our study has laid a path to larger prospective studies with long term follow-up to assess the prognostic impact of CMR in patients with severe AS.

Prognostic importance of exercise brain natriuretic peptide in asymptomatic chronic organic mitral regurgitation



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Background: Early surgery could be advisable in selected patients with chronic severe mitral regurgitation, but there are no criteria to identify candidates who could benefit from this strategy. In patients with primary mitral regurgitation (MR), BNP is known to be a good surrogate marker of MR consequences on the left ventricle, left atrium, and systolic pulmonary arterial pressure (PAP), and is a powerful predictor of outcome. It is hypothesized that the measurement of BNP at exercise could provide incremental value as compared with standard resting BNP for the risk stratification of patients with asymptomatic MR.

Methods and results: Comprehensive resting and exercise transthoracic Doppler echocardiography was performed in 50 consecutive asymptomatic patients with moderate to severe MR and preserved left ventricular (LV) function enrolled over a period of 12 months from October 2013 to October 2014. Blood samples were collected both at rest and during exercise. Follow-up was done every 3 months for 1 year. The BNP level significantly increased from rest to exercise in 16 patients. There was a significant graded relationship between increasing BNP level at exercise (according to tertiles) and increased incidence of cardiac events (death, heart failure, mitral valve surgery driven by symptoms, or LV dilatation/dysfunction onset) (1 year, $10 \pm 5\%$ vs. $20 \pm 6\%$ vs. 40.5 ± 9 in tertiles 1, 2 and 3, respectively). On multivariable analysis, after adjustment for demographic and echocardiographic data and for resting BNP level, exercise BNP remained significantly associated with increased risk of cardiac events during the follow-up (hazard ratio 2.6 and 3.8, $P = 0.040$ and 0.020 , for tertiles 2 and 3, as compared with tertile 1).

Conclusions: In asymptomatic patients with primary MR, exercise BNP level provides incremental prognostic value beyond what is achieved by demographic and echocardiographic data and resting BNP level. Patients with elevated exercise BNP should be considered at high risk of reduced cardiac event-free survival.

Balloon mitral valvuloplasty in situs inversus dextrocardia with rheumatic mitral stenosis



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