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Title: Left atrial compliance after following percutaneous mitral balloon valvuloplasty is an independent predictor of long-term cardiovascular events

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Background & Aims: Left atrial compliance (Ca) plays a significant role in determining pulmonary hypertension in patients with severe rheumatic mitral stenosis. Percutaneous mitral balloon valvuloplasty (PMBV) leads to increased Ca as a result of valve opening. However, the prognostic value of Ca following PMBV has not been clearly defined. The objective of this study is to investigate whether invasively measured Ca immediately after PMBV can predict adverse cardiovascular events during long-term follow-up.

Methods: A total of 341 patients with mitral stenosis, who were referred for PMBV at a tertiary center, were included in the study. All patients underwent echocardiography and both right and left heart catheterizations with pressure recordings before and after the PMV procedure. Brain natriuretic peptide (BNP) levels were also measured. Left atrial compliance was calculated both before and after PMBV using the formula: Stroke volume (SV) divided by the left atrial pressure variation during ventricular systole (mL/mmHg). The stroke volume (SV) was derived by dividing the cardiac output (CO), determined by the Fick method, by the heart rate. The left atrial pressure variation was determined by subtracting the nadir of the X descent from the peak of the V wave. Adverse cardiovascular events were defined as cardiovascular death or the need for surgical mitral replacement.

Results: The study population had a mean age of 45 ± 12 years, with 264 (85%) of the participants being female. Following the PMBV, 27 patients (7.9%) were excluded from the analysis due to procedural complications, primarily severe mitral regurgitation. Over a median follow-up period of 3.2 years (ranging from 1 month to 8 years), a total of 58 events occurred, including 12 cardiovascular deaths and 46 cases requiring mitral valve replacement. The incidence rate of cardiovascular events was calculated as 5.97 events per 100 patient-years, while the mortality rate was determined to be 1.24 deaths per 100 patient-years. There were no significant differences observed in the hemodynamic data prior to PMBV between the patients who had events and those who did not. However, after the procedure, patients who did not experience adverse events had higher cardiac index, lower left atrial (LA) pressure, and higher Ca. BNP levels were significantly lower in the group without adverse events. In the final multivariate model, the independent predictors of adverse events were age (hazard ratio [HR] 1.50, Confidence Interval [CI] 95% 1.13-2.01), mitral valve area (MVA) post PMBV (HR 0.13, CI 95% 0.03-0.50), severe of tricuspid regurgitation (TR) (HR 2.87, CI 95% 1.24-6.62), the change in BNP levels (HR 0.57, CI 95% 0.40-0.81), and Ca (HR 0.23, CI 95% 0.06-0.86). The inclusion of Ca in the prognostic model resulted in improved performance for predicting adverse cardiovascular events, with a C-statistics value of 0.820.

Conclusions: Ca after PMBV has been identified as an independent predictor of cardiovascular events during long-term follow-up. When Ca was added to the predictive model along with age, post-procedural valve area, severity of tricuspid regurgitation, and change in BNP levels, there was a significant improvement in the model's performance for predicting adverse events. This suggests that Ca is a valuable parameter that enhances the accuracy of prognostic predictions in patients undergoing PMBV.