

TOPIC 04 – Valvular heart disease and general cardiology

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137

Impact of left atrial volume on clinical outcome in organic mitral regurgitation

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Background: Left atrial (LA) enlargement is a consequence of organic mitral regurgitation (MR) but its association with clinical outcome independently of MR severity is uncertain.

Objectives: To assess the link between LA volume at diagnosis and outcome of patients with MR.

Methods: We prospectively enrolled 492 patients (63±15 years, 60% males) in sinus rhythm with organic MR (RVol. 68±42 mL/beat) and performed triple echocardiographic quantitation (MR severity, LA volume and left ventricular characteristics). Outcome with medical and surgical management were analyzed.

Results: LA volume indexed to body surface area (LA-index) was 55±26 mL/m² (<40 mL/m² in 158, 40-59 mL/m² in 160 and 60 mL/m² in 174 patients). Under medical management, 5-year survival was 80±2.9% and cardiac events 28±3%. Adjusting for established predictors of outcome, LA-index was independently associated with survival after diagnosis (HR1.3[1.1-1.5] per 10 mL/m² increment, P=0.001). Patients with LA-index 60 mL/m² had lower 5-year survival than those with no or mild LA enlargement (P<0.0001) and than survival expected in US population (53±8.6% versus 76%, P=0.017). Compared to patients with LA-index <40 mL/m², those with LA-index 60 mL/m² had increased mortality (HR2.8[1.2-6.5], P=0.016) and cardiac events (HR5.2[2.6-10.9], P<0.0001) with medical management. Mitral surgery was associated with decreased mortality (HR 0.46[0.26-0.84], P=0.01) and cardiac events (HR 0.38[0.23-0.62] P=0.0001). After surgery patients with LA-index 60 mL/m² did not incur excess mortality or cardiac events (P>0.30).

Conclusion: In organic MR, LA-index at diagnosis predicts long-term outcome, incrementally to known predictors of outcome. This marker of risk is particularly important because mitral surgery in these patients markedly improves outcome and restores life-expectancy. LA-index should be measured in routine clinical practice for risk-stratification and for clinical decision making in patients with organic MR.

138

Brain natriuretic peptide predicts left ventricular contractile reserve in asymptomatic degenerative mitral regurgitation

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Background: Current guidelines recommend mitral surgery in asymptomatic patients with severe degenerative mitral regurgitation (DMR) even when left ventricular (LV) systolic function is preserved. LV longitudinal deformation, quantified with 2D speckle tracking analysis (2DSt), can detect LV contractile reserve (CR). Moreover, plasma brain natriuretic peptide (BNP) may be used for risk stratification in patients with DMR. We sought to assess whether BNP may be used to identify LVCR in asymptomatic DMR.

Methods and results: Resting and exercise transthoracic echocardiography was performed in 82 consecutive asymptomatic patients with moderate to

severe DMR and with preserved LV systolic function. The presence of LVCR was defined as an exercise-induced changes in global longitudinal strain (GLS) >2%. Simultaneously to resting echocardiography, plasma BNP level was measured. GLS increased during exercise (from 20.9±3.1 to 23.4±3.4%, p<0.001) and CR was found in 45 patients (56%). Patients with CR were significantly younger (p=0.025) and had lower LV filling pressure (p=0.04) than to those without CR. BNP was significantly higher in patients without CR (42.7±2 vs. 14.8±2pg/ml, p<0.0001) and there was a good correlation between BNP and exercise-induced changes in GLS (r=-0.77, p<0.001). On multivariable analysis, BNP was independently associated with exercise-induced changes in GLS (p<0.001). ROC curves showed that BNP>26pg/ml predicted the absence of CR with good accuracy (sensitivity: 92%; specificity: 93%). Moreover, multivariable regression revealed that, after adjustment for age, sex, E/Ea ratio and resting GLS, only BNP was independently associated with CR (OR=1.4, 95%CI: 1.2-2, p<0.001).

Conclusion: In asymptomatic DMR and normal LV systolic function, CR may be absent in a large proportion of patients (45%). BNP is highly accurate to identify patients with subclinical LV dysfunction and no CR. Consequently, BNP could routinely be used to improve risk stratification.

139

Exercise pulmonary hypertension in asymptomatic organic mitral regurgitation

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Background: Current guidelines recommend mitral valve surgery for asymptomatic patients with severe organic mitral regurgitation (OMR) and preserved left ventricular systolic function when exercise pulmonary hypertension (PHT) is present. The aim of this study was to identify the determinants of exercise PHT and the impact on symptom-free survival.

Methods and results: Comprehensive resting and exercise transthoracic echocardiography were performed in 78 consecutive asymptomatic patients (61±13 years, 56% males) with moderate OMR. Resting and exercise PHT were defined as a systolic pulmonary arterial pressure (SPAP) >50mmHg and >60mmHg, respectively. Exercise PHT was more frequent than resting PHT (48% vs. 15%, p<0.001). In multivariable analysis, exercise ERO was an independent determinant of exercise SPAP (p<0.0001) and exercise PHT (p=0.002). During follow-up (mean: 19±14 months), 40 patients (51%) remained asymptomatic whereas 38 (49%) developed symptoms. Symptom-free survival was 71±5%, 54±6% and 40±7% at 1, 2- and 3-year, respectively. Resting PHT and exercise PHT were associated with markedly reduced 2-year symptom-free survival (36±14% vs. 59±7%, p=0.04; 35±8% vs. 75±7%, p<0.0001). After adjustment for age and sex, the impact of resting PHT on symptoms was no longer significant. Multivariable Cox model identified exercise PHT as an independent predictor of the occurrence of symptoms (Hazard-ratio=2.8, 95%CI: 1.4-5.4, p=0.002). ROC curves revealed that exercise SPAP was more accurate than SPAP to predict the occurrence of symptoms during follow-up (p=0.032). SPAP> 56mmHg predicted symptoms with good specificity (73%) and sensitivity (82%).

Conclusions: Exercise PHT is frequent in patients with asymptomatic OMR. Exercise MR severity is a strong independent predictor of both exercise SPAP and exercise PHT. Exercise PHT is associated with markedly low 2-year symptom-free survival emphasizing the use of exercise stress echocardiography.

140

Impact of TAVI with the Edwards-SAPIEN endoprosthesis on mitral regurgitation: results of a serial echocardiography assessment

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Purpose: The impact of transcatheter aortic valve implantation (TAVI) on mitral regurgitation (MR) is controversial. Two recent publications have reported improvement in MR grades following implantation of the Edwards-SAPIEN endoprosthesis. These findings were not replicated with the Core-Valve. The time course of improvement in MR grades with the Edwards-SAPIEN valve has not been described on an individual patient basis and the potential mechanisms of benefit are unclear. The aim of this study was to assess the acute and intermediate changes in MR severity after TAVI with the Edwards-SAPIEN endoprosthesis

Methods: Echocardiography was performed in 22 consecutive patients before and after treatment, and at 1 month follow-up. MR was assessed by color flow mapping and was graded as none, mild, moderate, or severe. MR was defined as organic or functional.

Results: The aortic valve area increased from pretreatment 0.72 cm² to post-treatment 1.87 cm² and postdischarge 1.81 cm² (P<0.0001). Before intervention MR was present in 73% of the patients. It was mild, moderate, or severe in 36% (n=8), 32% (n=7), and 4% (n=1) respectively. MR was defined as organic in 6 patients (27%) and functional in 10 patients (45%). Compared to baseline, MR grades improved by 1 month (p for trend=0.01). This benefit was secondary to a reduction in regurgitation grades in 50% of patients with an MR at baseline (n=6), while no worsening was observed in the other patients with an MR (n=6) and no occurrence of MR was observed in patients without MR (n=6). A trend for a greater improvement in MR grade was observed in patients with functional MR (n=7, -1.00) compared to those with an organic MR (n=5, -0.294; p=0.10).

Conclusion: In consecutive patients with a successful implantation of an Edwards-SAPIEN valve a significant improvement in MR was observed. This benefit was secondary to an improvement in 50% of patients with an MR and no worsening in the others.

141

Assessment of thromboembolic risk in mitral stenosis. Is left atrial volume superior to diameter?

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Objective: In patients with mitral stenosis (MS) in sinus rhythm (SR) without thromboembolic complications, current guidelines recommend anticoagulation if the left atrium (LA) is enlarged based on M-mode diameter. However, LA diameter poorly reflects LA enlargement. The aim of this study was to compare the predictive value of LA diameter and volume for the risk of embolic events as assessed by LA appendage emptying velocity (LAAv) <25cm/s and dense LA spontaneous contrast (SEC) during transesophageal echocardiography (TEE).

Methods: 152 patients (53±14years, 73% female) with severe MS (valve area <1.5cm²) were prospectively enrolled. A subset of 80 patients were identified in SR who also underwent clinically indicated TEE.

Results: Mean LA diameter and LA volume were significantly correlated (50±7[32-77]mm vs. 152±70[67-720]ml, r=0.71, p<0.001) but the relation was curvilinear and the 95% CI increased with LA diameter. In the SR/TEE subset, LA diameter was not significantly different between patients with normal vs. low LAAv (50±6 vs. 48±6mm, p=0.13) or between those with dense SEC vs. no/mild SEC (49±6 vs. 46±5mm, p=0.11). In contrast body surface area (BSA)-indexed LA volume differentiated patients with normal vs. low LAAv (86±17 vs. 71±17 ml/m², p<0.01) and patients with dense SEC vs. no/mild SEC (81±16 vs. 63±15 ml/m², p<0.01). BSA-indexed LA volume provided the highest area under the curve (AUC)(0.85) for high thromboembolic risk and LA diameter the lowest (0.65). A BSA-indexed LA volume above 60 ml/m² provided an excellent 90% sensitivity despite 44% specificity, 76% positive predictive value and 70% negative predictive value.

Conclusions: LA diameter is a poor indicator of LA size, with a range of error which is wide. In patients with MS in SR, LA volume is a better predictor of thromboembolic risk. We suggest using BSA-indexed LA volume to guide anticoagulation decisions and with a threshold of 60 ml/m² which has a good sensitivity albeit with a low specificity.

142

Impact of coronary artery disease on management of patients referred for transcatheter aortic valve implantation

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Purpose: To describe the impact of coronary artery disease (CAD) on management of high-risk patients with aortic stenosis referred for transcatheter aortic valve implantation (TAVI).

Methods: Of 240 patients referred for TAVI, 145 (60%) effectively underwent TAVI, while 31 (13%) were re-oriented towards conventional surgery and 64 (27%) were conservatively managed. We compared the 147 patients (61%) with CAD with the 93 (39%) with no CAD.

Results: Patients with CAD presented with one or several of the following: previous myocardial infarction in 54 (37%), coronary artery bypass grafting (CABG) in 63 (43%), percutaneous coronary intervention (PCI) in 49 (33%). CAD was diagnosed during the screening for TAVI in 46 (31%). CAD led to re-orient 5 patients (2%) towards conventional surgery for combined aortic valve replacement and CABG, and to perform PCI before TAVI in 9 (6%) or during the procedure in 2 (1%). No patient was denied any intervention because of CAD. The comparison between patients with and without CAD is detailed in the Table.

Conclusions: In high-risk patients referred for TAVI, CAD is frequent and associated with worse baseline characteristics, but has a limited impact on indications for TAVI. It seldom requires associated revascularisation and has no impact on mid-term results of TAVI.

	Overall (n=240)	CAD (n=147)	no CAD (n=93)	p
Age (years)	81±8	81±9	83±7	0.07
Female gender	111 (46%)	47 (32%)	64 (69%)	<0.0001
Carotid artery disease	58 (24%)	50 (34%)	8 (9%)	<0.0001
Renal failure	89 (37%)	63 (43%)	26 (28%)	0.03
2 comorbidities	151 (63%)	104 (71%)	47 (50%)	0.002
EuroSCORE (%)	28±16	31±17	24±12	0.001
TAVI performed	145 (60%)	83 (56%)	62 (67%)	0.11
TAVI procedural success	141 (97%)	81 (98%)	60 (97%)	0.76
post-TAVI troponin (mcg/L)	4.5±0.6	5.2±0.7	3.5±0.9	0.07
30-day post TAVI survival (%)	88	91	85	0.25
1-year post TAVI survival (%)	74±4	76±5	71±7	0.36
NYHA I/II last follow-up (%)	85	85	85	0.73