Usefulness of multimodality imaging approach in the diagnosis of mechanical prosthetic valve dysfunction

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Background:
Although the long-term outcome of mechanical mitral and aortic prosthetic valve (M-PV, Ao-PV), PV dysfunction (PVD) remains a very serious complication associated with high morbidity and mortality. Thrombosis/pannus and paravalvular leak are the 2 main mechanisms of PVD. The diagnosis of PVD, based on clinical presentation may be challenging, but it is essential for referring the patient to the optimal treatment (clinical follow-up, thrombolysis, surgery). An integrated multimodality imaging approach, comprising several parameters by transthoracic echocardiography (TTE) and fluoroscopy (F), is mandatory to pursue the correct therapeutic pathway.

Purpose:
This study aims to evaluate the incremental diagnostic value of combined TTE+F over each imaging modality alone in symptomatic pts with Ao-PV or M-PV and high suspicion of PVD.

Methods:
387 consecutive pts (63±11y, 213 Ao-PV, 173 M-PV) suspected for PVD, symptomatic for dyspnea, embolic events, fever or haemolysis were enrolled. All patients were imaged by TTE and F within 2 days after the admission to the hospital. TTE was defined positive for PVD in presence of intra/para-prosthetic regurgitation or high transprosthetic gradient (>20mmHg in Ao-PV, >8mmHg in M-PV) together with altered Doppler parameters (for Ao-PV: DVI <0.25, AT>95ms; for M-PV: Peak Mitral Velocity>2m/sec, VTIPrMV/VTILVO>2.5, PHT>130ms). F was defined positive for PVD when leaflet/s restriction occurs. PVD was confirmed by transoesophageal echocardiography (TOE) or positive response of thrombolysis (T), or surgical inspection (S).

Results:
PVD was found in 46% (99/213) of Ao-PV and in 53% (91/173) of M-PV at TOE/T/S. Sensitivity (SE), specificity (SP), negative predictive value (NPV), positive predictive value (PPV) and diagnostic accuracy (ACC) for TTE, F and combined TTE+F are reported in Table. The integration of TTE+F data significantly improved ACC both for Ao-PV and M-PV. At ROC analysis, the combined model of TTE+F showed the highest AUC for the detection of PVD compared with TTE and F alone (Figure).

Conclusions:
In patients with clinical suspicion of PVD, TTE and F are both valid tools to evaluate the PV performance. However, the combined model of TTE+F had a significant incremental value over TTE or F alone to diagnose the presence of PVD. This multimodality imaging approach allows to overcome several weaknesses of the TTE or F alone and consequently provides a prompt recognition of PVD even though TOE remains the gold standard to diagnose paravalvular Leak and non-obstructive thrombosis.

Table 1. Comparison of diagnostic accuracy between TTE, F, and TTE+F

<table>
<thead>
<tr>
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<th>TTE+F-Ao-PV (n=202)</th>
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Topic(s): Prosthetic Heart Valves

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Figure 1. ROC curves

Aortic Prosthesis

Mitril Prosthesis