Diagnostic agreement between echocardiography and second-level imaging techniques in patients with cardiac masses

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Background: Cardiac masses (CMs) are a diagnostic dilemma in clinical practice and require multimodality imaging to assess malignancy, which is essential to guide the proper treatment.

Aim: To define diagnostic accuracy and agreement between echocardiographic features and second-level imaging techniques (cardiac computed tomography – CCT or cardiac magnetic resonance – CMR) in patients with CMs.

Methods: All consecutive patients with histologically confirmed cardiac masses from January 2004 to December 2020, undergoing CCT and/or CMR after echocardiographic assessment were enrolled. Six echocardiographic variables, namely infiltration, polylobate mass, moderate-severe pericardial effusion, inhomogeneity, sessile and non-left localization, were used to predict malignancy. Patients with more than 3 of these features were considered at higher risk of malignancy. For the patients before 2017, the choice of which second-level imaging to perform was up to the clinical cardiologist. Since 2017, the choice was made by a multidisciplinary discussion by the Heart Team. A definitive diagnosis was achieved by histological examination or, in the case of cardiac thrombi, with radiological evidence of thrombus resolution after an appropriate anticoagulant treatment. The echo-vs-CCT agreement and echo-vs-CMR agreement were evaluated. Accuracy indicators (sensitivity, specificity, PPV, NPV, Cohen’s Kappa coefficient) were calculated by standard formulas.

Results: Out of 249 patients with histologically confirmed CM, 138 underwent a CCT and 112 a CMR, after the standard echocardiographic assessment. A complete agreement between the echocardiographic assignment (using the cut-off of 3 parameters as a marker for malignancy) and CCT was reached in 104 out of 138 cases (75.4%), ranging from 85.1 to 70.3% for benign and malignant cardiac masses, respectively. On the other side, the agreement between the echocardiographic assignment and CMR report was in 93 out of 112 cases (83%), ranging from 88.7 to 82% for benign and malignant cardiac masses. The agreement between these imaging techniques expressed as Cohen’s $\kappa$ was higher for echocardiography versus CMR ($\kappa$=0.73), compared to echocardiography versus CCT ($\kappa$=0.61). These results were also confirmed by the higher diagnostic accuracy of echocardiography versus CMR compared to echocardiography versus CCT (87% vs 80%), with best values of sensitivity, and specificity, denoting good reliability between the first 2 techniques.

Conclusions: A multimodal imaging approach is mandatory in the diagnostic work-up of CMs. The CMR, after a standard echocardiographic assessment, turned out to be the most accurate second-level investigation to discriminate between benign and malignant masses. However, when CMR is not available or the patient has a contraindication, the CCT could still be reliable.