Imaging – Cross-Modality and Multi-Modality Imaging Topics, Imaging of Heart Failure

Sensitivity and specificity of relative apical sparing pattern of global longitudinal strain in the diagnosis of cardiac amyloidosis: a systematic review and meta-analysis

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Background: Cardiac amyloidosis (CA), characterized by a progressive infiltration of amyloid fibrils in cardiac tissue, presents a diagnostic challenge due to its resemblance to other cardiomyopathies by echocardiography. Although reduced left ventricular (LV) global longitudinal strain associated with a relative apical sparing pattern (RELAPS) has been associated with CA, its diagnostic accuracy has varied across studies.

Purpose: The aim of this systematic review and meta-analysis was to assess the diagnostic accuracy of using a quantitative RELAPS on 2D-echocardiography to differentiate patients with either transthyretin (ATTR) or light-chain (AL) cardiac amyloidosis from those with other causes of cardiomyopathies.

Methods: A comprehensive literature search was performed using PubMed, Scopus, Web of Science, and Cochrane databases from inception till May 2024. We included cohort original studies that reported the sensitivity and specificity of a quantitative RELAPS in differentiating ATTR-CA or AL-CA from other types of cardiomyopathies. RELAPS was defined as average apical longitudinal strain segments divided by the sum of average basal plus average mid longitudinal strains segments. Meta-analysis was performed using bivariate random effects regression to calculate sensitivity and specificity summary estimates. Subgroup analysis assessed the impact of different RELAPS cutoff values (1.0 and 0.9) on diagnostic performance. The risk of bias was evaluated using the Quality Assessment of Diagnostic Accuracy Studies 2 tool.

Results: A total of 20 studies with 4308 patients were included in our meta-analysis, comprising 2,063 CA patients: 1,066 with ATTR-CA, 942 with AL-CA, and 55 unclassified CA patients. Eight studies used a cutoff of ≥0.9 to define the presence of RELAPS, while twelve studies used a cutoff of ≥1.0.

The estimated sensitivity of RELAPS irrespective of the cutoff used for cardiac amyloidosis was 67% (95% confidence interval (CI): 59 - 75), with a specificity of 85% (95% CI: 78 - 90). Subgroup analysis revealed that a RELAPS cutoff >1.0 had higher specificity (87%, 95% CI: 79 - 93) but lower sensitivity (57%, 95% CI: 40 - 72), whereas a cutoff of 0.9 showed higher sensitivity (69%, 95% CI: 65 - 73) but lower specificity (83%, 95% CI: 75 - 90).

Conclusion: Our results confirm that the RELAPS pattern is an effective and simple diagnostic tool for detecting cardiac amyloidosis using echocardiography, demonstrating fairly good sensitivity and excellent specificity. Moreover, the choice of RELAPS cutoff value impacts diagnostic performance, highlighting its potential role in enhancing the accuracy of echocardiographic evaluations in suspected cases of cardiac amyloidosis.

Forest Plot