CARDIOVASCULAR IMAGING MODALITIES FOR EVALUATION OF CORONARY CIRCULATION, CARDIAC STRUCTURE AND FUNCTION

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AUTONOMOUS HEART MURMUR DETECTION IN THE ELDERLY WITH VALVE DEFECTS

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Objective: Evaluate clinical performance of a new heart murmur detection algorithm on an elderly population through a blinded trial.
Background: Algorithms that autonomously detect heart murmurs have the potential to improve auscultation accuracy, but their practical application has been hampered by lack of blinded clinical testing.
Methods: Using an electronic stethoscope, 57 digital heart sound recordings (one per patient, 20 seconds each) were acquired from elderly in-patient subjects (mean: 72.4 years, SD: 13.6 years) admitted to the Division of Cardiology, University Hospital Graz, Austria. All patients had known pathological murmurs caused by multiple valve defects, confirmed by gold standard echocardiography. Defects were interpreted by the cardiologist as "low, medium or high" severity. Altogether, 155 valve defects were observed, including insufficiencies of the aortic (15%), mitral (32%), tricuspid (23%), and pulmonary (6%) valves; and stenosis of the aortic (21%) and mitral (3%) valves. Recordings were fully blinded before undergoing one-time automated analysis. Algorithm results for each recording included: AHA classification (I "pathologic" versus III "innocent/no murmur"), murmur timing, murmur grade, heart rate and S1/S2 identification. Two-sided 95%-confidence intervals (CI) for sensitivity were calculated.
Results: The algorithm's sensitivity for autonomous detection of pathologic murmurs was 89% (CI: 78-96%). Two of the six false negatives (FN) were detected as innocent murmurs, no murmur was detected in the other four. Of the six FN, two were diagnosed by the cardiologist as medium- and four as low severity. No high severity cases were missed by the algorithm.
Conclusion: In this blinded clinical trial, the algorithm performed with high sensitivity in the detection of pathological murmurs. Further, it yielded accurate heart rate estimation and S1/S2 detection, despite the presence of significant environmental noise. Results are consistent with this algorithm's clinical performance data from large-scale prospective studies on pediatric populations with congenital heart disease.