

[2005][384] Audioelectric Cardiographic Parameters for the Bedside Detection of Heart Failure

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The third heart sound (S3) often provides acoustical evidence of heart failure (HF). Using new audioelectric technology, we tested the ability of the electronically recorded S3 and other computerized audioelectric cardiographic parameters to detect HF in a variety of clinical settings.

Hypothesis: A combination of ECG and cardiac acoustical data can distinguish between subjects with and without HF.

Methods: We obtained recordings from 482 age and heart rate matched subjects (272 men, ages 25-90, mean 60 years) using Audicor™, a device that records and algorithmically interprets simultaneous 12-lead ECG and heart sound data using acoustical sensors attached to the V3 and V4 leads. Of the 482 subjects, 131 had clinical evidence of HF and 351 did not. Of the 131 patients with HF, 58 had presented to an emergency department (ED) with acute HF and 73 were being managed in a chronic HF clinic. Of the 351 subjects without HF, 198 were ambulatory and asymptomatic, and 153 had presented to an ED with dyspnea, but were found to have a non-HF etiology. The mean ± SD BNP in pg/mL was 1247 ± 1269 in ED patients with heart failure, and 251 ± 595 pg/mL in ED patients without HF. The mean ± SD pro-BNP in pg/mL was 2771 ± 5264 in chronic HF clinic. The clinical diagnoses were made independent of the Audicor findings. We evaluated the following computerized parameters: the S3, the Electromechanical Activation Time (EMAT) (the time from the onset of the Q wave to the acoustical detection of closure of the mitral valve), and EMAT as a proportion of the cardiac cycle (EMAT/RR). Unpaired t-test and chi square analysis were utilized to test statistical significance between the two groups.

Results: The following table shows the results (mean ± SD)

Parameter	No HF (n=351)	HF (n=131)	P
S3 Prevalance	9%	34%	<0.001
EMAT	97 ± 19 ms	124 ± 26 ms	<0.00001
EMAT/RR	0.11 ± .03 ms	0.15 ± .04 ms	<0.00001

For these parameters there was no significant difference between ambulatory patients who were asymptomatic and those who had dyspnea without heart failure.

Conclusions: HF patients demonstrated a prolonged EMAT when compared to patients without HF. Audioelectric cardiography may provide a new, non-invasive method for diagnosing patients with heart failure.

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