**PHYSIOLOGY OF THE SECOND HEART SOUND: INSIGHTS FROM DIGITAL PHONOCARDIOGRAPHY**

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Objective: Understand the characteristics of the second heart sound using portable digital phonocardiography.

Background: Appropriately selecting patients in need of cardiac imaging would save resources and improve overall quality of care. Although phonocardiography could perform this role, the technique lacks a contemporary reference standard.

Methods: Ambulatory patients were enrolled if in sinus rhythm without structural heart disease. The Vi-Scope phonocardiographic device (HD Medical Group) was used to simultaneously record an electrocardiogram and heart sounds at the left upper sternal border (LUSB), left lower sternal border (LLSB), and apex during quiet breathing (QB), end-expiration (EE) with cessation of breathing, end-inspiration (EI) with the cessation of breathing, and deep, continuous breathing (DCB). A novel, automated detection system was developed to separate A2 from P2 and to quantify the signal-to-noise ratio.

Results: Twenty patients were enrolled. Measured noise was the same in all auscultatory positions and breathing conditions. The ratio of the durations of P2 and A2 varied based on breathing condition (1.12±0.34 during QB, 1.14±0.31 during EE, 1.04±0.36 during EI, and 0.86±0.18 during DCB; p=0.046 between groups). The ratio of the mean intensities of P2 and A2 was 1.01±0.05, 1.02±0.06, and 1.00±0.03 at the LUSB, LLSB, and apex, respectively (p=NS).

Conclusions: In a healthy, ambulatory population, the components of S2 vary by breathing condition, but not by auscultatory position. Studies of S2 in other patient populations, including those with pulmonary hypertension, can use this database as a reference standard. Adoption of this technique could impact the appropriate use of cardiac imaging.