Electromechanical Cycle Length Mapping For Atrial Arrhythmia Detection And Cardioversion Success Assessment

Author Block: Melina Tourni, Lea Melki, MS, Rachel Weber, BA, RDCS, RVT and Elisa Konofagou, PhD. Columbia University, New York, NY

Abstract:

Background: Electromechanical Cycle Length mapping (ECLM) is a high frame rate (2000 fps) ultrasound-based frequency analysis technique, previously shown to non-invasively map atrial electromechanical activation in paced canines and re-entrant flutter (AF) patients.

Objective: The standard of care for arrhythmia diagnosis is a 12 lead ECG. More accurate localization before or during procedure may help decision making. This study tests ECLM feasibility of mapping atrial fibrillation (Afib) activation rate, monitor post-procedure recovery and potentially infer cardioversion (DCCV) failure in humans.

Methods: Eleven subjects (45.63±19.43 yo; 82% male; 2 AF; 3 Afib; 6 healthy volunteers) underwent transthoracic ECLM in four standard apical echocardiographic views. Afib patients were scanned pre and post DCCV. ECLM histograms were generated and the four 2D maps were co-registered spatially for each subject. Post DCCV results were then compared to healthy volunteers’ ground truth.

Results: ECLM successfully identified the activation rate in all subjects. For the Afib cases, irregular activation rates were detected pre-DCCV and ECLM analysis suggested that 2 patients did not fully recover back to sinus rhythm post-DCCV, compared to healthy patterns (Fig.1). These results were later confirmed clinically as patients were re-admitted for re-do DCCV or follow-up ablation.

Conclusion: ECLM was shown capable of non-invasively mapping the electrical activation in AF, Afib and post DCCV, as well as potentially identifying unsuccessful DCCV immediately post procedure. ECLM could be used by clinicians as a helpful treatment assessment and monitoring tool for these patients.

Figure 1: ECLM Cycle Length Histograms and Cycle Length Maps of two subjects. (a) 27 yo male healthy volunteer, sinus rhythm. (b) 70 yo female scanned within half an hour after DCCV, records showed uncontrollable sinus rhythm. Patient re-admitted 8 week later for Afib ablation.

Author Disclosure Information:

M. Tourni: Nothing relevant to disclose.

Category (Complete): Mapping & Imaging

Keywords (Complete): C -> Cardioversion ; E -> Echocardiography, transthoracic

Additional Information (Complete):

Presentation Preference: Poster Preferred

Proof of Concept/Innovation: True

At the conclusion of this presentation, attendees will be able to: (Maximum character limit 250)

*Learning Objective: understand how electromechanical cycle length mapping can assist for atrial arrhythmia detection and cardioversion success assessment immediately after cardioversion.

Abstract Awards (Complete):

None : True