Identification of Critical Isthmus by Coherence Map in Atypical Atrial Flutter with Multiple Reentrant Circuits

Shin-Huei Liu
Jennifer Jeanne B. Vicera
Po - Tseng Lee
Yenn-Jiang Lin
Shih-Lin Chang
Li-Wei Lo
Yu-Feng Hu
Fa-Po Chung
Tze-Fan Chao
Jo-Nan Liao
Ting-Yung Chang
Chin-Yu Lin
Da-Chyuan Duan
Cheng-I Wu
Chih-Min Liu
Wen-Han Cheng
Shih-Ann Chen

Introduction: Identifying the critical isthmus of atypical atrial flutter (AFL) in standard activation map is difficult, especially with substrate disease. The Coherence map excludes the limitations of early meets late in standard activation map in cases with non-conducting scars. Objective: This study aimed to investigate and compare the difference of critical isthmus between the novel Coherence map and standard activation map.

Methods: Twenty-one patients with clinically documented atypical AFL were investigated, including 9 patients with structural heart disease and 18 patients underwent previous ablation (Table 1). Standard activation map and Coherence map were complete using PentaRay mapping catheter and Carto 3.0 System Version 7 (Biosense Webster, Inc.). Conduction barriers were defined by velocity=0 m/s and critical isthmus (CI) was defined by concealed entrainment (post-pacing interval <20ms), conduction velocity< 0.3 m/s and local fractionated electrograms.

Result: A total of 29 CIs were identified from 21 patients (58.6±8.96y/o; 16 male) (Table 1, Figure 1). Eleven patients had single loop reentry and 10 patients had multiple loop reentry. The length of the isthmus showed no difference between activation and Coherence map, but the width of the isthmus was narrower measured by the Coherence map than by standard activation map (16.37±10.17mm vs 22.68±7.80mm, p=0.552) (Table 2). The TCL was significantly longer in multiple loop reentry AFL in comparison with single loop reentry AFL in comparison with single loop reentry (291.00 ±49.90 vs 281.33 ±28.98, p=0.045) (Table 3). The isthmus velocity between single and multiple loop reentry showed no difference (0.68±0.24 vs 0.33±0.21, p=0.878). The isthmus length showed no difference between single and multiple loop reentry, but the isthmus width in the multiple loop reentry was significantly narrower than the single loop reentry (10.68±1.17 vs 17.80±9.69, p=0.039) (Table 3).
Conclusion: The Coherence map identifies the CI more clearly which enables less extensive ablation in comparison with standard activation map in scar-related reentrant tachycardias. By eliminating the limitations of early-meets-late in standard activation map, the scar-related circuits can be precisely terminated.