Mechano-electrical contribution of ventricular contractions to the complexity of atrial fibrillation electrograms

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Background

• Intracardiac organization indices (OI), such as atrial fibrillation (AF) cycle length, have been used to track the efficiency of stepwise radiofrequency catheter ablation (step-CA) of persistent AF (pers-AF)\textsuperscript{1}.
• A better understanding of the components and complexity of AF electrograms (EGMs) is fundamental to track the organization of AF during step-CA.
• It remains unknown whether ventricular contractions influence the complexity of AF EGMs by means of mechano-electrical feedback.

Purpose

• Quantification of the potential mechano-electrical contribution of ventricular contractions (VC) on AF complexity.

Methods

Extraction of ventricular contribution to ICV

• The ventricular contribution (VC) to ICV was extracted as shown in figure 3. Lead V1 was used to identify the ventricular activations (panel A) from which a continuous signal of R-wave impulses was computed (panel B).

Cancellation of the VC from the ICV signal

• A continuous ICV signal devoid of the VC contribution was computed using an adaptive interference canceller.

Results

• Step-CA terminated 5/6 pers-AF into SR/AT.
• Figure 4 illustrates the VC contribution at a frequency of 2 Hz (green) to the RAA ICV signal (blue). The ICV signal devoid of VC contribution is shown in red. Note the preservation of all other ICV frequency components (= 0.5 Hz and = 1.5 Hz).

Overall Study Population

• The mean contribution of the mechano-electrical feedback on the complexity of AF signals as assessed by VC estimation was 37±15%.

Conclusions

• Our results suggest that by means of mechano-electrical feedback, VC contributes up to 37% of EGMs interval variability in pers-AF.
• These preliminary findings are a promising step towards the refinement of organization indices for the titration of ablation during step-CA of pers-AF "en route" to AF termination.

1. Halliguerre, Changes in atrial fibrillation cycle length and inducibility during catheter ablation and their relation to outcome - Circulation 2004