

## Comparison of Unipolar Electrogram Monitoring during Radiofrequency Ablation in Viable and Ablated Myocardium: Loss of the S-component

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### Abstract

- Change in the local unipolar atrial electrogram (EGMuni), with complete loss of the negative component (R-pattern), was previously shown to predict a transmural lesion resulting from RF ablation (RFA).
- However, these distinct morphologic changes were described for singular lesions surrounded by viable myocardium and might not apply for lesions that are contiguous and adjacent to ablated myocardium, as often encountered in clinical setting.

### Objective

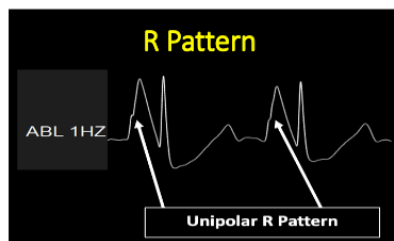
- To characterize how electrophysiological properties of surrounding atrial myocardium affect the baseline morphology of the local EGMuni, as well as its dynamic change during RFA.

### Methods

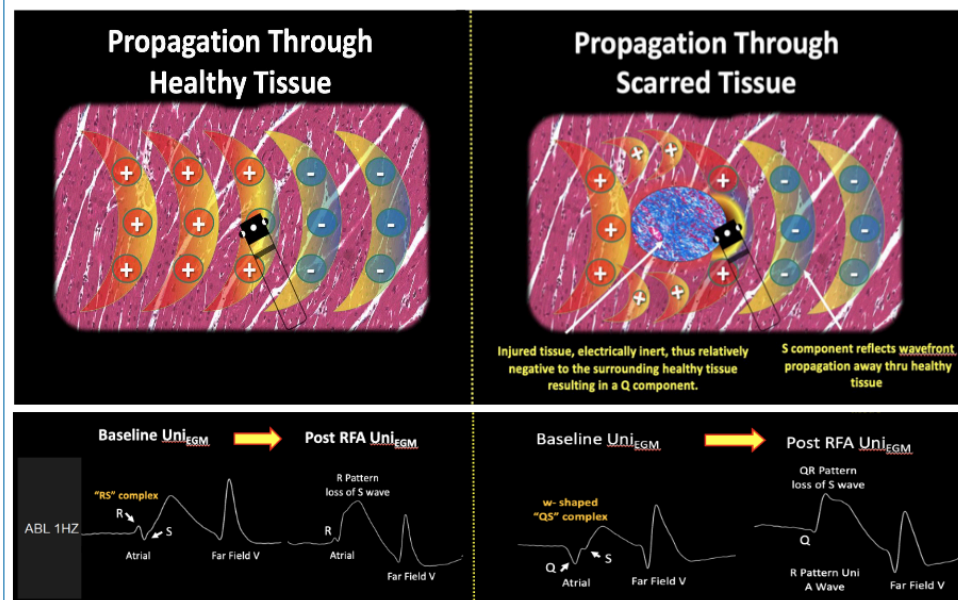
- In a beating heart Yorkshire swine model, RFA was performed to create both singular isolated lesions and contiguous lesions that constitute an ablation line.
- RFA was applied with an irrigated ablation catheter (Thermocool® SmartTouch Surround-Flow, Biosense Webster, Irwindale, CA) with power of 30W.
- RF delivery per lesion was turned off 3 seconds after a stable R-pattern change was seen on the unipolar EGM.
- The EGMuni morphology was characterized, before and after delivery of RF energy.
- Unipolar EGM signals were processed by the PureEP System (BioSig Technologies).
- All lesions were evaluated histopathologically.

### Results

- In 5 swine, singular (n=31) or contiguous lesions with spacing 2-3mm (n=32), were created in the right atrium using RFA.
- The mean contact force ( $12.8 \pm 4.1$  vs  $8.3 \pm 1.7$ g,  $p < 0.001$ ) and initial impedance ( $143 \pm 11.6$  vs  $134 \pm 8.5$  ohms,  $p = 0.002$ ) were noted to be slightly higher with the singular lesion group, yet with differences of no clinical relevance.
- There was no difference between the groups in impedance drop [ $17$  (10-22) vs  $12.5$  (10-18) ohms,  $p = 0.14$ ].
- All lesions, in both groups, were examined postmortem and confirmed to be transmural.
- 90% of singular lesions showed characteristic biphasic RS EGMuni morphology at baseline, while none of the contiguous lesions exhibited this initial morphology.
- Instead, 93% of contiguous lesions showed a distinct “w-shaped” QS EGMuni morphology at baseline.
- Despite baseline morphologic differences, RFA resulted in abolishment of the receding wavefront reflected in loss of the S component.
- Following RFA, R-pattern was observed in 94% of singular lesions and qR-pattern was seen in 100% of the contiguous lesions (Figure).



### Central Figure



### Conclusion

- Unipolar electrogram morphology reflects local activation and can vary depending upon the electrophysiological properties of the surrounding myocardium.
- RF ablation results in consistent loss of the S component and reflects abolishment of the receding activation wavefront.