

Unipolar Signal Modification-Guided Radiofrequency Ablation

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Background

- Positive atrial unipolar signal modification (USM) has been shown to reflect irreversible transmural lesions during radiofrequency ablation (RFA).



Objective

- To assess the relationship between tissue thickness and lesion transmuralty in RFA guided by USM, and to compare the ablation time between ablation index (AI)-guided RFA and USM-guided RFA.

Methods

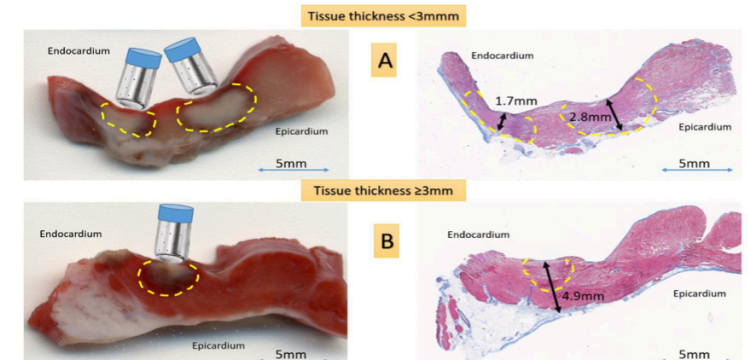
- In-vivo: USM guided RFA lesions were created in the right atrium of 9 Yorkshire swine using 30W-35W power.
- Secondary analysis stratifying for tissue thickness (thickness <3mm and thickness ≥3mm) was performed.
- In-human: in 5 consecutive patients undergoing first time RFA for paroxysmal atrial fibrillation guided by AI, the time to USM was recorded and was compared with the real-time needed for AI-guided ablation (AI=380-550).
- Unipolar ablation signals were collected and compared at high pass filter settings of 0.05Hz, 0.5Hz, 1.0Hz, and 5Hz using the PureEP System from BioSig.

Results

- In swine : n=41 lesions, time to USM was 5.4 ± 2 seconds and 81% of the lesions were transmural.
- The average corresponding AI at USM in swine was 280 ± 48 .
- Lesions with tissue-thickness <3mm transmuralty was 100% for USM-guided ablations, whereas in lesions with tissue-thickness ≥3mm transmuralty was achieved only in 66% of the cases when guided by USM.
- In humans: A total of 340 lesions were performed.
- Mean AI at USM was significantly smaller than the total actual AI at the end of RFA (313 vs 458 respectively, $P < 0.05$).
- Mean time for AI-guided ablation was 24 ± 9.5 seconds whereas the USM were noted at a mean time of 8 ± 3 seconds.

Conclusion

- In a swine model, for atrial tissue thickness <3mm, USM-guided ablation successfully resulted in complete transmural lesions with rapid application in all lesions.
- In human, the time needed for USM was very short and was less than one third of the time needed for AI-guided ablations.
- Further studies are needed to find the optimal ablation settings for tissue thickness ≥3mm where current methods of using AI-guided ablation might be too prolonged and USM alone might not be sufficient.



Total ablation time in ablation index-guided ablation and time to unipolar signal modification.

