Accuracy of a non-invasive mapping system for the localisation of re-entrant VT site of origin and its relationship to myocardial scar on cross-sectional imaging.

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Introduction

View in ventricular onset **(VIVO**) is a non-invasive mapping system used for localising the site of earliest activation in ventricular arrhythmia, utilising a mathematical algorithm, patient specific cardiac model (constructed using cross-sectional imaging data), 3D images of the patient's torso and a 12-lead electrocardiogram (ECG). Several publications have examined its role in the localisation of premature ventricular contractions (PVCs), and a 5 patient case series assessed its role in scar related re-entrant VT. However, its validity in a larger cohort and of the relationship to the relevant myocardial scar has not been investigated.

Purpose

Assess the accuracy of the VIVO mapping system in localising the VT-SoO for patients with scar related re-entrant VT and its relationship to the relevant myocardial scar on cross-sectional imaging.

Methods

20 patients with structural heart disease (18 ischaemic cardiomyopathy (ICM), 1 dilated cardiomyopathy (DCM), 1 hypertrophic cardiomyopathy (HCM)) (Male n=18, 63±14 years) and recent cross-sectional cardiac imaging, were recruited over a 16-month period. All patients had a clinical indication for VT ablation and were on optimal medical therapy. Invasive electro-anatomical mapping (EAM) was performed with the Advisor HD Grid multipolar catheter and maps were generated using Omnipolar electrograms (EGMs). The VT-SoO was identified using an activation- or pace-map by an experienced operator and the location defined using the American heart association's 17 segment model of the left ventricle during the procedure. VIVO maps were reviewed by a second independent operator and a segment allocated, scar segments were obtained from cross-sectional imaging. A "complete match" was defined as exact segment concordance between allocated segments, "partial match" as adjacent segments, and "no match" if it does not satisfy either of those requirements.

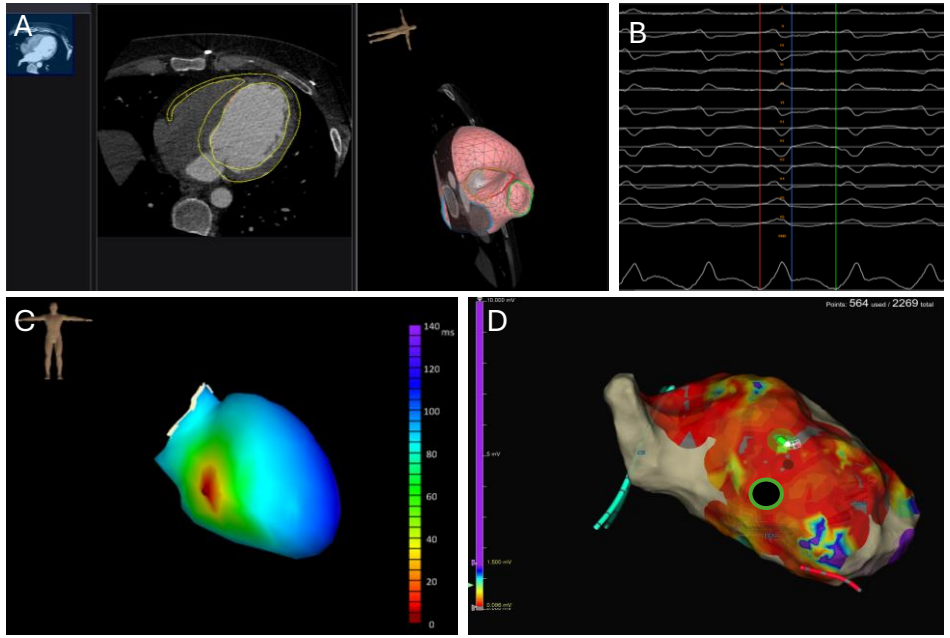
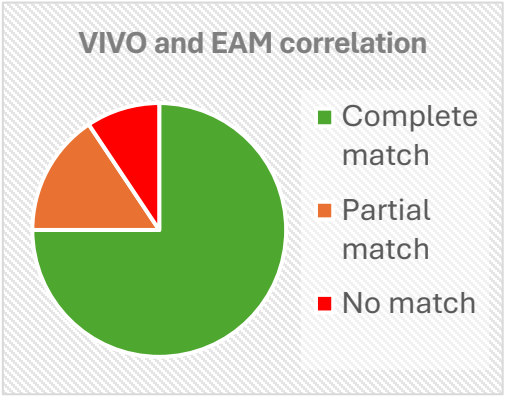
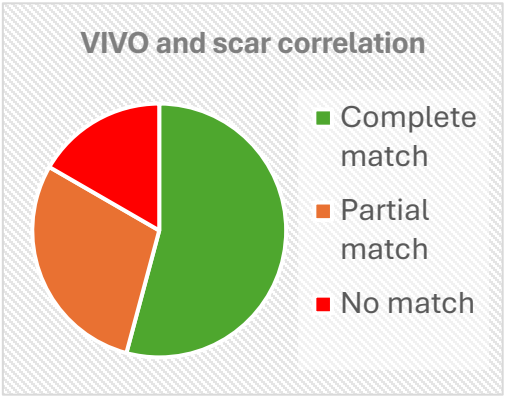


Figure 1: example case showing the imported cardiac CT scan as seen on VIVO (**panel A**); ECG tracing with the onset and offset of the QRS annotated **(panel B**); the VT-SoO as seen on VIVO based on the ECG, image of torso and cross-sectional imaging **(panel C**); and the VT-SoO based on EAM (PACE) mapping (**panel D**).

Results

Mean left ventricular ejection fraction was 35.5 ± 10.6%. Mean procedure time was 242 ± 70 minutes, with a mean ablation time of 20 ± 11.1 minutes. A total of 32 re-entrant VTs were mapped. The VT exit site was identified in all cases (11 activation-map; 21 pace-map**). A complete match between the EAM and VIVO map was seen in 75% of VTs and partial match in a further 15%.** The VT-SoO was **located within the myocardial scar (or directly adjacent to is) in 83%** of accurately mapped VTs. Procedural success was seen in 90% of patients at mean follow up of 7.3 ± 4.7 months.





Conclusion

VIVO non-invasive mapping system was able to **accurately map the VT-SoO in scar dependent VT, and identify the relevant myocardial scar** as seen on cross-sectional imaging. Further research assessing its ability to accurately identify relevant ablation targets is ongoing.