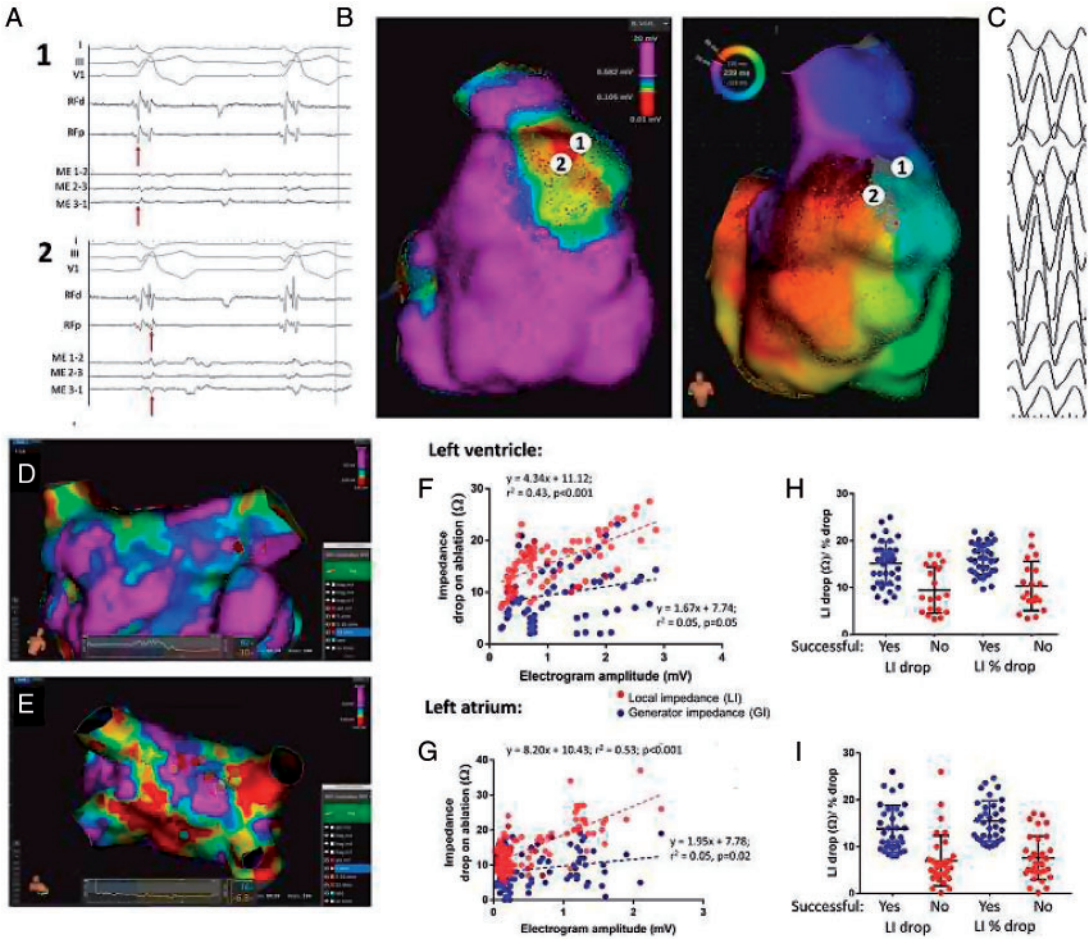

Abstract 41 Figures: (A) Electrograms from the Intellanav MiFi OI catheter, with micro-electrodes (ME) showing solely nearfield signal on either side of a line of block in the RV of a patient with Tetralogy of Fallot. (B) Rhythmia maps of voltage in SR (left) and activation in VT (right), demonstrating the region of scar around which the VT circuit was flowing. (C) 12 lead ECG of VT. (D-E) Examples of the Rhythmia DirectSense interface during an AT case. Voltage maps of the LA roof are shown; the inset graph demonstrates LI value. (D) With good catheter contact, on onset of ablation LI drops to a plateau with a 30 Ω drop. After a 30 s application, the signal had attenuated and there was no local capture. (E) Here the catheter had poor stability and lacked good contact; the impedance drop was only 6.8 Ω and local tissue capture remained. (F, G) Scatterplot of LI drop (red) and GI drop (blue) on ablation as a function of initial maximum electrogram amplitude in the LV (F) and LA (G). (H, I) Column scatterplot of absolute LI drop and LI drop as a percentage of initial LI value for successful (blue) and unsuccessful lesions (red) in the LV (H) and the LA (I).

ablation may give an indication of tissue contact and subsequent effective lesion formation.

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First simultaneous invasive validation of electrocardiographic imaging (ECGi) in intact human heart with epicardial mapping

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Introduction: Non-invasive electrocardiography (ECGi) combines body surface electrical data and anatomical information from medical imaging to calculate epicardial unipolar electrograms which are displayed on the epicardial surface of the heart. This gives insight into the electrophysiological substrate customarily available only with invasive contact electro anatomical mapping (EAM). The potential to rapidly localise exit sites of unstable ventricular arrhythmias and to define potentially arrhythmogenic substrate, without the need for invasive testing, has resulted in widespread interest in this technology. Invasive validation of the system has taken place using animal models and in humans sequentially after bypass surgery. These studies have shown good correlation between unipolar electrogram morphology, activation times, repolarisation times and pacing sites. However, validation of the system in the intact human heart during physiological conditions is lacking. We present the first real world invasive validation of the most recent iteration of the system in the intact human heart.

Methods: 6 patients undergoing epicardial catheter ablation of ventricular tachycardia (VT) were studied. A sub-xiphisternal puncture, using a Tuohy needle, was employed for access to the epicardium. An EAM (Carto, Biosense-Webster, CA, USA) of the epicardial surface of the heart was created during RV pacing in 3 patients and NSR in 1 patient. After creation of a sinus rhythm/RV pacing map, pacing was performed from multiple different locations on the epicardium. In addition to the epicardial EAM, a full geometry of the aorta was created for co-registration with ECGi (see figure 1). In all patients, a 252-body surface electrode vest (Medtronic, MN, USA) was in situ during the procedure with electrical data recorded simultaneously throughout. ECGi maps were formed from beats present during creation of the contact map and during pacing from different anatomical region of the epicardial surface. After co-registration of the geometries, cardiac sites from the 2 systems were paired (maximum distance between a CARTO and an ECGi point = 8 mm). Morphological similarity between the QRS complexes of the paired unipolar electrograms was measured with the Pearson's correlation coefficient. Local activation time was defined as the time of maximum negative downslope during the QRS and the distance between each pacing site and the site of earliest activation on the corresponding ECGi map was measured.

Results: Preliminary data was assessed in 4 of the 6 patients. 370.7 ± 214 paired electrograms were available for comparison with a median correlation co-efficient for the QRS morphology of 0.72/0.22 (median/interquartile range). The patient with the highest signal similarity had median cc of 0.81 and the lowest was 0.48. A total of 18 pacing sites were analysed with the average distance of the pacing point on Carto to the area of earliest activation on ECGI was 11 mm +/- 0.7.

Figure 1 A - Showing the co-registration of the geometries using the aorta (top). Examples of 2 unipolar electrograms are shown for the Carto and ECGi maps with the morphology match between paired unipolar electrograms shown on the right after merging.

Conclusion: ECGi offers a reliable non-invasive strategy for activation patterns of the epicardium and can accurately locate sites of early activation. This facet would have potential use in the mapping of haemodynamically non-tolerated ventricular arrhythmias.