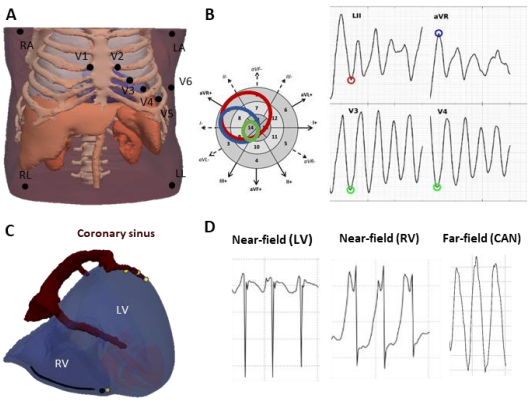
# Impact of Body Composition and Lead Placement On ECG-based Clinical Algorithm for Localizing Ventricular Tachycardia Origin

Monaci S., Rodero C., Strocchi M., Whitaker J., Rajani R., Razavi R., O'neill M., King A., Bishop M.

King's College London
London, United Kingdom

A recent clinical algorithm (QRS_algo) localizes monomorphic ventricular tachycardia (VT) from 12-lead ECGs. Its validation against patient variability and lead placement requires further investigation, as well as the potential for VT localization from implanted-cardioverter defibrillator (ICD) electrograms (EGMs). Two whole torso computational models were constructed (**A)** from high resolution CT data, with representative infarct morphologies. Within these models, eight morphologically distinct VT episodes were induced and corresponding ECGs simulated. Organ conductivities were changed within physiological ranges (± 75%), along with variation in ECG electrode placements (~ 2-9 cm). A total of 76 simulated ECGs were used within QRS_algo to locate VT origin (**B)** and tested against VT origin localization by visual inspection. Four episodes were used to calculate ICD EGMs (**C, D)** and extract features to link with VT origin. Although extreme variations in organ conductivities caused major changes in relative ECG amplitudes (RMSE > 0.25), VT localization via QRS_algo was not affected (successful in 36/36). Variation in lead placement by > 5 cm did return higher variability in ECG amplitude (RMSE > 0.3), without significant reduction in accuracy of VT localization (38/40). Differences in absolute and relative magnitude, beat duration and morphology could be used to localize VT exit sites from near-field EGMs. Our in-silico platform has demonstrated the robust nature of algorithms for ECG-based VT localization, and suggests potential development for direct use with EGMs from multipolar implanted devices.




**A** Torso Model; **B** VT localisation in simulated 12 leads ECGs; **C** ICD leads; **D** near-, far-fields EGMs.