Trajectories of the Single Moving Equivalent Dipole in Subjects with Left Fascicular Block

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**Aims:** At CinC 2017 we presented an application based on a spherically bounded model with homogeneous volume conductor to determine location, strength and orientation of a single moving equivalent dipole (SMED) in 12-lead ECGs. To initially explore its potential clinical use, we wanted to verify that the SMEDs in conduction defects will be in other locations than those in a healthy heart. To this purpose, we studied ECGs with left fascicular blocks.

**Methods:** Applying ECG criteria of RS patterns in the extremity leads in the absence of other ECG abnormalities, we studied subjects with left anterior or fascicular block (LAFB, n=10) and subjects with left posterior fascicular block (LPFB, n=18), and contrasted these with subjects with normal ECGs (n=42, with two recordings within one year), focusing on the initial 60 ms of the QRS complex. The SMEDs were determined in 5-min supine resting 12-lead ECGs with a time resolution of 1 ms.

**Results:** The figure shows the frontal views of representative cases from the normal, LAFB and LPFB subjects. Subjects with a normal ECG exhibited diverse, but characteristic SMED trajectory patterns, stable over time. The trajectories were confined into a narrow space with initial orientation anteriorly and towards the septum and later orientation along the long ventricular axis. In LPFB ECGs the SMEDs appeared in 15/18 cases above the center with anterior and basal orientation and moved after ~10-20 ms downward with apical and slightly posterior orientation, exhibiting a typical flip. In LAFB ECGs, the SMED trajectories were less typical and exhibited a to-and-fro movement in the postero-basal to antero-apical direction with initial apical and posterior orientation that flipped in ~10-20 ms to a predominant anterior orientation.

**Conclusions:** This initial study with single moving equivalent dipole assessment shows promising, so far unexplored, ECG-derived information. Further research in ECGs with various pathology is needed to investigate the possible applicability of this analysis in future ECG diagnostic algorithms.