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Three-dimensional visualization of atrial conduction disorders using simultaneous endo-epicardial mapping

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Mapping of the atria is usually performed from either the endocardium or epicardium, assuming that atrial conduction in the two-dimensional plane is representative of transmural excitation. It is most likely that when conduction disorders occur in the two-dimensional endocardial or epicardial plane, they also occur in the three-dimensional plane, thus transmurally. On the other hand, it is also known that significant differences in atrial conduction between the endocardium and epicardium may occur already during sinus rhythm.[1] Simultaneous endo-epicardial mapping enables us to investigate atrial conduction disorders in the three-dimensional plane.

Simultaneous endo-epicardial mapping of the right atrium was performed during sinus rhythm (*Figure 1*). Local activation times (LATs) were determined by annotating the steepest negative deflections of atrial potentials on every electrode. Consistent with prior epicardial mapping studies, areas of conduction block were defined as interelectrode differences in LATs of ≥12 ms corresponding with effective conduction velocities <17 cm/s.[2] Written informed consent was obtained before surgery.

Video 1 illustrates activation of the endocardium and epicardium in two patients. In the first patient, the upper part of the mapping arrays

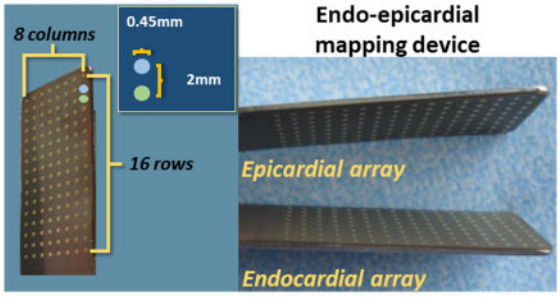
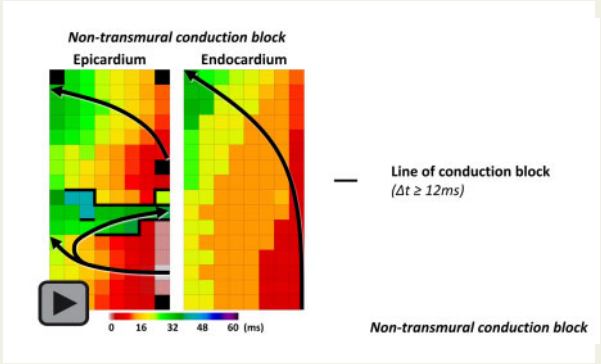


Figure 1 Mapping clamp containing two electrode arrays, each containing 16 rows and 8 columns of electrodes with a diameter of 0.45 mm and an interelectrode spacing of 2 mm. Simultaneous endo-epicardial mapping was performed of the right atrium.



Video 1 This video visualizes patterns of activation in both the endocardium and epicardium simultaneously. The first activation pattern demonstrates transmural conduction block and the second demonstrates solely conduction block at the epicardium, thus non-transmural conduction block. The arrows display the main wave trajectories and local activation times are depicted near the head and tail of the arrow; black bold lines indicate conduction block (Δt ≥ 12 ms).

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clearly demonstrates an oblique line of conduction block, which can be observed at *both* the endocardium and epicardium and is therefore most likely a transmural conduction block. The lower part of the mapping arrays also demonstrate transmural conduction block, however, the endocardium shows more extensive conduction block compared to the epicardium.

Conduction block can also be present in *either* the endocardium or epicardium, thus non-transmural conduction block. Activation mapping of the second patient in *Video 1* demonstrates extensive epicardial conduction disorders in the presence of smooth conduction at the endocardium. Presence of conduction disorders solely present in the epicardium may therefore be missed when mapping only the endocardium and vice versa.

Consent: The author/s confirm that written consent for submission and publication of this case report including image(s) and associated text has been obtained from the patient in line with COPE guidance.

Conflict of interest: none declared.

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