Epicardial atrial connections causing failure to block linear ablation lesions: A single center experience

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**Introduction**: In cases of atrial flutter, inability to block linear ablation lesions is an important cause of ablation failure. A proportion of such failures is believed to be due to epicardial atrial connections, but this type of connection is poorly described in the literature. We report our center's experience.

**Methods**: We retrospectively reviewed atrial flutter cases treated with a linear lesion in either right or left atrium, looking for failure to block a linear ablation lesion. In all cases, 3D mapping system was used (Rhythmia HDx, BSc; CARTO 3v4, BW; ESI Precision, Abbott Medical). We defined endocardial block as clear demonstration of wavefront propagation proceeding exclusively towards the ablation line. Correspondingly, an epicardial connection was proposed when there is a focal breakout beyond a line of endocardial block (either during pacing, or during tachycardia). We defined and presumed endo-epicardial block once the focal breakout distal to the linear lesion was abolished. Termination of tachycardia alone was not deemed sufficient evidence of endo-epicardial block. Entrainment was used as necessary to confirm the impression of a re-entrant endo-epicardial circuit.

**Result**: 7 cases were identified (3% of all patient cases during the review period; table). 2 involved the right atrial cavotricuspid isthmus. 1 was a short connection crossing the cavotricuspid isthmus, and 1 was a very long connection arising from the lateral RA and connecting near the right septum at the roof of the coronary sinus. 5 cases involved the left atrium. 4 were mitral-isthmus (MI) dependent. 2 were ablated successfully within the CS but away from the endocardial MI-line, at the site of epi-endocardial connection. 2 were ablated successfully at the site of epi-endocardial connection but this time at the endocardial end. 1 occurred in a post-atrial fibrillation ablation patient with a roof line; epi-endocardial exit was identified anterior to the roof line.

**Conclusion**: Epicardial connections in the atrium can cause failure to achieve a line of block. They appear to be uncommon but may well be under-recognized. They should be suspected when: (1) endocardial block can be demonstrated by wavefront propagation towards the ablation line, (2) despite which there is either failure to terminate the tachycardia or achieve an adequate timing interval across the line when pacing near one side of the line. Usually the distal (epi-endocardial) connection appears near the line of block but rarely, the connection can be long and >2cm away from the line – in such cases, a high index of suspicion is required as the activation map can then appear confusing. We show that
careful endocardial mapping aids the recognition of epicardial connections and focal ablation at the site of endo-epicardial breakthrough (which may be distant from the ablation line itself) is usually sufficient to completely block the ablation line.