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Impact of cryoballoon freeze duration on long-term durability of pulmonary vein isolation in atrial fibrillation: insights from Re-mapping procedures (the ICE Re-map study)

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Background: Second-generation cryoballoon (CB2) represents a powerful pulmonary vein isolation (PVI) tool. Recently, the randomized time-to-effect guided (ICE-T) CB2 strategy targeting a 240s single freeze demonstrated fast and efficient PVI. To further optimize safety and efficacy, a shortened 3min freeze duration has been suggested but PVI durability remains unclear.

Methods: Between May 2013 and December 2017 all CB2 ablations followed the ICE-T concept (target-freeze: 240s or 180s). Patients undergoing a second procedure for arrhythmia recurrence were analyzed. Two groups were defined based on the index freeze duration (group 240s vs. group 180s). In all repeat procedures a 3D left-atrial map was obtained. Durability of PVI and localization of conduction gaps were compared.

Results: A total of 106/788 (13%) patients underwent a second procedure

(group 240s: 80/604 vs. group 180s: 26/184) after a mean of 377 days. There was no difference regarding PV occlusion and time-to-isolation in the index procedure between two groups. No major complications occurred. During the second procedure significantly more patients demonstrated durable isolation of all PVs in group 240 (61% vs 35%, $p=0.02$) along with a significantly increased rate of PVI durability (88% vs. 69%, per vein, $p<0.001$). Left sided PVs did significantly benefit from 240s freezes (reconnection LSPV: 6% vs 27%, $p=0.004$, LIPV: 14 vs. 39%, $p=0.006$).

Conclusions: The ICE-T strategy is associated with a high rate of durable PVI in patients with arrhythmia recurrence. Target freeze duration of 240s vs. 180s is associated with significantly increased lesion durability, particularly at left sided PVs, without increasing complications.