

Assessment and incidence of PV gaps as determined by HD Grid and circular mapping catheters

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Background: Many tools and techniques are utilized to assess pulmonary vein isolation (PVI), such as evaluation of entrance and exit block, voltage mapping, and use of drugs such as adenosine. It is unclear which tools and techniques may provide greater sensitivity in the identification and elimination of pulmonary vein (PV) gaps, leading to better long-term outcomes. The HD Grid simultaneously records orthogonal bipolar EGMs to reduce directional sensitivity. Previously published data suggest that the use of HD Grid may improve sensitivity for gap identification.

Purpose: To determine, in a large cohort of procedures, the rate of gap detection when using HD Grid to check for PVI as compared to circular mapping catheters (CMC).

Methods: Anonymized, acute procedural data was prospectively collected in de novo AF ablation procedures in which either a 10- or 20-pole CMC or HD Grid catheter was used to assess PVI. Procedural data including gap detection and PVI assessment method were analyzed using chi-squared test.

Results: 559 cases from over 60 institutions in 8 countries were analyzed. Of the 559 cases, 47.4% (265/599) used HD Grid, and 52.6% (294/599) used a CMC. PV gaps were found in 52.5% (139/265) of HD Grid procedures and in 36.7% (108/294) of CMC procedures ($p < 0.001$). The most common PVI assessment method in both HD Grid and CMC groups was entrance/exit block (90.9%, 92.5%, respectively). Mapping as a post-ablation assessment method was used in 69.1% (183/265) of HD Grid procedures whereas it was only used in 42.8% (126/294) of CMC procedures ($p < 0.001$). Of the 183 HD Grid procedures that utilized mapping for PV assessment, 57.9% (106/183) used both voltage and activation mapping, 41.0% (75/183) used voltage only and 1.1% (2/183) used activation mapping only. Significantly more gaps were found in the HD Grid group that used both activation and voltage mapping (83.0%, 88/106) as compared to voltage mapping only (49.3%, 37/75, $p < 0.001$). At the end of the procedure, 95.8% of patients in the HD Grid group were in sinus rhythm, as compared to 84.7% of the CMC group.

Conclusions: While this analysis does not represent a direct comparison of the sensitivity of the two different technologies, HD Grid detected significantly more PV gaps compared to CMC in AF procedures. Previous publications have attributed similar findings to HD Grid's ability to reduce voltage amplitude dependence on wavefront directionality. The significantly larger number of HD Grid cases that utilized mapping as a method of determining PVI could be explained by the need to maneuver the HD Grid around the circumference of the vein, which may naturally lead to map collection. This data also suggests that using both voltage and activation mapping identifies significantly more gaps as compared to only voltage mapping, however, further analysis could be warranted to better understand how these maps were collected and what map settings were used.