The omnipolar voltages as an ablation indicator for pulmonary vein isolation in patients with atrial fibrillation

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Background: Lesion Index (LSI) without considering myocardial voltage is well-known to guide pulmonary vein isolation (PVI) ablation using the TactiCath™ Ablation Catheter in paroxysmal atrial fibrillation (PAF) patients. However, some patients show gaps after LSI-guided PVI ablation. Meanwhile, the omnipolar voltages detected using EnSite™ Omnipolar Technology (OT) have been reported to improve the underestimation of voltage.

Purpose: We aimed to clarify their differences by comparing the omnipolar voltages with conventional bipolar voltages and to verify whether it could be an additional indicator of LSI.

Methods: [Study1] We retrospectively studied 48 PAF patients (32 male, 69±8yrs) who received catheter ablation (CA). The left atrial voltage mapping was performed with Advisor™ HD Grid Mapping Catheter under right atrial pacing. The voltages within a 1cm diameter circle were measured at each site (Roof, Anterior, Posterior, Septal, Lateral; 238 sites) and evaluated the omnipolar and conventional bipolar voltages.

[Study2] Twelve patients (8 males, 71±9yrs) with PAF who underwent CA were prospectively studied. The left atrial voltage mapping was performed before PVI ablation. The pre-ablation omnipolar voltages / bipolar voltages and LSI on each ablation site (558 points) of the PVI line were measured and compared in gapped and non-gapped regions. The gapped areas were defined as sites that required additional ablation after the first-round ablation of PVI.

Results: [Study1] The omnipolar voltages were higher than the bipolar voltages (total 238 sites, 2.84±2.05 vs. 2.67±1.81 mV, P<0.0001) in the entire left atrium. There was no feature in the difference between the omnipolar voltage and the bipolar voltage, according to the site and the voltage height (Figure). [Study2] Five gaps (14 ablation points) were confirmed after the first round of LSI-guided PVI (LSI 4.5±0.4, minimum 3.8 - maximum 5.8) in 4 of 12 patients. The omnipolar voltage in the gapped areas was higher than the non-gapped areas (544 ablation points) (5.64±1.93 vs. 3.73±2.82mV, P=0.0118, cut-off value 3.56mV, the area under the curve 0.74678). Meanwhile, there was no difference between the gapped and non-gapped areas in LSI and the conventional bipolar voltage.

Conclusion: Although the omnipolar voltage obtained by OT is detected only slightly higher than the bipolar potential, the higher omnipolar voltage could be an indicator of additional ablation to the LSI.