Long-term clinical outcomes of abandoned cardiac implantable electronic device lead

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**Introduction:** As implantation of cardiac implantable electronic devices (CIED) increased, lead malfunction and device system upgrade are emerging issues. However, there is a paucity of information about the long-term clinical outcomes of abandoned leads (AL). We aimed to compare the long-term adverse outcomes according to the presence of AL in patients with CIED.

**Methods:** From a single center CIED registry over 34 years, 130 patients who had AL were identified. We have matched patients with non-AL by age, sex, device type, and index date of CIED implantation (2:1, n=260). We have compared the composite outcomes of CIED-related infection (CRI) and thromboembolism (TE) between two groups.

**Result:** A total of 2,962 CIED procedures were performed in 2,240 patients between 1984 and 2018. The number of AL was 153 (57 atrial and 96 ventricle leads), and the mean time from abandonment was 8.4±7.3 years in patients with AL (mean age 52.9 ± 15.5 years, male 45.4%, pacemaker 93.8%, and implantable cardioverter defibrillator 6.2%). Common causes of AL were lead malfunction (n=82, 63.1%), device upgrade or mode switch (n=24, 18.5%), and CRI (n=13, 10.0%). During a mean follow-up of 13.4±9.0 years, the primary outcome occurred in 21 (5.4%) patients (14 CRIs and 7 TEs). Cumulative incidence rates were not different between patients with and without AL (0.54 per 100 patients-year (PY) vs. 0.30 per 100 PY, log-rank P=0.21 for the primary outcome; 0.36 per 100 PY vs. 0.20 per 100 PY, log-rank P=0.24 for CRI; 0.17 per 100 PY vs. 0.10 per 100 PY, log-rank P=0.65 for TE). In Cox regression analysis, the AL group did not show an increased risk of adverse clinical outcomes (hazard ratio [HR]=1.14, 95% confidence interval [CI]=0.45-2.87, P=0.79 for composite outcome; HR=1.18, 95% CI=0.39-3.62, P=0.77 for CRI; HR=0.98, 95% CI=0.19-5.13, P=0.9 for TE). We have divided patients with AL according to the number of AL (109 patients with single AL and 21 patients with multiple ALs). Patients with multiple ALs had more atrial ALs compared to those with single AL (76.2% vs. 33.9%, P <0.001). Multiple ALs group showed higher CRI rates compared to the group without AL (P<0.001) and single AL group (P=0.001). Cox regression analysis indicated that patients with multiple ALs had a 3.77-fold greater risk for CRI (HR=3.77, 95% CI=1.02-13.76, P=0.04) compared to patients without AL. However, there was no significant difference in the risk of TE among the three groups.

**Conclusion:** Patients with multiple ALs showed an increased risk of CRI, whereas those with single AL have comparable outcomes as those with non-AL. It would be appropriate not to abandon multiple leads in patients with CIED.