**Electrical Isolation of Superior Vena Cava Using Upstream PN Pacing to Avoid Phrenic Nerve Injury**

Takehiro Kimura, Seiji Takatsuki, Nobuhiro Nishiyama, Kotaro Fukumoto, Yoshiyasu Aizawa, Yukiko Karube, Shunichiro Miyoshi, Keiichi Fukuda

**Department of Cardiology, Keio University School of Medicine, Tokyo, Japan**

**Background:** Phrenic nerve (PN) injury is a potential complication during superior vena cava (SVC) isolation to cure atrial fibrillation (AF). Avoiding radiofrequency (RF) energy delivery is safer but may lead to a failed isolation. High-output PN pacing above the ablation site, upstream PN pacing, is a promising technique to avoid PN injury. This study was conducted to elucidate the safety of delivering RF energy at the site where high-output pacing captures PN.

**Methods and Results:** SVC isolation was carried out in 41 drug-resistant AF patients. When high-output pacing (25 mA) from the ablation catheter captured PN, upstream PN pacing (cycle length: 1000-1500msec) was applied during RF delivery. RF energy was ceased upon the failure or weakness of diaphragmatic twitching. The feasibility of SVC isolation using upstream PN pacing was investigated. In all 41 patients, SVC isolation was successfully achieved. RF energy was delivered at the PN capture site in 26 patients (154±138 sec, 18±5 W), and upstream PN pacing was successfully applied in all patients. Out of 46 SVC isolations, including 5 redo sessions, PN injury occurred in 2 patients, who recovered spontaneously within 2 weeks.

**Conclusions:** Upstream PN pacing is effective in completing SVC isolation safely and reducing the severity of PN injury.

**Keywords:** AF, ablation, phrenic nerve injury