Is Greater Influence of Cryoballoon Ablation for Pulmonary Veins on Myocardium of SVC Than Radiofrequency Ablation Related to Paroxysmal Atrial Fibrillation Suppression?

Tomihisa Nanao
Norishige Morita
Takayuki Iida
Nana Murotani
Yuka Karasawa
Hirofumi Nagamatsu
Yoshiya Yamamoto
Tomoaki Hama
Daisuke Fujibayashi
Youta Kawamura
Akiko Ushijima
Akira Ueno
Fuminobu Yoshimachi
Yoshinori Kobayachi

Introduction: Pulmonary vein (PV) isolation (PVI) by cryoballoon-ablation (CrA) has been established for curing atrial fibrillation (AF). It has been known that the ectopic firings from superior vena cava (SVC) in relation to its myocardial sleeve extension from right atrium (RA) are implicated in AF recurrence (≈10-20%) even after PVI by radiofrequency-ablation (RFA). Whether the ectopic firings originated from such an extended myocardial sleeve are also related to AF recurrence after CrA for PVs remains unknown because the greater influence of CrA on such a myocardial sleeve may occur compared to RFA thus, AF recurrence would be less after CrA than RFA for paroxysmal AF.

Methods: This study was consisted of 57 patients (37 Male: 65±11y/o), undergoing CrA for paroxysmal AF. All the patients underwent SVC venography and the following right atriography. The distance from SVC-right atrium junction (SRJ) to the most cranial level of SVC where the SVC potentials could be recorded (d-SVCp) was measured. According to the median value of d-SVCp obtained (range: 22-59mm), the patients were divided into the following two groups; Group-A (d-SVCp \(\leq 35\)mm, N=25: 67±10y/o) and Group-B (d-SVCp>35mm N=32: 62±12y/o). The level difference in length between the bottom of right inferior PV (RIPV) orifice and SRJ (d-RIPV) was also assessed.

Result: The AF recurrence rate did not differ between Groups A and B (2.7 vs. 3.1% ns) during mean follow-up of 12months. The bottom level at the RIPV orifice was all located at caudal level to SRJ (d-RIPV: 23.8±9.7mm) and no difference for d-RIPV was found between Groups A and B (26.6±7.4 vs. 21.6±10.8mm ns). The location of the earliest SVC-potentials that could be recorded at the SRJ level during sinus rhythm after CrA were more frequently recorded at the anterior wall than that posterior wall of SVC, which was anterior to RIPV antrum and spatially close to right PV antrum (61 vs. 15% p<0.05), although that at the most caudal level of the SVC with myocardial sleeve extension did not differ (40 vs. 35 % NS).

Conclusion: This study might imply that CrA affects the myocardial sleeve of SVC on its posterior
side extended from RA, which may trigger AF initiation even after PVI by ablation, as well as its adjacent third fad pad located posteriorly to SVC which contains ganglionated plexi. These combined influences by CrA may lead to less AF recurrence than RFA, particularly in the paroxysmal AF patients who had the myocardial sleeve extension long enough to evoke trigger AF.