Reduction of radiation exposure in atrial fibrillation ablation: From near-zero to zero fluoroscopy catheter ablation

Koichiro Ejima
Kyoichiro Yazaki
Satoshi Higuchi
Shohei Kataoka
Miwa Kanai
Daigo Yagishita
Morio Shoda
Nobuhisa Hagiwara

Introduction: Since there is no definite level of exposure that is known to be completely safe, the utilization of ionizing radiation during medical diagnostic or interventional procedures should be as low as reasonably achievable (ALARA principle). The purpose of this study was to evaluate the feasibility and safety of atrial fibrillation (AF) ablation with approaches using near-zero and zero fluoroscopy compared to that with ablation procedures performed under fluoroscopic guidance.

Methods: We compared the fluoroscopic time, procedure time, and occurrence of complications between the patients who underwent AF ablation procedures with the usual fluoroscopy use (control group; n=50), with snapshot pulsed fluoroscopy use (SS group; n=41), and without fluoroscopy (zero-fluoroscopy; ZF group; n=27). All procedures were performed using a combination of three-dimensional electroanatomical mapping (CARTO3 system) and intracardiac echocardiography (ICE). In all cases, image integration with a three-dimensional computed tomography image (CARTO MERGE) was performed. Irrigated radiofrequency ablation was performed to encircle each pair of ipsilateral pulmonary veins. In the ZF group, at first, the superior vena cava, right atrium, and coronary sinus geometry were created using Fast Anatomical Mapping, an equipped function of the CARTO3 system without fluoroscopy. Then, a fluoroless transseptal puncture was performed under ICE guidance. A comparison of the procedure time was evaluated only for the first session case in each group.

Result: Compared with the control group, the SS group had a significantly reduced fluoroscopic time (10.7±4.3 minutes vs. 40.2±45.3 seconds, p<0.0001). The procedure time did not differ between the SS group (n=34) and control group (n=26) (122.2±36.0 vs. 123.4±31.0 minutes, p=0.91). In the ZF group, an ablation procedure without fluoroscopy was achieved in 25 of 27 patients (93%). The procedure time in the ZF group (n=19,) was longer than that in the SS group but was not statistically significant (122.2±36.0 vs. 133.3±35.5 minutes, p=0.30). In the ZF group, the procedure time was longer in the first half of patients (ZF-1, n=9) than that in the second half (ZF-2, n=10) (155±41 vs.114±11 minutes, p<0.01). The procedure time in the ZF-1 group was longer than that in the control group (p=0.03) and SS group (p=0.0496). However, there was no difference in the procedure time between the ZF-2 group, control group (p=0.38), and SS group (p=0.82). There were no major complications that required any intervention.

Conclusion: Zero or near-zero fluoroscopy catheter ablation of AF is safe and feasible using a
combination of ICE and EAM without compromising the procedure time.