

Minimal fluoroscopic approaches and factors associated with radiation dose when high-definition mapping is used for supraventricular tachycardia ablation: insight from the CHARISMA registry

La Greca C.¹; Cauti FM.²; Piro A.³; Di Belardino N.⁴; Anselmino M.⁵; Scaglione M.⁶; Pecora D.¹; Rossi L.⁷; Di Cori A.⁸; Tola G.⁹; Pedretti S.¹⁰; Mantovan R.¹¹; Solimene F.¹²; Rossi P.²; Bianchi S.²

¹Poliambulanza Foundation Hospital Institute of Brescia, Cardiology, Brescia, Italy

²Giovanni Calibita Fatebenefratelli Hospital, Rome, Italy

³Umberto I Polyclinic of Rome, Rome, Italy

⁴Presidio Ospedaliero di Anzio e Nettuno, Anzio, Italy

⁵Molinette Hospital, Turin, Italy

⁶Cardinal Massaia Hospital, Asti, Italy

⁷Guglielmo da Saliceto Hospital, Piacenza, Italy

⁸Azienda Ospedaliero Universitaria Pisana, Pisa, Italy

⁹AO Brotzu Hospital, Cagliari, Italy

¹⁰Sant'Anna Hospital, Como, Italy

¹¹Conegliano General Hospital, Conegliano, Italy

¹²Montevergine Cardiology Clinic, Mercogliano, Italy

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Background: Limited data exist on factors associated with radiation exposure during ablation procedures when a high definition mapping technology is used.

Purpose: To report factors associated with radiation exposure and data on feasibility and safety of a minimal fluoroscopic approach using the Rhythmia mapping system in supraventricular tachycardia (SVT) ablation procedures.

Methods: Consecutive patients indicated for arrhythmia ablation were enrolled in the CHARISMA study at 12 centers. We included in this analysis consecutive right-side procedures performed through a minimal fluoroscopy approach with the Rhythmia mapping system were analyzed. A 3D geometry of chambers of interest was reconstructed on the basis of the electroanatomic information taken from the mapping system. Fluoroscopy was used only if deemed necessary. The effective dose (ED) was calculated using accepted formula. For our purpose high dose exposure was defined as an ED greater than the median value of ED of the population exposed to radiation.

Results: This analysis included 325 patients (mean age = 56 ± 17 years, 57% male) undergoing SVT procedures (152 AVNRT, 116 AFL, 41 AP and 16 AT). During the study, 27481 seconds of fluoroscopy was used (84.6 ± 224 seconds per procedure), resulting in a mean equivalent ED of 1.1 ± 3.7 mSv per patient. The mean reconstructed RA volume was 99 ± 54 ml in a mean mapping time of 12.2 ± 7 min. The mean number of radiofrequency ablations (RFC) to terminate each arrhythmia was 9.4 ± 9 (mean RFC delivery time equal to 6.7 ± 6 min). 192 procedures (59.1%) were completed without any use of fluoroscopy; during the remaining 133 procedures (39.9%), 206.6 ± 313.4 seconds of fluoroscopy was used (median ED = 1.2 mSv). In a minority of the cases (n = 25, 7.7%) the fluoroscopy time was higher than 5 minutes (median ED = 6.5 mSv), whereas radiologic exposure time greater than 1 minute occurred in ninety cases (27.7%, median ED = 2.1 mSv). On multivariate logistic analysis adjusted for baseline confounders the RFC application time (OR = 1.0014, 95%CI: 1.0007 to 1.0022; p = 0.0001) was independently associated to an ED greater than 1.2 mSv, whereas female gender had an inverse association (0.54, 0.29 to 0.98; p = 0.0435). Acute success was reached in 97.8% of the cases. During a mean of 290.7 ± 169.6 days follow-up, no major adverse events related to the procedure were reported. Overall, the recurrence rate of the primary arrhythmia during follow-up was 2.5%.

Conclusions: In our experience, arrhythmias ablation through minimal fluoroscopy approach with the use of a novel ablation technology is safe, feasible, and effective in common right atrial arrhythmias. High-dose exposure occurred in a very limited number of cases, without any reduction of the safety and acute and long-term effectiveness profile.