Minimising Radiation Exposure during Biventricular Device Implantation

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Introduction: Complex intervention and device implantation procedures often require long fluoroscopy time and expose both the operator and patient to high levels of radiation. As part of a systematic study, we have assessed fluoroscopy time in complex interventions and taken protocol-driven steps to reduce radiation exposure; without any change in imaging equipment or procedure hardware. Here, we present our data on radiation exposure during Biventricular device implantation and the feasibility and reliability of biventricular device implantation with modified fluoroscopy protocols.

Methods: Forty-one patients with heart failure underwent implantation of a cardiac resynchronization therapy (CRT) device with or without defibrillator (CRT-D; CRT-P) from January 2018 to June 2019. In September 2019 we changed our imaging protocols by incorporating many radiation lowering settings. This included lowering the Fluoroscopy frame rates from 15fps to 4fps, frequent use of ‘flurosave’ and decreasing cine frame rate from 15fps to 10fps. Of the 41 patients, 24 procedures were done before the change in imaging protocol (PRE-Group A) and 17 procedures were done after (POST-Group B). Both groups were matched for age, sex, and type of device.

Result: In Group A, the median fluoroscopy time was 42.9 min. Median Dose surface product (PKA) was 2493.5 mGy, and skin surface entry dose (KAR) was 23020µGym2. In Group B, the median fluoroscopy time was 25.45 min, Median Dose surface product (PKA) was 787.5 mGy, and skin surface entry dose (KAR) was 7985µGym2. There was a significant decrease in the radiation exposure as measured by Dose surface product (PKA), skin surface entry dose (KAR) after changing the imaging protocol (P values < 0.04 and < 0.03 respectively). There was no significant difference in the fluoroscopy time suggesting that clinically acceptable imaging could be achieved even after using very low frame rates during fluoroscopy.

Conclusion: Keeping the radiation exposure to ‘as low as reasonable’ (ALAR) is the philosophy behind all interventional procedures. Our study shows that biventricular device implantation can be done using very low frame rate fluoroscopy and the radiation exposure can be decreased by almost two-thirds when compared to default imaging settings.