The Electrical Mechanical Interference of Implantable Cardiac Devices at X-Ray Fluoroscopy

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Background: X-ray radiation during computed tomography (CT) scanning has been reported to cause electrical mechanical interference (EMI: oversense and partial electrical reset) in implantable cardiac device. However it remains elusive whether EMI was occurred by X-ray fluoroscopy at clinical scan condition. Purpose: Our purpose is to investigate the EMI of implantable cardiac devices at X-ray fluoroscopy.

Method: Implantable cardiac device (cardiac pacemaker, biventricular pacemaker: CRT-P, biventricular pacemaker with implantable cardioverter defibrillator: CRT-D, Medtronic) with its electrode lead sink in a tank filled with saline. X-ray fluoroscopy (Philips: Allura Xper) scanned Implantable cardiac device with scan conditions in our hospital.

Results: (1) On low frequency pulse radiation (2, 3, 3.75, 6 frame/sec), X-ray radiation inhibited the pacing pulses of cardiac pacemakers due to oversense of noise. When X-ray radiation exposed CRT-D, cardioversion was delivered because frequent noise was understood as ventricular fibrillation. (2) On high frequency pulse radiation (15, 30 frame/sec), all implantable cardiac devices EMI was not occurred because remove of high frequency noise by band-path filter. (3) X-ray induced EMI depended on the direction of X-ray radiation.

Conclusion: EMI of implantable cardiac devices at X-ray fluoroscopy depended on frequency of pulse radiation and direction of X-ray radiation. The radiological technologists should select the frequency of pulse radiation and remove implantable cardiac device from radiation range.

Keywords: electrical mechanical interference, X-ray fluoroscopy, implantable cardiac device