Purpose: To present our preliminary experience and quality-assurance (QA) procedures in implementing intraoperative-radiation therapy (IORT) for accelerated-partial-breast irradiation (APBI) using the Axxent-system controller (Xoft Inc.)

Methods: IORT was implemented in our institution utilizing a 50-keV x-ray source. APBI allows breast conserving in patients with early-stage-breast cancer by delivering radiation to the lumpectomy bed via an applicator balloon filled with water, to which a prescribed dose of 20 Gy was applied to its surface. In-situ anesthesiology, breast-surgery and radiation-oncology teams were required to achieve this procedure. Calibration of the source, including temperature and pressure corrections, was performed by the controller resulting in a calibration factor, which was manually introduced by a physicist into an in-house program providing the corrected dwell times. Evaluation of exposure measurements determined that personnel standing behind glass-rolling shields during irradiation were sufficient protection.

Results: We have successfully treated four patients to date. Surgical times averaged about two hours, QA and setup of controller took about 30 minutes, while radiation-treatment times ranged 7.8-10.4 minutes. Exposure to personnel showed a negligible dose compared to background based on the in-vivo measurements. Our measurements have shown that placement of a shielding layer (FlexiShield) on top of the drape-protected breast reduced radiation exposure to in-room personnel. In one case, treatment was automatically stopped by the controller due to a sudden undetected cooling water flow; due to the pre-treatment training, treatment was successfully resumed within a minute after manual adjustment of the flow sensor.

Conclusions: Implementation of IORT to treat patients with APBI using low-energy x-ray source should follow the manufacturer's recommendations regarding to the acceptance and personnel training. Our experience indicates that two physicists are necessary at least at the implementation stage. Appropriate training to deal with potential problems is crucial before clinical treatment can be ready.