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## Significant inter-fraction variations during tangential breast irradiation. An indication for image-guided radiotherapy for simultaneously integrated boost.

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### Abstract

**OBJECTIVE:** To use electronic portal images (EPI) to clinically evaluate inter-fraction variations during tangential breast irradiation, using either a skin marks setup, or a bony anatomy setup, and to determine the required margins for simultaneously integrated boost (SIB) planning target volume (PTV).

**METHODS:** Ten patients undergoing radiotherapy to the entire breast with tangential fields, after breast conservation surgery were considered for this pilot prospective study in the Radiation Therapy Unit of King Abdulaziz University Hospital between February and September 2009. Patient setup was carried out either using skin marks or bony anatomy landmarks. The EPIs of the medial tangential radiation fields were performed daily; displacement of the EPI with respect to the digital reconstructed radiographs (DDRs) was quantified after manual registration with the corresponding DDRs and recorded in both antero-posterior (AP) and cranio-caudal (CC) directions. The inter-fraction variations were used to calculate required margins for SIB PTV.

**RESULTS:** Considerable geometric uncertainties in patient positioning have been observed for both investigated treatment setup protocols. The margins required for a correct assessment of boost PTV were: 15.6 mm for AP and 15.4 mm for CC directions for the skin marks setup protocol, and 12 mm for AP and 12.2 mm for CC directions for the bony anatomy landmarks setup protocol.

**CONCLUSION:** Systematic and random errors induced by inter-fraction patient setup variations are significant in tangential breast radiotherapy, and lead to a large PTV margin for SIB. Such large margins indicate the need for image-guided radiotherapy.