In vivo skin dose measurement using MOSkin detectors in tangential breast radiotherapy


Abstract

The purpose of this study is to measure patient skin dose in tangential breast radiotherapy. Treatment planning dose calculation algorithm such as Pencil Beam Convolution (PBC) and in vivo dosimetry techniques such as radiochromic film can be used to accurately monitor radiation doses at tissue depths, but they are inaccurate for skin dose measurement. A MOSFET-based (MO Skin) detector was used to measure skin dose in this study. Tangential breast radiotherapies ("bolus" and "no bolus") were simulated on an anthropomorphic phantom and the skin doses were measured. Skin doses were also measured in 13 patients undergoing each of the techniques. In the patient study, the EBT2 measurements and PBC calculation tended to over-estimate the skin dose compared with the MOSkin detector (p < 0.05) in the "no bolus radiotherapy". No significant differences were observed in the "bolus radiotherapy" (p > 0.05). The results from patients were similar to that of the phantom study. This shows that the EBT2 measurement and PBC calculation, while able to predict accurate doses at tissue depths, are inaccurate in predicting doses at build-up regions. The clinical application of the MOSkin detectors showed that the average total skin doses received by patients were 1662 ± 129 cGy (medial) and 1893 ± 199 cGy (lateral) during "no bolus radiotherapy". The average total skin doses were 4030 ± 72 cGy (medial) and 4004 ± 91 cGy (lateral) for "bolus radiotherapy". In some cases, patient skin doses were shown to exceed the dose toxicity level for skin erythema.

Highlights

- Patients' skin dose during tangential breast radiotherapy have been determined.
- EBT2 film and PBC overestimated the skin dose.
- The skin dose is approached and exceeded the dose toxicity level for skin erythema.
- The use of suitable metrological device is necessary to determine actual skin dose.

Table 1

Table 2

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Keywords
MOSFET; Breast conserving radiotherapy; Chest wall irradiation; Surface dose; Superficial dose; In vivo dosimetry

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