Evaluation of the Chest Wall Skin Dose Associated With Bolus Application in Postmastectomy Radiation Therapy (PMRT) Using Nanodot OSLD

April 30, 2015 | ARS 2015 [1]

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PURPOSE: A wide variation in the use of bolus has been observed in postmastectomy radiotherapy (PMRT), which affects dose delivery to skin and may have an impact on locoregional recurrence. However, even treatment planning systems (TPSs) with advanced algorithms do not provide accurate dosimetry in the buildup region. This study aims to perform in vivo measurements of the chest wall (CW) skin dose using optically stimulated luminescence dosimeters (OSLDs) and to ensure that adequate skin dose is obtained for all patients undergoing PMRT.

MATERIALS AND METHODS: In total, 37 patients undergoing PMRT were treated with either conformal technique or volumetric-modulated RT (RapidArc, Varian Medical Systems). Each patient had two plans for CW radiation: one with 0.5-cm bolus and the other without bolus, originally prescribed as every other day (QOD). During the first treatment of bolus and no-bolus plans, the physicist placed four to six nanoDots (Landauer, Glenwood, IL), a type of OSLD suitable for accurate in vivo dosimetry, at the scar and the superior, inferior, medial, and lateral locations of the CW field. For each patient, there were 8-12 nanoDots sent to Landauer for absolute dose reading. The skin dose difference between the no-bolus and bolus plans was analyzed at our clinic for each patient. Furthermore, if the composite CW skin dose was less than the clinically desired dose (ie, 45 Gy), then we would increase the number of fractions for the bolus plan and reduce the number of fractions for the no-bolus plan to ensure that CW skin obtains the clinically desired dose coverage.

RESULTS: A total of 8 out of 37 patients had skin dose below 45 Gy with the 0.5-cm QOD bolus application, and we had to revise the plan fractionation. Among them, two were conformal plans and seven were RapidArc plans. For the conformal planned patients, the average skin dose increase for bolus use compared with no bolus was 34% ± 12%. In contrast, for RapidArc plans, the average skin dose increase for the bolus plan was 57% ± 27%. This was probably due to the oblique incidence of tangential photon beams in the three-dimensional (3D) conformal technique already providing relatively high skin dose.

CONCLUSION: Skin dose is dependent on patient anatomy, the incident beam geometry, and planning techniques. For example, RapidArc plans with tissue expanders should be monitored for skin dose coverage. In conclusion, the skin dose should be measured to ensure that the clinically desired dose is obtained for the various bolus applications in patients undergoing PMRT.

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