Purpose: TD is a newly introduced modality by TomoTherapy (Tomotherapy Inc., Madison, WI) allowing users to plan and deliver a series of overlapping radiation fan beams at static beam angles with a moving couch. We observed undesired breast skin dosing in whole breast treatment plans with TD. The purpose of this work was to develop a method using a treatment planning subcutaneous avoidance structure (SAS) to lower this subcutaneous skin dose (SCSD) in whole breast TD treatment planning.

Methods: As a 3DCRT modality, TD only allows PTV coverage to be specified. We placed SAS, circles of approximately 3 mm in diameter, at the subcutaneous region of the breast as a pseudo-target with slightly lower prescription dose than the BreastPTV. Five left-sided early breast cancer patients were selected for this study. BreastPTV was defined as breast tissue limited 5mm from the skin surface. Two skin structures were contoured, a 5mm and a 2.5mm strip extending from patient surface towards the BreastPTV. Plans with and without SAS were generated for the 5 patients and an anthropomorphic phantom with 6 tangent-like beams. SAS was optimized to limit the dose to 45 Gy for a Breast TV prescription dose of 50Gy. Dose volume histograms were compared. Subcutaneous dose, with and without SAS, were measured using both Gafchromic EBT2 film and thermoluminescence dosimetry (TLD).

Results: With similar BreastPTV coverage and normal tissue sparing, plans without SAS had a V45 in the subcutaneous region of 80-90% whereas plans with SAS had a V45 of 70-80%, 10% decrease in the 5mm skin strip. For the 2.5 mm skin strip, decreasing in V45 was about 20% in plans with SAS. The results were confirmed with film and TLD measurements, which demonstrated an 8% decrease in a plan with SAS.

Conclusions: The SAS planning technique can lower SCSD without compromising PTV coverage using TomoDirect.