Purpose

To evaluate the effects of the couch, the immobilization/support devices, and air gap on the skin dose for SBRT treatment with abdominal compression device and to investigate strategies to minimize skin dose by phantom measurement.

Material and methods

Skin-sparing comes from lower dose in buildup region, anything added between tissue and air may change buildup PDD curve hence skin dose increases. To investigate such effects due to different buildup materials and air gap between the buildup material and the surface, we employed EBT2 film in slab and water phantoms to measure doses at depths varying from surface to dmax, field sizes (4x4 to 10x10 cm2), and air gaps from 5 to 15 cm for 6 MV photons. Measured dose was normalized to dose at dmax for a 10x10 cm2 field. The buildup materials included table tops (tennis net, Exact Couch and Indexed Immobilization table tops), vacuum bags (Civco Vac-Lok and Med-Tec cushions), and body frames (Elekta stereotactic body frame and Civco Body Pro-Loc).

Results

The relative doses at depth of 1.00 mm were 0.63 with no buildup, 0.90 with couch+6cm bag, 0.91 with bodyframe+bag, and 0.96 with couch+bodyframe+bag for a 4x4 cm2 field. With a 10x10 cm2 field, the above values changed to 0.67, 0.94, 1.01, and 0.97, respectively. Thick bag (6.0cm) increased skin dose by 10% comparing to the thinner bag (1.5cm). For a buildup (couch + body frame) plus air gap, the relative doses were 0.73, 0.84, and 0.91 for air gap of 15.0, 10.0, and 5.0 cm, respectively, for a 10x10 cm2 field.

Conclusion

The skin dose increases by up to 40% if patient was treated through the immobilization device or couch. Skin dose also increased with increasing field size. Introduction of large air gap may recover much of the lost buildup effect.