

AbstractID: 6676 Title: Challenges in Limiting Kidney Dose when Delivering Total Body Irradiation (TBI) for Patients with Severe Systemic Sclerosis (SSc)

Purpose: To describe challenges in limiting kidney dose when delivering TBI to SSc patients enrolled on a multicenter Phase II/III SCOT (Scleroderma Cyclophosphamide or Transplantation) protocol.

Material and Methods: The SCOT protocol uses a preparative regimen of 800 cGy TBI. The kidney dose is limited to 200 cGy. This level of attenuation is atypical for TBI. Hence, the effect of the block thickness and proximity to the spinal cord was investigated with EDR film in an anthropomorphic phantom using 5 cm thick kidney blocks positioned 3, 5, and 8 cm apart. Due to their poor renal function, the kidneys of SSc patients cannot be localized using intravenous contrast. Therefore, methods of kidney-localization and block-positioning were devised. Six patients have been treated on the TBI arm of the trial at Duke and information on kidney shape and the shifts from prone to standing position were recorded using diagnostic ultrasound (US).

Results: A 10-20% dose inhomogeneity in the lumbar spine region is achievable with a minimum kidney block separation of 4-5 cm (typical width of a vertebral body). Two methods for kidney localization have been proposed. Block design and placement can be accomplished using a combination of CT and US or CT alone. Kidney-localization based on the combination of CT and US enables more accurate block-positioning and reduces the superior-inferior block margins. Kidney shape proved similar among the six patients imaged, leading to a potential use of standard kidney blocks. The US information revealed a wide range of kidney travel, both inferior and superior with a magnitude as large as 3.3 cm.

Conclusions: The dose to the kidneys can be attenuated by 75% (per protocol) during TBI while maintaining a 10-20% dose inhomogeneity. The kidneys can be localized more accurately using both CT and US than CT alone.