Purpose:

To report on an initial investigation into the use of optically stimulated luminescent dosimeters (OSLDs) for in-vivo dosimetry for total body irradiation (TBI) treatments. Specifically, we report on the determination of angular dependence, sensitivity correction factors and the dose calibration factors.

Methods:

The OSLD investigated in our work was InLight/OSL nanoDot dosimeters (Landauer Inc.). Nanodots are 5 mm diameter, 0.2 mm thick disk-shaped Carbon-doped Al2O3, and were read using a Landauer InLight microstar reader and associated software.

OSLDs were irradiated under two setup conditions: a) typical clinical reference conditions (95cm SSD, 5cm depth in solid water, 10x10 cm field size), and b) TBI conditions (520cm SSD, 5cm depth in solid water, 40x40 cm field size.). The angular dependence was checked for angles ranging Â±60 degree from normal incidence.

In order to directly compare the sensitivity correction factors, a common dose was delivered to the OSLDs for the two setups. Pre- and post-irradiation readings were acquired.

OSLDs were optically annealed under various techniques (1) by keeping over a film view box, (2) Using multiple scan on a flat bed optical scanner and (3) Using natural room light.

Results:
Under reference conditions, the calculated sensitivity correction factors of the OSLDs had a SD of 2.2% and a range of 5%. Under TBI conditions, the SD increased to 3.4% and the range to 6.0%. The variation in sensitivity correction factors between individual OSLDs across the two measurement conditions was up to 10.3%. Angular dependence of less than 1% is observed. The best bleaching method we found is to keep OSLDs for more than 3 hours on a film viewer which will reduce normalized response to less than 1%.

Conclusions:

In order to obtain the most accurate results when using OSLDs for in-vivo dosimetry for TBI treatments, sensitivity correction factors and dose calibration factors should all be determined under clinical TBI conditions.