Purpose: To dosimetrically evaluate advantages and disadvantages of using multiple, shorter, sub-arcs versus full arc deliveries for treatment of cranio-spinal axis (CSA) irradiation.

Methods: Five (n=5) cranio-spinal axis irradiation patients were planned using 2 complete arcs, one superior and one inferior; with gantry rotations from 1 to 359 degrees. Due to supine patient setup, each original full arc was then replanned split into two sub arcs with gantry rotations from 1 to 100 and 260 to 359 degrees creating 4 smaller arcs. The PTV was normalized such that 95% received at least 23.4 Gy in 13 fractions. The PTV was evaluated based on conformity number and homogeneity index. The normal structures were evaluated based on maximum and mean doses. Beam on times and monitor units were compared.

Results: Averaged over all patients, conformity number was calculated to be approximately 0.86 and 0.82 for full arc and sub arc plans respectively. The homogeneity index was approximately 1.07 and 1.06 for full arc and sub arc plans. This indicates better target conformity but less homogeneous dose distribution for full arc plans as compared with sub arc plans. With the exception of the eyes, each normal structure evaluated had lower maximum doses with subarc plans. All normal structures, with the exception of the left kidney, had lower mean doses using sub arc deliveries. Beam on times were shorter on average for full arcs, but the monitor units were lower on average for sub arcs.

Conclusions: Overall, CSA patients would benefit from the use of sub arc treatment deliveries versus full arc deliveries. Nearly all normal structure doses were lower for sub arcs, while the PTV was still adequately covered and beam on times and monitor units were similar.