AbstractID: 6900 Title: A treatment planning study comparing active scanning beam delivery and passively scattered beam delivery in proton therapy

Purpose:
Treatment planning study for proton passive, active beam with and without bolus and aperture.

Method and materials:
Most beam delivery systems in proton therapy use passive beam spreading techniques to conform the dose to the target. Chordoma, meningioma, GBM and other head and neck cases are routinely treated with passively scattered beams at many proton centers. Patched fields are often used in sparing normal tissues surrounding the targets. This is achieved by matching the distal edge of one beam with the lateral edge of another beam to get good target coverage and reduce normal tissue doses. Boluses are used to compensate for the distal contour of the target and tissue density variations upstream of the target. This modality offers distinct advantages over conventional (X-ray) radiation therapy, viz., no dose to the normal structures distal to the tumor and easy avoidance of normal structures surrounding the tumor; resulting in low integral dose to the patient. Passively scattered proton beams offer limited treatment field size, necessitating the use of matching fields to cover larger targets, e.g., medulloblastoma, and cranio-spinal irradiation. Also there is increased risk of neutron contamination for passively scattered proton beams. Active beam scanning eliminates these limitations. This technique can, in principle, be used without the use of boluses and apertures. However, comparing with passively scattered beam, the increased penumbra of the active scanning beam for a shallower target may compromise treatment delivery by giving increased dose to the healthy tissues.

Results:
In this study, we compare the passively scattered beam and active scanning beam plans for the extra-medullary plasmacytoma of the right maxilla, a head and neck tumor.

Conclusions:
A significant reduction in dose to healthy tissues can be achieved by using the scanning beam technique in conjunction with a limited use of apertures and boluses.