AbstractID: 13163 Title: Analysis of average path length and inhomogeneity correction effect for cranial SRS cases

Abstract

Purpose: This study is designed to analyze the properties of beam path length at different brain locations and the effect of Inhomogeneity Correction (IC) on isocenter dose of cranial Stereotactic Radiosurgery (SRS) treatment planning.

Method: Fifty five clinical cranial SRS plans, with total 63 lesions were analyzed in this study. Lesions were grouped as frontal (16 lesions), parietal (10 lesions), temporal (10 lesions), occipital (10 lesions), cerebellum (10 lesions), and acoustic neuroma (7 lesions). All plans were planned on Brainlab iPlan RT Dose 3.0.2. Pencil beam convolution dose calculation algorithm was used both with and without IC with identical beam parameters. Nine to 11 beams were used for each lesion. Average beam path length, and differences in isocenter dose for each lesion with and without IC were analyzed.

Result: The mean and standard deviation (SD) of average beam path length for frontal, parietal, temporal, occipital, cerebellum and acoustic neuroma lesions without IC were 47.54±16.03mm, 45.33±8.69mm, 64.15±12.33mm, 51.27±9.73mm, 78.70±10.89mm and 79.92±7.46mm, respectively. The corresponding results with IC were 56.08±14.86mm, 52.80±8.79mm, 71.85±12.27mm, 59.97±10.20mm, 86.57±11.26mm and 90.07±7.57mm, respectively. The differences in average beam path length between with and without IC were 8.54±1.62mm, 7.47±1.04mm, 7.70±1.66mm, 8.71±1.56mm, 7.87±1.39mm and 10.15±3.52mm respectively.

The mean and SD of isocenter dose for frontal, parietal, temporal, occipital, cerebellum, acoustic neuroma and all lesions combined without IC were 3.83±0.72%, 3.35±0.61%, 3.47±0.88%, 3.99±0.76%, 3.69±0.69%, 4.83 ±1.77% and 3.81±0.96% higher then the isocenter dose with IC, respectively. The maximum dose difference was 7.05% for an acoustic neuroma case and minimum dose difference was 1.59% for a frontal lobe lesion.

Conclusion: In conclusion, an isodose difference between dose calculation with and without IC of about 4% was found for cranial SRS case. The effect of planning cranial SRS with or without IC increases with the average path length differences.