Purpose: To investigate application of 3D gel dosimetry in verification of intensity modulated stereotactic radiotherapy (IMSRT) of intracranial lesions.

Method and Materials: Radionics treatment planning (XK-RT3) and delivery systems, including a Mini Multileaf Collimator (MMLC) were used in this study. A PVC Head phantom filled with MAGAT polymer gel (Normoxic MAGIC gel with THP as anti oxidant) attached to the GTC frame and stereotactic localizer. The phantom was CT and MR scanned using stereotactic protocols and image fusion was performed for the localization. A four field non-coplanar IMSRT plan was generated using a 6 MV beam with the Radionics planning system and delivered according to our routine stereotactic treatment procedures. For comparison with the planned isodose distribution, the R2 maps were converted to relative dose maps using an R2-dose calibration curve. The polymer dose maps were then co-registered with the planning dose distributions in an in-house Matlab program which provides reconstructed sagittal and coronal images for 3D evaluation of measured and planned dose. Various isodose levels in the 3D dose map have been compared between the treatment plan calculations and gel measurement.

Results: Results of this study have shown good agreement between the gel dosimetry and treatment planning calculation. The 2D and 3D agreement was overall better than 5% in dose or to within 3 mm distance for the 80% and 95% isodose levels. The maximum difference for these isodose levels was 10%.

Conclusion: In this work we have demonstrated that the Polymer gel dosimetry have the ability to accurately localize the high dose regions delivered by intensity modulated stereotactic radiotherapy.