

How Gliomas Affect White Matter Tract Bundles Associated with the Limbic Cortex

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Introduction

Neurocognitive dysfunction can occur in the presence of glioma, depending on localization of the tumor. Diffusion Tensor Imaging (DTI) of limbic pathways may assist in assessing this relationship.

Objectives

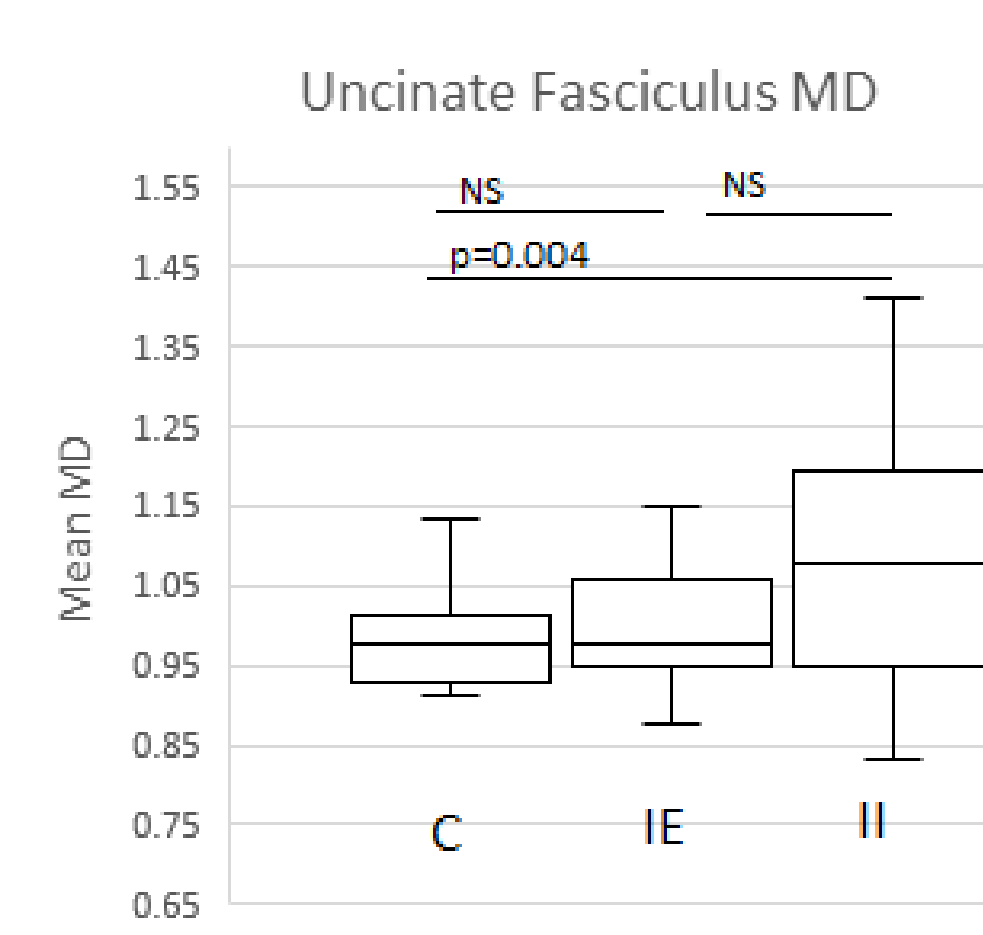
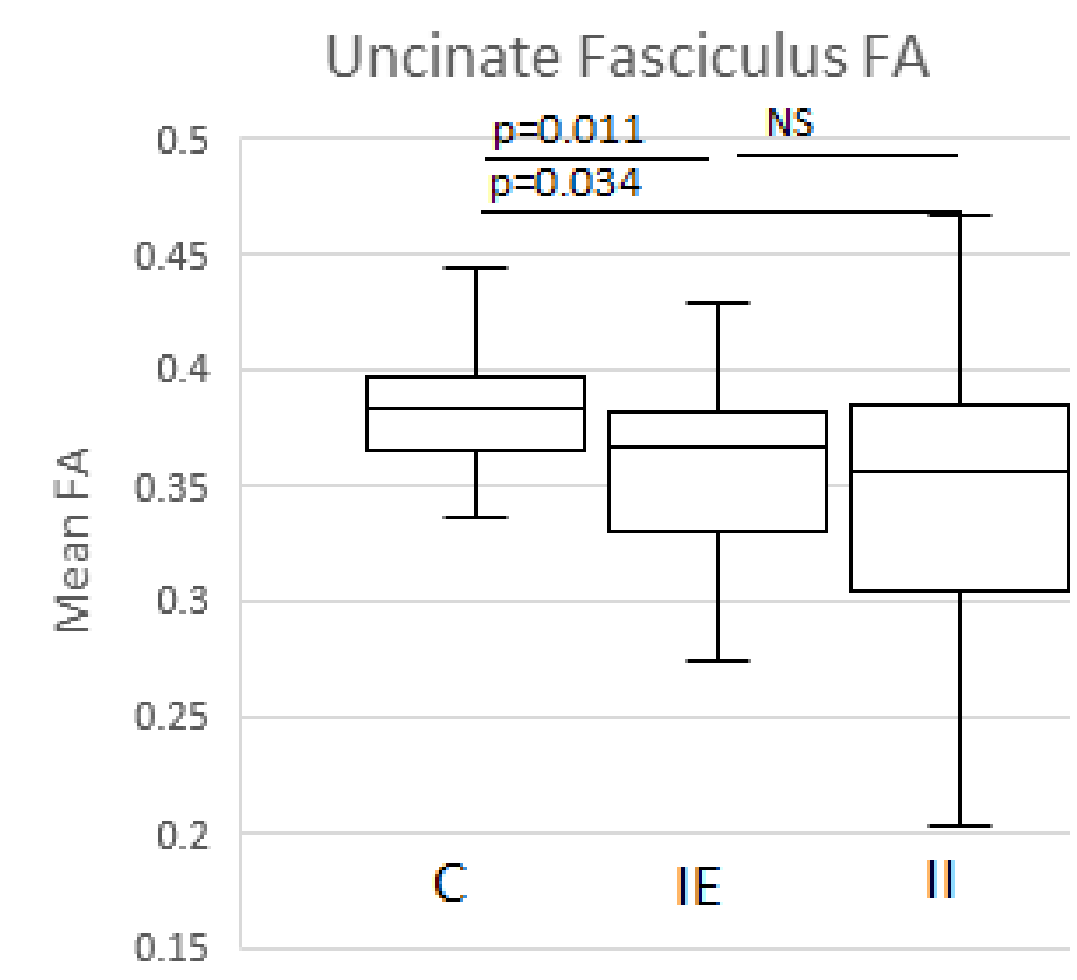
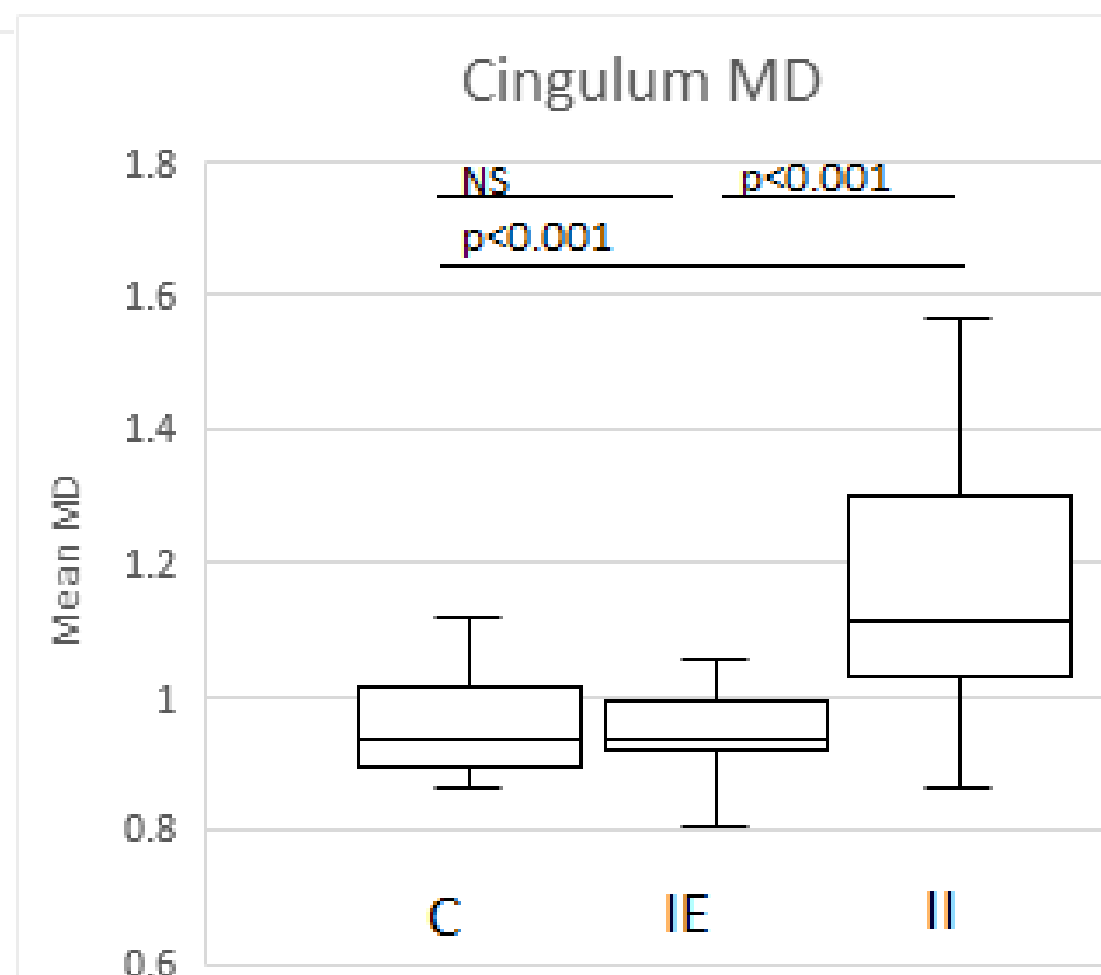
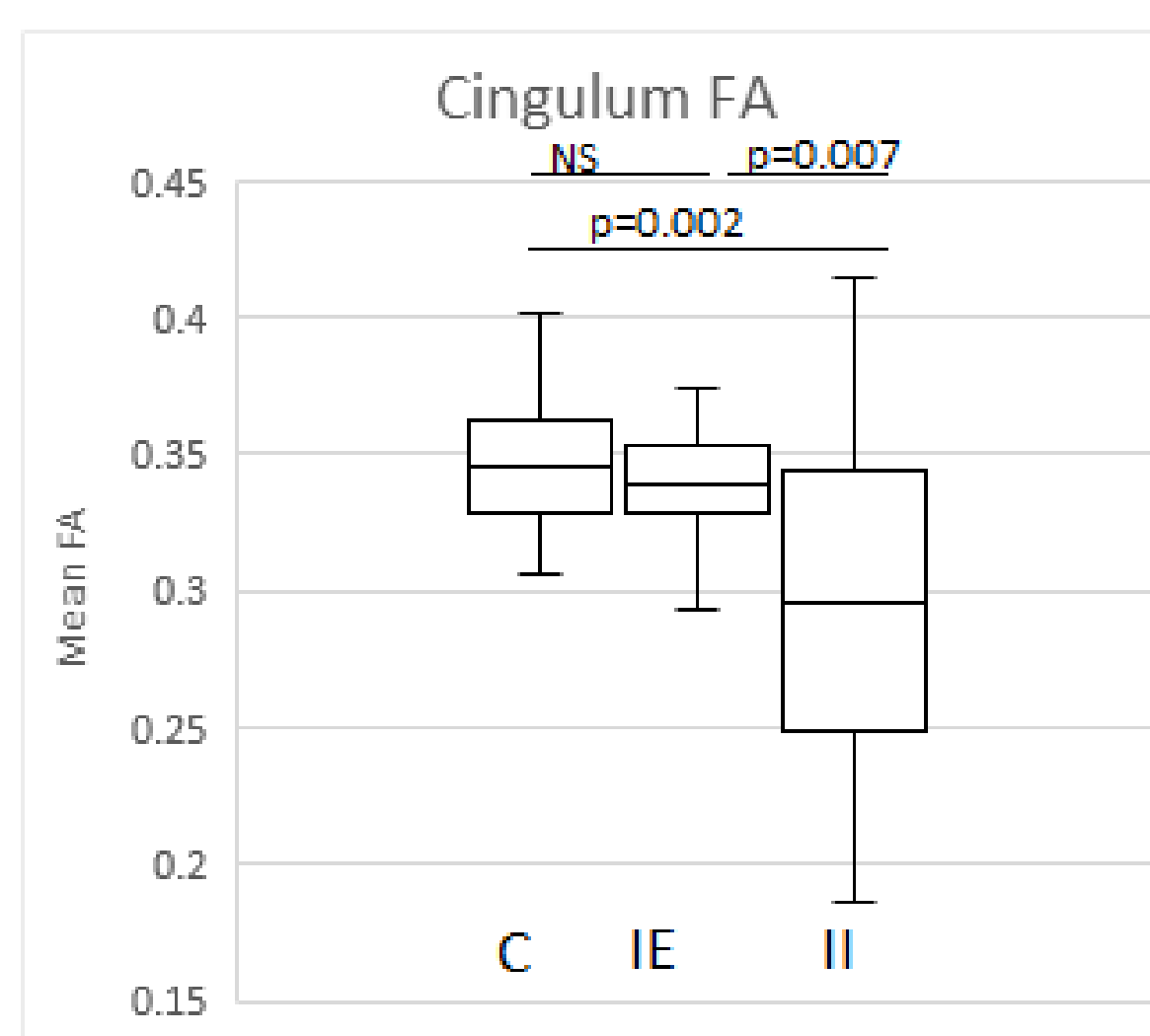
To examine whether gliomas affect the structure of limbic white matter tracts, and whether these changes correlate with tumor location and size.

Methods

We conducted a retrospective study of 33 glioma patients who underwent preoperative DTI and examined their cingulum, fornix, and uncinate fasciculus. With fractional anisotropy (FA) and mean diffusivity (MD) as measures of axonal integrity, tracts of the non-tumor hemisphere (contralateral), the tumor hemisphere and traversing the tumor (ipsilateral inclusive), and the tumor hemisphere without traversing the tumor (ipsilateral exclusive) were compared. Additionally, we examined the correlation between MD/FA and tumor size/location.

Results

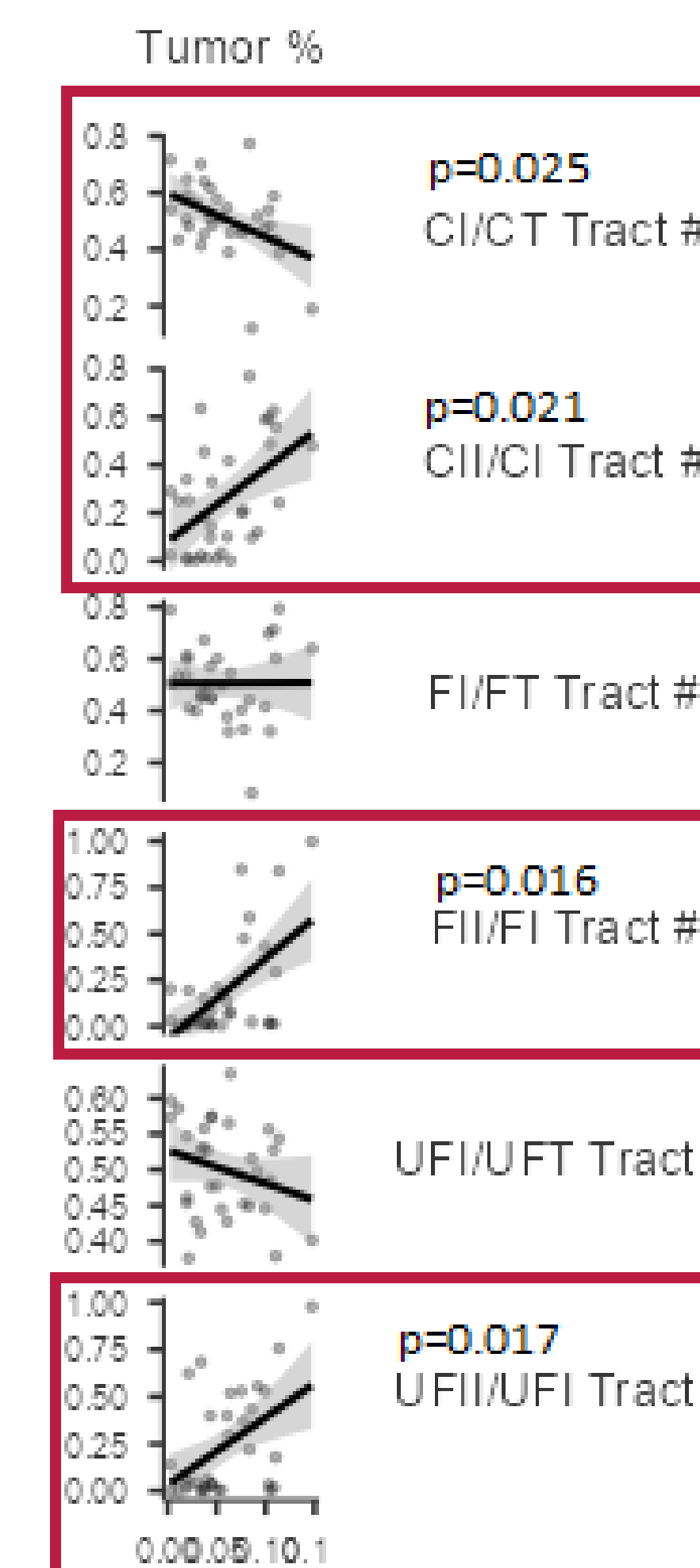
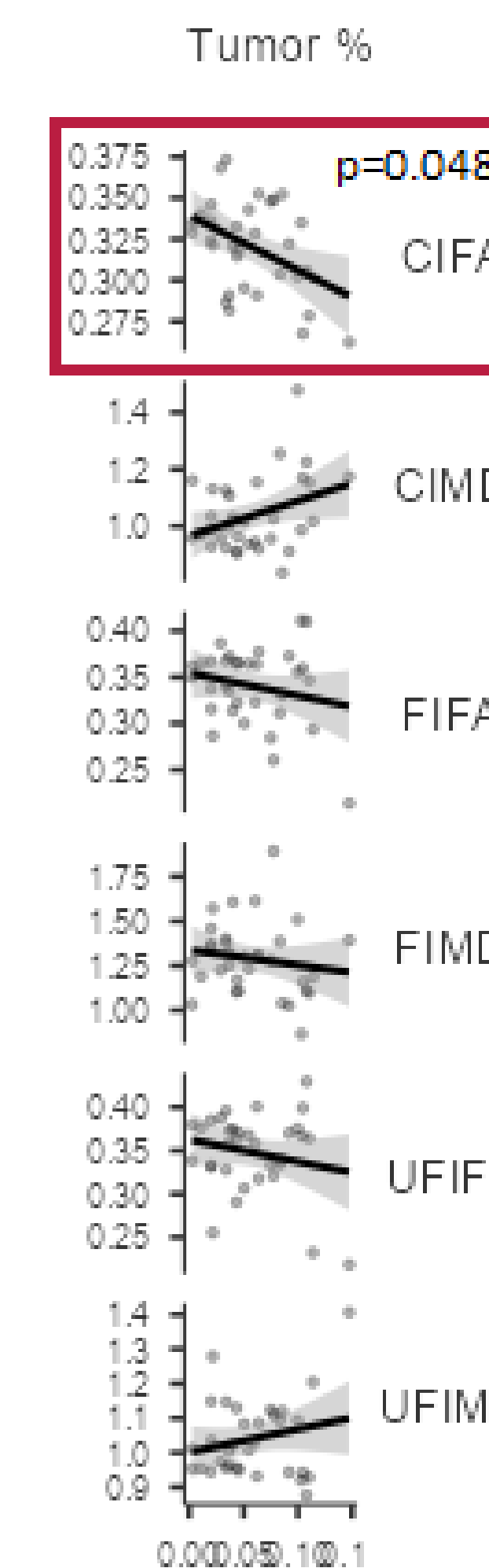
Pairwise Comparison between Contralateral, Ipsilateral Inclusive, Ipsilateral Exclusive Fractional Anisotropy (FA) and Mean Diffusivity (MD) Values of Cingulum and Uncinate Fasciculus



C = Tracts contralateral to tumor
IE = Tracts ipsilateral to tumor that does not cross the tumor
II = Tracts ipsilateral to tumor that cross the tumor

Bottom Right: Correlation between Tumor Volume (as % of total brain volume) and Number of White Matter Tracts in the Cingulum (C), Fornix (F), and Uncinate Fasciculus (UF) (as a ratio of Ipsilateral/Total (I/T) and Ipsilateral Inclusive/Ipsilateral (II/I))

Bottom Left: Correlation between Tumor Volume (as % of total brain volume) and FA and MD Values of the Ipsilateral Cingulum, Fornix, and Uncinate Fasciculus



Conclusion

Our study, one of the first to specifically examine axonal integrity of limbic related tracts, shows that gliomas could increase white matter tract numbers and impact tract structure. Localized impact on white matter integrity is in line with previous observations. These findings support DTI as a pre-op planning tool; white matter of significant limbic tracts are affected by gliomas and this change is measurable.

In our cohort:

- Gliomas affected the FA/MD of the Cingulum and Uncinate Fasciculus when comparing that of the tumor side versus the non-tumor side
- The larger the glioma, the lower the cingulum FA
- The larger the glioma, the more white matter tracts that cross the tumor

References

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