Whole Brain Tractography for Non-Neoplastic Lesions; An Analysis Based on Fractional Anisotropy

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Introduction

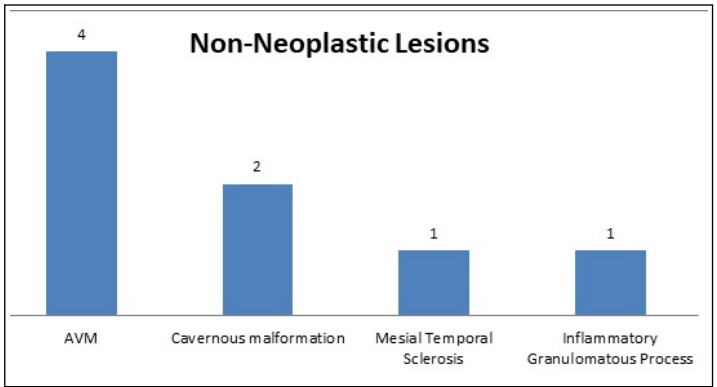
Diffusion Tensor Imaging (DTI) delineates white matter (WM) tracts, their orientation, and microstructural integrity on imaging (1,2). WM tracts may get affected by neoplastic and non-neoplastic lesions of the brain (3,4). DTI in neoplastic lesions of the brain is well studied with little data on WM interactions with non-neoplastic lesions of the brain (3,4,5). We present a study of non-neoplastic lesions in the brain and their effect on WM tracts studied using DTI.

Methods

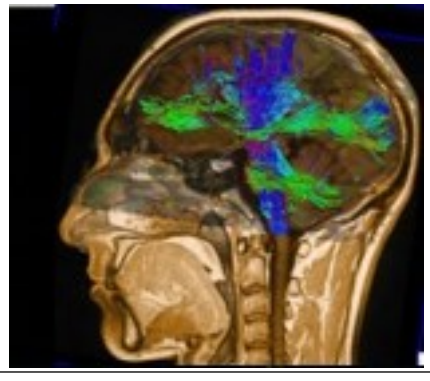
This was a retrospective review of DTI images of non-neoplastic lesions of the brain. Tractography images of patients who underwent surgery using neuronavigation Synaptive DTI protocol were included in the study. Quality control was performed by clinical application specialist. The images were interpreted by a consultant neuroradiologist. Arcuate fasciculus (AF), Corticospinal tract (CST), optic radiation, corpus callosum (CC), and superior longitudinal fasciculus (SLF) were categorized as either edematous, displaced, infiltrated or disrupted, using fractional anisotropy values at 3Tesla MR console.

Results

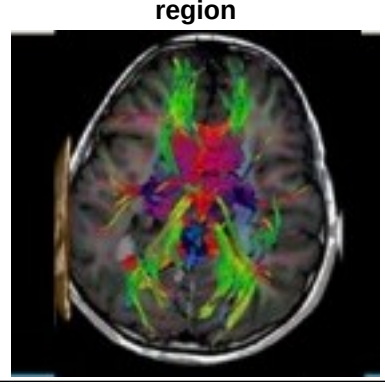
Eight patients were included in the study. This included 4 cases of arteriovenous malformation (AVM), two cases of arachnoid cysts, and one case of each mesial temporal sclerosis and granulomatous inflammatory process. Two lesions were located in the left frontal lobe, while one lesion was located in the left frontoparietal and parieto-occipital lobe each. Mesial temporal sclerosis involved left temporal One lesion was located in the right frontoparietal and parieto-occipital lobe each. One of the arachnoid cysts was located in the third ventricle and had displaced CST laterally. One AVM which was previously ruptured had disrupted SLF. None of the other lesions disrupted any of the white matter tracts. Other lesions caused either displacement or infiltration of the adjacent tracts.



Relationship of WM tracts to AVM in left parietal region



Relationship of WM tracts to AVM in right parietal region



Conclusions

Non-neoplastic brain lesions tend to either displace or infiltrate white matter tracts. We observed a case of SLF disruption caused by AVM rupture which could be explained by previous hemorrhage.

Learning Objectives

Non-neoplastic lesions do not appear to disrupt white matter tracts. A knowledge of the WM tract relationship with the lesions can help chose a safe surgical corridor.

References

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