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CORPUS CALLOSUM DAMAGE IN HEAVY MARIJUANA USE: PRELIMINARY EVIDENCE FROM DIFFUSION TENSOR TRACTOGRAPHY AND TRACT-BASED SPATIAL STATISTICS

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Heavy marijuana use has well established long term consequences for cognition and mental health, but the effect on brain structure is less well understood. We used an MRI technique that is sensitive to the structural integrity of brain tissue combined with a white matter mapping tractography technique to investigate structural changes in the corpus callosum (CC). Diffusion tensor imaging (DTI) was obtained in eleven heavy marijuana users who started using marijuana in early adolescence and eleven age matched controls. Mean diffusivity (MD) and fractional anisotropy (FA) (which measure structural integrity and tract coherence, respectively) were analysed within the corpus callosum which was spatially defined using tractography and tract-based spatial statistics (TBSS). MD was significantly increased in marijuana users relative to controls in the region of the CC where white matter passes between the prefrontal lobes. This observation suggests impaired structural integrity affecting the fibre tracts of the CC and is in keeping with previous reports of altered and diversified activation patterns in marijuana users. There was a trend towards a positive correlation between MD and length of use suggesting the possibility of a cumulative effect of marijuana over time and that a younger age at onset of use may predispose individuals to structural white matter damage. Structural abnormalities revealed in the CC may underlie cognitive and behavioural consequences of long term heavy marijuana use.