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Investigating white matter changes in auditory cortex and association fibres related to speech processing in noise-induced hearing loss: a diffusion tensor imaging study

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Abstract
Background: This study explores the impact of noise-induced hearing loss (NIHL) on the microstructural integrity of white matter tracts in the brain, focusing on areas involved in speech processing. While the primary impact of hearing loss occurs in the inner ear, these changes can extend to the central auditory pathways and have broader effects on brain function. Our research aimed to uncover the neural mechanisms underlying hearing loss-related deficits in speech perception and cognition among NIHL patients. Methods: The study included two groups: nine bilateral NIHL patients and nine individuals with normal hearing. Advanced diffusion tensor imaging techniques were employed to assess changes in the white matter tracts. Regions of interest (ROIs), including the auditory cortex, cingulum, arcuate fasciculus, and longitudinal fasciculus, were examined. Fractional anisotropy (FA) values from these ROIs were extracted for analysis. Results: Our findings indicated significant reductions in FA values in NIHL patients, particularly in the left cingulum, right cingulum, and left inferior longitudinal fasciculus. Notably, no significant changes were observed in the auditory cortex, arcuate fasciculus, superior longitudinal fasciculus, middle longitudinal fasciculus, and right inferior longitudinal fasciculus, suggesting differential impacts of NIHL on various white matter tracts. Conclusions: The study's findings highlight the importance of considering association fibres related to speech processing in treating NIHL, as the broader neural network beyond primary auditory structures is significantly impacted. This research contributes to understanding the neurological impact of NIHL and underscores the need for comprehensive approaches in addressing this condition. © The Author(s) 2024.

Author Keywords
Auditory cortex; DTI; NIHL; Speech; White matter

Index Keywords
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