Oral

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Oral 9

[O-9-06] Early psychosis is characterized by white matter abnormalities in fiber structures supporting local connectivity

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Background

While long-range white matter (WM) connectivity has been widely studied in schizophrenia-spectrum disorders (SSDs), recent evidence highlights the importance of local network disruptions. Superficial white matter (SWM), located between cortex and WM, comprises short association fibers supporting local connectivity. As SWM matures in the latter stages of development relative to deep WM structures, it may be particularly vulnerable to neurodevelopmental disruptions observed in SSDs. However, its complex fiber architecture and proximity to the cortex pose challenges for conventional diffusion tensor imaging.

Methods
To overcome these limitations, we applied an advanced diffusion MRI approach to assess fiber density (FD) in the SWM of 78 individuals with early psychosis (age 22.0 ± 3.0, 45% female) and 78 controls (age 21.8 ± 3.2, 45% female).

Results
Early psychosis individuals showed widespread reductions in SWM FD, particularly in occipital, temporal, parietal, and insular regions, whereas no significant group differences were detected using fractional anisotropy from tensor imaging. FD reductions were associated with reduced cortical thickness ($p<0.0005$, $r=0.32$) and surface area ($p=0.006$, $r=0.23$), indicating coordinated cortex-WM alterations. SWM FD was associated with processing speed ($p=0.0029$) and working memory ($p=0.048$). Further, SWM mediated the relationship between cortical structure and processing speed in frontal and parietal regions.

Conclusions
These findings highlight SWM, supporting local network connectivity, as a tissue compartment showing widespread alterations in SSDs. By implementing an advanced diffusion MRI technique, we were able to assess changes that were specific to the complex WM at the cortical boundary, and to demonstrate functionally important alterations in this difficult-to-characterize tissue compartment.