Modic changes linked to microbial differences in lumbar spine

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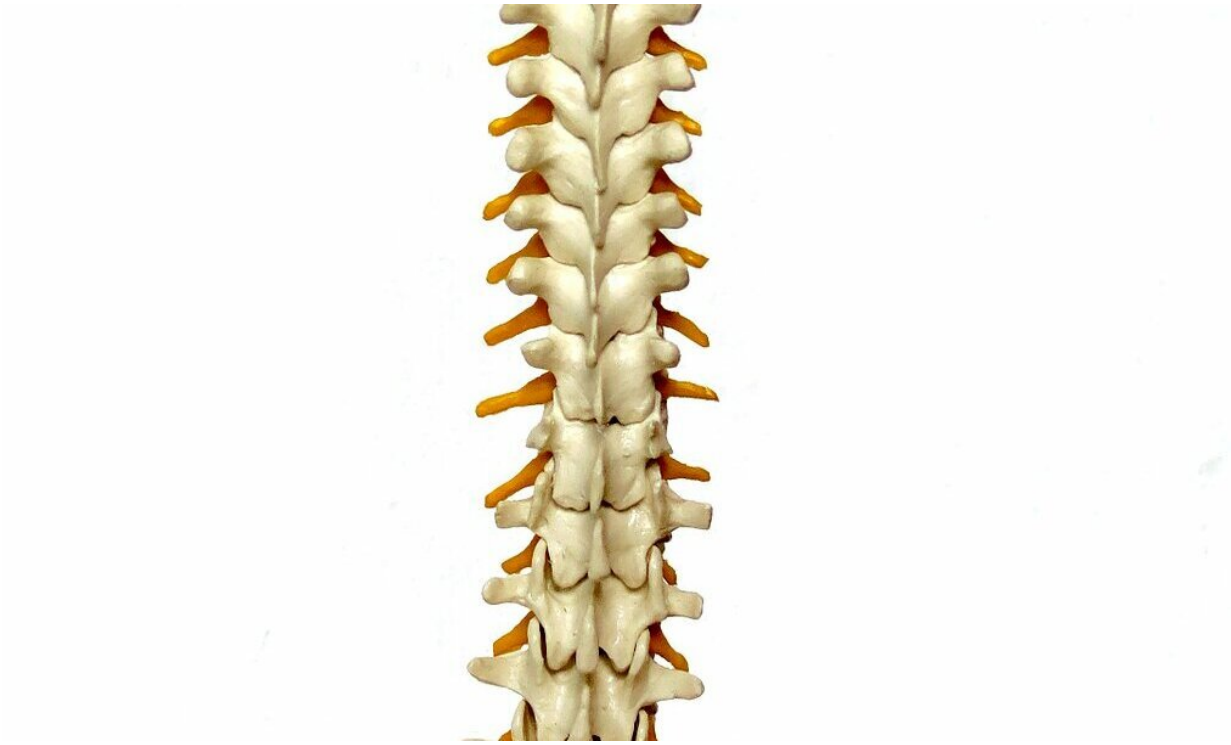

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Among patients undergoing lumbar spinal fusion, the presence of Modic changes is associated with differences in microbial diversity and metabolites in the lumbar cartilaginous endplates (LCEPs), reports a study in *The Journal of Bone and Joint Surgery*.

"These findings suggest that changes in the microbiota may disrupt unsaturated fatty acid metabolism within the LCEP microenvironment, potentially influencing the onset and progression of Modic changes [MCs]," according to the new research by Jiayu Chen of The Affiliated Hospital of Kunming University of Science and Technology & The First People's Hospital of Yunnan Province, Yunan, China, and colleagues.

New data on microbiota and metabolic differences associated with Modic changes

Modic changes refer to the presence of subchondral changes of the vertebral endplate detected on magnetic resonance imaging. Previous studies have linked Modic changes to an increased risk of severe low back pain as well as increased severity and recurrence among patients undergoing surgery for lumbar disc herniation. "[E]lucidating the pathogenesis of MCs is an important step toward improving surgical outcomes for lumbar disc disease," the researchers write.

Some evidence has suggested that Modic changes may be the result of an inflammatory response to the intervertebral disc microbiota. Dr. Chen and colleagues compared the microbiota and metabolic features of LCEPs from spinal fusion patients with and without Modic changes.

The study included LCEP specimens from 54 patients undergoing spinal fusion for lumbar disc degenerative disease. Of these, 30 had signal changes on T1 and T2 MRI sequences consistent with Modic changes. Patients with Modic changes had more severe, more advanced lumbar disc degeneration.

Potential implications for diagnosis and treatment of Modic changes

On species diversity analysis of 16S rRNA, both alpha diversity and beta diversity were significantly different between patients with and without Modic changes. Of 26 genera that differed in abundance between groups, nine were identified as potential biomarkers for Modic changes.

Metabolomic analysis showed a "distinct metabolite profile" in specimens with Modic changes, with 19 enriched metabolites involved in nine key pathways. Multiomic correlation analysis identified five genera—Caulobacteraceae (unclassified), Mycobacterium, Clostridium, Blautia and Bifidobacterium—associated with dysregulated fatty acid metabolism and potential contributors to the pathogenesis of Modic changes.

The microbiota and metabolic differences were also correlated with clinical factors including height, weight, and body mass index; Oswestry disability score; and low back and leg pain.

The findings suggest that "LCEPs may play a key role in MC pathogenesis by promoting inflammation and cartilage degradation," the researchers write. They note some limitations of their preliminary analysis, which cannot determine any causal associations.

"Our study represents a foundational effort to examine the landscape of the microbiota and metabolites in patients with Modic changes," Dr. Chen and co-authors conclude. They believe the findings "may pave the way for novel diagnostics and therapeutic strategies" for clinical conditions related to Modic changes.

More information: Sunqi Nian et al, Landscape of the Lumbar Cartilaginous End Plate Microbiota and Metabolites in Patients with Modic Changes, *Journal of Bone and Joint Surgery* (2024). DOI: 10.2106/JBJS.23.00805