Modic type 1 changes

The relationship between the presence of pain and Modic type 1 changes has been examined in several studies. However, no study has assessed the relationships between pain severity or ODI and the total vertebral area of MT1 involvement.

After excluding any patients with type 2 or 3 MT changes, 49 patients diagnosed with LBP and MT1 changes demonstrated on MRI were included. MT1 involvement area, disc height, number of Schmorl's nodes, disc degeneration (Pfirrmann grading system), and the cross-sectional area of the lumbar muscles were obtained via MRI. Additionally, patient demographics, body mass indices, physical activity levels, and disability (ODI) scores were assessed.

The total vertebral area of MT1 involvement was significantly and positively correlated with ODI (p = 0.001). In the multivariate linear regression model wherein ODI was the dependent variable and age, mean Pfirrmann grade, total vertebral area of MT1 involvement, and sex were independent variables, only total vertebral area of MT1 involvement was significantly associated with ODI.

A significant positive correlation was noted between the extent of vertebral MT1 involvement and changes in ODI. Conversely, other MRI features of patients with LBP were not related to pain severity or ODI.

Sagittal T1w, T2w, and fat-suppressed fluid-sensitive MRI images of 100 consecutive patients (consequently 500 vertebral segments; 52 female, mean age 74±7.4 years; 48 male, mean age 71±6.3 years) were retrospectively evaluated.

Finkenstaedt et al., recorded the presence (yes/no) and extension (i.e., Likert-scale of height, volume, and end-plate extension) of Modic I changes in T1w/T2w sequences and compared the results to fat-suppressed fluid-sensitive sequences (McNemar/Wilcoxon-signed-rank test).

Fat-suppressed fluid-sensitive sequences revealed significantly more Modic I changes compared to T1w/T2w sequences (156 vs. 93 segments, respectively; p<0.001). The extension of Modic I changes in fat-suppressed fluid-sensitive sequences was significantly larger compared to T1w/T2w sequences (height: 2.53±0.82 vs. 2.27±0.79, volume: 2.35±0.76 vs. 2.1±0.65, end-plate: 2.46±0.76 vs. 2.19±0.81), (p<0.05). Modic I changes that were only visible in fat-suppressed fluid-sensitive sequences but not in T1w/T2w sequences were significantly smaller compared to Modic I changes that were also visible in T1w/T2w sequences (p<0.05).
In conclusion, fat-suppressed fluid-sensitive MRI sequences revealed significantly more Modic I end-plate changes and demonstrated a greater extent compared to standard T1w/T2w imaging.

When the Modic changes classification was defined in 1988, T2w sequences were heavily T2-weighted and thus virtually fat-suppressed. Nowadays, the bright fat signal in T2w images masks edema-like changes. The conventional definition of Modic I changes is not fully applicable anymore. Fat-suppressed fluid-sensitive MRI sequences revealed more/greater extent of Modic I changes.

Erosive degenerative disc disease, also known as Modic changes of type 1, is usually characterized by low back pain with an inflammatory pain pattern, as seen in spondyloarthopathies. (low SI on T1W images and high SI on T2W images) are associated with vascularized granulation tissue within subchondral bone, and indicate an ongoing active degenerative process. Modic type I change can correspond to reversible local inflammation.

MRI appearance: hypointense on T1, hyperintense on T2

Likely inflammatory in origin, seem to be strongly associated with active low back pain and segmental instability, appear to predict excellent outcome following lumbar fusion.

The histology of type I shows disruption and fissuring of the endplate and vascularized fibrous tissues within the adjacent marrow. If contrast is administered, there will be enhancement of the endplate that may involve the disk and is presumably related to the vascularized fibrous tissue within the adjacent marrow.

Although further prospective studies, in which other preoperative modalities are used for the evaluation, is needed, data suggest the presence of Modic type 1 as a risk factor for discitis following laminectomy. Latent pyogenic discitis should be carefully ruled out in patients with Modic type 1. If lumbar laminectomy is performed for such patients, more careful observation is necessary to prevent the development of postoperative discitis.


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