The Effect of Lumbar Disc Degeneration on Positional Changes in the Lumbar Lordosis: a cross-sectional comparison with healthy controls

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Purpose

It is generally assumed that age related LDD leads to a flattened lumbar-lordosis. Therefore, we aim to examine the influence of Lumbar Disc Degeneration (LDD) on the lumbar lordosis in weight-bearing positional magnetic resonance imaging (pMRI).

*Left: The conventional diagnostic MRI position. Right: The new positional position with the potential of increasing the diagnostic value of MRI of the lumbar spine. All participants completed first the standing pMRI followed by the supine MRI in this 0.25 T open MRI scanner (G-Scan, ESAOTE, Italy)*
Methods and materials

Patients with Low Back Pain (LBP) score above 40 on a 0-100 mm visual analogue scale (VAS) both during activity and rest; and a sex and age-decade matched control group without LBP were scanned in the supine and standing position in a 0.25 T open MRI unit (G-Scan). All images were evaluated and LDD was graded by Pfirrmann’s LDD classification on a scale from 1 to 5.

Subsequently, the L2-to-S1 lumbar lordosis angle was measured (Modified Cobb’s angle).

Lumbar disc degeneration

Grade I

Grade II

Grade III

Grade IV

Grade V

A Classification and images reprinted from Pfirrmann et al.
Results

Thirty-eight patients with an average VAS of 58 (±13.8) mm during rest and 75 (±5.0) mm during activity and 38 healthy controls were included.

Specific degenerative MRI findings were frequent in both groups (i.e. protrusion, extrusion, HIZ, and annular tears, Modic changes and Schmorl’s nodes spondylolisthesis and spinal stenosis. Only the frequency of disc bulging was significant higher in patients compared with the healthy controls.
Results

The lumbar disc degeneration mean sum-score of the Pfirrmann’s gradings (LDD-score) was higher in the patients, and was significantly associated with age in both patients and controls (P < 0.001).

The LDD scores were uncorrelated with the lordosis angle in both standing and supine position, but for the controls it correlated with the supine-to-standing lordosis angle change (Pearson: r = -0.54, P< 0.001).
Conclusion

- MRI disc changes were common in both groups, whereas, the summation of the lumbar Pfirrmann’s grades (LDD score) was significantly higher in the patients.

- Lumbar disc degeneration’s was unassociated with lordosis angle in both supine and standing position.

- In individuals without LBP, age related disc degeneration may lead to increased lumbar stiffness since LDD scores were inversely correlated with lordosis angle change when changing from supine to standing position.
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