# Magnetic Resonance Imaging and Low Back Pain in Adults: A Diagnostic Imaging Study of 40-Year-Old Men and Women

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Kjaer, Per PT, MSc, PhD; Leboeuf-Yde, Charlotte DC, MPH, PhD; Korsholm, Lars PhD; Sorensen, Joan Solgaard MD; Bendix, Tom MD, Dr Med Sci

FROM ABSTRACT:
Study Design.
Cross-sectional cohort study of a general population.

Objective.
To investigate abnormal lumbar spine magnetic resonance imaging (MRI) findings, and their prevalence and associations with low back pain (LBP).

Summary of Background Data.
The clinical relevance of various abnormal findings in the lumbar spine is unclear. Distinguishing between inevitable age-related findings and degenerative findings with deleterious consequences is a challenge.

Methods.
Lumbar spine MRI was obtained in 412, 40-year-old individuals.

Predefined abnormal MRI findings were interpreted without any knowledge of patient symptoms.

Associations between MRI abnormalities and LBP were calculated.

Results.
Most abnormal MRI findings were found at the lowest lumbar levels.

Irregular nucleus shape and reduced disc height were common (>50% of individuals).

Relatively common (25% to 50%) were hypointense disc signal, anular tears, high intensity zones, disc protrusions, endplate changes, zygapophyseal joint degeneration, asymmetry, and foraminal stenosis.

Nerve root compromise, Modic changes [Modic changes are irregularities found at the vertebral end plates, including Scheuermann disease and Schmorl nodes], central spinal stenosis, and anterolisthesis/retrolisthesis were rare (<25%).

Most strongly associated with LBP were Modic changes and anterolisthesis (4 times more likely to be associated with LBP than other findings).
Significantly positive associations with all LBP variables were seen for hypointense disc signals, reduced disc height, and Modic changes.

All disc abnormalities except protrusion were moderately associated with LBP during the past year.

Conclusion.
Most degenerative disc abnormalities were moderately associated with LBP.

The strongest associations were noted for Modic changes [irregularities found at the vertebral end plates, including Scheuermann disease and Schmorl nodes], and anterolisthesis.

THESE AUTHORS ALSO NOTE:

For a large proportion of patients with low back pain (LBP), it is difficult to obtain a specific diagnosis because almost all lumbar structures are possible sources of pain.

MRI is frequently applied as a diagnostic tool in the search for sources of pain.

"There are several disc-related and bone-related abnormalities that can readily be observed on lumbar MRI, including reduced signal intensity, irregularities of the nucleus's shape, reduced disc height, anular tears (AT), high intensity zones (HIZ), changes in disc contour (bulging, protrusion, extrusion, and sequestration), nerve root compromise, endplate irregularities, Modic type changes, central and foraminal stenosis, degeneration and asymmetry of Z- joints, and anterolisthesis and retrolisthesis."

"However, the clinical significance of such findings is debatable, and many studies have shown that abnormalities are commonly found in asymptomatic individuals."

For the purpose of the present report, the following questions were used:
1. Have you had trouble with the lowest part of your back:
a. during the past 7 days
b. during the past month
c. during the past 12 months
2. Have you sought care during the past year due to trouble with the lowest part of your back? (please select the items that best apply to you):
a. general practitioner
b. emergency service
c. specialist
d. outpatient clinic
e. hospitalized
f. chiropractor
g. physical therapist
h. other treatment

"In this analysis, all individuals presenting with disc protrusions, extrusions, or sequestrations were excluded."

This study included 199 males and 213 females.

No statistically significant differences in low back pain was noted between men and women.

Most positive MRI findings were noted at the L4-S1 vertebral levels.

Extruded and sequestrated discs were rare (<1%).

"Among the nondisc findings, the prevalence rates of endplate and Modic changes are noteworthy (30% and 22%, respectively)."

"Strong positive associations were seen only for Modic changes and anterolisthesis regarding LBP."

DISCUSSION:

This is the first study to investigate the associations between MRI findings and LBP in a large sample from the general population involving subjects of the same age.

In this study, the prevalence rate of LBP in the past year was 69%. **[WOW]**

"Only Modic changes and anterolisthesis were strongly associated with LBP year."

This study found a strong association between LBP year and anterolisthesis.

The prevalence rate of anterolisthesis was 3.4% in this study. In other studies the range is between 4% to 7%.

"In one prospective study on non-symptomatic adults, MRI defined degenerative disc findings were significantly correlated to LBP at follow-up, and progression of degenerative findings were linked to LBP," increasing the risk of LBP by 250%. **[Important]**
[Borenstein DG, O'Mara J-WJ, Boden SD, et al. The value of magnetic resonance imaging of the lumbar spine to predict low-back pain in asymptomatic subjects: A seven-year follow-up study. J Bone Joint Surg Am 2001;83-A:1306-11.]

"No significantly positive associations were noted for disc protrusions." **[Important]**

CONCLUSIONS

"Modic changes [vertebral end plate irregularities, including Scheuermann disease and Schmorl nodes], are the most clinically relevant single MRI finding in relation to LBP. They are strongly associated with LBP year, are consistently

associated with all LBP variables, and have acceptable specificity and PPV for LBP year."

"We also suggest that degenerative disc findings, especially hypointense signal and reduced height, should be considered clinically relevant."

KEY POINTS FROM AUTHORS:

1) Modic [vertebral end plate irregularities including Scheuermann disease and Schmorl nodes] changes are consistently and strongly associated with LBP.

2) Degenerative disc changes, such as loss of signal and height, are consistently associated with LBP, but the association is weaker than vertebral end plate changes.

3) Disc herniation and nerve root compromise are not associated with LBP.

KEY POINTS FROM DAN MURPHY

1) In this study, 69% of 40-year-olds experienced low back pain in the past year.

2) Women and men have the same prevalence of LBP.

3) 25% to 50% of 40-year-olds have hypointense disc signal, annular tears, high intensity zones, disc protrusions, endplate changes, zygapophyseal joint degeneration, asymmetry, and foraminal stenosis.

4) In this study, the strongest association with LBP was Modic vertebral end-plate changes [including Scheuermann disease and Schmorl nodes], and anterolisthesis.

5) The prevalence rate of anterolisthesis was 3.4% in this study. In other studies the range is between 4% to 7%.

6) Most positive MRI findings were noted at the L4-S1 vertebral levels.

7) Studies have shown that asymptomatic MRI defined degenerative disc findings in adults, are significantly (by 250%) correlated to LBP at follow-up evaluations, and the degenerative findings progress. **[Important: this would argue the need to treat asymptomatic degenerative changes of the lumbar spine in an effort to slow progression of degenerative changes and reduce incidence of LBP.]**

8) Importantly, in this study, disc herniation and nerve root compromise were not associated with LBP.