



# Are Modic changes related to outcomes in lumbar disc herniation patients treated with imaging-guided lumbar nerve root blocks?



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## ABSTRACT

**Objective:** To compare outcomes after imaging-guided transforaminal lumbar nerve root blocks in MRI confirmed symptomatic disc herniation patients with and without Modic changes (MC).

**Methods:** Consecutive adult patients with MRI confirmed symptomatic lumbar disc herniations and an imaging-guided lumbar nerve root block injection who returned an outcomes questionnaire are included. Numerical rating scale (NRS) pain data was collected prior to injection and 20–30 min after injection. NRS and overall improvement were assessed using the patient's global impression of change (PGIC) scale at 1 day, 1 week and 1 month post injection. The proportion of patients with and without MC on MRI as well as Modic I and Modic II was calculated. These groups were compared for clinically relevant 'improvement' using the Chi-squared test. Baseline and follow-up NRS scores were compared for the groups using the unpaired *t*-test.

**Results:** 346 patients are included with MC present in 57%. A higher percentage of patients without MC reported 'improvement' and a higher percentage of patients with MC reported 'worsening' but this did not reach statistical significance. The numerical scores on the PGIC and NRS scales showed that patients with MC had significantly higher pain and worse overall improvement scores at 1 month ( $p=0.048$  and  $p=0.03$ ) and a significantly lower 1 month NRS change score ( $p=0.04$ ).

**Conclusions:** Patients with MRI confirmed symptomatic lumbar disc herniations and MC report significantly lower levels of pain reduction after a lumbar nerve root block compared to patients without MC.

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## 1. Introduction

Since Dr. Michael Modic first identified and categorized the bone marrow signal intensity changes often observed adjacent to degenerated discs on lumbar MRI scans and distinguished these findings from septic arthritis [1], 'Modic changes' have been the focus of considerable research interest [2–18]. Now that the reliability of identifying and categorizing these bone marrow changes is established [6–10], it is important to determine whether or not Modic changes are clinically relevant MRI abnormalities. However, the research evidence at this point in time appears to remain somewhat controversial.

Several researchers have published interesting studies addressing the link between low back pain symptoms and Modic changes and so far the research evidence supports this relationship [4,5,11,17,18] particularly for the inflammatory or Modic type I changes [17]. Both Weishaupt et al. [4] and Braithwaite et al. [5] demonstrated that the presence of Modic changes on MRI scans was strongly linked with painful lumbar disc derangement on discography. Researchers at the University of Southern Denmark identified specific patterns of low back pain frequency, severity, and associated activity restrictions in patients with Modic changes plus degenerative disc disease compared to patients without Modic changes and suggested that this subgroup of patients may actually have *specific* low back pain [11]. Two recent studies have also found a positive relationship between the presence of Modic changes and disc herniations at the same spinal level in both the lumbar and cervical regions [15,16].

Studies evaluating whether or not the presence of Modic changes on MRI influence the outcomes from various therapeutic interventions report mixed results however. Fayad et al. [13]

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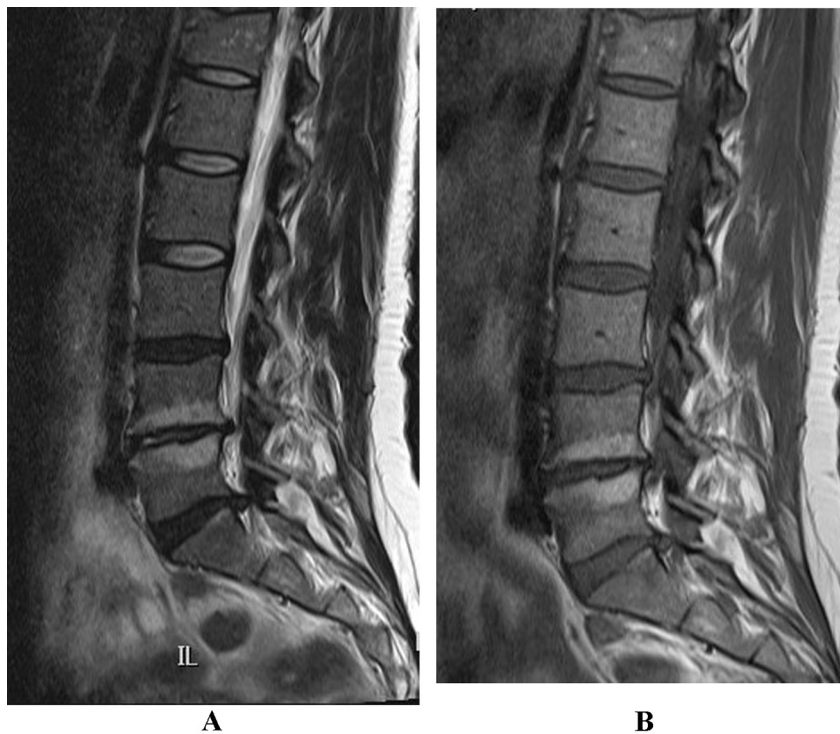
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**Fig. 1.** Modic type I changes in a patient with disc herniation at the L5–S1 level showing high signal in the bone marrow on T2-weighted (A) and low signal on T1-weighted (B) slices.

and Buttermann [14] both found that patients with the inflammatory pattern of Modic changes (type I) (Fig. 1) had significantly better short-term outcomes after intradiscal injection of corticosteroids compared to patients with the fatty Modic change pattern

(type II) (Fig. 2) or no Modic changes. Additionally, Buttermann also reported that these same patients with Modic type I changes even responded better to epidural steroid injections compared to patients without Modic changes [14]. Studies evaluating the



**Fig. 2.** Modic type II changes at L4-5 showing high signal intensity on both T2-weighted (A) and T1-weighted (B) slices.

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