



DO MODIC CHANGES HAVE PREDICTIVE VALUE FOR THE RECURRENCE OF LUMBAR DISC HERNIATION?

MODİC DEĞİŞİKLİKLERİ BEL FITİĞİNDA NÜKS AÇISINDAN ÖNGÖRÜSEL DEĞER TAŞIR MI?

Uygur ER¹,
Ersin ÖZEREN²,
Mehmet Orçun AKKURT³,
Pınar ÖZİŞİK¹

¹Koru Hospital Department of Neurosurgery

²Koru Hospital Department of Orthopaedic Surgery

³Aksaray State Hospital, Department of Neurosurgery, Aksaray.

SUMMARY

Objective: The aim of this study is to investigate whether Modic changes by MRI are associated with the likelihood of recurrence of herniation in the lumbar discs.

Patients and Methods: Twenty-six consecutive patients with recurrent lumbar disc herniation were included in the study. In this period, 1,427 patients were operated on for lumbar disc hernia.

Results: Modic changes at the relevant vertebral level were detected in 20 patients (76.9%) who were aged between 30 and 68 years old. The rate of detection of Modic changes in 1,401 patients with no recurrence in the two year follow-up period was only 13.8%. The recurrence of lumbar disc hernia was seen postoperatively between 6 and 12 months for four patients, between 12 and 18 months for 17 patients, and between 18 and 24 months for five patients.

Conclusion: Modic changes in the MRIs of patients with lumbar disc herniation increase the rate of recurrence and shorten the time of recurrence. Prospectively designed studies on wider populations are required for further elucidation.

Key words: Lumbar disc herniation, Modic change, MRI, Recurrent lumbar disc herniation

Level of evidence: Prospective (Case-control) study, Level III

ÖZET

Amaç: Bu çalışmanın amacı MRG' de tanımlanan Modic lezyonlarının nüks açısından önemi olup olmadığının araştırılmasıdır.

Hastalar ve Yöntem: Çalışma grubuna peşi sıra gelen 26 nüks bel fitiği hastası alındı. Çalışma süresi içinde 1427 bel fitiği hastası ameliyat edildi.

Sonuçlar: Yaşları 30 ile 68 yaş arasında değişen hastaların 20'sinde (% 76,9) ilgili disk mesafesinde Modic değişikliği saptandı. İki yıllık izlem süresi içinde nüksü görülmeyen 1401 hastada ise Modic değişiklik saptanma oranı sadece % 13,8 idi. Hastaların 4' ü 6-12 ay arasında, 17' si 12-18 ay arasında, 5' i ise 18-24 ay arasında nüks ile geldiler.

Son çıkarım: Bel fitiği nedeni ile cerrahi yapılan hastalarda MRG'de Modic değişiklikleri olması nüks olasılığını artırmakta, nüks zamanını kısaltmaktadır. Bu konuda geniş hasta toplulukları ile yapılacak prospektif çalışmalara ihtiyaç vardır.

Anahtar kelimeler: Bel fitiği, Modic değişikliği, MRG, nüks bel fitiği

Kant Düzeyi: Prospektif klinik çalışma, Düzey III

Address: Uygur Er,
Söğütözü C., 4. Sk., No:22/7,
06510, Ankara
Tel: 0 505 5892355
E-mail: uygurer@gmail.com
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INTRODUCTION:

The lifetime prevalence of lower back pain (LBP) is as high as approximately 80% in all communities^{8,23}. Some LBP results from lumbar disc herniation (LDH), and surgery is a frequent treatment method with well-established indications. An inadequate outcome of 5–20% after lumbar disc surgery has been reported in the literature^{6,17}. The recurrence of herniation is 3–19%, and this is the most important indicator for an inadequate surgical outcome^{4,5,7}. Magnetic resonance imaging (MRI) is the gold standard for diagnosis of LDH¹⁴. MRI not only shows degenerated and herniated disc material, but also demonstrates other lesions. The most prominent lesions in MRI that are thought to be associated with intervertebral discs (IVD) and LDH are subchondral signal abnormalities called Modic changes (MCs), which have been detected in the vertebral corpus (Figures-1,2)¹³. The aim of this study is to investigate whether or not MCs in spinal MRIs are a factor in the recurrence of LDH.



Figure-1. A hypointense lesion in endplates of the L4 and L5 vertebrae in T1-W sagittal MRI (a), and the same lesion seen hyperintensely in T2-W images (b) points to a Modic type I change.

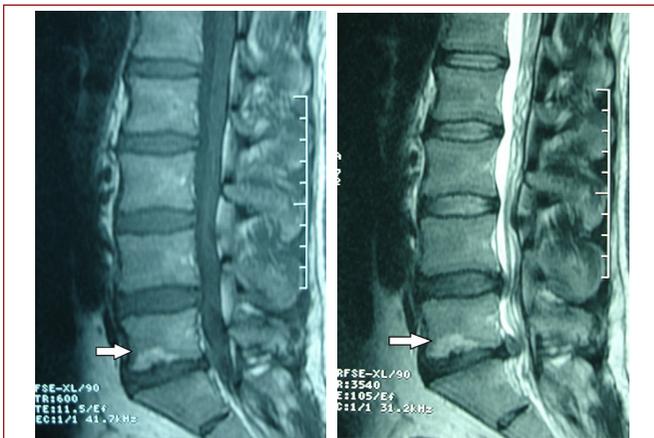


Figure-2. A hyperintense lesion in both T1-W (a) and T2-W (b) sequences in endplates of the L5 and S1 vertebrae shows a Modic type II change.

PATIENTS AND METHODS:

Twenty-six consecutive patients with recurrent LDH in accordance with the inclusion criteria were included in the study. During this period of study, 1,427 patients with LDH that met the inclusion criteria received standard microdiscectomy. All of the 26 patients included were admitted to hospital with LBP, and LDH was detected in the previous intervertebral level and side by MRI in the two year follow-up period. Reoperation was decided upon after neurological examination by the surgical council.

Inclusion criteria:

1. Male or female patients with LDH aged between 25 and 70 years;
2. Patients with LBP complaints with radicular signs on neurological examination;
3. Patients with single-level and one-sided LDH at the L4–5 or L5–S1 intervertebral level detected by MRI;
4. Patients who were diagnosed with recurrent LDH at the same level and side as the previous LDH by MRI in the two year follow-up period, and for whom the surgical council decided reoperation was appropriate.

Exclusion criteria:

1. Patients with LDHs at more than one level or who had bilateral symptoms and/or LDHs;
2. Patients with lumbar listhesis and/or stenosis, even when these lesions were not found at the same intervertebral level as the LDH;
3. Patients who had had previous lumbar surgery;
4. Patients with diabetes mellitus, obstructive lung disease, hypertension, osteoporosis and malignancy;
5. Patients who had an operation without standard microdiscectomy;
6. Patients who had not had any previous surgery in the hospitals of the contributing authors, but who were admitted to these hospitals for recurrent LDHs;
7. Patients who were admitted to the hospital with LBP after an initial operation, who were found to have LDH at another intervertebral level, and patients with a new lesion in their MRIs that had not been detected previously;
8. Patients with any kind of spine deformity.

In total, 26 patients (12 male and 14 female) who met the above criteria were included in the study. Neurological examination of the patients was recorded. Lateral and posteroanterior direct upright roentgenograms of patients were performed, as femoral heads were seen. MRIs were performed and Modic type I and II lesions were recorded.

RESULTS:

The patients were aged between 30 and 68 years, with a mean of 47.7 years. LDH was detected at the L5–S1 intervertebral level in eight patients, and at the L4–5 level in 18 patients. A right dominance (right/left=8/4) was seen in male patients, and a reverse state was detected in female patients (R/L=5/9). MCs were detected at the relevant intervertebral level in 20 patients (76.9%). MCs were seen in 66.7%⁸ of male patients and 85.7% (12) of female patients (Table-1). The rate of MCs in 1,401 patients without recurrent LDH in the two year follow-up period was only 13.8% (193 patients). Type I MCs were seen at a rate of 30.0% (6 patients), and type II were seen at a rate of 70.0% (14 patients) for patients with recurrent LDH. Type I MCs were seen at a rate of 22.3% (43 patients), and type II MCs were seen at a rate of 77.7% (150 patients) for patients without recurrent LDH (Table II). Recurrent LDH was seen in six patients between 6 and 12 months, in 17 patients between 12 and 18 months, and in five patients between 18 and 24 months.

Table-1. Gender, side and intervertebral level of recurrent lumbar disc herniations.

LEVEL	MALE (n=12)			FEMALE (n=14)			n=26	
	RIGHT	LEFT	T	RIGHT	LEFT	T		
L4-5	6	2	8	3	7	10	18	
L5-S1	2	2	4	2	2	4	8	
T	8	4	12	5	9	14	26	

Table-2. Modic changes in patients with or without recurrences.

Recurrence	Modic changes				
	Type I	Type II	T	None	T
R+ (n=26)	6	14	20	6	26
R- (n=1401)	43	150	193	1208	1401
T (n=1427)	49	164	213	1214	1427

DISCUSSION:

MCs were first defined in 1987¹⁹, and were classified as Modic after one year¹⁵. To date, their etiopathogenesis and role in the development of IVD degeneration are not clear¹², but asymptomatic patients are rarely encountered²⁴. While some studies in the literature have found a correlation between MCs, particularly type I, and the development of IVD degeneration^{12,18}, other studies have claimed that MCs are irrelevant to IVD degeneration and LDH¹¹. However, a majority of studies on this topic suggest that there is a correlation between LBP and MCs^{2,10,22}. In 2011, Borg et al.

demonstrated that MCs, especially type I, are associated with three different structural pathologies: pedicle fractures, facet fractures, and facet degeneration².

The prevalence of type I MCs has been given as between 1.7% and 59% in various studies^{2,10,11,16}. Type I and II MCs were detected in 14.9% of patients in this patient study. This rate was 76.9% in patients with recurrent LDH and only 13.8% in patients without recurrent LDH. This striking difference implies that MCs not only cause disc degeneration or accelerate existing degeneration, but also lead to the development of recurrent LDHs.

Although the etiopathogenesis of MCs and their role in the development of IVD degeneration are not clear, there are two main theories concerning the development of these lesions^{9,25}. The mechanical theory claims that MCs develop under improper axial loading¹. Improper axial loading evokes microfractures in the vertebral endplates, which results in inflammation of the bone marrow¹⁹. The infectious theory points to a bacterial infection that spreads from the relevant IVD to the endplates^{3,20}. As seen in this present study, MCs may play a role in the recurrence mechanism. This finding seems to support the mechanical theory, because continued improper axial loading after surgery may trigger mechanical deterioration, with the second herniation at the same intervertebral level. A correlation between segmental hypermobility and MCs²¹ can explain why patients who have MCs in their first MRIs recur more frequently than others.

It can be seen that the presence of MCs in the first MRI correlates with the recurrence in the present study. At the same time, MCs may give a rough indication of recurrence time. Recurrent LDHs were seen between 12 and 18 months in 17 patients (65.4%). Although there are no studies of recurrence time in the literature for comparison, in the present study, the fact that four out of five patients with recurrence between 18 and 24 months have no MCs in their MRIs may be significant. With reference to this finding, it can be claimed that MCs may shorten the recurrence time, as the probability of recurrence increases.

The most important limitation of this study is its retrospective design. Prospectively designed studies with large patient populations are needed. A less significant potential limitation of this study is that the LDHs were not classified radiologically. It may be claimed that different types of LDHs are likely to have different recurrence rates⁶. This claim must be considered in future studies.

Patients with MCs in MRI have a greater likelihood of recurrence. These lesions may also give a rough indication of recurrence time. Prospectively designed studies with larger patient populations are needed to reach stronger conclusions as to whether or not to add a stabilization procedure to surgery.

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