Original Article

Late appearance of low back pain relating to Modic change after lumbar discectomy

ABSTRACT

Background: In practice of neurosurgery, we find that a wide number of patients referred for refractory low back pain have a history of lumbar discectomy. In a large number of them, magnetic resonance imaging (MRI) studies detect Modic changes (MCs). The aim of this study is to determine the relationship between emergence of MC and low back after lumbar discectomy.

Materials and Methods: Three hundred and fifty-eight patients with a medical history of discectomy had a MC at the level of the operated disc without any other discopathy. They have been selected from among the 1154 patients operated for lumbar disc herniation over 5 years.

Results: Two hundred and fourteen patients (67.30%) had not presented MCs on preoperative MRI.

Conclusion: Our study awakens a strong presumption about the relationship between emergence of MC after lumbar discectomy.

Keywords: Low back pain, lumbar spine degenerative disease, Modic change

INTRODUCTION

A main indication for magnetic resonance imaging (MRI) is degenerative lumbar spine exploration. It enables a complete assessment of degenerative diseases of spine. Normal disc is composed by chondrocytes and collagen fibers, lying in proteoglycan matrix. This composition allows to disc to absorb the impact of shocks.[1-6]

Disc degeneration (discopathy) is characterized by dehydration and increase in NP collagen content.[7-10] Degeneration of the intervertebral discs is accompanied by marrow changes of adjacent vertebral endplates in more than half the cases. These changes can be detected on MRI.[11,12] The initial lesions consist of subchondral bone changes and superficial eroded bone. Changes occur also in the hematopoietic marrow.[12] In 1988, Modic proposed his classification concerning vertebral endplates' modifications in discopathy.[13,14] In the everyday practice of Department of Neurosurgery, we find that a wide number of patients referred for refractory low back pain have a history of lumbar discectomy. In relatively large numbers of them, MRI studies detect Modic changes (MCs). These observations led us to review and analyze our patient's records to determine whether discectomy can cause MCs or at least accelerate it in the long term. This acceleration has been suggested in some studies.[1,2] However, most studies focused on MCs in the immediate postoperative period andnot in the long term.[3-5]

MATERIALS AND METHODS

Between January 2010 and September 2017, We reviewed files of 38,521 patients all sent to our Departments for low back pain. Patients who had radiculagia or intermittent

Keyvan Mostofi, Babak Gharaei Moghaddam[1], Morad Peyravi[2]

Department of Neurosurgery, Centre Clinical, Chirurgie De Rachis, Soyaux, France, [1]Department of Neurosurgery, Neurosurgical Clinic of Dr Gharaei, Tehran, Iran, [2]Department of Neurosurgery, Werner Forssmann Hospital, Academic Hospital of Charité – Universitätsmedizin Berlin, Germany

Address for correspondence: Dr. Keyvan Mostofi, Department of Neurosurgery, Centre Clinical, Chirurgie de Rachis, Soyaux, France.
E-mail: keyvan.mostofi@yahoo.fr

Access this article online	
Website: www.jcvjs.com	Quick Response Code
DOI: 10.4103/jcvjs.JCVJS_25_18	

How to cite this article: Mostofi K, Moghaddam BG, Peyravi M. Late appearance of low back pain relating to Modic change after lumbar discectomy. J Craniovert Jun Spine 2018;9:93-5.

claudication were excluded from the study. Patients who had other degenerative disease such as facet joint syndrome, canal stenosis, Baastrup disease, and scoliosis were also excluded from the study. Among remaining patients with discopathy (19,261 patients), 1156 patients (6%) had a history of discectomy for lumbar disc herniation, over 5 years earlier. Discopathy is qualified using grading system proposed by Pfirrmann.[15] We took into consideration only the patients with Grade IV and V. Six hundred and eighty-two patients had more than one level discopathy. They were excluded from the study. Four hundred and seventy-five remaining patients had a single level discopathy. Among them, 358 patients (75.37%) had a MC at the level of the operated disc without any other discopathy. Among them, only 318 patients possessed preoperative MRI. These 318 patients were included in the study. All patients had a conservative treatment for low back pain on average for 17 months.

RESULTS

Figure 1 and Table 1 demonstrate the number of patients, the affected level by MCs.

Among the included patients, 214 patients (67.30%) had not presented MCs on preoperative MRI. All of 318 patients had been operated for a discectomy on average 7.47 (5–19) years earlier. One hundred and four patients (32.70%) had already presented MCs before surgery. Among 214 patients who presented late postoperative MCs, 169 patients (78.97%) had Modic I. forty-four patients (20.56%) had Modic II. One patient (0.47%) had Modic III. Figure 2 demonstrates the ratio of late postoperative MCs.

Table 1: The number of patients and the affected level by Modic changes

Level	Modic 1	Modic 2	Modic 3
L4	2	1	0
L5	115	33	0
S1	114	52	1
Total number	231	86	1

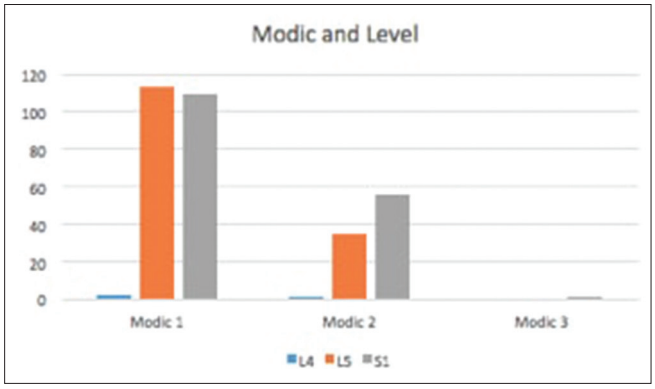

Figure 1: The number of patients, the affected level by Modic changes

DISCUSSION

On MRI, MC type 1 corresponds to endplates' hyposignal T1 and hypersignal T2. During performed biopsies, Modic found that there were inflammatory reaction and hypervascularity in endplates in MCs type 1.[12-16] Type 2 corresponds to endplates T1 and T2 hypersignal. This stage is compatible with a bone marrow fatty involution.[12,13] Type 3 corresponds to endplates T1 and T2 hyposignal and would be compatible theoretically with poor vascularity fibrosis and hyperostosis.[13,17]

Unlike Modic initial finding, there is no always a linear evolution. MC type 1 can be stable, normalize, or worsen. MC type 2 can be stable or proceed into type 1.[9,10,12,18,19]

Data collated and analyzed show at least in two-thirds of the cases; late MC changes have been observed. Among these 214 patients, more than 78% presented MC type 1. Although classically, transition of MC type 1 to type 2 corresponds to reduce low back pain,[20,21] our data cannot support the above claims. Pain intensity was not commensurate with MC types 1 or 2. No specific cause was found in our patients. Apart from MC and discopathy, we did not find other degenerative diseases which could explain low back pain in patients. Patients with MC type 2 had also refractory low back pain. We did not find linear evolution in MC types. Among patients with MC type 1, we found MC type 2 before surgery. Among patients with MC type 2, we discovered patients with Type 1 and 2 and not MC change before surgery. Only one patient had MC type 3. Due to insufficient number of patients, interpretation would be impossible. He had had MC type 1 before surgery – 3 years earlier. The analysis of this results reveals that MC evolution is undetermined and MC can be

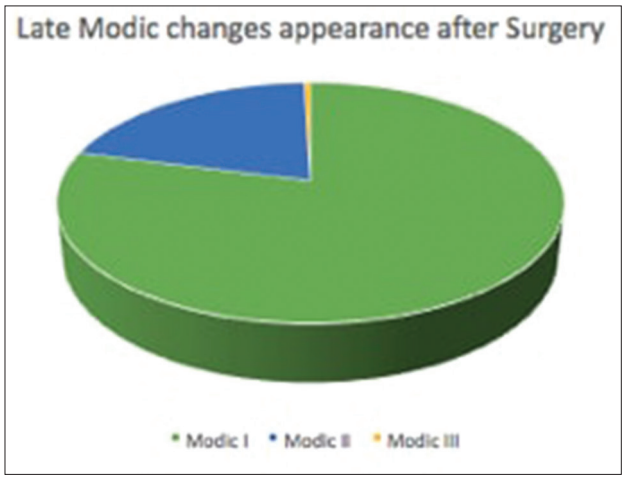

Figure 2: Distribution of Modic changes according to affected level

reversible in both directions. The results also indicate that the presence of MC in patients who had lumbar discectomy is most probably the effect of the latter. It seems that discectomy provokes endplate modification and low back pain in the long run.

CONCLUSION

Our study awakens a strong presumption about relationship between emergence of MC after lumbar discectomy. To determine if discectomy really causes MC and consequently low back pain, a prospective study is necessary. That study should also permit to follow patients more closely after surgery at first evidence of MC and low back pain.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Myers M, Weinandt B. Understanding end plate changes associated with disc surgery. Spine J 2002;2 Suppl:112-3.
2. Rahme R, Moussa R, Bou-Nassif R, Maarrawi J, Rizk T, Nohra G, *et al.* What happens to modic changes following lumbar discectomy? Analysis of a cohort of 41 patients with a 3- to 5-year follow-up period. J Neurosurg Spine 2010;13:562-7.
3. Laustsen AF, Bech-Azeddine R. Do modic changes have an impact on clinical outcome in lumbar spine surgery? A systematic literature review. Eur Spine J 2016;25:3735-45.
4. Rahme R, Moussa R. The modic vertebral endplate and marrow changes: Pathologic significance and relation to low back pain and segmental instability of the lumbar spine. AJNR Am J Neuroradiol 2008;29:838-42.
5. Modic MT. Modic type 1 and type 2 changes. J Neurosurg Spine 2007;6:150-1.
6. Rannou F, Poiraudeau S, Revel M, Corvol M. Biologie du disque interverébral. Getroa-Gel OPUS XXXV Le Rachis GETROA. Montpellier: Sauramps Médical; 2008. p. 17-22.
7. Hadjipavlou AG, Tzermiadianos MN, Bogduk N, Zindrick MR. The pathophysiology of disc degeneration: A critical review. J Bone Joint Surg Br 2008;90:1261-70.
8. Pearce RH, Thompson JP, Bebault GM, Flak B. Magnetic resonance imaging reflects the chemical changes of aging degeneration in the human intervertebral disk. J Rheumatol Suppl 1991;27:42-3.
9. Kerttula L, Luoma K, Vehmas T, Grönblad M, Kääpä E. Modic type I change may predict rapid progressive, deforming disc degeneration: A prospective 1-year follow-up study. Eur Spine J 2012;21:1135-42.
10. Kuisma M, Karppinen J, Niinimäki J, Kurunlahti M, Haapea M, Vanharanta H, *et al.* A three-year follow-up of lumbar spine endplate (Modic) changes. Spine (Phila Pa 1976) 2006;31:1714-8.
11. de Roos A, Kressel H, Spritzer C, Dalinka M. MR imaging of marrow changes adjacent to end plates in degenerative lumbar disk disease. AJR Am J Roentgenol 1987;149:531-4.
12. Bordet B, Borne J, Fantino O, Bousquet JC, Coillard S. Analyse IRM selon modic: Intérêt dans les lombalgies. Résonances Eur Rachis 2000;13:1650-2.
13. Modic MT, Steinberg PM, Ross JS, Masaryk TJ, Carter JR. Degenerative disk disease: Assessment of changes in vertebral body marrow with MR imaging. Radiology 1988;166:193-9.
14. Morel M, Morillon D, Chastanet P, Demondion X, Duquesnoy B, Cotten A. Affections Mécaniques et Dégénératives du Rachis Thoracolombaire Cotten, A. Paris: Elsevier Masson; 2008.
15. Pfirrmann CW, Metzdorf A, Zanetti M, Hodler J, Boos N. Magnetic resonance classification of lumbar intervertebral disc degeneration. Spine (Phila Pa 1976) 2001;26:1873-8.
16. Zhang YH, Zhao CQ, Jiang LS, Chen XD, Dai LY. Modic changes: A systematic review of the literature. Eur Spine J 2008;17:1289-99.
17. Emch TM, Modic MT. Imaging of lumbar degenerative disk disease: History and current state. Skeletal Radiol 2011;40:1175-89.
18. Malghem J, Cotte A, Laredo JD, Maldague B, Sintzoff S, Tavernier T, *et al.* IRM de rachis lombaires " asymptomatiques " étude multicentrique du GETROA. In: Le Rachis Lombaire Degenerative. Montpellier: Sauramps Medical; 1998. p. 119-28.
19. Weishaupt D, Zanetti M, Hodler J, Boos N. MR imaging of the lumbar spine: Prevalence of intervertebral disk extrusion and sequestration, nerve root compression, end plate abnormalities, and osteoarthritis of the facet joints in asymptomatic volunteers. Radiology 1998;209:661-6.
20. Albert HB, Kjaer P, Jensen TS, Sorensen JS, Bendix T, Manniche C, *et al.* Modic changes, possible causes and relation to low back pain. Med Hypotheses 2008;70:361-8.
21. Järvinen J, Karppinen J, Niinimäki J, Haapea M, Grönblad M, Luoma K, *et al.* Association between changes in lumbar modic changes and low back symptoms over a two-year period. BMC Musculoskelet Disord 2015;16:98.