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 and not 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...
claudication were excluded from the study. Patients who had other degenerative disease such as facet joint syndrome, canal stenosis, Baatrup 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.

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

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       |
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.

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**Conflicts of interest**

There are no conflicts of interest.

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