Changes Of Residual Disc Bulging After Successful Lumbar Microdiscectomy On Postoperative MR Imaging

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Introduction: We often experience patients with lumbar disc herniation on whom radicular symptoms improve relatively soon after surgery, although postoperative magnetic resonance (MR) imaging shows a mass protruding into the spinal canal from the posterior aspect of the intervertebral disc that compresses the nerve root and dural sac and that persists for a long period. According to some reports, it is possible to differentiate among residual herniation, and scar tissue by observing the pattern of enhancement on gadolinium-enhanced MR imaging. However, there have only been a few reports on the changes of such lesions over time. In the present study, we observed the changes of the protruding residual mass and radicular symptoms after surgery over time.

Methods: We examined 57 patients (Male: 29, female: 28, 19-67 years [mean age: 42.5 years]) with a diagnosis of lumbar disc herniation who were underwent microdiscectomy and could be followed up for more than 2 years. All of the patients initially received adequate conservative treatment such as administration of analgesics and epidural block, but elected to have surgery because their sciatica was not alleviated. Period of sciatica to surgery: 5.3±3.5 months. MR imaging was performed before surgery and 3, 6, 12 and 24 months afterwards. MR imaging studies were performed on a 1.5-T permanent magnet (Signa General Electric). \(T_1\) and \(T_2\)-weighted spin-echo images under condition of 5 mm slice thickness, 50% interslice gap, 256×256 matrix and four excitations. The distance between the posterior edge of the disc and the top of the mass protruding into the spinal canal measured before and after surgery. We calculated the reduction rate (Fig.1). In base of such percentage, the patients were classified in four different groups as follows. Group A is no residual mass protruding into the spinal canal. Group B is very small residual mass protruding into the spinal canal that reduction rate is from 75 to 100%. Group C showed the reduction rate is from 25 to 75%. Reduction rate of Group D is below 25%. Group C and D showed the compression of the dural sac by an epidural mass.

Results: Radicular symptoms improved in all patients within 3 months after surgery. However, more than half of the patients had a residual mass compressing the dural sac, but with time progression the number of the patients decrease and after 24 months, 76% patients had very small (Group B) or no residual mass (Group A) (Fig.2). These groups did not show the dural sac and nerve root compression. Improved in all patients within 3 months after surgery, but recurred in one of the patients in whom mass protrusion was still evident at 24 months after surgery. The residual mass decreased with time progression. 22.8% discs (Group C and D) showed the dural sac compression by an epidural mass 2 year
after surgery and we found the re-bulging of hernia in 5 out of 57 discs (8.8%) (Fig.3). However, these patients were asymptomatic and had not the recurrence radicular symptoms.

**Discussion:** There are some reports of postoperative MR imaging findings after successful lumbar discectomy (1-6). Boden (1) found compression of the dural sac by an epidural mass in 70% at 3 months after operation. And another and our study reported 20-45% of compression of the dural sac by an epidural mass at 6 months after surgery. In the present study, all patients showed rapid improvement of radicular symptoms after surgery, whereas MR imaging performed at 3 months postoperatively showed a residual mass protruding from the intervertebral disc into the spinal canal in more than half of the patients. The finding of an anterior epidural mass can be misinterpreted as recurrent or residual disc material. In our study, we found around 22.8% of residural bulging with dural compression 2 years after surgery, however no clear correlation was found between the improvement of symptoms and the postoperative MR imaging appearance. But if the recurrent radicular pain occurs, we have to diagnose the cause of recurrent disc hernia or periradicular fibrosis.

**Significance:** This study indicates that there are patients who have a residual mass in the spinal canal even after the improvement of radicular symptoms by surgery for lumbar disc herniation. This should be kept in mind when following up these patients postoperatively.

**Fig. 1.** Evaluation of persistent disc bulging after microdiscectomy on MRI findings. The distance between the posterior edge of the intervertebral disk and the top of the mass protruding into the spinal canal before surgery (a). Distance between the posterior edge of the intervertebral disk and the top of the mass protruding into the spinal canal from the disk after surgery (b). Reduction rate = a-b/a × 100 (%).

- **Group A** (Reduction rate = 100%): No residual mass protruding into the spinal canal.
- **Group B** (75% ≤ Reduction rate < 100%): Very small residual mass protruding into the spinal canal.
- **Group C** (25% ≤ Reduction rate < 75%): Moderate reduction in the protrusion of the mass compared with before surgery.
- **Group D** (Reduction rate < 25%): Protrusion is comparable to that before surgery.
Fig. 2. Time course of changes of the residual herniated mass

Fig. 3. MR imaging of asymptomatic re-bulging disc (41 years old, female, L4/5 disc herniation). In this study, we found around 8.8% (5/57 discs) of re-bulging 2 years after surgery, however no clear correlation was found between the improvement of symptoms and the postoperative MRI appearance. No clear correlation was found between the improvement of symptoms and the postoperative MRI appearance.