Microendoscopic discectomy for recurrent disc herniations

ROBERT E. ISAACS, M.D., VINOD PODICHETTY, M.D., M.S.,
AND RICHARD G. FESSLER, M.D., PH.D.

*Cleveland Clinic Florida Spine Institute, Weston, Florida; and Section of Neurological Surgery,
University of Chicago, Illinois*

Object. The use of microendoscopic discectomy (MED) for the treatment of primary lumbar disc herniations has become fairly well accepted; its role in recurrent disc herniations is less clear. The reluctance of many surgeons to use this technique stems, in part, from the concern of undertaking an endoscopic discectomy in a patient in whom the anatomy is distorted from a previous operation. It appears counterintuitive to operate through a limited working area when the traditional open approach for recurrence favors wider exposure of the surgical field. Given that operating on previously exposed tissue can be associated with even greater morbidity than on virginal tissue, the authors describe their experience with performing MED for recurrent disc herniation.

Methods. Unilateral MED was performed in patients with classic symptoms of lumbar radiculopathy, a previous operation at that level, and findings of recurrent disc herniation on magnetic resonance imaging. The approach was similar to a standard MED. Aided by fluoroscopic guidance, a working cannula was docked on the laminofacet junction at the level of the nerve root, with care taken to ensure a slightly more lateral initial trajectory. A good decompression of the nerve root could then be achieved through the use of the endoscope with preservation of the paraspinous musculature and much of the remaining facet capsule.

Ten consecutive patients undergoing the procedure were analyzed prospectively and compared with the previous 25 who underwent routine single-level MED. Use of the MED technique provided excellent visualization and decompression of the nerve root; no conversions to open procedures were necessary in either group. The average operative time in the experimental group was 98.5 minutes, with a mean blood loss of 33 ml and an approximate hospital stay of 7.3 hours. In this respect, there was no statistical difference between the two groups (analysis of variance, $p = 0.39$, 0.68, and 0.51, respectively). There was one cerebrospinal fluid leak in each group.

Conclusions. Microendoscopic discectomy for recurrent disc herniation can be safely performed without an increase in surgery related morbidity.

KEY WORDS • recurrent lumbar disc herniation • microendoscopic discectomy • minimally invasive spine surgery

Recurrent lumbar disc disease (reherniation on the same side and at the same level where a previous discectomy had been performed) can present a formidable challenge in the treatment of patients with radiculopathy. Initially, there exists a diagnostic challenge, differentiating disc material from residual bone hypertrophy and epidural scar formation. Secondly, there is a therapeutic dilemma. Failure to relieve stenosis (along with operating at the incorrect level) is one of most preventable causes for failed-back syndrome;^{3,17} however, this must be weighed against the fact that reoperation carries with it a higher rate of complications and a lower rate of success.²⁵ Finally, there is a progressively larger group of patients whose condition worsens following each operation, and the long-term success rate tends to drop in those patients who undergo multiple operations at the same level in the lumbar spine.^{2,4,10–12,15,17,25,27} Clearly, careful patient selection is of

paramount importance in determining a candidate for reoperation (Fig. 1).

The standard surgical technique for recurrence utilizes a more extensive tissue dissection to aid with exposure.¹³ Increased visualization facilitates tissue manipulation and increases the surgeon's understanding of the exposed anatomy. For this reason, despite acceptance of the MED technique, previous surgery in the same anatomical distribution is considered a contraindication to MED.⁶ The increased morbidity associated with repeated surgery may be partially related to operating in an area without smooth tissue planes and with distorted anatomy. This is known to increase the risks of surgery^{5,18–22} as well as postoperative pain. It is understandable given this distortion of anatomy and increased risks that one would want to maximize the area seen, not limit it as one does when working with an endoscope. Despite that, once comfortable with the use of an endoscope, we do not believe that we are "limited." By way of example, we present our experience in reoperation using the MED technique.

Abbreviation used in this paper: MED = microendoscopic discectomy.

Fig. 1. Axial contrast-enhanced magnetic resonance image obtained in a patient with recurrent disc herniation at L5–S1 prior to undergoing removal by a MED.

CLINICAL MATERIAL AND METHODS

Between October 2000 and June 2001, 10 consecutive patients underwent surgery for recurrent symptoms after previous discectomy by means of the MED technique. These patients were analyzed prospectively and compared with the last 25 patients who had undergone routine single-level MED. All of the operations were performed under the direction of the senior spinal neurosurgeon (R.G.F.) and were conducted at Shands Hospital, University of Florida or at the Chicago Institute of Neurosurgery and Neuroresearch. Patient data and radiographs were prospectively collected and compiled in a computer database. Additional study information and follow-up data were obtained from a combination of clinic files, medical records, and telephone interviews. Patients with evidence of lumbar instability that required fusion were excluded from the MED study group. Patients were all evaluated preoperatively with static and dynamic plain lumbar spine radiographs, magnetic resonance imaging, and/or computerized tomography myelography. Each patient in the study group had symptoms of lumbar radiculopathy, a previous operation at that level on the same side, findings of recurrent disc herniation, and residual lateral recess or foraminal stenosis on their preoperative imaging studies. The control group matched these characteristics, with the exception that the patients had had no previous surgery at that level.

SURGICAL APPROACH

The approach is similar to that of a standard MED, with slight modifications to help ensure that the approach does not encroach on the area of the previous operation. A stab incision is initially made approximately 1.5 cm off midline ipsilateral to and at the level of the disease. Under fluoroscopic guidance, a thin Steinmann pin is inserted through the fascia and paraspinal musculature, down to the facet of the target level. Particular care is taken at this point to ensure that the guidewire is docked on bone to avoid inadvertent dural penetration. From the standpoint of a standard MED, a slightly more lateral initial trajectory is needed to ensure seating on the facet. Once the guide-

wire has been docked on the facet in question, the skin incision is extended above and below the Steinmann pin for a total length of approximately 2 cm. A series of dilators are then sequentially inserted through the soft tissues, over which an 18-mm tubular retractor is then inserted. Real-time lateral radiographic images are obtained as often as needed to ensure a proper working trajectory throughout this process. The working channel (tubular retractor) is then attached to a flexible retractor affixed to the operating table siderail and locked in position at the junction of the lamina and lateral mass.

Once extraneous muscle is removed, a straight curette is used to define the lateral aspect of the previous laminectomy. This area may be further defined with an up-angled curette. A drill with a long endoscopic bit (such as, AM-8 bit with a Midas Rex or TAC bit with MEDNext drill) is used to thin the medial facet lateral to the previous laminectomy. In this manner, a few millimeters of “new” bone is removed. An angled curette is used to break off the remaining rim of bone between the old surgical defect and the new area of decompression. The result is a fairly standard decompression typical of an MED—the lateral recess and proximal foramen are cleared of any bone stenosis—while working through primarily virginal tissues. A good decompression of the nerve root is achieved through the use of the endoscope while preserving the majority of the remaining facet capsule and adjacent lamina.

Once the decompression is completed, the lateral aspect of the thecal sac is evident. In the case of disc disease, the dura is then mobilized medially in a similar fashion to the open procedure. When scar tissue limits this maneuver, care must be taken to work in the epidural space exposed laterally to free this restriction prior to mobilization. The disc space is incised and a discectomy is performed with endoscopic rongeurs.

RESULTS

The senior surgeon personally evaluated all patients. There was a 1:1 ratio of male/female patients in the experimental group which included five men and five women. The age range in the experimental group ranged from 22 to 59 years compared with 24 to 53 years in the repeated surgery group. For those who underwent reoperation, there was a predominance of surgeries at L5–S1 (seven or 70%) compared with only three at L4–5. In the control group, there was a slightly more equitable distribution of disease, with 60% at L5–S1 (15 of 25 patients), 32% at L4–5 (eight of 25 patients), and 8% at L3–4 (two of 25 patients). The ratio of male to female patients was essentially even (12 male/13 female). Use of the MED technique enabled excellent visualization and decompression of the nerve root; no conversion to an open procedure was necessary in either group. The average operative time in the revision group was 98.5 minutes with a mean blood loss of 33 ml and an approximate hospital stay of 7.3 hours compared with 88 minutes, 51.5 ml, and 10.7 hours, respectively for the control group. In these respects, there was no statistical difference between the two groups (analysis of variance, $p = 0.39, 0.68, \text{ and } 0.51$, respectively). There was one cerebrospinal fluid leak in each group (Table 1).

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TABLE 1
Comparison of results of repeated and primary MED
in 35 patients*

Variable	Repeated MED	Primary MED	p Value
male	5	12	NA
female	5	13	NA
op time (mins)	98.5	88	0.42
blood loss (ml)	33	25.2	0.73
hospital stay (hrs)	12.2	10.7	0.39
complication (no.)			
CSF leak	1	1	NA
recurrent disc	1	1	NA
infections	none	none	NA
neurological injuries	none	none	NA
delayed instability	none	none	NA

* Data were compared using the Student t-test. Abbreviations: CSF = cerebrospinal fluid; NA = not applicable.

Patient outcomes were graded using modified Macnab criteria¹⁴ (Table 2). According to these criteria, at an average follow up of 13.1 months (minimum 10 months), 40% of the patients had an excellent result, 50% good, and 10% had a poor outcome. The patient with the poor result was the one in whom a reherniation occurred, which required operative intervention. She is asymptomatic at 13 months and therefore no patient suffers from radiculopathy currently.

DISCUSSION

Recurrence after primary lumbar discectomy has been shown to occur in between 1.7 and 9% of patients.^{7,9,16,23,24,26,28,30} Reports vary greatly as to how successful repeated microdiscectomy is, ranging from 44 to 100% being able to return to work and 56 to 88% having relief of sciatica.^{5,8,18,25,28,29} When recurrence requires additional operative intervention, higher surgical morbidity exists both in the short and long term. Potential problems include an increased incidence of dural laceration and nerve root injury, an increased incidence of failure to relieve symptoms as well as the recurrence of symptoms, an increased incidence of need for reoperation, and an increase in postoperative pain.^{5,18,20-22}

To help minimize the risks associated with this operation, the common surgical approach to this problem is to

provide wide exposure of the normal adjacent anatomy prior to performing revision discectomy.¹³ Although this may increase postoperative pain, a less invasive and less morbid option in the treatment of disc herniation,¹⁹ MED, is thought to be contraindicated in the setting of recurrent disc herniation.⁶ Surgeons are therefore trained to perform a rather aggressive approach for this surgical entity. We believe our results mitigate against this philosophy.

Our revision operative and early postoperative results (operating room time, operative blood loss, hospital length of stay, operative complications) essentially mimic those in primary discectomy. In our experience, revision discectomy via the MED approach is no more difficult, takes no longer, and is not associated with a significantly higher complication rate than that which we have come to associate with initial MED. Clearly, however, our long-term results are not nearly as favorable as our primary MED data reported earlier,¹ in which we demonstrated 76% excellent and 94% good to excellent results (compared with 40% excellent and 90% good to excellent result in the current study) using Macnab criteria (Fig. 2). On the other hand, these represent different patient populations (primary compared with recurrent radiculopathy).

Results appear more favorable when we compare them with those of recurrent disc herniation derived from the literature. A previous retrospective outcome study of microsurgical reoperation following lumbar disc surgery in 92 patients by Ebeling and colleagues⁵ showed 22% of the patients reported an "excellent" surgical result, with an additional 30% of patients as "good," and 29% as "satisfactory." Therefore, 19% of these patients had a "poor" outcome and only approximately half (52%) would be graded as either good or excellent. In another prospective study of 19 recurrent lumbar discectomies reported on by Postacchini, et al.,²² seven patients (37%) reported an excellent result, with an additional 47% reporting a good outcome for a total of 84% good or excellent. In the report by Ozgen and colleagues,¹⁸ of 114 patients in whom a different outcome measure was used, 69% had a good outcome according to the Prolo scale (Fig. 3).

In our patients 100% were cured of sciatica (compared with 56–88% in previous studies^{5,8,18}) and 90% had good or excellent outcomes. Certainly, given the small size of our series, drawing any conclusions regarding the MED technique compared with the standard open technique is difficult; this was not our goal. Rather, when comparing

TABLE 2
Modified Macnab criteria used to assess clinical outcome in
patients undergoing MED

Grade	Description
excellent	free of pain; no restriction of mobility; able to return to normal work and activities
good	occasional nonradicular pain; relief of presenting symptoms; able to return to modified work
fair	some improved functional capacity; still handicapped and/or unemployed
poor	continued objective symptoms of root involvement; additional op intervention needed at index level, irrespective of repeated op or length of postop follow up

Fig. 2. Pie charts showing a comparison of 150 consecutive patients who underwent primary MED performed by Perez-Cruet, et al., with our revision MED results based on Macnab criteria.

Fig. 3. Pie charts showing a comparison of operative results in patients who have undergone revision lumbar discectomy.

surgical series in which the results of operative intervention for recurrent radiculopathy were reported, we see that our results compare well.

CONCLUSIONS

Microendoscopic discectomy is a potentially safe alternative in the treatment of recurrent radiculopathy. Repeated MED is not associated with a significant increase in operative time, blood loss, duration of hospitalization, or operative complications. Long-term data compare favorably with reports found in the literature. Further study is warranted to determine if minimally invasive surgery may lessen the morbidity we have come to associate with reoperation on the lumbar spine.

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Address reprint requests to: Robert E. Isaacs, M.D., Cleveland Clinic Florida Spine Institute, 2950, Cleveland Clinic Boulevard, Weston, Florida 33331. email: isaacsr@ccf.org.