Acta Orthop. Belg., 2009, **75**, 70-74

ORIGINAL STUDY

Microsurgical muscle-splitting approach for extracanalicular lumbar disc herniation : An analysis of 28 consecutive cases

Theodossios BIRBILIS, Dimitrios KOULALIS, Georgios MATIS, Efthymia THEODOROPOULOU, Kleo PAPAPARASKEVA

From the Department of Neurosurgery, Democritus University of Thrace Medical School, Alexandroupolis, Greece

Extracanalicular lumbar disc herniation (ELDH) is a specific clinical entity with compression of the nerve root in its extraforaminal course. The classical midline interlaminar approach is often difficult because the facet joint obviates a direct view of the nerve, and a partial facetectomy is required. Consequently, the risk of instability or continued postoperative back pain is increased. The authors performed a microsurgical muscle-splitting approach in an attempt to obtain a direct view of the disc rupture without sacrificing the facet joint. Twenty-eight consecutive patients were operated upon with this surgical procedure. A retrospective study showed that 10 patients (35.7%) had an excellent, 13 (46.4%) a good, 4 (14.3%) a fair and one (3.6%) a poor result, according to the Macnab criteria. No serious postoperative complications were noted. This procedure is safe, effective and less invasive.

Keywords : extracanalicular disc herniation ; far lateral disc herniation ; lumbar ; approach ; microsurgery ; muscle-splitting.

INTRODUCTION

Extreme lateral- or far lateral- or extracanalicular lumbar disc herniation (ELDH) (fig 3) is a specific clinical entity with compression of the nerve root outside the vertebral canal and in its extraforaminal-extracanalicular course (*2*). The classical midline interlaminar approach for exploration of ELDH is often difficult because the facet joint obviates a direct view of the course of the nerve root. Consequently a partial facetectomy is required, which increases the risk of instability or continued postoperative back pain (*10*).

The authors prefer a muscle-splitting microsurgical intertransverse approach, targeting the lateral part of the isthmus, in an attempt to reach the foraminal and extraforaminal space with a minimum of bone resection (*14*). This retrospective study describes their experience with 28 consecutive cases.

PATIENTS AND METHODS

General anaesthesia with endotracheal intubation, muscle relaxation, and artificial respiration were used with the patient in the kneeling position. In this position

■ Theodossios Birbilis, MD, PhD, Assistant Professor of Neurosurgery.

■ Dimitrios Koulalis, MD, PhD, Consultant Orthopaedic Surgeon.

■ Georgios Matis, MD, Resident.

■ Efthymia Theodoropoulou, PhD, Research Fellow.

■ Kleo Papaparaskeva, MD, Consultant.

Department of Neurosurgery, Democritus University of Thrace Medical School, Alexandroupolis, Greece.

Correspondence : Theodossios A. Birbilis, Department of Neurosurgery, University Hospital of Alexandroupolis, Democritus University of Thrace Medical School, GR-68100, Dragana Alexandroupolis, Greece.

E-mail : theobirbilis@yahoo.com

No benefits or funds were received in support of this study

Fig. 1. — The muscle-splitting approach (long arrow)

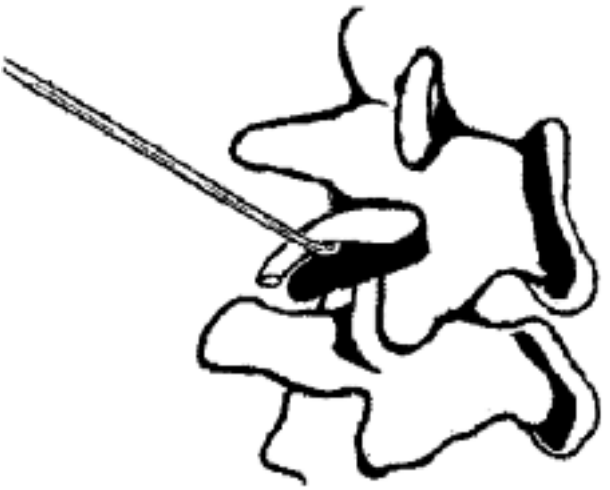

Fig. 2. — Drawing : extraforaminal root decompression without medial facetectomy.

and before draping, the anatomic segment to be explored was needle-marked under fluoroscopic guidance. After a 5 cm paramedian skin incision (two finger breadths from the midline), a microsurgical muscle-splitting approach (fig 1) through the erector spinae muscle was performed on the affected side to expose the appropriate facets, transverse processes, and intertransverse ligament. A self-retaining retractor was inserted in a slightly oblique position. After resection of the ligament the herniated disc was exposed, separated and removed with a forceps. This approach permits perfect root decompression without partial facetectomy or disruption of the pars interarticularis (isthmus) (fig 2).

The case records were retrospectively analysed with respect to history, operative protocol, pain questionnaires, visual analogue scales, physical examination, magnetic resonance imaging (MRI), computed tomography (CT) and dynamic (flexion/extension) radiographs. An operation was undertaken when signs and symptoms of root compression failed to improve or increased in spite of conservative treatment for two weeks, except in case of a recent motor deficit. The conservative care consisted of bed rest combined with analgesics and anti-inflammatory agents, muscle relaxants, CT-guided nerve root infiltration and physiotherapy. Between 1996 and 2000, 24 out of 52 patients (46%) with ELDH improved with conservative treatment, while 28 (54%) patients needed surgery. In the same 4-year-period a total of 1,037 patients underwent lumbar disc surgery, which means that the incidence of ELDH was 2.7%. There were 10 women (36%) and 18 men (64%) in the surgical ELDH group ; their ages ranged from 31 to 74 years (mean age : 62 years). Twenty-four patients (86%) suffered intense radicular pain of the femoral type, and 4 (14%) of the sciatic type. The mean preoperative visual analogue scale (VAS) was 7.7. All patients had minimal back pain. On physical examination, a positive Lasègue sign was found in 16 patients (57%), while the femoral stretch test was positive in 12 patients (43%). Motor weakness was present in 19 patients (68%) and a sensory deficit in 22 patients (79%). ELDH was confirmed by MRI in 21 patients (fig 3) and by CT in 7 patients. Myelography was not used. The extracanalicular lumbar disc herniations were found at L2-L3 in two cases, at L3-L4 in 10 cases, at L4-L5 in 16 cases, and at L5-S1 in no case.

RESULTS

The operative protocols revealed an average surgical time of 60 +/- 8 min and no need for peroperative blood transfusion. The outcome data for each patient were obtained by follow-up visits and by

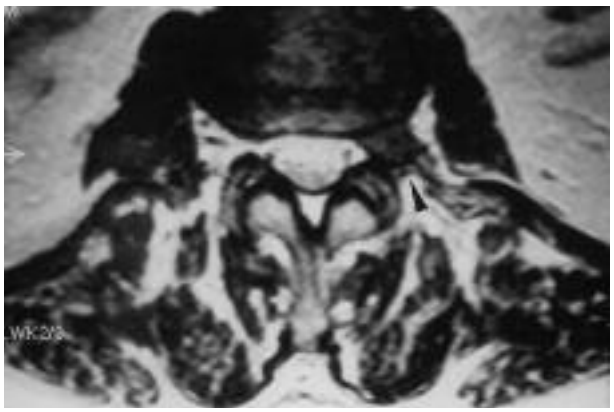

Fig. 3. — T2-weighted axial MRI showing extraforaminal hernia on the left (short arrow).

telephone interviews with the family physicians or the patients themselves. The mean follow-up period was 27 months (range : 12 to 49). The postoperative results were evaluated with respect to improvement of pain, motor weakness, sensory deficit, functional impairment and work activity (MacNab criteria).

Ten out of 28 patients (35.7%) had an excellent result with complete resolution of leg pain and without restriction of activity. Thirteen patients (46.4%) were left with occasional back or leg pain of sufficient severity to interfere with their ability to do normal work or to enjoy leisure hours : a good result. Four patients (14.3%) had only a fair result with an improved functional capacity, but were handicapped by intermittent pain of sufficient severity to curtail or modify work or leisure activities. These were older patients, in whom we had insisted with conservative treatment before operation. One patient (3.6%) had a poor result with insufficient improvement to enable an increase in activities. In this case an early recurrence was observed and reoperation was necessary, through the same approach, because a disc fragment had been left in place underneath the ganglion due to inadequate exploration towards the pedicle. Perineural scar formation was probably the reason for the final poor result. It was one of the first cases. The mean visual analogue scale (VAS) improved from 7.7 to 3.3.

No serious complications were noted (one wound infection and one intramuscular haematoma). None of the patients presented the neuropathic pain sometimes reported after the application of this technique. Motor weakness rapidly decreased from an incidence of 68% to 10% ; after 3-4 months under physical rehabilitation the incidence of motor deficits further decreased to 7%. Sensory deficits diminished from an initial incidence of 79% to 14%. No patient developed radiographic signs of vertebral instability postoperatively, and no stabilisation procedures were needed later on.

DISCUSSION

As the lumbar nerve roots exit the intervertebral foramen, they once again lie in juxtaposition to an intervertebral disc and are susceptible to compression, with subsequent radiculopathy (*9*). Radiculopathy caused by "extraforaminal" or "extracanalicular" lumbar disc herniation is less common than that caused by classical posterolateral disc herniation. The clinical entity "extreme lateral lumbar disc herniation" was first described by Abdullah *et al* (*1*) in 1974. The incidence ranges from 0.7 to 11.7% (*11,16*) of all lumbar disc herniations ; in the current series the incidence was 2.7%. A reliable diagnosis can be made only since improved imaging techniques have become available : high-resolution CT and MRI (*3,12*). Before the availability of these imaging methods, the diagnosis of lateral disc herniations rested solely on clinical, electromyographic, and nerve conduction findings (*2,9*). In this study, we confirmed the diagnosis with MRI in 21 out of 28 patients (75%) and with CT in 7 (25%). No myelograms were performed : the pathology is usually beyond the lateral extent of the dural root sleeve, so that this investigation is non-diagnostic, in accordance with the literature (*8*).

The clinical picture is a typical one with a history of sudden and intense leg pain, with minimal back pain. It is usually found in older patients because of the degree of associated degenerative changes, such as spinal canal stenosis, foraminal osteophytes and foraminal stenosis (*7*). The pain is severe enough to alter the sleep pattern dramatically. All 28 patients

described intense radicular pain (mean pre-operative VAS : 7.7). Compression of the dorsal root ganglion by the disc fragments is probably the explanation for the severe radicular pain. Clinical examination showed a monoradicular neurological syndrome with motor, sensory, or reflex changes, in the majority of the 28 patients.

The presence of an ELDH on CT or MRI is not a surgical indication *per se*, as many patients will become asymptomatic with conservative treatment or no treatment at all (*2*). This was confirmed by the fact that in the current study 24 patients out of 52 (46%) with ELDH experienced definite improvement with conservative measures (bed rest, medication, CT-guided nerve root infiltration, physiotherapy). Conservative care was always tried for two weeks, unless a recent motor deficit necessitated a surgical approach. Theoretically, chemonucleolysis and automated percutaneous lumbar discectomy might have been considered as alternatives (*5,17*). However, since extruded migrated fragments occur in 95% of extreme lateral disc herniations, and the nerve is significantly displaced near the site of usual needle or cannula placement for each of these procedures, they have been considered unsuitable for these herniations (*4,13*).

Surgical treatment will be rendered difficult by the "hidden" localisation of the disc fragments and by the anatomy of this area, less familiar to spine surgeons. Most earlier series have reported approaches via a posterior midline incision that damaged bordering bone structures with wide hemilaminoarthrectomy (*1*). In the long term it is likely that sacrificing a whole facet joint will lead to recurrent back pain due to instability. In an attempt to minimise the extensive bone resection but nevertheless reach the foraminal and extraforaminal space, several authors developed other lateral approaches (*14,16,18*). To-day, the most common surgical technique to reach the lateral aspect of the isthmus remains the usual paramuscular (via midline submuscular dissection) and the transmuscular approach (*16,18*). The use of the microscope facilitates these approaches. Familiarity with the microsurgical anatomy of the far-lateral compartment is essential for operating in patients with far-lateral disc herniations.

The usual paramuscular approach via midline submuscular dissection requires a longer midline skin incision and an important lateral muscle retraction to pass over the facet joint. It allows easier identification of the anatomical landmarks and is therefore recommended in obese patients with a far-lateral herniated disc at the L5-S1 level. Using this technique in 38 patients, Siebner and Faulhauer (*18*) noted in their study a 70% substantial clinical relief of pain after a mean follow-up period of 9.5 months. Three cases were reported by Wang *et al* (*19*) : all 3 had an excellent or good outcome, and returned to work 2 to 3 months postoperatively. Donaldson *et al* (*6*) reported a 72% excellent or good outcome rate with a mean follow-up period of 30.3 months.

The authors preferred the transmuscular (muscle-splitting) approach because it is a less invasive procedure, spares the facet, reduces muscle retraction and devascularisation, and allows oblique visualisation of the lateral interpedicular compartment. Moreover, it avoids resection of the facet joint, and minimises manipulation of the nerve, since the herniation is removed before the root is mobilised. In the current series excellent or good results were observed in 23 out of 28 cases (82.1%). A fair result was noted in 4 (14.3%). A poor result was observed in a single case (3.6%) : recurrence prompted a reoperation which probably led to perineural scar formation. Using the same muscle-splitting approach, Porchet *et al* (*15*) reported a 73% excellent or good outcome rate in their study, which included 202 patients, with an average follow-up of 50 months. Theoretically in this older patient age group, an earlier decompression of the nerve root might have led to a better recovery of neurological function.

Blood transfusion was not necessary, in accordance with the literature : McCulloch and Young (*13*) also reported a blood loss of only 25 to 200 ml, using this technique. On the other hand, the transmuscular approach to the intertransverse interval is difficult to expand to be able to deal with pathology within the spinal canal. Also, the L5-S1 level may create some difficulties because of the possible proximity of the iliac crest (*15*).

As a conclusion, the microsurgical muscle-splitting approach is a safe, effective, less invasive

technique, which respects the facet joint, so preserving spinal stability. It is achieved with minimal muscle retraction and manipulation of the nerve structures.

REFERENCES

1. **Abdullah AF, Ditto EW 3rd, Byrd EB, Williams R.** Extreme-lateral lumbar disc herniations. Clinical syndrome and special problems of diagnosis. *J Neurosurg* 1974 ; 41 : 229-234.
2. **Abdullah AF, Wolber PG, Warfield JR, Gunadi IK.** Surgical management of extreme lateral lumbar disc herniations : review of 138 cases. *Neurosurgery* 1988 ; 22 : 648-653.
3. **Angtuaco EJ, Holder JC, Boop WC, Binet EF.** Computed tomographic discography in the evaluation of extreme lateral disc herniation. *Neurosurgery* 1984 ; 14 : 350-351.
4. **Choi G, Lee SH, Bhanot A *et al.*** Percutaneous endoscopic discectomy for extraforaminal lumbar disc herniations : extraforaminal targeted fragmentectomy technique using working channel endoscope. *Spine* 2007 ; 32 : E93-99.
5. **Deutman R.** The case for chemonucleolysis in discogenic sciatica. A review. *Acta Orthop Scand* 1992 ; 63 : 571-575.
6. **Donaldson WF 3rd, Star MJ, Thorne RP.** Surgical treatment for the far lateral herniated lumbar disc. *Spine* 1993 ; 18 : 1263-1267.
7. **Epstein NE, Epstein JA, Carras R *et al*.** Far lateral lumbar disc herniation : diagnosis and surgical management. *Neuro-orthopedics* 1986 ; 1 : 37-40.
8. **Fankhauser H, de Tribolet N.** Extreme lateral lumbar disc herniation. *Br J Neurosurg* 1987 ; 1 : 111-129.
9. **Fankhauser H, de Tribolet N.** Extraforaminal approach for extreme lateral lumbar disc herniation. In : Torrens MJ and Dickson RA (eds). *Operative Spinal Surgery*. Churchill Livingstone, Edinburgh, 1991 : pp 146-160.
10. **Garrido E, Connaughton PN.** Unilateral facetectomy approach for lateral lumbar disc herniation. *J Neurosurg* 1991 ; 74 : 754-756.
11. **Jackson RP, Glah JJ.** Foraminal and extraforaminal lumbar disc herniation : diagnosis and treatment. *Spine* 1987 ; 12 : 577-585.
12. **Kornberg M.** Extreme lateral lumbar disc herniation. Clinical syndrome and computed tomography recognition. *Spine* 1987 ; 12 : 586-589.
13. **McCulloch J, Young P.** Foraminal and extraforaminal lumbar disc herniation. In : McCulloch J and Young P (eds). *Essentials of Spinal Microsurgery*. Lippincott-Raven, Philadelphia-New York, 1998 : pp 409-411.
14. **Melvill RL, Baxter BL.** The intertransverse approach to extraforaminal disc protrusion in the lumbar spine. *Spine* 1994 ; 19 : 2707-2714.
15. **Porchet F, Chollet-Bornand A, de Tribolet N.** Long-term follow up of patients surgically treated by the far-lateral approach for foraminal and extraforaminal lumbar disc herniations. *J Neurosurg* 1999 ; 90 (Suppl 1) : 59-66.
16. **Porchet F, Fankhauser H, de Tribolet N.** Extreme lateral lumbar disc herniation : clinical presentation in 178 patients. *Acta Neurochir* (Wien) 1994 ; 127 : 203-209.
17. **Privat JM.** Percutaneous nucleotomy-diskectomy techniques. Automated and manual techniques. Indications and results. *Neurochirurgie* 1993 ; 39 : 116-124.
18. **Siebner HR, Faulhauer K.** Frequency and specific surgical management of far lateral lumbar disc herniations. *Acta Neurochir* (Wien) 1990 ; 105 : 124-131.
19. **Wang QP, Lee NS, Zhang Y *et al.*** Intertransverse approach for extraforaminal herniations. *Spine* 1997 ; 22 : 701-705.