FAR LATERAL LUMBAR DISC HERNIATION
THE KEY TO THE INTERTRANSVERSE APPROACH

L. J. O’HARA, R. W. MARSHALL

From the Royal Berkshire Hospital, Reading, England

Of a total of 330 patients requiring operation on a lumbar disc, 20 (6.1%) with lateral disc prolapse had a new muscle-splitting, intertransverse approach which requires minimal resection of bone.

There were 16 men and 4 women with a mean age of 52 years. All had intense radicular pain, 15 had femoral radiculopathy and 19 a neurological deficit. Far lateral herniation of the disc had been confirmed by MRI.

At operation, excellent access was obtained to the spinal nerve, dorsal root ganglion and the disc prolapse. The posterior primary ramus was useful in locating the spinal nerve and dorsal root ganglion during dissection of the intertransverse space.

At review from six months to four years, 12 patients had excellent results with no residual pain and six had good results with mild discomfort and no functional impairment. Two had poor results. There had been neurological improvement in 17 of the 20 patients.

We recommend the use of a muscle-splitting intertransverse approach to far lateral herniation of the disc, using the posterior primary ramus as the key to safe dissection.


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The term ‘far lateral’ applies to prolapse of a lumbar disc which compresses the nerve root at the same level irrespective of whether it is in the intervertebral canal, at the foramen or further laterally. Failure to recognise its presence has often been responsible for a poor outcome and persistent sciatica after operation. CT and MRI now allow successful demonstration of protrusions of the lateral disc which account for between 6% and 10% of all lumbar discs which need operation. Prolapse of a lumbar disc at this site, however, may still be overlooked.

There has been discussion as to the most suitable surgical approach to a far lateral disc lesion. Most surgeons use an interlaminar approach, but full exposure of the nerve root requires total resection of the facet joint which may prejudice the subsequent stability of the spine. This has led to the development of approaches to expose the nerve root within the intertransverse space by a paramuscular route with retraction of the erector spinae from the midline, or by muscle splitting, usually with a paramedian incision. These require minimal resection of bone. The paramuscular route is preferred by many, despite its disadvantages, because surgeons are not familiar with the anatomy of the muscle-splitting approach. We found that the posterior ramus of the spinal nerve is a useful anatomical landmark in this approach, allowing early identification of the spinal nerve and dorsal root ganglion and safe dissection of the intertransverse space. We describe our experience in 20 operations and in a cadaver study.

PATIENTS AND METHODS

Between August 1992 and January 1996 out of a total of 330 patients with prolapse of the lumbar disc requiring operation, 20 with far lateral herniation (6.1%) were treated by the senior author (RWM). There were 16 men and four women with a mean age of 52 years (26 to 78), and a mean duration of symptoms of 23 weeks (4 weeks to 2 years).

All patients complained of intense, unilateral radicular pain which was either sciatic (25%) or femoral (75%). In 13 the onset was sudden. Only five had a history of injury; in the remainder the onset was insidious. Thirteen patients
had back pain (65%) but this was more intense than the radicular pain in only five. Nineteen patients had neurological deficits (95%); 17 had sensory loss and 14 had motor weakness. The motor deficit was usually mild; only two had weakness to MRC grade 3. Abnormal deep tendon reflexes were found in only five (25%) patients; all were absent knee reflexes in patients with prolapse of the L3/4 disc. All patients had a positive nerve-tension test (Table I).

A positive femoral stretch test was present in 12 (60%), most of whom had a prolapse at L4/5 and above. Reduced straight-leg raising was found in ten patients (50%), including all five with an L5/S1 disc lesion (Table I).

Pain was assessed using a visual analogue scale before and after operation. Plain radiography showed a grade-2 spondylolisthesis at L5/S1 in two patients who had an extraforaminal prolapse at the same level. In one, who was awaiting spinal fusion before the sudden onset of intractable sciatica, fusion was performed at the same time as far lateral discectomy. Axial and sagittal MRI confirmed the diagnosis, and showed that 75% of far lateral disc herniations occurred at L4/5 and above (Table II and Fig. 1).

All patients were assessed clinically at the last review by the first author (LJO'H), who had not been involved in their treatment.

Operative technique. The patient is anaesthetised and placed prone on a Montreal mattress and antibiotic prophylaxis is given (1.5 g cefuroxime). The intertransverse space is approached through a paramedian incision 5 cm lateral to the midline, splitting multifidus and longissimus as described by Wiltse for spinal fusion. The bases of the transverse processes are identified with a fingertip and a self-retaining retractor inserted. The level is checked by image intensifier.

We use binocular loupe magnification and a fibreoptic headlight to identify the posterior primary ramus of the spinal nerve where it passes through the medial aspect of the intertransverse membrane, before distributing its branches to the dorsal musculature. This nerve is a useful anatomical guide later in the dissection. The transverse process and the facet joint are exposed by reflecting soft tissue, and the isthmus is defined by reflecting muscle from the pars interarticularis.

The dorsal root ganglion and the spinal nerve are embedded in extraforaminal fat and connective tissue beneath the intertransverse membrane. Identification of the posterior primary ramus allows the surgeon to locate these vulnerable neural structures rapidly and safely (Figs 2 and 3) thus reducing the risk of avulsion injury. Overhanging isthmic

| Table I. Nerve-tension signs on clinical examination in 20 patients |
|----------------|----------------|----------------|
| Level         | Number | SLR | PST | PST + SLR |
| L2/3          | 2      | 0   | 2   | 0         |
| L3/4          | 7      | 2   | 6   | 1         |
| L4/5          | 6      | 3   | 3   | 0         |
| L5/S1         | 5      | 5   | 1   | 1         |
| Total         | 20     | 10  | 12  | 2         |

* reduced straight-leg raising
† positive femoral stretch test

| Table II. Number (%) of far lateral disc herniations as shown by MRI |
|----------------|----------------|----------------|
| Disc level    | Number | % |
| L2/3          | 2      | 10 |
| L3/4          | 7      | 35 |
| L4/5          | 6      | 30 |
| L5/S1         | 5      | 25 |
| Total         | 20     | 100 |

Axial (a) and sagittal (b) MRI showing an extraforaminal disc at L4/5. The disc prolapse displaces extraforaminal fat on the sagittal view.
bone may be cleared, if necessary, with a high-speed burr while protecting the underlying nerves with a blunt dissector. Further access is obtained by trimming the most lateral aspect of the superior articular process of the facet with a burr without disturbing the joint itself. Resection of bone is not always needed, but trimming of the superior articular process is invariably required at the L5/S1 level because of the size of the facet.

The spinal nerve is usually found to be under tension from the herniated disc, which is often sequestrated. The nerve is carefully retracted laterally allowing access to the disc material which is removed with pituitary forceps, reducing the tension of the nerve. The remaining degenerative disc material is then cleared from the disc space itself. Further exploration beneath the dorsal root ganglion with a probe allows any residual, sequestrated material to be removed.

RESULTS

The results at six months to four years were excellent in 12 patients (60%) with no residual discomfort, and good in six (30%) who had only minor leg or back pain and no functional impairment. One patient with a long-standing far lateral protrusion of the L4/5 disc showed no improvement after surgery. Subsequent MRI indicated the possibility of residual extraforaminal disc material, but at a further operation only scar tissue was found. This was released but there was no improvement. The other patient with a poor outcome had increased radicular pain after operation although there was an improvement in neurological function.

Sequestrated disc material was found in 50% of cases. There was neurological improvement in 17 of 19 patients. Of 14 patients with motor weakness 12 showed improvement and 11 had complete resolution. A sensory deficit improved in 14 of 17 patients with total resolution in nine. The mean leg pain score improved from 8.0 preoperatively to 1.5 after operation.

Cadaver study. A cadaver was dissected to determine whether the medial branch of the dorsal primary ramus could be identified at every level of the lumbar spine. At five levels (L1 to S1) the medial branch of the dorsal
primary ramus was readily identified and traced down through the intertransverse membrane to the spinal nerve and its dorsal root ganglion.

**DISCUSSION**

Lindblom\(^2\) demonstrated prolapse of the lumbar disc outside the confines of the vertebral canal in a cadaver study in 1944, but the clinical diagnosis has remained difficult, since these lateral protrusions could not be shown by myelography, or by limited operative exploration. In 1971 Macnab\(^1\) reported two cases of compression of the L5 root by an extraforaminal protrusion of the L5/S1 disc after a failed exploration at L4/5. In 1974 Abdullah et al.\(^3\) described the clinical syndrome of the “extreme lateral” herniation of the lumbar disc as demonstrated by discography; they found herniations beneath or beyond the facet, compressing the nerve root at the same level, in 11.7% of prolapses of lumbar discs. The characteristic clinical findings included anterior thigh and leg pain, appropriate sensory loss, absence of back pain, an absent knee jerk and no reduction of straight-leg raising. Subsequent authors have described these discs as "extreme lateral", \(^4,5,6,9,16\) "extraforaminal" \(^3,8,10,13,14,19,21,24\) - "far lateral", \(^5,6,9,16,18\) “extracanalicular” \(^6\) and “foraminal” or “extraforaminal" \(^3,8,10,17,25-27\) Larger series have reported incidences of between 5.8% and 10.3%\(^,10\) which agree with our figure of 6.1%.

The characteristic feature is that a far lateral disc compresses the nerve root which exits at the same level; this is in contrast to classic posterolateral disc compression which affects the nerve root leaving at the level below.

Far lateral herniation more often compromises the upper lumbar nerve roots\(^1,8,10,13,16\) producing a femoral radiculopathy; in 75% of our patients the nerve root at L4 and above was found frequently with an incidence of 38% in the 178 cases of Porchet et al.\(^3\) and 25% in our series. Since the L5 nerve root is compressed by L5/S1 far lateral protrusion, there is a high frequency of decreased straight-leg raising.

The intensity of the radicular pain in far lateral prolapse is particularly severe; this probably results from direct contact of nuclear or annular fragments with the dorsal root ganglion.\(^8,17,18\) Instability\(^8,17\) and severe back pain\(^8,17\) have been reported after an interlaminar approach with facetectomy and spinal fusion has been advocated in every case.\(^21\) An extraforaminal disc prolapse is often sequestrated \(^3,8,9,10,19,19\) and many migrate superiorly and laterally. These sequestrated fragments may be missed even after full facetectomy, and are the cause of persistent radicular pain.\(^7\)

The precise localisation of a far lateral disc by CT and MRI\(^1,22\) has allowed more direct and anatomically favourable approaches to be used. Since the mid 1980s the intertransverse route has been used to provide direct access to the extraforaminal area and the intervertebral foramen with minimal resection of bone. The paramuscular approach requires a larger incision and greater soft-tissue retraction, but exposes less of the foramen;\(^7\) its advocates find the muscle-splitting approach disorientating because of the lack of anatomical landmarks.\(^1,8\)

The course and relationship of the lumbar nerve are different at each level because of the variation in the structure of the lumbar vertebrae which is also altered by the Lasegue sign is less reliable in determining the level of root compression, but it is wrong to believe that straight-leg raising is usually normal.\(^1,7,19\)

In the series of Abdullah et al.\(^3\) there were no cases of compression of the L5 nerve root and the frequency of Lasegue’s sign was only 4%. Since then far lateral herniation at L5/S1 has been found frequently with an incidence of 38% in the 178 cases of Porchet et al.\(^3\) and 25% in our series. Since the L5 nerve root is compressed by L5/S1 far lateral protrusion, there is a high frequency of decreased straight-leg raising.

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The appearance of the intertransverse ligament has been described as being that of a membrane\(^8\) and our operative and cadaver studies confirm that the term ‘ligament’ is a misnomer. The intertransverse ‘ligament’ consists of sheets of connective tissue extending from the upper border of one transverse process to the lower border of the one above. It lacks a distinct border medially or laterally, with less densely packed and more irregular collagen fibres than is found in a true ligament. It probably forms part of a complex fascial system separating the paravertebral com-
The membrane extends to the lateral aspect of the pars interarticularis and the facet. It can be incised safely provided that the underlying neural structures are protected after identification by tracing the posterior primary ramus into the intertransverse space.

We recommend the use of a muscle-splitting, intertransverse approach to a far lateral disc, with the posterior primary ramus providing the key to safe exposure of the spinal nerve and the underlying structures.

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REFERENCES