Extreme lateral lumbar disc herniation

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Disc herniations in the foraminal zone typically involves the nerve root exiting at that level (e.g. an L4–5 foraminal disc herniation will involve the L4 nerve root). The dorsal root ganglion (sensory) is also located in the foramen within the nerve root sheath. Disc herniations in the extraforaminal zone occasionally involve the nerve root exiting at that level; however, disc herniation here and those herniating anterior to the spine may not result in any nerve root involvement.

Authors have described these discs as “extreme lateral”,“far lateral”, “extracanalicular” and “foraminal” or “extraforaminal”.

They may be purely far lateral or extraforaminal in location, located beyond the pedicles, or may include intraforaminal and even intracanalicular components.

Lindblom [1] 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 [2] 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 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 [3].

Classification

Extreme lateral lumbar disc herniation classification.

Epidemiology

Extreme lateral lumbar disc herniations (ELLDHs) occur more frequently among elderly patients, with a peak incidence in the sixth decade [4] [5] [6] [7] [8] [9] [10] [11] [12] [13] ,and are rarely found in children.

Larger series have reported incidences of between 5.8% and 10.3% [14] [15] [16] [17]

Occurring predominantly at the L4-L5 and L3-L4 levels in almost equal numbers, they are occasionally noted at L5-S1.

In isthmic spondylolisthesis, extreme lateral disc herniation occasionally occurs; therefore, every isthmic spondylolisthesis patient should be examined carefully for extreme lateral disc herniation with thin-cut axial CT or MRI, especially when the patients complain of lateralizing symptom [18].

Clinical features

Because they compress the exiting root with its dorsal root ganglion, the clinical presentation often involves lancinating leg pain, whereas low back pain is often mild to moderate.

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 [19].

Clinical syndromes reflect compression of the superiorly exiting nerve root and ganglion; ie an L4-L5 far lateral disc produces a L4 root syndrome. Clinical complaints often include severe radicular pain accompanied by very positive mechanical signs; Laségue and reverse Laségue (femoral stretch test) maneuvers. Neurological deficits, including motor, reflex, and sensory findings, are seen over 75% of the time.

Diagnosis

Patients will frequently complain of pain in the groin and anterior thigh but little if any back pain. Because the L4 root is often involved, the physical exam often shows quadriceps weakness and a diminished patellar reflex. Other important signs include a negative Lasèque's sign and reproduction of pain with lateral bending of the back toward the involved extremity. Currently, CT or MRI are the diagnostic procedures of choice [20].

CT

Although computed tomography (CT) has been shown to be useful in diagnosing posterolateral and central lumbar disk herniations, its effectiveness in demonstrating lateral herniated disks has not been emphasized. The myelographic recognition of those herniations may be difficult because root sheaths or dural sacs may not be deformed. A total of 274 CT scans interpreted as showing lumbar disk herniation was reviewed. Fourteen (5%) showed a lateral disk herniation. The CT features of a lateral herniated disk included: (1) focal protrusion of the disk margin within or lateral to the intervertebral foramen; (2) displacement of epidural fat within the intervertebral foramen; (3) absence of dural sac deformity; and (4) soft-tissue mass within or lateral to the intervertebral foramen. Because it can image the disk margin and free disk fragments irrespective of dural sac or root sheath deformity, CT may be more effective than myelography for demonstrating the presence and extent of lateral disk herniation [21].

MRI

The diagnosis is best established by using magnetic resonance imaging which visualizes the foramen in an axial and sagittal plane [22].

Although CT and magnetic resonance imaging (MRI) allow successful demonstration of protrusions of the lateral disc, which account for between 6% and 10% of all lumbar disc herniations, prolapse of a lumbar disc in the far lateral zone might be overlooked [23) 24) 25) 26)]. The extraforaminal zone is generally not focused on in daily practice with spine MRI, particularly in the condition of large extrusion or protrusion causing descending nerve root compression or severe spinal stenosis at other levels. In particular, it is difficult to observe the disc morphology at the L5-S1 level due to the overlapping bony structures, such as the sacral ala or iliac bone, and severe decrease in disc height by degeneration.

Thirty-three patients presenting with persistent radiculopathy and showing an image suggesting a far lateral disk herniation on CT at 34 disk levels were prospectively imaged with magnetic resonance (MR). In all cases the disk fragment was identified and its separation from the nerve root was possible. This separation was more readily visible on sagittal or angled coronal views. The exact location of the herniation in relation to the facet joints and the pedicles was best assessed with MR: Ten were purely intraforaminal, 8 extraforaminal, and 15 both. Cephalad migration was noted on the sagittal lateral facet plane in 71% of cases. Surgical correlations were available for 25 disks. Three were falsely positive for disk herniation. Enlarged foraminal veins were responsible for this appearance as confirmed by surgery in two of these. When a prediction of disruption of the lateral extension of the posterior longitudinal ligament was made, it was confirmed at surgery in 52% of cases because of extreme lateralization of the herniations [27)].

The possibility of disc herniation should be seriously considered in cases of nerve root compression in which epidural gas is present, especially those associated with gaseous degenerated discs [28)].

Differential diagnosis

Extraforaminal periganglionic free, encapsulated disc fragments may mimic tumoral masses, from which they may not be distinguished on MRI [29)].

A report discusses the clinical features of a patient who presented with an L-3 radiculopathy in whom magnetic resonance imaging demonstrated what appeared to be a nerve sheath tumor in an extraforaminal location on the L-3 nerve root. A lateral intermuscular approach to excise the lesion was used to preserve the facet joint. Histological examination of the intraneural lesion revealed degenerative disc fragments. The authors hypothesize that the structure of the annulus fibrosus in the upper lumbar region predisposes these regions to lateral herniation. Furthermore, it is proposed that the lateral disc herniation allowed the disc fragments to erode through the epineurium of the neural sheath. This case expands the differential diagnosis of fusiform enlargement of nerves to include disc herniation [30)].

Symptomatic epidural varix is rarely described in the literature and is difficult to diagnose by CT. A case of symptomatic foraminal epidural varix associated with bilateral spondylolysis simulating an extreme lateral disc herniation on CT is reported [31)].

Treatment

Conservative treatment for ELLDHs includes nonsteroidal anti-inflammatory medications or high-dose steroid combined with bed rest, and even epidural or selective nerve root steroid injections [32)].

Gabapentin provided fast and effective relief of pain caused by FLLDH. It should be kept in mind in the first-step medication of pain for such patients. Direct compression of the dorsal root ganglion or its distal part may be related to the intense pain-relief effect provided by gabapentin [33].

Although conservative management is occasionally successful (10%), surgery is usually required. The extent of stenosis and attendant degenerative changes dictate whether laminectomy, hemilaminectomy or laminotomy are required along with one of several facet resection options; full facetectomy, the intertransverse approach, medial facetectomy, or an extreme lateral procedure [34].

There has been discussion as to the most suitable surgical approach to a far lateral disc lesion [35].

Surgical Approaches

Operative techniques for the treatment of extreme lateral lumbar disc herniations (ELLDH) have ranged from an interlaminar approach with subtotal or total facetectomy to an enlarged midline approach and various paraspinal lateral, as well as endoscopic approaches. In contrast to purely endoscopic techniques, use of a working tube together with an operative microscope (“minimally invasive microscopically assisted percutaneous approach”) combines the advantages of three-dimensional visual control with the minimal surgical trauma of an endoscopic approach.

The best approach is microsurgical decompression of the spinal nerve via the intertransverse muscle, ligament and fascia. With this approach, there is no facet destruction and satisfactory nerve root decompression is safe and effective in relieving radicular pain [36]

O'Brien et al have identified constant anatomical landmarks in cadaveric dissections that facilitate access to the intervertebral foramen when combined with a posterolateral approach, as described by Watkins, for lumbar spinal fusion. The authors describe a technique that allows rapid localization and safe excision of these extreme-lateral lumbar disc herniations without the need for bone resection [37].

The paraspinal approach for extreme lateral lumbar disc herniations using the minimally invasive microscopically assisted percutaneous technique is reasonable and safe and thus a good alternative to open surgical procedures [38].

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.

They often cannot be adequately exposed through the typical midline hemilaminectomy approach. Many authors have advocated a partial or complete unilateral facetectomy to expose these herniations, which can lead to vertebral instability or contribute to continued postoperative back pain.

The extent of stenosis and attendant degenerative changes dictate whether laminectomy, hemilaminectomy or laminotomy are required along with one of several facet resection options; full facetectomy, the intertransverse approach, medial facetectomy, or an extreme lateral procedure. Postoperatively, patients' neurological outcomes based on both surgeon and patient based outcome measures (SF-36), were comparable for the different surgical procedures which had been based on the individual patient's pathology [39].

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.

see paramuscular approach

Microsurgical anatomy

Level dependent changes in the posterior arch cause a shift of the disc space distally relative to the facet joint, an increasing amount of bone to overlie the intervertebral foramen, and a decreasing amount of working space within the exposure in the caudal direction. Therefore, more bone removal from the lateral aspect of the pars interarticularis and supero-lateral aspect of the facet joint is required in the lower lumbar spine. When the exposed ligamentum flavum is resected, the dorsal root ganglion is seen and access to the herniation and disc space is achieved. Level dependent changes in the pedicles and transverse processes lead to an alteration in the course and relationships of the nerves, thereby influencing the pathophysiology of and surgical technique for the ELLDH. The operative target is the lateral aspect of the pars interarticularis and not the intertransverse space as has been previously described. Our techniques allows for the early identification of the nerve with minimal risks of injury to it, to the adjacent vessels and to the structural integrity of the facet joint and pars interarticularis [40].

Outcome

Failure to recognise its presence has often been responsible for a poor outcome and persistent sciatica after operation [41) 42) 43) 44) 45)].

Case series

Extreme lateral lumbar disc herniation case series.

Case reports

A 46-year-old woman presented with a history of mild low back and intense right leg pain. The leg pain was like electrical discharges. Right knee extension was weak together with hyperalgesia and loss of heat sensation in the right LA dermatome. The right patellar reflex was absent. Electromyography showed acute and chronic denervation of muscles innervated by the right L4 nerve root. MR scan showed a right L4-5 extraforaminal mass distorting the L4 dorsal root ganglion. The mass enhanced homogeneously after gadolinium injection and was thought to be a tumor. It was surgically removed using a midline incision and intraspinal, followed by extraspinal dissection. Under the operating microscope, the mass extended between an intact lateral longitudinal ligament and a swollen dorsal root ganglion. Histopathologic examination ruled out a tumor and showed that the mass consisted of degenerated disc material surrounded by a large peripheral zone of neovascularization.

Extraforaminal periganglionic free, encapsulated disc fragments may mimic tumoral masses, from which they may not be distinguished on MRI [46)].

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