Dorsal Lumbar Disc Migrations with Lateral and Ventral Epidural Extension on Axial MRI: A Case Series and Review of the Literature

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ABSTRACT

SUMMARY: Dorsal epidural migration of lumbar disc extrusion is rare and commonly misdiagnosed. Our purpose was to retrospectively analyze soft-tissue abnormalities on axial MR imaging in both the ventral and lateral epidural space in such dorsal epidural migrations. The presence of each component required complete concordance by 3 independent neuroradiologist readers. In a case series (n = 6) of surgically proved dorsal lumbar disc migrations, in which the radiologist’s favored prospective diagnosis had not been correct, each case demonstrated epidural soft-tissue abnormality that had components both laterally and ventrally, abutting the parent disc. Similarly, in previously published cases for which axial MR imaging was available, the lateral component was demonstrated in 23/24 cases (96%). Ventral abutment of the parent disc was evident, in addition, in 17/18 cases (94%) with available disc-level axial images. Both ventral and lateral epidural soft-tissue abnormalities are typically present in dorsal lumbar disc herniations and may help radiologists suggest this rare diagnosis in appropriate cases.

Per the second version of lumbar disc nomenclature derived by multisociety task forces, a disc extrusion is defined as a disc herniation that is displaced “beyond the outer annulus of the disc material with any distance between its edges greater than the distance between the edges of the base...”; the term “migration” refers to “displacement of disc material away from the site of extrusion...regardless of continuity with the disc...in either the sagittal or axial plane.” Lumbar disc extrusions are common, with disc material typically migrating superiorly, inferiorly, or laterally. Migration into the dorsal epidural space (Fig 1), however, is rare. This was first described by Lombardi in 1973 as a “posterior rotation of the annulus fibrosis.” Posterior migration of the disc is thought to be anatomically inhibited by the posterior longitudinal ligament and the peridural membrane, midline septum, epidural fat/venous plexus, dura, and nerve root.

Morphologically, the phenomenon of dorsal epidural disc migration has often been referred to as a “posterior sequestered disc fragment” in prior articles. However, we have anecdotally observed, in our clinical practice, that in at least some cases of dorsal disc migration, the abnormal epidural soft tissue on MR imaging is typically not purely located in the dorsal epidural space. Rather, as noted in a prior single case report, the abnormality contacts the parent disc in the ventral epidural space and from there asymmetrically involves the lateral epidural space to reach a posterior location. The purpose of the present clinical report was to analyze this morphology on axial MR imaging in dorsal lumbar disc herniations, both in a retrospective case series and in images of previously published cases.

Case Series

Institutional review board approval with waived consent was obtained for this Health Insurance Portability and Accountability Act–compliant retrospective clinical report. The study took place...
at Mayo Clinic in Rochester, Minnesota. Between 2006 and 2015, 6 patients from our spine surgery practice with surgically and pathologically proved diagnoses of dorsal lumbar disc migration were identified through a search of the electronic medical record, including radiologic, surgical, and pathologic data bases. The relevant clinical, imaging, and surgical features were reviewed. We searched PubMed for published reports of dorsal lumbar disc herniation, during 2000–2015. Search terms included “dorsal/posterior epidural disc/disk herniation,” “extrusion,” “migration,” and “sequestration.” Relevant references from identified articles were reviewed. For all cases (series and literature), a staff neuroradiologist with American Board of Radiology certification and a Certificate of Added Qualification in neuroradiology (F.E.D., with 6 years of postfellowship experience) recorded the cases that had available axial MR images of sufficient quality to evaluate 2 specific morphologic features: 1) epidural soft tissue wrapping laterally around the thecal sac from ventrolateral to dorsolateral/dorsal, and 2) apparent abutment with the parent disc in the ventral epidural space at disc-level axial images, when available (Fig 1). These 2 features on axial images only were evaluated at an electronic workstation independently by 3 staff neuroradiologists with the same qualifications (F.E.D., A.L.K., and J.T.W., with 6, 17, and 20 years of postfellowship experience, respectively). The features were considered present only if all 3 neuroradiologists graded them as evident. Because most cases did not include postcontrast imaging, no attempt was made to discriminate whether the ventral/lateral epidural soft tissue, if present, represented either actual disc material and/or granulation tissue extending to the dorsally migrated disc material.

The clinical and relevant MR imaging features of the 6 cases are shown in the Table. The interpreting radiologist’s clinical report was available in 5 cases (1 outside MR imaging was not formally interpreted; each interpreting radiologist had American Board of Radiology certification and a Certificate of Added Qualification in neuroradiology); in no case was the dorsal disc herniation the favored diagnosis (Table). On independent analysis by all 3 reviewing neuroradiologists, all 6 of these dorsally migrated disc herniations demonstrated the epidural soft-tissue abnormality both wrapping laterally around the thecal sac and abutting the parent disc. In case 1, MR imaging (Fig 2) demonstrated a 3.5-cm peripherally enhancing (Fig 2C, -F) left dorsal epidural mass, extending from the L4 to the lower L5 body levels. At the operation, a large, flat, adherent, and firm left dorsal mass of disc material (pathologically confirmed) was resected (Fig 3). This tracked from L3 to L5, enveloping the L5 nerve circumferentially. The patient obtained relief of the leg pain and was discharged on postoperative day 3.

In case 2, MR imaging (Fig 4) demonstrated a 1.9-cm dorsal epidural mass at L3–4, contributing to severe spinal stenosis. The

![Fig 1. Illustration of a dorsal lumbar disc herniation. The bulk of the herniated disc material is located in the dorsal epidural space (asterisk), causing mass effect on the thecal sac and cauda equina. However, a lateral epidural component is also present (arrow). In this example, disc material extends into the ventrolateral epidural space directly to a rent in the annulus, contiguous with the parent disc (block arrow). On MR imaging, the soft tissue ventrally/laterally can represent disc material and/or granulation tissue. Reproduced with permission from the Mayo Foundation for Medical Education and Research.](image-url)
radiologist’s differential diagnosis favored focal epidural hematoma and included dorsal disc migration, a synovial cyst, or sequela of a recent epidural injection. At the operation, a 2-cm dorsal disc fragment (pathologically confirmed) adherent to the dura at L3–4 was resected. This disc fragment was followed laterally to the right aspect of the L3–4 disc, where a rent in the annulus was detected in the foraminal zone. The patient was discharged on postoperative day 2 with noted improvement in pain, ambulation, and strength.

In case 3, MR imaging (Fig 5) showed severe central canal stenosis due to spondylotic changes and developmental narrowing, greatest at L2–3 and L4–5. At L2–3, a 2.0-cm left dorsal-lateral epidural mass contributed to the stenosis. At the operation, left L2–3 disc material (pathologically confirmed) was visualized dorsally, resected, and followed to the ventral aspect of the disc. No rent in the annular fibers was visualized. Postoperatively, the patient had resolution of pain and recovery of motor deficits. He was discharged on postoperative day 3.

In case 4, MR imaging (Fig 6) demonstrated spondylotic changes causing multilevel severe central stenosis from L1 to S1, most notable at L3–4 due to a 1.3-cm left dorsal-lateral epidural mass. At the operation, an L3–4 left disc fragment (pathologically confirmed) was resected. This fragment had a tail that wrapped...
toward the disc at this level. This was followed ventrally, with no additional fragment identified. The patient was discharged on postoperative day 2 with resolution of pain and ongoing weakness in the ankle dorsiflexors of his right foot.

In case 5, MR imaging (not shown) demonstrated severe central stenosis at L4–5 due primarily to a 2.9-cm peripherally enhancing left dorsal epidural mass, extending from the mid-L4 to the upper L5 body levels. At surgery, a large left dorsal mass of disc material (pathologically confirmed) compressing the thecal sac was resected. This was traced back to an L4–5 annular defect. At a 6-week follow-up, the patient described marked improvement in back and leg symptoms and demonstrated considerably greater lower extremity strength.

In case 6, MR imaging (not shown; images from this case are included in a pictorial review of unusual manifestations of disc pathologic conditions\(^8\)) demonstrated severe spinal stenosis at L4–5 due primarily to a 4.0-cm peripherally enhancing large right ventrolateral-through-foraminal and dorsal epidural soft-tissue mass, extending from L4–5 to L3–4. At the operation, densely fibrous disc material (pathologically confirmed) was resected, with complete decompression of the thecal sac and right foramen. The patient was discharged on postoperative day 2 and was completely pain-free at a 3-week follow-up.

### Analysis of Images from Published Cases

In addition to our 6 cases, 52 cases from 22 articles on dorsal-lumbar disc herniation dating back to 2000 were identified.\(^5\)-\(^7\),\(^9\)-\(^15\),\(^17\)-\(^19\),\(^21\),\(^23\)-\(^27\)

Note that a unique case describing sequestered fragments migrating into facet joints was not included among these 52 cases and was excluded.\(^28\) Among the 52 cases, MR images were available in 29 cases (56%) from 19 articles.\(^5\)-\(^7\),\(^9\)-\(^15\),\(^17\)-\(^19\),\(^21\),\(^23\)-\(^27\) One case was eliminated due to poor image quality (case 1 from Sengoz et al\(^11\)).

At least 1 axial MR image was included in 24 of the remaining 28 cases (86%). Thirteen of the published cases included a single axial image, and 11 had at least 2 axial images, with 8 of the latter containing >1 MR imaging sequence type.
When disc level axial images were available (18 cases from 15 patients), a number of more common features were noted. However, the current clinical report shows that in both a small case series and a larger series of previously published cases of dorsal lumbar disc herniation, 2 morphologic features on axial MR imaging are described this phenomenon. Lack of radiologists’ confidence in diagnosing dorsal disc herniation, even by fellowship-trained neuroradiologists as seen in our series, is further evidence for the lack of awareness of the axial morphology we describe herein. As for the apparent contact with the parent disc, it is often not possible to distinguish whether this represents disc material remaining in contiguity or granulation tissue between sequestered material and the parent disc, particularly if postcontrast MR imaging has not been performed. Chen et al. described this phenomenon on postgadolinium imaging in their case report of a dorsally migrated disc fragment. They noted, “A tractlike structure with enhancement from the site of the ruptured disk to the posterior epidural space was identified, suggesting the route of the sequestered disk migration.” On the basis of histopathology and existing literature, these authors attributed the contrast enhancement to granulation tissue (“increased vascularized epidural tissue wrapping the disk contents”).

Suggesting the diagnosis on MR imaging is important because the frequently atypical clinical presentation of dorsal disc herniations can render the diagnosis difficult. Atypical features seen in these types of herniation include a relatively short duration of symptoms, often acute, as seen, for instance, in cases 4 and 5 of our series. Although it was not seen in our patients, there is a high occurrence of cauda equina syndrome compared with more typical ventral herniations. Moreover, a number of more common entities with different management approaches to surgical resection are in the differential diagnoses on MR imaging. Dorsal disc herniations are often mistaken for nondiscal lesions, such as abscess, hematoma, synovial cyst, or neoplasm on MR imaging. In our series, the interpreting radiologist favored epidural lateral to the thecal sac, and 2) on disc-level axial images, epidural soft tissue ventrally, abutting the parent disc. Indeed, the lesion typically spans from ventral/ventrolateral to dorsolateral/dorsal, rather than being purely dorsal (such as in Figs 2A, -C; 4G, -D; 5B, -D; and 6A, -B, and -D). These findings may help radiologists more confidently suggest this relatively rare phenomenon in appropriate cases of a dorsolateral-dorsal epidural soft-tissue lesion.

DISCUSSION

The current clinical report shows that in both a small case series and a larger series of previously published cases of dorsal lumbar disc herniation, 2 morphologic features on axial MR imaging are seen in most (>90%) cases: 1) asymmetric epidural soft tissue
In addition, they often have a rim of T2-hypointensity and may peripherally enhance. Synovial cysts may be observed, treated percutaneously, or resected surgically. Solid enhancement can be a clue for a neoplasm, but gadolinium is often not routinely administered for typical lumbar spine MR imaging indications.

Limitations of our clinical report include its retrospective nature. The supplementation of our case series with a separate analysis of published images is not ideal but allows evaluation (albeit imperfect) of considerably more cases of a rare condition. Because our design was based on anecdotal observation, we may have had an expectation bias while reviewing the images. However, the analysis was conducted independently by 3 different board-certified neuroradiologists, with complete agreement needed for the findings to be considered present. Our clinical report does not allow further characterization of how often the ventrolateral abnormal soft tissue represents granulation tissue versus contiguous disc material from the ventral to the dorsal epidural space. We did not conduct a formal analysis of the image quality of the published cases. We acknowledge that other entities on the differential diagnosis described above could (especially if large) have soft-tissue abnormalities present from the ventral-through-dorsal epidural space; thus, this morphology does remain a nonspecific finding. We did not seek to directly compare our series of dorsal disc herniations with a series of epidural hematomas, abscesses, or synovial cysts; thus, the reviewing radiologists were not blinded to the diagnosis of dorsal disc herniation for this clinical report.

In summary, rarity, atypical clinical presentation, and nonspecific MR imaging features cause difficulty in the diagnosis of dorsal lumbar disc herniation. Ventral and lateral epidural soft-tissue abnormalities are typically present on axial MR images and may help radiologists suggest this uncommon diagnosis in appropriate cases or at least include it in the differential diagnosis.

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