Conjoined Lumbosacral Nerve Roots: Report of Two Cases

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Abstract : Conjoined origin anomalies of lumbosacral nerve roots, if incorrectly interpreted, could be misdiagnosed as disc herniations on computed tomography (CT) and myelography. Anomalous L-5 and S-1 nerve roots appear infrequently. An underlying herniated disc may not be diagnosed because of unique anatomical changes. If not properly recogized, surgery for entrapment disorders may result in serious neural injury because of an improper surgical approach in exposure and removal of the underlying herniated disc. In this paper, we present two cases with such anomalies.

Key Words : Conjoined Nerve Root, Discectomy, Lumbar Disc, Myelography, Spinal Computed Tomography

INTRODUCTION

Anomalous spinal nerve roots have been recognized by anatomists since normal nerve configurations were first described (4,9,10). The anomalous roots present primarily as a bifid, conjoined structure arising from a wide area of the dura. Because of their size and attachment to surrounding structures, they are uniquely susceptible to trauma. The effects of compression and entrapment are amplified in the presence of stenosis of the lateral recesses where developmental changes and disc herniations deplete the available reserve space (6). The anomalous root may be difficult to recognize, event at the operating table, because of swelling and reactive changes which obscure the anatomical details so that the appearance may simulate that of mass lesion. Two such patients with herniated disc are presented.

Case 1

A 32 year-old woman had a 15-year history of low-back pain radiating to the right leg which intensified during the last 3 months. The pain was aggravated by coughing and sneezing. Straight leg-raising test was positive at 80 degrees ipsilaterally, and negative contralaterally. There were no sensory, motor and reflex changes.

X-ray changes included flattening of the lordotic curve and mild spondylotic changes. A lumbosacral CT revealed a large, 11 mm disc herniation at L5-S1 level, lateralizing to the right (Fig. 1). A lumbar iohexol myelogram confirmed the CT (Fig. 2).

The patient underwent a right L5-S1 partial hemilaminectomy. Following flavectomy, an unusual appearance of the anatomical structures was encountered. There were two roots, emerging separately from the dural sac, and entering through the same spinal foramen. The laterally located nerve was considerably thicker than the medial one. The roots were fixed and we could hardly mobilize them medially to reach the disc. A moderately protruded disc was found and removed.

Retrospective evaluation of the oblique myelograms brought to our attention the origins of the double roots, which were previously overlooked (Fig. 3).

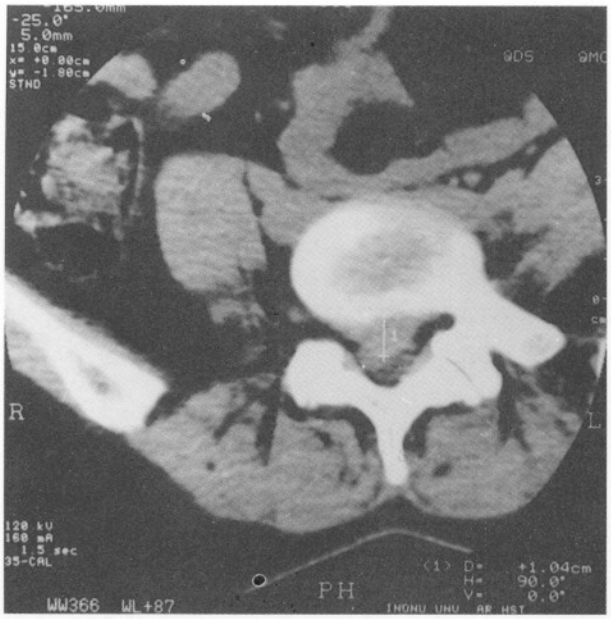

Fig. 1 : Case 1. Preoperative spinal CT. Soft tissue fills the anterolateral aspect of the spinal canal.

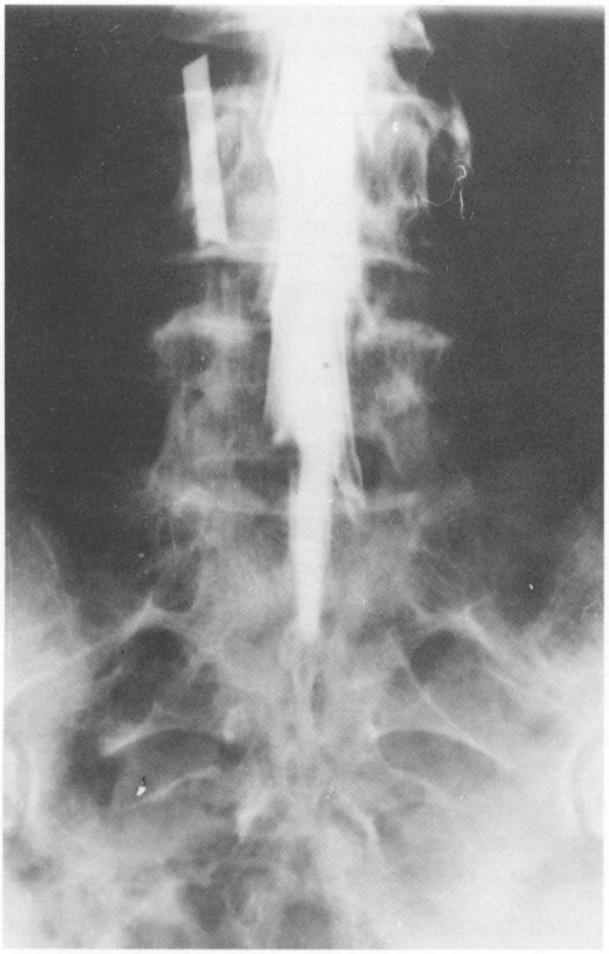

Fig. 2 : Case 1. Lumbar iohexol myelogram, anteroposterior view.

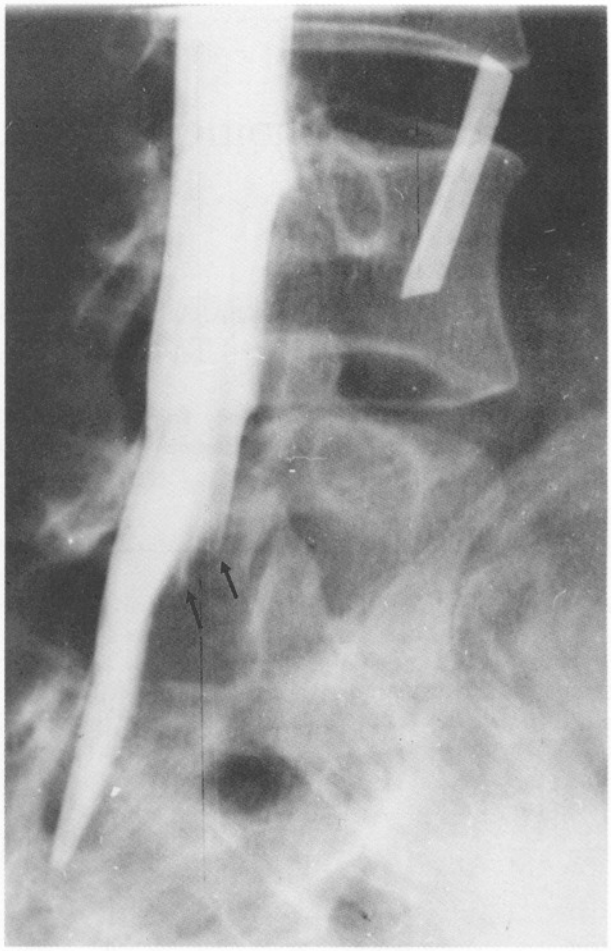

Fig 3 : Case 1. Right oblique myelogram. Note the origin of the conjoined roots (arrows).

Case 2

A 65 year old man presented with a 5-month history of low-back pain radiating to the left hip and leg, which was developed following outreach lifting. Straight legraising test was positive at 45 degrees on the left. Neurological examination revealed a decrease to pin prick in the left L5 and S1 dermatomes. Weakness of the anterior tibial muscle group and extensor hallucis longus were present. There were no reflex changes.

A lumbar CT scan performed prior to the myelogram showed disc herniation at L4-L5 lateralizing to the left, and a soft-tissue abnormality at left L5-S1 level, ventral to the thecal sac, replacing the epidural fat normally seen at this location. The density of the abnormal soft tissue was only slightly higher than the thecal sac. Initially, a herniated disc

was suspected. A lumbar iohexol myelogram showed no evidence of herniated disc at L5-S1 level, but disclosed conjoined nerve roots (Fits. 4,5). There was a disc herniation at the L4-L5 level. A contrast-enhanced CT study, immediately following the myelogram, showed the previously suspicious area filled with iohexol, confirming the CT density was due to conjoined roots (Fig. 6). On the next lower sections, two separate roots in the left lateral recess became clearly visible (Fig. 7).

A left L4-L5 partial hemilaminectomy was performed and the herniated disc was removed. Since the symptoms and signs were mostly attributed to the herniated disc, rather than the conjoined roots, the L5-S1 level was not explored.

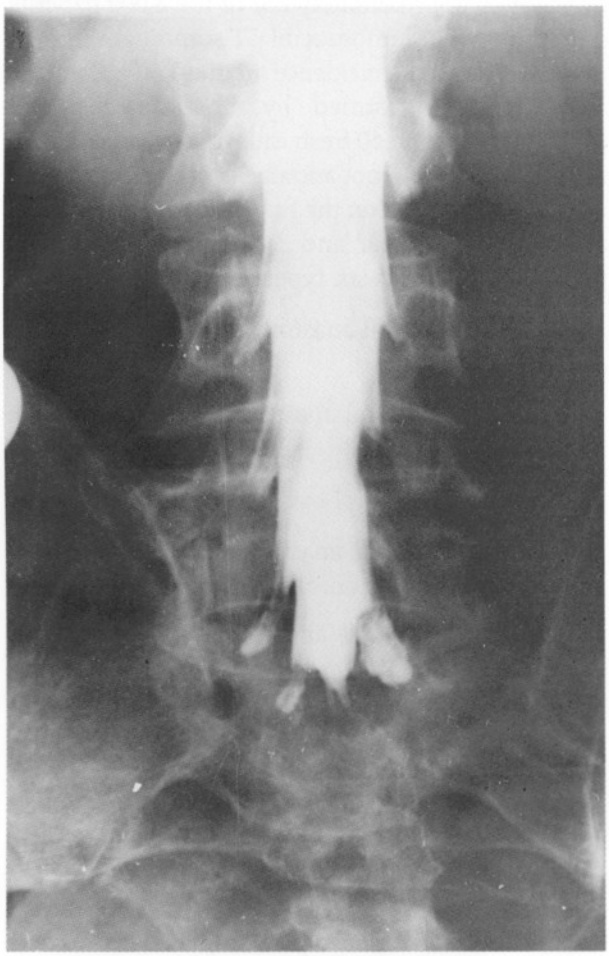

Fig. 4 : Case 2. Anteroposterior myelogram. Disc herniation at left L4-L5, and conjoined roots at L5-S1 are shown. Note the asymmetric generation of S1 roots from the thecal sac.

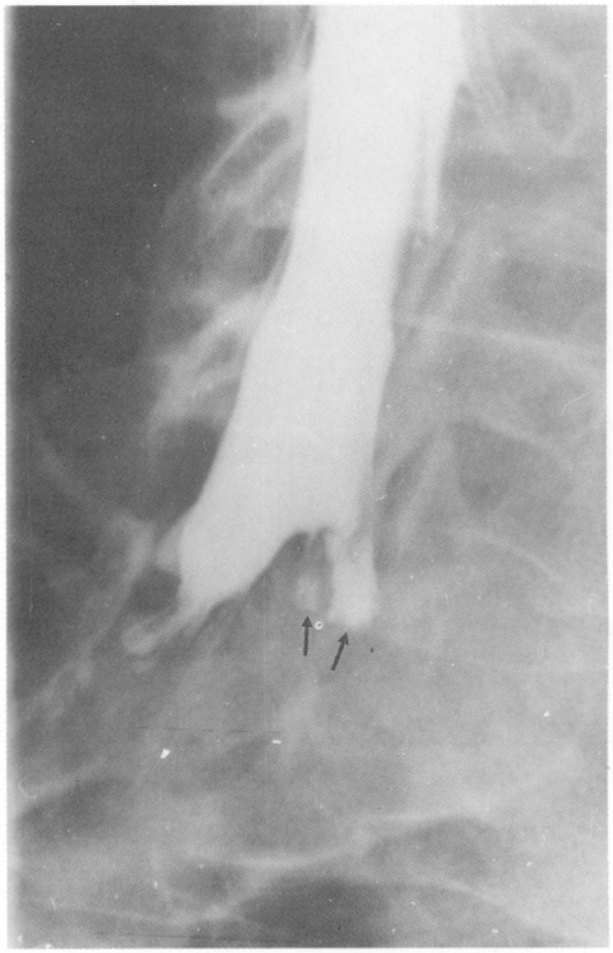

Fig. 5 : Case 2. Left oblique myelogram. Conjoined roots at L4-L5 are clearly visible (arrows).

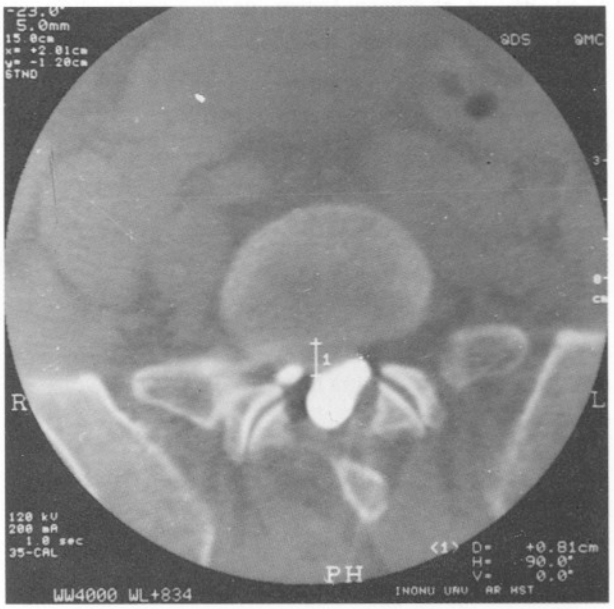

Fig. 6. Case 2. Iohexol lumbar CT at L4-L5 level. Note that iohexol has filled conjoined root sleeve on the left.

Fig. 7 : Case 2. CT slices caudate to that in fig. 6. The soft tissue density has fragmented into two rounded parts that appear to be nerve roots.

DISCUSSION

There have been several reports of lumbosacral root anomalies discovered at surgery undertaken for suspected disc herniation (3,7,12). Anomalies of the lumbosacral nerve roots probably result from aberrant migration of the involved roots during their embryological development (3). They could occur either as the result of a local factor, or as a consequences of a widespread embryological disorders associated with other anomalies such as sacrum bifidum, and situs inversus of the viscera. Cannon et al. (3) distinguished three different types:

1. *Conjoined roots.* In this type, two adjacent root-sleeves show a common origin as they arise from the dura mater.

2. *Anastomosis between roots.* Usually a branch is given off by the root shortly after emitting from the dura mater and joins immediately the lower root obliquely.

3. *Transverse course of the root.* This anomalous root usually originates at a lower level than the average, and forms approximately a right angle with the dura mater.

As discussed by Agnoli (1), these anomalies alone should not be considered a causative factor in low back pain and sciatica. The vast majority of these patients present following a ruptured disc with physical signs corresponding to the appropriate dermatomes. In our second case, there was a conjoined nerve root at L5-S1 but not a herniated disc, and we could not detect any radiculopathy associated with S1 root compression. The patient was totally asymptomatic after removal of the L4-L5 disc. This finding was in accordance with the literature.

Several reports indicated that the L5-S1 nerve roots are most frequently involved (3,5,7). On the other hand, Cannon et al. (3) stated that this fact did not necessarily imply any topographical selectivity since these roots are the most frequently explored during operations for herniated disc.

Peyser et al. (11) observed a conjoined nerve root anomaly in approximately 2 % of the 8,000 patients who underwent lumbosacral CT scanning. White et al. (13) reported the incidence around 1.3 %. Contrarily, a study performed by Chotigavanich and Sawangnatra (4) on 60 fresh cadavers revealed a 30 % incidence of nerve root anomalies of the lumbar and sacral region. Based on the findings of this study, the anomalies of lumbar and sacral nerve roots have been classified into six types:

Type I. Intradural anastomosis between rootlets at different levels.

Type II. Extradural anastomosis between nerve roots.

Type III. Extradural division of the nerve root.

Type IV. Extradural anastomosis between rootlets and extradural division of nerve root.

Type V. Intradural and extradural division of nerve root.

Type VI. Close adjacent nerve roots.

White, et al., (13) proposed that a hint of a possible nerve root anomaly is a negative Lasègue's sign in a patient with radiculopathy. They could not explain the negative straight leg-raising test in these patients. In their series, 40 % of 63 cases with documented disc ruptures plus conjoined nerve roots had a negative lets. This is in contradistinction to the findings of Bouchard, et al., (2) who did not find the negative Lasègue's sign lelpful in their series of 12 patients. In our first patient the Lasègue's sign was also negative.

Peyser et al. (11) proposed several characteristic features that should help to distinguish a conjoined nerve root anomaly from a herniated disc. 1 - The density of the conjoined root anomaly is almost identical to that of the thecal sac or other visualized nerve roots. 2 - The conjoined root anomaly usually occurs above the intervertebral disc space, at the level of the pedicle. 3 - Recognition of aberrant or asynchronous root generation from the thecal sac is usually noted in cases of conjoined roots by comparing two sides. 4 - Division of the larger soft tissue density (representing the conjoined nerve root) into two smaller densities with the typical appearance and location of nerve root is usually seen on consecutive slices.

Several authors believe that these anomalous roots, due to their bulk and fixations, are prone to compression by mild stenosis of the lateral recess (3,7,8,12).

CONCLUSION

The diagnosis of a conjoined nerve root anomaly has several points of significance. If not correctlY interpreted, it could be mistaken for a herniated disc. This could result in potentially unwarranted surgery, and, if approached with limited exposure, it could further result in serious damage to the anomalous roots. We conclude that correct diagnosis of root anomalies is especially important for patients who are considered for percutaneous discectomy and laser surgery, which a misinterpretation could lead to catastrophic consequences.

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