The "Redundant" or "Knotted" Nerve Root: A Clue to Spondylotic Cauda Equina Radiculopathy

Case Report

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During the last 15 years or so, there have been a number of observations at myelography and operation of curiously enlarged, tangled, knotted, redundant, or tortuous lumbar nerve roots.1-8 We have recently seen a patient whose myelogram elucidates this matter of root redundancy.

Case Report

This 50-year-old man was admitted to the hospital for evaluation of difficulties due to spondylotic cervical myelopathy and radiculopathy. During positive-contrast myelography, certain abnormalities including a "redundant" nerve root were seen in the lumbar region (Fig. 1 left). After this finding had been filmed, attention was directed to making the cervical myelogram; during this procedure the usual maneuvers involving flexion and extension of the neck and back were carried out. Later, when the patient was returned to his original position for reexamination of the lumbar subarachnoid space after completion of the cervical myelogram, we were surprised to find no evidence of the redundant nerve root that had shown so clearly before the maneuvers. The spondylotic encroachments remained (Fig. 1 right). The spinal needle was removed, and the patient was placed supine and then prone again, but the only abnormalities to be seen in any position were the spondylotic encroachments at L-4-5, and to a lesser extent at L-5, S-1, and increased prominence of two nerve roots above the L4-5 interspace.

After decompressive cervical laminectomy and foraminotomy, the patient became symptom-free and so far has not developed any clinical manifestations of spondylotic cauda equina radiculopathy, and no operation has been performed on his lumbar spine. His reflexes, including the Achilles, remain hyperactive, but the spasticity present before operation has lessened since the cervical cord decompression. The plain radiographs of this patient's spine (Fig 2) show not only lumbar and cervical arthrosis but also evidence of a congenitally shallow spinal canal, which is a recognized predisposing factor in the development of spondylotic radiculopathy and myelopathy.

Discussion

We believe that in this case, and possibly in those reported by others, the myelographic demonstration of redundant roots and obstruction to flow of contrast material was not due to primary nerve root abnormality, but to lumbar spondylosis. We believe the appearance of redundancy was produced by spondylotic squeezing or gripping of the cauda equina.

When the spine is lordotic and the hips extended, the caudal roots normally have considerable slack or redundancy. This slack is taken up uniformly along the entire length of the roots by an appropriate degree of shortening per unit of length and increase in cross-sectional area. When the back is rounded and the hips flexed, the roots stretch in length with concomitant reduction in cross-sectional area. We suggest that in certain positions of the lower back when assumed by patients with a shallow lumbar canal and spondylosis producing extradural nerve root compression, the caudal root bundle is gripped by the pathological process in such a way as to hold the portion of the roots above the spondylotic process tautly. This, in turn, gives the roots below this level excess slack. We have also observed the reverse of this process which causes the roots above the constriction to have a redundant appearance, probably accounting for the type of abnormality reported by Fox.5

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We suggest that this mechanism alone produced the appearance of one or more roots having excess length, and contorted, knotted, and tangled rather than straight courses. This belief seems supported by the fact that in most of the cases reported the redundant roots were in close relationship to partial extradural blocks typical of spondylotic encroachment.2-6,8

To account for instances in which redundancy persisted after laminectomy,2 we suggest that a root that has been pulled taut actually may elongate and remain so indefinitely.

The disappearance of a serpentine myelographic abnormality in the cauda equina with positioning will differentiate this condition from an arteriovenous malformation in which, of course, a comparable picture would be persistent, regardless of position.

Summary

We have described a patient with a congenitally shallow lumbar spinal canal and lumbar spondylosis, who at the time of myelography for cervical spondylosis showed “redundant” lumbar nerve roots which, however, disappeared after changes in low back posture incident to the filming. We suggest that appearance of the spondylotic process in a small canal exerted a gripping influence that stretched a length of root above the constriction, thus creating slack in the re-