

The Anatomic Basis of the Autonomic Syndrome Associated with Lumbar Disk Extrusion

John R. Jinkins, M.D.

●A retrospective review of 250 magnetic resonance imaging examinations of the lumbar spine yielded 145 studies positive for disk extrusion. With the lateral margin of the neural foramen and pedicle as the boundary, 29.2% of peripheral disk extrusions were anterior and 56.4% were posterior. In addition, a prevalence of 14.4% was found for central disk extrusions, in which there was a rupture of disk material into or through the vertebral body itself.

Clinical evaluations revealed a vertebro-genic symptom complex, which includes local spinal pain, distant referred pain, and autonomic reflex dysfunction within the lumbosacral zones of Head. Generalized autonomic alterations in viscerosomatic tone also may be observed. The anatomic basis for the expression of clinical signs and symptoms generated within the disk and paradiskal structures rests with afferent sensory fibers from two primary sources: first, posterolateral neural branches emanating from the ventral ramus of the somatic spinal root, and second, neural rami projecting directly to the paravertebral autonomic neural plexus. Thus conscious perception of noxious stimuli and unconscious manifestations of autonomic effects originating in the vertebral column, although complex, have definite pathways represented in this dual peripheral innervation associated with convergent central ramifications. It is postulated that the specific clinical features of the autonomic syndrome are mediated predominantly, if not entirely, within the sympathetic nervous system.

The original report of intervertebral disk herniation was Kochner's postmortem description published in 1896. Subsequently, continued radiologic advancements have improved diagnostic efficacy in evaluating spinal disk disease. These methods have been directed chiefly toward explaining posterior disk extrusion (PDE), but some publications have addressed the diagnosis of anterior disk extrusion (ADE)—anterior to the confines

of the neural foramen—and central disk extrusion (CDE)—into or through the vertebral body itself.¹⁻³ This review details the potential of magnetic resonance imaging (MR) to reveal such extrusions and examines the pathways of autonomic pain mediation and autonomic dysfunction engendered by these lesions within the lumbar vertebral column.

The basis of this review is a random retrospective study by Jinkins et al. of 250 MR examinations of the lumbosacral spine in adults.⁴ The system of classification divided the extrusions into three major categories: anterior (ADE) and posterior (PDE) peripheral disk extrusions (with the lateral border of the neural foramen used as the boundary between ADE and PDE) and central extrusions indicating herniations into or through the vertebral body itself (CDE). The criteria used in this series for diagnosis of ADE and PDE included two parameters: (1) focal extension of high- and mixed-intensity disk substance beyond the peripheral margin of the vertebral body, resulting in a balloon configuration with a neck indicating complete anulus rupture and disk extrusion; and (2) further extension of the mixed-intensity disk fragment superiorly or inferiorly away from the intervertebral disk space, signifying migration.⁵⁻⁷ CDEs were classified as (1) a focal rounded or square-shaped extrusion of disk substance into the adjacent vertebral body synonymous with the so-called Schmorl node; and (2) a transosseous extrusion of disk material obliquely through the corner edge of the vertebral body (also termed a limbus vertebra) or an extreme peripheral transvertebral extrusion resulting in a distracted ring epiphysis fragment (designated here as an epiphyseal avulsion).⁸⁻¹⁰

Since most patients in the retrospective review were referred from outside institutions, only fragmentary follow-up was possible on the further care of those with PDE. No patients in the series underwent surgical excision of the demonstrated ADE or CDE.

To place the radiographic findings in a clinical context, the charts of 20 patients with "isolated" ADEs or CDEs were reviewed and pertinent signs and symptoms

From the Neuroradiology Section, The University of Texas Health Science Center at San Antonio.

The major portion of this text was previously published in the *American Journal of Neuroradiology* and the *American Journal of Radiology* (Ref. 4). The American Society of Neuroradiology has granted permission for the reproduction of figures in this article.

This paper was presented as the Herschel Lecture at the 19th Annual Meeting of the American Academy of Thermology.