Lumbar Spinal Imaging in Radicular Pain and Related Conditions

Jan T. Wilmink

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Understanding Diagnostic Images in a Clinical Context

Springer

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Preface

Many years ago as a young neurologist I found myself, more or less by chance, with a temporary appointment in the neuroradiological staff of the University Hospital Groningen. As it turned out, this "temporary" excursion proved to be more permanent than I had anticipated, and some thirty years later, I look back on a career in neuroradiology, which has centred importantly on spinal imaging.

An encounter of crucial importance for me was with Lourens Penning, then professor of neuroradiology and head of the department in Groningen. Lourens was a gifted and driven researcher and an accomplished illustrator, as well as being strongly interested in spinal morphometry and biomechanics. He imparted to me an understanding of the principles of spinal imaging, especially functional imaging, as well as of clinical research. Our co-operation was a fruitful one, as numerous joint references in this book attest.

I have been privileged to experience an era of almost bewildering change in the field of medical imaging. At the time of my arrival on the scene in 1976, the mainstays of cerebral diagnosis were still pneumoencephalography, the notorious air study, together with cerebral angiography, with subsidiary roles for brain isotope scanning and echoencephalography. In the spine, diagnosticians still relied heavily on plain X-ray films, with contrast myelography available to image the soft contents of the spinal canal and isotope studies to study CSF flow patterns and detect vertebral lesions.

Computed tomography (CT scanning) of the brain had recently been introduced, but was not generally available. Spinal CT would not become feasible until the advent of large-bore body scanners and high-resolution algorithms. When this did occur in the late-1970s, techniques such as epidural venography and peridurography, which had been introduced as attempted substitutes for myelography, quickly disappeared from the scene. Myelography was relegated to second place, but remained of value, usually in combination with CT.

The advent of magnetic resonance imaging (MRI) provided another great advance in imaging technology and image resolution. MRI has become the prime modality for diagnostic imaging of the brain and spine, and has proven to be superior in many ways to CT. To neurologists and neurosurgeons trained in the last twenty years, it seems almost incredible that neurological diagnosis could previously be achieved without access to these sophisticated imaging modalities. Yet this was actually the case, and while it is undoubtedly true that modern imaging has made life much easier for present-day diagnosticians and patients, it is also a fact that the application of this technology by itself has not provided answers to many important questions which still confront us.

This is also true in the diagnosis of lumbosacral radicular pain and related conditions such as neurogenic claudication. Whereas it is now possible to detect and

classify even the smallest disc herniation and measure accurately the dimensions of the spinal canal, fundamental questions are still unanswered.

Much is still unclear about the pathogenesis of sciatica, but it has now become obvious that there is more involved than simply "rupture of the intervertebral disc with involvement of the spinal canal" as Mixter and Barr described in their historic article in 1934. Inflammatory components have proved to play an important role. In neurogenic claudication presenting in patients with lumbar spinal stenosis, vascular factors appear to be at work beside compression of the cauda equina within the narrowed canal. Functional spinal imaging in different postures has, however, helped us to explain the posture-dependency of this complaint

Lumbar disc herniations are frequently encountered by chance in individuals who are not suffering and who will not suffer from symptoms attributable to these herniations. The prevalence of these incidentally-found herniations in the healthy population is generally estimated at around 30%, though even higher percentages have been reported! It is still not fully clear in which ways these asymptomatic herniations and these individuals differ from morphologically similar herniations in patients who do present with radicular symptoms.

Radicular pain episodes tend to be self-limiting, and the presence of a herniated disc causing radicular pain is not a mandatory indication for surgical therapy, as the majority of these pain syndromes will show spontaneous remission. On the other hand, the complaints can be persistent in a small minority of these and it would obviously be useful to be able to select such cases for early surgical therapy, thereby saving these patients an extended period of fruitless conservative therapy.

This book represents an attempt to formulate the beginning of an answer to some of these questions. As a consequence of my neurological and neuroradiological background, I have chosen to focus on the assessment of the state of the nerve root. For this reason, much attention is devoted to technical aspects and interpretation of MR myelographic imaging.

Chapter 1 on the nature of radicular pain presents an overview of the evolution of this concept, from a simple mechanical compression model to a complex phenomenon with humoral and auto-immune inflammatory components, and featuring besides pain by direct involvement of the nerve root, pain originating in spinal musculoskeletal structures, which is referred via a central mechanism to the lower extremities

In Chapter 2, lumbar spinal imaging techniques are reviewed, briefly discussing methods formerly used and focusing on MRI with special attention to MR myelography.

Chapter 3 deals with normal topographic and sectional spinal anatomy, with a section devoted to functional imaging, describing the effects of postural changes on normal spinal structures and dimensions.

Chapter 4 is devoted to pathologic anatomy and the way in which symptomatic nerve root compression can come about. In this chapter as well as the next, case illustrations are captioned with a brief summary of the presenting clinical symptoms of the patients illustrated.

Chapter 5 describes pre- and post-operative imaging, and attention is devoted to features which may help to predict the natural evolution of radicular complaints in an individual patient. In the same chapter, the presentation of various adverse post-operative events is reviewed.

Maastricht, The Netherlands Prof. Dr. Jan T. Wilmink

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I consider myself fortunate to have encountered so many gifted clinicians and teachers during my general medical and post-graduate neurological and radiological training, many of whom were especially interested in spinal diagnosis and therapy. I have tried to pass on their teaching to my students and trainees, who have also played a vital part in my own ongoing post-graduate training.
The most important message is probably always to keep in view the patient behind the image.

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