MR in Low Back Pain: What the Neuroradiologist Can Contribute

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Spinal disorders are both common and costly. The point prevalence of low back pain among adults is 37 percent, and the lifetime prevalence is 85 percent. About 20 percent of adults report that their pain is severe or disabling. According to the 2002 National Health Information Survey, respondents ranked back pain first (26.4 percent) among pain syndromes lasting at least one whole day during the preceding three months. Back pain ranks among the top five reasons for visits to primary care physicians in the U.S. Back injuries represent the most common work-related injury, with 2 percent of the U.S. workforce sustaining a compensable back injury annually.

The direct and indirect costs of caring for patients with spinal disorders are significant and increasing. The direct costs of caring for back pain doubled from 1997 to 2004, and they are now estimated to be approximately $90 billion annually. The indirect costs in terms of lost productivity and disability are even more substantial. The total annual economic burden for low back pain alone in the U.S. has been estimated to range from $118.8 billion to more than $600 billion.

Despite spending increases for back care, clinical and functional outcomes have been deteriorating. Even though the mean spending per capita on patients with low back pain rose from $4,695 in 1997 to $6,096 in 2005, the proportion of persons with spine problems reporting physical limitations also rose during the same period — from 20.7 to 25.6 percent.1 During a similar time frame, in the Medicare population the number of lumbar MRIs increased by 307 percent and the number of epidural steroid injections rose by 271 percent. Variations in spine care across the U.S. are well-documented, as there is nearly an eightfold difference in the use of

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discectomy and a twentyfold difference in the use of spinal fusion by region.2 (1). In parallel there is a moderate to strong correlation between changes in the rates of CT/MRI and spine surgery (2,3).

Spine care is fragmented among multiple providers, including medical and surgical physicians of various specialties, chiropractors, physical therapists, massotherapists, interventional radiologists, anesthesiologists, psychologists, and practitioners of alternative medicine. The precise anatomic source of back pain is not identifiable in most patients, and no generally accepted diagnostic nomenclature exists. Widely available imaging techniques such as CT and MRI commonly demonstrate abnormalities of questionable clinical significance, which can lead to errors of symptom attribution and misdirected medical and surgical treatment.

The role of imaging is to provide accurate morphologic information and influence therapeutic decision making. A necessary component, which connects these two purposes, is accurate natural history data. Understanding the relationship of etiologic factors, the morphologic alterations, which can be characterized with imaging, and the mechanisms of pain production and their interactions in the production of symptoms will require more accurate and reproducible stratification of patient cohorts.

No less a problem than understanding etiology is agreeing on terminology that is reliable and reproducible to describe the morphologic alterations produced by the degenerative process. We prefer the terminology described by Milette (4).

Any study looking at the natural history of degenerative disk disease, prognostic value of imaging, or its effect on therapeutic decision making will be confounded by the high prevalence of morphologic change in the asymptomatic population (5-7). A 20%–28% of asymptomatic patients demonstrate disk herniations, and the majority have evidence of additional degenerative disk disease (5-7). In a study of symptomatic patients, the prevalence of disk herniation in patients with low back pain and those with radiculopathy at presentation was similar (8). There was a higher prevalence of herniation, 57% in patients with low back pain and 65% in patients with radiculopathy, than the 20%–28% prevalence reported in asymptomatic series (6,7). Disks characterized as extruded showed more marked regression in patients with both low back pain and radiculopathy. In general, one-third of patients with disk herniation at presentation had significant resolution or disappearance by 6 weeks and two- thirds by 6 months (8). The type, size, and location of herniation at presentation and changes in herniation size and type over time

did not correlate with outcome. In fact, the presence of a herniation at a MR was a positive prognostic finding (8).

Interestingly, not only do disk herniations have a tendency to regress, but also new or larger ones may appear after the onset of symptoms. In this study, 13% of patients in this symptomatic series developed new or larger disk herniations over a 6-week period. In looking at patients with low back pain or radiculopathy, MR did not have additive value over clinical assessment. No prognostic sign that might alter treatment versus clinical assessment alone was identified. The size and type of disk herniation and location and presence of nerve root compression, significant in terms of morphologic alteration, were not related to patient outcome. Like- wise, the presence or absence of steno- sis, facet disease, or degenerative mar- row changes did not correlate with patient outcome (8).

This lack of prognostic value also appears to apply to the conservative management of spinal stenosis. There do not appear to be reliable prognostic imaging findings that would correlate with surgical success or even whether patients would benefit from surgery and spinal stenosis (9,10). A study of the qualitative morphologic features of the spinal canal dimensions and herniated disks has not proved helpful in predicting outcomes in patients with back pain and sciatica. Demographic and clinical features appear to predict outcome of nonsurgical treatment, whereas morphometric features of disk herniation and spinal canal are more powerful predictors of surgical outcome (11).

Reliability and reproducibility of imaging findings is of great importance. A number of papers have addressed the issue of intra and interobserver variance (3, 12, and 13). The bottom line is that there is good agreement between readers on the level and location but only fair for comparing morphology. Readers tend to have good agreement on the severity of stenosis but only fair for other qualifying descriptors, such as the presence or absence of nerve root compression.

So while the role of imaging to provide accurate morphologic information is well established. It's more important attribute is its ability to influence therapeutic decision making. This has been examined by a number of authors and the consensus is that in low back pain, absent red flag symptoms or history, imaging does not affect management or improve clinical outcomes compared with usual clinical care without immediate imaging. (8,13,14)

Table 1-Red Flags

History of malignancy	Inability to find a comfortable position
Pain at night	Unexplained fever
Significant spinal trauma	Bowel or bladder dysfunction
Gait or balance disturbance	Progressive weakness
Known osteoporosis	IV drug abuse

In summary, low back pain related to degenerative disease is a common and costly condition. The etiology of pain and degenerative disease is more complex than a simple mechanical explanation. Reliable and reproducible descriptive terminology is critical to meaningful description of morphologic abnormalities. The prognostic value of these findings is confounded by their high prevalence in the asymptomatic population. In patients with uncomplicated back pain or radiculopathy, MR imaging may not have an additive value over clinical assessment.

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