

Diagnosis and Treatment of Lumbar Spinal Disorders – A Multidisciplinary Approach: Introduction

Adetokunbo A. Oyelese, MD, PhD

LUMBAR SPINAL DISORDERS ARE AMONG THE MOST COMMON ailments afflicting patients in the United States and account for the second highest number of missed work days behind the common cold. As the lumbar spine is comprised of bony, neural, ligamentous and muscle elements, localizing the specific source of the pain (the pain generator) and the effective treatment can prove challenging for primary care physicians and spine specialists alike. The underlying cause may range from a simple “muscle strain”, causing a back ache to a disc herniation impinging upon a nerve and causing radiculopathy or “sciatica” with pain down the leg. Degenerative changes of the lumbar spine in the disc and the facet joints may also lead to chronic back pain and conditions such as lumbar spinal stenosis in the elderly causing neurogenic- or pseudo-claudication which refers to pain in the back with radiation down the legs with ambulation. As such, the treatment of lumbar spinal disorders usually involves a number of different specialties and requires a multidisciplinary approach including physical therapy, chiropractic care, pain management and psychiatry care and usually as a last resort, surgical intervention with a neurosurgical or orthopedic spine specialist. In this article, we have outlined the approach to lumbar spinal disorders from different disciplinary perspectives. In the first section, I give an overview of the approach to patients with low back pain, then Dr. Pradeep Chopra, a pain specialist discusses the indications for and the benefits of cortisone injections and other pain management strategies. Dr. Donald Murphy discusses a chiropractor’s approach and perspective in

the second section. The indications for and approach to surgical management are discussed in the following two sections by Dr Philip Lucas (orthopedic spine) and Drs. Heather Spader, Jonathan Grossberg and I (neurosurgery). Finally, we take a look at patients who have continued back pain after undergoing surgical intervention in a discussion of “failed back syndrome” by Dr. Daniel Aghion (neurosurgery), Dr. Pradeep Chopra (pain management) and myself.

Adetokunbo A. Oyelese, MD, PhD, is an Attending Neurosurgeon and the Director for Spinal Disorders for the Department of Neurosurgery at Rhode Island Hospital, and an Assistant Professor of Neurosurgery at the Warren Alpert Medical School of Brown University.

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CORRESPONDENCE

Adetokunbo A. Oyelese, MD, PhD
Department of Neurosurgery
The Warren Alpert Medical School
of Brown University
593 Eddy Street, APC-6
Providence, RI 02903
phone: (401) 793-9128
fax: (401) 444-2661

Approach To the Patient With Low Back Pain

Adetokunbo A. Oyelese, MD, PhD

THERE ARE TWO IMPORTANT INITIAL determinations to make in evaluating and assessing a patient with low back pain: The first is a determination as to whether or not the symptoms are indicative of a serious medical condition (such as an unstable fracture or severe spinal compression that could lead to significant neurological injury, a potentially life threatening infection or a malignant neoplastic process). The second determination is as to where specifically the pain is arising from (the so-called “pain generator”—intervertebral disc disruption, a pinched nerve, lumbar facet arthropathy etc). It is the answers to these two questions that directs the diagnostic work up and the ultimate

approach to strategies for management of the patient’s symptoms. A detailed clinical history, physical examination and judicious use of diagnostic testing are key in helping the practitioner navigate this complex landscape.

CLINICAL HISTORY

The clinical history is critical in the initial evaluation of a patient presenting with a disorder of the lumbar spine. It is important to first distinguish between innocuous back pain (such as from a muscle strain suffered in a sporting or occupational activity), and pain from a potentially life threatening process (such as an infection or a malignancy). It is

also important to identify potentially critical neurological symptoms affecting the patient that may lower the threshold for urgent diagnostic imaging and surgical intervention. Thus, a patient with mild to moderate pain or numbness in a radicular distribution (from a presumed disc herniation or stenosis) must be approached very differently than a patient complaining of significant leg weakness or bladder and bowel incontinence which may signify a cauda equina (multiple lumbosacral nerve root) compression syndrome. The evaluating healthcare provider should elicit a history detailing the onset, quality, duration and pattern of the pain as well as its location. Pain

from a spinal malignancy that is not due to spinal instability tends to be nocturnal as the patient's endogenous cortisol levels decrease and may improve during the day. This is in contrast to pain associated with spinal instability which is exacerbated by motion. Constitutional symptoms such as fevers, chills, sweats and weight loss may indicate the presence of an infectious or malignant process. Additionally, a history of chronic steroid use, immunosuppressive therapy or disease, IV drug abuse may be predictive of a compression fracture or an infectious process. Severe or rapid onset of pain and weakness in a particular root distribution usually indicates a significant degree of neural compression and is more concerning when several nerve roots are involved.

Another subset of patients in whom one must have a lower threshold for obtaining radiographic studies and suspecting a significant injury includes elderly osteoporotic patients and patients with spinal spondyloarthropathies such as ankylosing spondylitis and **diffuse idiopathic skeletal hyperostosis (DISH)**. In these patients, spinal biomechanics are significantly altered because of auto-fusion across multiple segments or decreased bone mass and a seemingly innocuous traumatic event (such as a tripping action without a fall) may produce a compression fracture or a severely unstable spinal fracture which may be neurologically catastrophic if unrecognized. If the clinical history and subsequent physical (and neurological) examination speak to a significant underlying pathological process, further immediate diagnostic testing including appropriate laboratory and radiological studies (see below) must be obtained. Conversely, if a benign process is suspected, it is likely to be a self-limiting process and one may institute a more conservative approach with rest, NSAID treatment or physical therapy and pursue further testing and work up only if the symptoms do not improve.

SOCIAL HISTORY

Social factors play a significant role in the development of symptoms in lumbar spinal pathology and may affect the response of the patient to treatment and their ultimate outcome. For instance, it has been noted that the incidence of back pain, sciatica and spinal degenerative

disease is higher among patients with a significant history of tobacco use.¹ Smoking also delays healing following spinal fusion surgery and increases the rate of pseudoarthrosis or incomplete fusion.¹ Additionally, patients with a history of depression, a work injury, or who may be involved in litigation or have secondary gain have a less favorable outcome and response to treatment for lumbar spinal disorders. Patients who have been out of work because of a spinal problem for less than six months, one year and two years have a 50%, 20% and less than 5% chance respectively of returning to work.

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PHYSICAL EXAM

The physical examination of a patient with low back pain begins with a visual examination of the unclothed spine to assess for normal alignment and curvature. Percussion or palpation may reveal areas of tenderness or muscle spasms with guarding which should alert the examiner to a potential underlying injury. Passive range of motion testing should be conducted with the patient flexing forward and extending backwards as well as bending laterally and it should be noted whether these motions elicit pain or discomfort. Back pain elicited with forward bending is thought to be related to disc disease (as the load-bearing shifts to the anterior column of the spine) while back pain with extension could be indicative of facet joint-mediated (posterior spinal column) pain. Leg pain with extension of the spine is usually indicative of spinal canal or neural foraminal stenosis. A thorough neurological examination is necessary and may help in the localization of the pathology within the spinal canal. Each spinal nerve exiting the spine at a particular level subserves sensory and

motor function for a particular distribution within the lower extremities. The purpose of the neurological examination is to determine whether or not there is any neural compression and to use this "road map" to identify the spinal region or "neighborhood" where the compression or disturbance is occurring. The upper lumbar nerve roots (L1-3) primarily innervate the muscles of the upper leg involved in hip flexion (L1, L2) and knee extension (L3, L4) and convey sensation from the medial and anterior thigh region. The L4 and L5 nerve root are primarily involved in ankle and foot motion (dorsiflexion, extensor hallucis longus and eversion) and convey sensation over the antero-lateral thigh, medial leg, medial malleolus and over the dorsum of the foot. The gastrocnemius and soleus (calf) muscles utilized in plantar flexion (standing on the toes) are innervated by the S1 nerve roots which also convey sensation to the lateral aspect of the foot. Occasionally, a diminished patella (L3, L4) or Achilles tendon (S1) reflex may precede weakness that is noticeable to the patient or the examiner. Finally, radiating posterior thigh and leg pain on straight leg raising with the patient supine (Lasegue's sign) may indicate lower lumbar nerve root irritation from a disc herniation (L4-S1). A femoral nerve stretch test performed with the patient prone and with passive flexion of the thigh at the knee and extension of the hip producing anterior thigh pain indicates irritation of the upper lumbar nerve roots (L2-L4). Because hip pain can frequently mimic lumbar radiculopathy, testing of the hip joint with internal and external rotation (Patrick's maneuver) for groin pain and examination of the trochanteric bursa region should be performed when examining a patient for back pain and radicular symptoms.

RADIOGRAPHIC ASSESSMENT

Radiographic studies are a very useful adjunct in the diagnosis and treatment of disorders of the spine and are used to confirm or rule out what has already been suspected based upon the clinical history and physical examination. Radiographic tests ordered by treating physicians may include plain film x-rays, a **computed tomography (CT)** scan, **magnetic resonance imaging (MRI)** scan or a nuclear medicine study such as a bone scan. The

specific test should be tailored to the clinical situation in question. For instance, plain film xrays or a CT scan give a good overview of the bony anatomy and alignment (curvature—scoliosis, angulation—kyphosis) and are useful in assessing for fractures, dislocations or displacement and congenital spinal dysraphisms. These radiographic tests are also useful in evaluating a patient following a spinal arthrodesis and instrumentation operation to assess for adequate bony fusion and healing. X-rays with flexion and extension views (dynamic x-rays) may uncover an occult instability within a spinal segment particularly if there is an underlying spondylolisthesis (anterior or posterior displacement of one vertebral body with respect to another). A bone scan is useful in identifying hypermetabolic regions within the spine as may occur with an infectious or neoplastic process. Perhaps the imaging modality most utilized is the MRI because of the ability to examine in significant detail, the soft tissue elements of the spine such as the intervertebral discs, the spinal cord and nerve roots, **cerebrospinal fluid (CSF)**, and the paraspinal soft tissues, in addition to the bony vertebral elements. When coupled with the administration of intravenous gadolinium contrast dye, vascular lesions, neoplasms and infections are very well visualized. However, the high sensitivity of MR imaging has led to normal anatomical variation or age-related change in the spine such as disc degeneration being incorrectly identified as a cause for pain. A great many patients undergo surgical intervention in the United States every year with questionable diagnoses such as this and unsurprisingly, their post-operative outcomes are quite poor. Jensen and colleagues² demonstrated the presence of a disc bulge in a least one spinal level in 98 asymptomatic patients ages 20 to 80 years of age with the incidence of a disc bulge increasing with age. Notwithstanding, an MRI may provide information as to the presence of a disc herniation or protrusion compressing the thecal sac or

a nerve root, arthropathy or degeneration and inflammation within the facet joints, spinal canal stenosis from facet joint and ligamentous hypertrophy. Modic³ described and characterized changes within the bone marrow associated with inflammation and degeneration adjacent to the intervertebral disc based upon the appearance on distinct MRI sequences. Type I changes were associated with acute or subacute inflammation while types II and III were consistent with more chronic changes. The incidence of low back pain has been found to be greater in patients with Type I Modic vertebral endplate changes.^{4,5}

OTHER CLINICAL TESTING

Electrodiagnostic testing (EMG, Nerve conduction studies) maybe used as an adjunct to the other testing listed above in determining whether a patient's symptoms are consistent with a radiculopathy. Electrodiagnostic testing is also useful for determining whether numbness is due to diabetic neuropathy or nerve compression. Urodynamic testing of bladder function is useful in the diagnosis of a neurogenic bladder in patients with urinary incontinence or hesitancy from compression of the cauda equina or tethering of the spinal cord.

In summary, the practitioner must be part "detective" in gleaning critical information from the patient using the clinical history, physical examination and diagnostic testing, analyzing the data and coming up with a definitive diagnosis. Once it is determined that the condition is not life threatening, it is the responsibility of the practitioner as a "therapist" to devise an appropriate multimodality management strategy for the relief of the patient's symptoms with referrals to appropriate specialists when indicated and also to reassure the patient and encourage them to make the necessary lifestyle changes to improve the lumbar spinal health. The role of the specialist is explored in greater detail in the ensuing sections.

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