

SPINECARE

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CHAPTER I

INTRODUCTION - WHY I WROTE THIS BOOK

80 to 90% of the population of the United States will experience significant episode of pain in their lifetime. Neck and back complaints are one of the most common presenting problems in the primary care physician's office. Unfortunately, many medical school and residency training programs provide very little instruction on diagnosis and treatment of these problems.

There is also a disparity of understanding of problems of the low back even among those physicians that should be well versed in this subject, such as orthopaedic surgeons and neurosurgeons.

As an orthopaedic spine surgeon in private practice, I see many referrals from primary care physicians. With the changes in health care involving managed care and the gatekeeper concept; it is to the primary care physician's advantage to have a better concept of management of problems of the spine. With this better concept, one would hope that there would be less unnecessary testing, greater diagnostic accuracy, better communication with the patient and referring physicians, and overall better patient outcome.

I have written this book to try to bridge the gap between the lack of educational resources for care of the spine and the large number of patients presenting to the primary care physician with this complaint. Many important questions arise such as when is physical therapy and nonsteroidal treatment indicated? When is an MRI scan or other ancillary test needed? When does the patient need to be referred to a specialist for further evaluation? What is the natural history of this disease process?

I hope to answer these questions in the ensuing chapters in a concise, practical, and easy to understand fashion.

CHAPTER II

ANATOMY

It is important to understand some of the anatomical similarities and differences in the spine so that one is able to correlate this with the pathophysiology of the disease process. It is not my intent to explore this in such detail that one would need from a surgeon's point of view, but rather enough detail to understand the disease process.

The vertebral bodies in the spine are arbitrarily divided into cervical, thoracic, lumbar, sacral, and coccygeal areas ([Figure 1](#)).

There are seven cervical vertebral bodies, which in the sagittal plane are normally lordotic. There are twelve thoracic vertebral bodies, which are normally kyphotic. There are five lumbar vertebral bodies, which normally are lordotic connected to the sacrum and the small coccygeal bones at the caudal aspect of the spine. The overall anatomical relationships throughout the spine are similar except that obviously the cervical vertebral segments are smaller. One important difference between the cervical and the lumbar spine would be the facet joints in the posterior aspect of the spine, which are a part of the three-joint complex, which we will discuss later ([Figure 2](#)). The cervical facet joints are oriented in a different direction in the lumbar facet joints and also seem to be more involved as pain generators in the cervical spine than the facet joints in the lumbar spine.

The segments are joined together by the anterior longitudinal ligament, posterior longitudinal ligament, along with interspinous ligaments, and the ligamentum flavum ([Figure 3](#)). The spinal cord runs through the spinal canal and ends at approximately L1, where the nerve roots continue on into the sacral area, otherwise known as the cauda equina (because it looks like a horse's tail) ([Figure 4](#)).

DISKS

The disk is structurally similar in the cervical, thoracic, and lumbar spine and is composed of outer fibers of annulus fibrosis, which are arranged at 30° to each other in a lamellar pattern ([Figure 5](#)). The inner portion or nucleus pulposus is a gelatinous structure with hydrostatic properties. The function of the disk is to transfer vertical compressive forces evenly to the annular fibers, therefore, dissipating this force; and also to provide flexibility and stability.

The disk itself can be thought of as a shock absorber in that its function is important in mobility, but also in stability of each motion segment (motion segment defined as two vertebral bodies and the intervening disk).

The disk is innervated by nerve fibers that can transmit pain and proprioceptive impulses. These nerve fibers are in the outer aspect of the annulus fibrosis and also are in the posterior longitudinal ligament, which lies just behind the annulus fibrosis. The next chapter will discuss the changes that occur with aging and injury to the disk and how this accounts for pain syndromes involved with disorders of the spine.

NEURAL ELEMENTS

The spinal cord begins as an extension of the central nervous system at the foramen magnum at the base of the skull. It is encased in the spinal canal protecting it from injury. The spinal cord is also surrounded by cerebral spinal fluid and supported by small ligamentous structures, which are also protective in nature. As stated previously, the spinal cord ends around the L1 area. At that point, nerve root divisions to the lower extremities are encased in cerebral spinal fluid. This is an important factor to remember in that disk herniations or problems below L1 usually result in nerve root problems rather than spinal cord problems (radiculopathy rather than myelopathy).

In the spinal cord, the motor and sensory rootlets come off at each level ventrally and dorsally and form the spinal nerve, which contains both motor and sensory fibers into the extremities. These spinal nerves are responsible for specific sensory dermatomal distributions along with specific muscular innervations, as seen in [Figure 6](#). It is important to remember that these relationships are not hard and fast, and that

there is some crossover in this area, but knowing the motor and sensory innervation to the lower extremities is useful in determining which nerve root or roots are affected by specific lesion.

CHAPTER III

PATHOPHYSIOLOGY AND NATURAL HISTORY OF DISEASE PROCESSES

This is a very important chapter if one wants to truly understand the care of the spine. It makes common sense that before we can understand what our treatment is doing for a disorder, we need to know what happens to this disorder if it receives no treatment whatsoever. In other words, we need to know whether our treatments are making any impact at all on the patient's outcome positively or negatively. This is where most of the misunderstanding in spine care lies, and there has been great strides in the last 10 years in understanding the natural history of these disease processes. In most cases, we have found that many disorders have been overtreated both nonsurgically and surgically.

In the next few sections, I am going to be discussing degenerative processes and how this causes back pain (axial pain) versus leg pain (radicular pain). IT IS IMPERATIVE THAT ONE UNDERSTANDS THE DIFFERENCE BETWEEN BACK PAIN AND LEG PAIN AND THE TREATMENT REGIMENS FOR EACH OF THESE. Likewise, as we will discuss later in the history taking process, it is important to understand from the patient's perspective whether the majority of their pain is axial versus radicular. THIS IS THE ONE MOST IMPORTANT CONCEPT IN THIS BOOK.

DEGENERATIVE DISK "DISEASE"

The disk obtains most of its products of nutrition and gets rid of its waste by diffusion. Most of the disk metabolism is anaerobic. At birth, and up to about 20 years of age, the cartilage end plates provide diffusion from the vertebral body into the disk and allow waste products to exit the disk. After 20 years of age, this cartilage deteriorates. The disk loses its nutritional supply and is unable to discard its waste products. At this time, the disk begins a degenerative process.

This degenerative process happens in all of us, but is made worse by certain factors such as: Injury, inherited factors, smoking, vibrations (such as truck drivers), and iatrogenic causes, such as surgeries.

As the disk degenerates, it loses many of its hydrostatic properties. Therefore, it loses its efficiency in transferring compressive stresses, and it is more prone to injury. During the degenerative process, there begins to develop clefts in the annular fibers, along with loss of disk space. Because of these biomechanical changes, instability can develop. This instability may also involve the facet joints as I mentioned in the Anatomy chapter, which can result in increased motion in these three joints (a disk and 2 facets).

Disk degeneration is a normal process of aging that typically occurs in the 3rd, 4th, and 5th decade of life and can result in back pain. This back pain occurs because the pain fibers that innervate the outer annulus and the posterior longitudinal ligament are exposed to inflammatory chemicals from the disk and also are exposed to abnormal motion, both of which can cause back pain.

This degenerative process continues and the body tries to decrease this motion by forming bony osteophytes (spurs), which can be seen on x-ray. This usually begins in the 4th and 5th decades of life,

and in many people by the 6th and 7th decades of life, there are diffuse osteophytes which have stabilized this excess motion ([Figure 7](#)).

The natural history of degenerative disk disease, therefore, is to have back pain, which may or may not follow an injury, which occurs in the 2nd, 3rd, and 4th decades of life, but usually this back pain will improve in the 6th decade of life as stability occurs. This is of great comfort to patients to understand the natural history of this disease and the fact that with age, most likely their back pain will improve. It is also important to understand that there is little that can be done to change the course of this degenerative process or speed up the stabilization phase. Physical therapy, injection, or medicines are not going to affect this process. A regular aerobic exercise program, which may strengthen the trunk muscles (core muscle strengthening) and aid in weight loss may help to unload some of the forces acting on the spine, and therefore may improve symptoms somewhat.

I will discuss surgeries in a later chapter, but will mention here that fusions are occasionally done in well-selected patients to help with back pain. The concept of a fusion is to decrease the abnormal motion at one or more segments in the spine, therefore, hopefully eliminating back pain. Recently artificial disc replacement has been advocated to replace a degenerative disc and preserve motion at a segment.

Again, it is important to remember that I have been discussing disk degeneration and how this causes back pain. This is not to be confused with disk herniation, which causes leg pain.

It is important in differentiating back pain and leg pain to understand that there is a portion of leg pain that I am going to call referred leg pain. This leg pain is usually in the thigh area and does NOT extend below the knee. It can be in the anterior or posterior thigh. This pain is referred from the back meaning that this pain does not come from compression of a nerve root, but rather is a part of the whole back pain process. It is known from experimental studies that when the nerve fibers that innervate the outer annulus and the posterior longitudinal ligaments and some of the interspinous ligaments are stimulated, this will cause not only back pain, but a dull aching pain into the thighs. This is a point of confusion among many people in trying to differentiate between back pain and leg pain. The important thing to remember here is that referred leg pain is usually a nonspecific aching pain that does not occur below the knee, whereas radicular pain does occur below the knee.

SPINAL STENOSIS

As the degenerative disk disease process continues, the body forms bony spurs in an attempt to stabilize the spinal segments and decrease the motion at each segment. These bony spurs can occur in the facet joints and may cause narrowing of the neuroforamina centrally around the spinal canal and in the intervertebral foramen, which may cause symptoms of spinal stenosis ([Figure 8](#)). This spinal stenosis usually occurs after the 5th decade of life and may cause leg pain in one or both legs. As one would expect, the neural encroachment and symptoms are slowly progressing. We will discuss more about spinal stenosis in a later chapter, but spinal stenosis typically causes leg pain that is worse with walking and prolonged standing, and better with rest and recumbency.

Remember, we discussed the fact that the disk dehydrates with age. Therefore, it is rare for a patient over 60 years of age to have a herniated disk because the disk itself is too dehydrated to have a herniation in most instances. Therefore, when a patient has leg pain after the 5th decade of life, one needs to consider spinal stenosis as a more common etiology than a herniated disk. This can be confusing point in that spinal stenosis patients typically have a normal neurologic examination and the symptoms are only present in most cases when the patient is ambulating. The symptoms are also much less specific and the pain may not be in a definite dermatomal pattern and may also involve both legs.

HERNIATED DISK

Occasionally, a portion of the nucleus pulposus will rupture through the outer annular fibers, usually in the posterolateral region of these annular fibers ([Figure 9a](#)). The reason this rupture usually occurs in the posterolateral region is because this is the weakest area of the annulus. When this rupture of nuclear material occurs, it may cause compression on a nerve root. Only rarely does the disk herniate centrally, which in the cervical spine could cause compression of the spinal cord. Therefore, in the vast majority of patients, the symptoms are one-sided.

After the nuclear material herniates through the fibers of the annulus, this causes inflammation of the nerve root because of some chemicals released by the material along with possibly an immunologic phenomena in addition to the pressure on the nerve root. Because of the inflammation of the nerve root, radiculopathy occurs in a certain dermatomal distribution. There may be pain along with sensory changes, motor changes, and reflex changes involving the innervation of one specific nerve root in one extremity ([See Figure 6](#)).

The disk herniation typically compresses the root that traverses the disk space so that an L4-5 HNP, for example, would compress the L5 root ([Figure 9b](#)).

NATURAL HISTORY

There have been several studies done on the natural history of a herniated disk in the lumbar spine. The most classic of these studies was done by Weber*. These studies were done with two groups of patients, all which had herniated disk and radiculopathy. The groups were randomized into surgical and nonsurgical treatment. The patients were then looked at and rated based on leg pain and neurologic changes in both groups. For the most part, the patient's that had surgery fared better than those who did not have surgery at the 4 month interval, but by one year, there was little difference between operative and nonoperative group and there was no difference at 4 years and at 10 years between those that had surgery and those that did not have surgery for a herniated disk. This tells us that surgery for a herniated disk for leg pain is basically a temporizing measure.

In this study, it is also interesting to note that there was no difference in return of motor function, sensory function, or reflex function in those that had surgery and did not have surgery.

Eighty-five percent of patients with a radiculopathy from a herniated disk will improve over 6 to 8 weeks period of time and not require surgery. This makes perfect sense when we consider the natural history as I had previously discussed. It also makes perfect sense that STATIC weakness or numbness is NOT an indication to consider surgical intervention in a patient since there is no difference in return of sensory or motor function when one considers surgical versus nonsurgical treatment.

*Lumbar Disk Herniation, Weber, H; Spine 8:131-140, 1983

Therefore, the only absolute indication for surgical intervention in a patient with a herniated disk would be a PROGRESSIVE motor deficit or a cauda equina syndrome (bowel and bladder incontinence associated with herniated disk). Both of these situations are very rare.

A relative indication for surgery for a herniated disk and leg pain would be in the patient that has had at least a four to six weeks trial of nonoperative management for this herniated disk and still has leg pain that is incapacitating for the patient and that the patient cannot live with and that is not improving. If the patient is improving, then it is reasonable to just to continue the present treatment and watch and wait

until the improvement plateaus. There is no difference in return of neurologic function or decrease in pain postoperatively in those patients that are operated on early and those patients that are operated on up to six months following the disk herniation. There is no evidence to suggest that there is any permanent changes in the nerve root from a longstanding disk herniation except those that are longstanding past 6 months.

In practice, this means that after six weeks or so of nonoperative treatment, if a patient is not showing improvement and the leg pain that they have is incapacitating and they cannot live with it, then I would consider surgical intervention after discussing the implications of surgery and the risks involved. If one considers the natural history of this disease, then it also makes sense that if a physician were to obtain an MRI scan on every patient that was in his or her office with symptoms of a herniated disk and radiculopathy, then 85% of the time this would be an unneeded test. I will discuss more about MRI scans in the diagnostic imaging chapter.

CHAPTER IV

HISTORY TAKING PROCESS IN SPINAL DISORDERS

This chapter is rather straightforward, and for the most part, the history taking process with problems of the spine is similar to any other history taking process, but I hope to give the reader a couple of pearls that may make this process a bit more fruitful.

Hopefully, you have already read the preceding chapters and understand about the difference between back pain and leg pain, and realize that these are two separate processes. Therefore, the prognosis and treatment are different. Therefore, the one most important thing to determine in the history taking process is **WHETHER THE PATIENT HAS MORE BACK PAIN OR RADICULAR LEG PAIN**. Remember not to be confused with referred pain and radicular leg pain (referred pain being nonspecific leg pain that does not occur past the knee, whereas radicular pain is pain going down below the knee usually in a specific dermatomal pattern).

In asking the patient about back pain and leg pain, it is important to remember to ask the nature of the pain, whether it is constant or if it is associated with activity. Also important, is whether or not the pain wakes them from sleep. It is obviously also important to determine how long this pain has been going on.

One also wants to determine any specific traumatic event that started this pain. It is important to ask about associated medical conditions such as atherosclerotic cardiovascular disease, which may be associated with peripheral vascular disease in leg pain. One must also remember diabetes, which can cause a peripheral neuropathy or a motor nerve plexopathy that can mimic neurologic problems similar to spine problems. One must also keep in mind diseases such as multiple sclerosis, which in the early stages can mimic motor and sensory findings seen with herniated disk or spinal stenosis.

Back pain that has been going on only a few weeks could easily be secondary to a traumatic event causing a muscular strain that will usually improve quite rapidly, whereas, back pain that has been going on greater than eight weeks most likely is not from a muscular etiology if one considers that most muscle injuries will heal over a six to eight weeks period of time.

Degenerative disk disease typically causes sporadic type pain that is worse with prolonged sitting, prolonged standing, or with increased activity. This pain usually improves with rest and with recumbency. Back pain that is constant and wakes a person from sleep that has been going on greater than six to eight weeks is worrisome for an occult etiology such as a tumor or an infection.

In asking about leg pain, it is important to determine first off where the leg pain is occurring, and also if there is associated neurologic symptoms of numbness or weakness. It is also important to inquire if the pain is at rest or is associated with increased activities, such as standing or walking. Spinal stenosis (which will be discussed in a later chapter) typically causes increased leg pain, weakness, and/or numbness with walking or prolonged standing that improves with rest.

It is also important to inquire if there is any other neurologic problem, such as clumsiness, which might indicate upper motor neuron spasticity or possibly bowel and bladder incontinence, which might indicate a cauda equina type syndrome.

It is also important to determine whether the problem is getting better or getting worse. The different portions of the history taking process will become more clear in the subsequent chapters discussing evaluation and treatment of these disorders.

CHAPTER V

PHYSICAL EXAMINATION - INTRODUCTION

Observation of the patient indirectly as the patient walks into the office and into the examining room and moves about the room on and off the examining table is probably the most important part of the physical examination. It is important when looking at the patient to determine their spinal mobility. Is there any limp? Is the patient guarding or overreacting to the situation?

SECTION I - EXAMINATION OF THE SPINE

It is important to ask the patient exactly where is the pain occurring and try to localize it as much as possible by palpation. In many instances, you can localize the facet area if you remember that the L4-5 facet is going to be at approximately the level of the iliac crest. One can also palpate the paraspinal muscles and determine if there is spasm. It is also important to palpate the sacroiliac joint to be sure there is no tenderness over these areas as these are a common source of back pain.

It is important to determine range of motion, and this needs to be done both directly by asking the patient to perform range of motion while observing, but also indirectly to be sure that these observations do correlate.

There are several signs of pain magnification behavior or inappropriate illness behavior identified by Waddell* in a classic paper. These Waddell signs are helpful in determining the patient that has significant psychological overlay or secondary gain issues involved. These signs include: 1. Tenderness. An example would be the patient with pain to light touch or light stroking of the skin over the spine area. 2. Simulation. This would include the trunk rotation test with the arms to the side and the feet together. The trunk is rotated slightly as a unit. This should not move the spine at all, but the patient with inappropriate illness behavior will complain of back pain with this maneuver. The head compression test is also another excellent test. With the patient standing upright, the head is gently compressed with the hands downward, and the patient with inappropriate behavior will complain of low back pain with this maneuver. 3. Distraction test. This would include testing the straight leg raise with the patient in the sitting position. Typically while testing reflexes or checking pulses, the legs can be straightened out to 90 degrees. If the patient has no evidence of nerve root tension signs while in the sitting position, but does have nerve root tension signs in the supine position, then this would be an indication of inappropriate illness behavior. 4. Regional pain or nonatomic pain. This would be the patient that describes whole leg numbness or whole leg weakness that does not fit into an anatomic pattern. 5. Overreaction by verbalization, muscle tension, collapsing, or sweating.

Other parts of the exam that can sometimes be overlooked, but need to be documented would be examination of the pulses in the feet to rule out a vascular claudication type problem or an aortic aneurysm type problem. It is also important to document that there is no stiffness or pain on range of motion of the hips, which can also cause leg pain.

As I mentioned before, the sacroiliac joint can be a source of pain that can cause pain similar to low back pain and even can cause leg pain similar to radicular type pain. If there is significant pain on palpation over the iliac crest, this can further be isolated by performing a Figure 4 or Patrick's test. This is performed by having the patient lie in the supine position and bring the affected leg into the abducted externally rotated position ([Figure 10](#)).

It is also important to determine if the patient has a scoliosis or has any abnormal rotation on forward bending or has an abnormal lumbar lordosis or thoracic kyphosis. Skin changes, skin lesions, and hairy patches are also important. Nerve root tension signs occur because with movement of the legs into an extended position, there is 3 to 5 mm of movement of the nerve root in the intervertebral foramen. It is important to remember that this involves movement of only the lower nerve roots, (L4, L5, and S1). A positive straight leg raise test indicates an irritated nerve root typically resulting from a herniated disk. Positive straight leg raise is indicated by pain **BELOW THE KNEE** with extension of the knee and flexion of the hip less than 70°. Straight leg raise that causes only pain in the thigh or the buttock area is inconclusive for nerve root tension signs ([Figure 11](#)).

A cross straight leg raise test is pain that occurs in the opposite leg with a straight leg raising and is indicative of a free fragment herniated disk causing radicular leg pain. Remember that upper lumbar herniated disk (i.e. those at L1-2, L2-3, and L3-4) most likely will not have a positive straight leg raise test. Many people feel that the reverse straight leg raise test or femoral stretch test involving flexion of the hip and knee is indicative of upper lumbar herniated disk, but I have not found this portion of the physical examination to be helpful.

SECTION II - NEUROLOGIC EXAMINATION

Part I - Observation

It is important to look for atrophy; abnormal gait, such as ataxia; and/or a limp as part of the overall neurologic examination.

The motor examination involves testing of motor strength and is graded on a scale of 0 to 5 (see table 1). It is important to test the strength in the iliopsoas muscle by asking the patient to flex the hip up off the table. Also, to test the quadriceps, extensor hallucis longus, anterior tibialis, and gastroc soleus muscles, which are innervated by specific nerve roots (see table 2), it is important to remember that in many cases, one will not be able to notice weakness in the quadriceps or the gastroc soleus muscle since this is such a large muscle and it is difficult to overpower with normal strength testing. It is sometimes helpful to ask the patient to heel walk and toe walk. In many instances, a difference in strength between one side to the other may be detected that could not be detected on manual muscle testing.

Part II - Reflexes

It is important to test the patellar tendon reflex along with Achilles reflexes in the lower extremities. In many instances, a decreased Achilles reflex may be the only objective sign of an S1 radiculopathy (see [Figure 6](#), Page 3). Reflexes are graded on a scale of 1 to 5 with 2/5 being normal reflexes (see Table 3).

Pathologic reflexes are also important to rule out an upper motor neuron type lesion (i.e. spinal cord problem). Normally, a patient should have less than 2 beats of clonus. Clonus is best demonstrated with the patient in the relaxed position sitting on the examination table. With the patient relaxed, the forefoot is placed into forced dorsiflexion causing dorsiflexion of the ankle and there should be less than 2 reflex muscle contractions following this. More than 2 beats may indicate upper motor neuron involvement. Plantar reflexes should also be tested by stroking the bottom of the foot with an instrument such as the back side of a hammer. Typically, the toe will plantar flex. An abnormal reflex involves extension of the toe with stroking of the sole of the foot ([Figure 12](#)).

CHAPTER VI

TREATMENT PHILOSOPHY FOR BACK PAIN - INTRODUCTION

Remember it is important to differentiate back pain and referred leg pain from radicular leg pain. This chapter deals with BACK pain, whereas, the next chapter will focus on treatment of radicular LEG pain.

In the history taking process, it is important to determine whether the back pain resulted from injury or was it of insidious onset, and also when did the back pain begin? Once this is determined, it is easiest to separate the back pain into acute (less than 3 months duration) versus chronic back pain (greater than 3 months duration).

One wants to rule out history of osteoporosis or other metabolic bone disease that might be an etiology for back pain. It is also important to note if the patient smokes. Smoking can increase disk degeneration and certainly is associated with increased instance of herniated disk and low back pain.

ACUTE BACK PAIN (Less than 3 months duration)

Typically, this back pain results from some type of injury, either a lifting injury, fall or a twisting type of injury. Most likely, the etiology of this back pain is a tear in the paraspinal musculature. The patient will have back pain without leg pain. The physical examination will reveal decreased range of motion along with palpable paraspinal spasm. The natural history of this problem is to improve over a 6 to 8 week period of time as the muscle heals with scar tissue. If back pain does not heal over at least an 8 to 12 week period of time, then one can assume that it is not muscular in origin. In a patient with acute back pain, with presumed muscular origin or lumbar strain, treatment involves basically helping the patient to feel better while healing occurs, while preventing further or recurrent injury.

I have found in practice several treatments to be helpful:

1. Physical therapy modalities - I am not talking about exercises here, which might aggravate the problem, but rather heat and ultrasound and electrical stimulation, which will help with the spasm. I typically will start this on the day that I see the patient and continue this for 10 days to 2 weeks for 3 times a week. It makes no sense to continue this on a long-term basis, and certainly if the patient is not responding to 1 or 2 treatments, it is best to discontinue physical therapy than to cause further harm and cost and inconvenience to the patient.

2. Muscle relaxers are helpful in the acute period to help with the spasm although certainly one should caution the patients about sleepiness or operating heavy machinery or driving while taking these medicines.

3. Nonsteroidal anti-inflammatory agents are helpful for pain in this acute period. In my opinion, narcotics should be used only very rarely. The majority of patients will respond quite nicely to nonsteroidal anti-inflammatory agents without the dangers and addictive potentials of narcotic pain medicines.

Bed rest greater than 48 hours has been shown to be harmful to the patient's long-term recovery, and in most instances for acute back pain, I do not find bed rest to be helpful. The majority of patients can continue working on some type of light duty regimen so that they don't become deconditioned while in the recovery and healing phase.

It is important to remember that this healing of muscle occurs over a 6 to 8 week period of time, so one wants to protect the patient from further reinjury while in this healing phase.

After the patient is seen back in 10 days to 2 weeks, usually the spasm is subsiding and the pain is improved. In many instances, the muscle relaxers can be discontinued. The physical therapy regimen might be discontinued at that time or changed to range of motion and strengthening as the patient progresses. The majority of patients are improved by a 6 to 8 weeks period of time following injury and can return to normal activities without restrictions.

In the patient with recurrent strains, it is important to recommend a regular program of aerobic exercise and trunk strengthening exercises.

In the patient that continues to have back pain beyond the 8 week period of time, one has to consider that the diagnosis of lumbar strain is suspect since the muscle should have healed by this time. The patient that has back pain greater than 3 months would then be placed into the chronic back pain category, which will be discussed in the next section. When seeing the acute back pain patient in the office, unless there is a significant trauma, or unless it is a medical legal situation or workers' compensation situation, an initial plain x-ray examination is not indicated. If the patient continues to have back pain beyond a 2 to 3 week period of time, then the clinician is probably obligated to obtain plain x-rays of the lumbar spine to rule out a structural abnormality.

CHRONIC BACK PAIN

In a patient with back pain greater than 3 months duration, then obviously muscle injury would have healed in this period of time. One must consider several differential diagnoses with chronic back pain which can be divided into the following categories: 1. Degenerative disk disease is by far the most common etiology for chronic back pain and we will discuss in further detail in the next few paragraphs. 2. Viscerogenic pain such as abdominal problems or prostate problems. 3. Vascular etiology such as abdominal aortic aneurysm. 4. Occult abnormalities such as infection or tumor involving the spinal column or neural elements.

In most instances, the history taking process and physical examination can rule out an occult abnormality for cause of back pain. As discussed previously in the history taking chapter, back pain that is of a constant nature that wakes a patient from sleep might be associated with an occult condition. These causes are rare, but must be kept in mind when evaluating the patient and may cause the clinician to order further laboratory and radiologic tests in the early evaluation phase. When one is considering an

occult process such as a tumor or infection for the cause of a patient's back pain, the most sensitive and specific test available is an MRI scan. In addition to the MRI scan, a CBC, sed rate, and serum protein electrophoresis are excellent screening laboratories to rule out an occult process. A bone scan is nonspecific and probably not helpful in this situation. One must also remember that a bone scan can be negative with multiple myeloma, a common etiology for bone metastatic processes.

Degenerative disk disease is by far the most common cause of chronic low back pain. If one remembers the pathophysiology and natural history of this condition, it makes perfect sense that degenerative disk disease is most often going to be seen in the patient age group of 25 to 55 years of age when the microinstability involved with this degeneration is causing back pain. The history taking process reveals that this back pain is usually worse with prolonged sitting, or prolonged standing, or with increased activities, and is improved with rest. Physical examination will typically reveal no areas of specific point tenderness and no palpable paraspinal spasm. Neurologically, the patient will usually have a normal exam with no nerve root tension signs (negative straight leg raise). When one considers the etiology of back pain and degenerative disk disease, it becomes evident that physical therapy, injections, medicines, chiropractic manipulation, acupuncture, and other treatment modalities most likely are not going to have a dramatic effect on the underlying biomechanical problem causing the back pain.

In a patient with chronic back pain, it is important to obtain a plain x-ray of the lumbar spine to evaluate for any structural problems that could be associated. Typically, the patients with chronic low back pain will have some mild degenerative changes such as anterior traction spurs, which result from osteophyte formation along the anterior longitudinal ligament and the bodies attempt to decrease the motion at each segment. The patients may also have decreased disk spaces. Occasionally, one will see a patient with a [spondylolisthesis](#), which may be associated with chronic low back pain.

One of the most important tasks to accomplish in the patient with degenerative disk disease is to identify the problem and discuss it with the patient so that they understand the etiology of their problem, and so that they understand the natural history of their problem. It is very comforting for the patient to have a label for their pain and also to understand what will and will not help their pain and also to understand that most likely their pain will improve as they get into their late 50's and 60's as the body stabilizes this excess motion and the spine stiffens secondary to osteophyte formation.

A regular aerobic exercise program such as walking, bicycling or swimming 30 to 45 minutes, 3 to 4 times weekly, is helpful in maintaining proper trunk strengthening and also in enabling weight loss, which are both important in decreasing some of the pain associated with degenerative disk disease. Upper extremity strengthening and exercises such as martial arts and yoga are helpful for core muscle strengthening.

Weight is also an issue since biomechanical studies have shown that for every excess 1 pound in front of the trunk, this can mean as much as 4 pounds of stress onto the spine area.

In my opinion, it is not, in most instances, helpful to obtain an MRI scan in a patient with presumed degenerative disk disease. This MRI scan is not going to change the treatment plan for this patient.

In rare instances for patients with back pain from degenerative disk disease greater than a year that do not respond to nonsteroidals and a regular aerobic exercise program and still have incapacitating pain, there may be an indication for surgery in the form of a lumbar fusion or disc replacement. The fusion would presumably decrease the motion at the effective segment, thereby removing the abnormal impulses that are causing the patient to experience back pain. The fusion is an involved surgical procedure certainly with associated risks with an overall success rate of approximately 75%. One certainly does not want to consider this type of surgery until the patient has exhausted all other options.

The patient with degenerative disk disease usually can continue to work although they may need to avoid lifting heavy objects greater than 35 or 40 pounds and they may find it helpful to change from a sitting to a standing position every 30 to 45 minutes.

CHAPTER VII

TREATMENT PHILOSOPHY FOR LEG PAIN

A. HERNIATED DISK WITH RADICULOPATHY

Remember that herniated disks usually occur in the patients from about 20 years of age until 50 years of age. Those patients with leg pain that are greater than 50 years of age typically have leg pain from spinal stenosis, which will be discussed in the next section.

Patients with a herniated disk and radiculopathy typically give a history of a short course of back pain as the herniation occurs that may or not be associated with an injury. This back pain usually decreases over a 1 to 2 week period of time, while leg pain increases. This leg pain typically goes down past the knee in a specific dermatomal pattern. This may or may not be associated with numbness or weakness in one leg.

The physical examination usually will reveal a positive straight leg raise on the affected side along with decreased sensation, plus or minus associated weakness and reflex changes in one dermatomal pattern ([see Figure 3](#), page 2). If one remembers our discussion from the natural history chapter, then it is important to remember that 85% of patients with a herniated disk and leg pain will improve over a 6 to 8 week period of time, will not require surgery, and regain near full function. It is important when talking with the patients to discuss with them these optimistic figures.

It is also important when talking with patients to differentiate back pain from leg pain and stress that any treatment involved for this herniated disk is going to be aimed at treating the leg pain, and most likely the back pain that they have will continue.

Initial treatment involves therapies aimed at relieving the inflammation in the affected nerve root. The 5 to 6 day tapering oral steroid regimen is an excellent way to improve the leg pain in the herniated disk in a patient with no contraindications to this therapy such as diabetes or peptic ulcer disease. Once the patient finishes the steroids, it is usually helpful to start them on a nonsteroidal anti-inflammatory agent over a 3 to 4 week period of time as the pain subsides. It is important during this period of time to avoid activities, such as excessive walking, bending, twisting, sitting, driving, and lifting, which might aggravate this pain.

Each time the patient is seen, neurologic examination along with straight leg raise test is documented along with subjective assessment to determine if improvement is occurring. Remember that the only absolute indication for surgical intervention with a herniated disk is a cauda equina syndrome or PROGRESSIVE motor weakness. In the rare patient with cauda equina syndrome or progressive neurologic deficit, emergent MRI imaging and surgical consultation should be obtained.

An MRI scan is NOT indicated in the patient with a herniated disk in the first few weeks of treatment. Assuming that 85% of patients with a herniated disk will improve and not require surgical intervention, then there is no need to obtain an MRI scan on these patients just to make a definitive diagnosis. The

diagnosis can be made by history and physical examination alone, and the only time an MRI is indicated is if the patient is considering surgical intervention.

Surgery is contemplated in those patients that do not see improvement and have intolerable leg pain after a reasonable trial of conservative management over a 6 week period of time. Remember that surgery is indicated for leg pain, and not numbness or weakness alone. Statistically, there is no difference in return of motor function or sensory function in those patients that have surgery versus those patients treated nonsurgically.

Studies have shown that there are no permanent changes in the nerve root following a disk herniation in the patient with continued leg pain symptoms until the compression has been going on for at least 6 months. Typically, one can ascertain whether or not the patient is making improvement, and whether or not this leg pain is going to be tolerable for the patient within a 6 to 8 period of time. Certainly, if the patient is not making progress despite nonoperative management, then referral to a spine surgeon is indicated along with an MRI scan. CT scans and myelogram CT scans are generally not helpful or indicated unless there is some contraindication to an MRI scan in a certain patient.

B. SPINAL STENOSIS

This leg pain is typically in the patient greater than 50 years of age and can be in both legs and is associated with ambulation or prolonged standing. These patients may or may not have associated back pain, and when discussing treatment options with them, it is important to remember to differentiate between back pain and leg pain and discuss with them the fact that any treatment regimen undertaken most likely is not going to improve the back pain that they have, but can hopefully improve the leg pain component of their pain. Typically, these patients will have minimal tenderness in the lumbar spine and most likely will have a normal neurologic examination and will have a negative straight leg raise (no nerve root tension sign). It is important to document that there is no evidence of peripheral vascular disease and no evidence of degenerative arthritis in the hips which can mimic this type of leg pain.

In most instances, the diagnosis of spinal stenosis is made mainly on the classic history that the patient gives of progressive leg pain with walking or standing, improved with sitting or recumbency. Plain x-rays are usually obtained and usually show degenerative changes such as anterior traction spurs, decreased disk space, and may also show a scoliosis and possibly a degenerative [spondylolisthesis](#), which usually involves the L4-5 vertebra rather than the L5-S1 vertebra.

It is important to reassure the patient that this is not anything dangerous, and is not typically rapidly progressive, and is not going to cause paralysis or other problems. Again, there is no surgical urgency in a patient with a static motor or sensory deficit, and the main indication for treatment would be leg pain or progressive weakness with walking consistent with neurogenic claudication.

In my opinion, it is important to document the amount of spinal stenosis and the exact location of the spinal stenosis by an MRI scan. Myelogram CT scan is not indicated unless an MRI scanner is not available, or the patient is not a candidate for an MRI scan because of implants or severe claustrophobia.

Once an imaging study determines what level or levels the spinal stenosis is involved, then usually the patient can be helped with an epidural steroid injection. These are usually administered by the anesthesiologist or radiologist at the desired level, and can in many patients provide prolonged relief of up to a year. It is safe to have 3 to 4 of these injections per year. I generally do not recommend more than 2 injections if they do not seem to be working, but I have many patients who will have an injection every few months and get significant relief from their leg pain and are able to live with their leg pain much easier.

Surgery is indicated in a spinal stenosis patient for leg pain or neuroclaudicant symptoms that are intolerable, and that are not improved with epidural steroid injections. Surgery for spinal stenosis patients is in the form of a laminectomy, which involves removing the lamina and osteophytes centrally and in the neuroforamina at the involved levels ([Figure 13](#)). One has to be careful that this procedure does not destabilize the spine and cause a progressive deformity. One has to be particularly careful in the patient with [spondylolisthesis](#) or degenerative scoliosis, and in fact in most instances, this patient needs to have a concomitant fusion procedure along with the laminectomy to prevent later deformity.

11. CERVICAL SPINE:

One can use the same concepts for cervical spine disorders to treat problems in the cervical spine. It is again imperative to determine whether the patient is having axial (neck) versus arm pain.

Neck pain is not treated successfully by surgery. It is felt to come from the facet joints in the posterior spinal area, not the disks. I prefer non-surgical treatment such as P.T. for mobilization and strengthening or Chiropractic treatment. As a last resort there may be an option for pain specialists to percutaneously denervate the facet joints under local anesthesia.

Arm pain and radiculopathy from a herniated disc or bone spur will improve in 85% of patients non-surgically over a 6 week period of time. For those that continue to have incapacitating arm pain then surgical option of outpatient anterior cervical discectomy and fusion has a 90-95% success rate. Please see link to surgical procedures for specifics on this surgery.

Surgical Procedures: Microdiscectomy, Anterior cervical [discectomy](#) and fusion, [Lumbar fusion](#).