Herniated NUCLEUS PULPOSUS
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HISTORY

The herniated intervertebral disc is most frequently seen between the ages of 20 and 50 years. With great regularity it presents a characteristic history and physical examination. Therefore, in diagnosis an accurate, detailed history is of utmost importance. About one half of the cases will give a definite history of trauma, either a fall on the buttocks or lifting a heavy object in a bent forward position. A sudden "catch" in the low back is usually experienced, followed by inability to straighten. Radiation along the course of the sciatic nerve may occur at the time of the accident or sometimes later in association with further trauma. Movement, coughing, or sneezing usually aggravates the pain. The regions of greatest tenderness are found along the sciatic nerve in the gluteal region, back of the knee, and the lateral aspect of the thigh. Numbness, or the sensation of "needles and pins", may be felt in the legs and feet. In the case of a large herniated disc, radiation may be bilateral. There is a tendency toward recurrent attacks, the pain increasing in severity with each attack.

EXAMINATION

On examination, the patient will invariably show a limp with muscle spasm and a list away from the side of the sciatic pain. Lateral bending to the side of the lesion usually increases the leg pain; bending away from the side of the lesion decreases it. Hyperextension usually causes increase in pain. Point tenderness can be elicited at the site of the lesion and is an important sign. When firm and prolonged pressure, exerted at this point, produces increase in the leg pain, it is almost pathognomonic of a herniated disc.

The most frequent site of disc herniation is the lumbosacral symphysis. This is the most vulnerable point
in the spine because both the body weight and the force of lifting with the upper extremities are transmitted through this joint to the fixed pelvis. It is also a frequent site of congenital anomalies. Its articulation with its two posterior synovial joints is intimately associated with the lumbosacral plexus. With lesions at this level, the ankle jerk will be absent or diminished. Sensory loss is usually encountered. Mapping the dermatome involved is important in the diagnosis and in determining the level of the lesion. A lesion at the fifth lumbar interspace involves dermatomes S1 and S2 producing a loss of sensation over the top of the foot, the four lateral toes, and the lateral aspect of foot, ankle, and calf. A lesion at the fourth lumbar interspace involves dermatomes L5 and S1, producing sensory changes over the top of the great toe and a small strip up the anterior tibia.

The jugular compression test, when positive with radiation of pain and tingling along the sciatic nerve, is pathognomonic of a disc. The test is best done using a blood pressure cuff with 40 to 50 mm. of pressure.

Other standard tests which are employed routinely are important in the differential diagnosis:

(1) The straight leg raising test, or Laseque's sign, produces pain by stretching the sciatic nerve. It is a valuable index of the degree of sciatica by determining the angle at which pain is first elicited. The test also places a rotary stress on the sacro-iliac joint. In sacro-ilial disease, pain will be produced on the same side usually before an angle of 45 degrees has been reached. A modification of this test is to flex the foot actively toward the dorsum, with the leg elevated. This increases the stretch on the sciatic nerve and causes increased pain.

(2) Gaenslen's test is a sacro-ilial test which eliminates the stretch on the sciatic nerve. The patient is placed on his side and the pelvis is fixed by flexion of the knee on the abdomen; then the opposite thigh is hyper-extended, causing severe stress on the sacro-iliac joint.

(3) Faber's sign for sacro-ilial disease is elicited by forced flexion, abduction, and external rotation of the hip with the knee flexed.

(4) Forced and prolonged separation or compression of the wing of the ilium is perhaps the most reliable sacro-
iliac test as it does not involve the sciatic nerve or the lumbo-sacral joint.

(5) Ober's sign or test is used to determine spasm of the glutei or tensor fasciae latae. Gaenslen's test is carried out as above and the extended leg is pushed toward the table. If no spasm is present the knee will touch the table without difficulty.

A careful physical examination will usually rule out sacro-iliac involvement and also the diagnosis of sacro-iliac disease will be less frequently made. The sacro-iliac joint is not commonly a cause of sciatica. Anatomically it is a very stable joint, possessing the strongest ligamentous support of any joint in the body allowing only a few degrees of rotary and sliding motion. The nerve trunks are not in intimate contact with the joint, being only loosely attached to the anterior surface. Spondylitis usually first manifests itself in the sacro-iliac joint and tuberculosis of the sacro-iliac is not uncommon. These lesions, however, rarely cause sciatic pain. Considering the above it is not likely that a mild sprain or minute subluxation would cause a sciatic neuritis.

A rectal examination should be carried out routinely to rule out pelvic pathology. Neoplasm must always be kept in mind. Rectal examination may also reveal a spastic pyriformis muscle which not uncommonly causes sciatica. Tenderness in the region of the sacro-iliac joint may be encountered in sacro-iliac disease.

A lumbar puncture is always indicated along with a Queckenstedt test to determine a block. If disc herniation is present, the protein will be found to be elevated from 42 mgm to 60 mgm/cc. With a protein of 100 mgm one should suspect a tumor. Spinal fluid examination is not entirely reliable, since a chronic disc herniation can exist with a normal protein. Also inflammatory changes in or about the nerve root may possibly cause an elevation of spinal fluid protein.

Other routine laboratory procedures are also important in the differential diagnosis. The sedimentation rate is a valuable procedure in all cases of low back pain. An early spondylitis or neoplasm may be manifested by an elevated sedimentation rate.

X-rays are a valuable aid in the diagnosis of a herniated disc. Narrowing of the joint space at the level of the lesion
is frequently found. X-ray will rule out fractures in traumatic cases. Associated congenital anomalies can be visualized which predispose to an unstable lumbar spine and which will be important in deciding the final type of surgical treatment.

Where the diagnosis cannot be made definitely on the bases of the history and physical examination, myelography is indicated. Pantopaque is the medium of choice. It is removed at the end of the examination, even though it has been found not to cause irritation when left in. Pantopaque myelograms are made routinely at Walter Reed General Hospital on all disc cases in which surgery is contemplated. They are done to verify the diagnosis and to localize the lesion accurately. This permits removal of the disc with the least possible disturbance to the spinal weight-bearing mechanism. It must be remembered that a herniated disc occasionally may be missed on myelographic studies. These herniations are incomplete and produce only a temporary bulge in the annulus fibrosis with the patient in certain positions. Also multiple lesions may occur. A large protrusion at the fourth interspace may block the canal and prevent accurate visualization of a fifth lumbar disc. Surgery without myelography is justified only when the patient presents the classical history and neurologic findings.

DIFFERENTIAL DIAGNOSIS

Spinal cord and cuada equina tumors constitute the most difficult problem in diagnosis. In the case of a tumor, the pain is more constant and frequently is nocturnal. The patient will usually complain of increased pain when recumbent even on a firm surface. There is a greater increase in pain on coughing and on jugular compression. Both sensory and motor changes may be found. The spinal fluid protein shows a marked increase. The Queckenstedt may show a block.

TREATMENT

The initial treatment of a herniated disc is conservative. Many cases are cured by early conservative measures of bed rest and traction. It is felt by some that an acute herniation can occasionally be reduced by manipulation. This should never be attempted until after x-rays have been obtained. Other cases, which respond to conservative treatment undoubtedly are based upon a tear or laceration in the
annulus fibrosus or upon an incomplete herniation which protrudes only at times. These heal by scar formation when placed at bed rest.

The fact that conservative treatment will cure many early disc herniations makes early diagnosis imperative. All back cases should be thoroughly examined and properly evaluated. Often it is not until secondary trauma is inflicted that radicular pain develops. Complete herniation sometimes can be prevented by early treatment. Many traumatic cases should be given an initial period of bed rest and observation, even if a disc herniation cannot be diagnosed definitely. This period of bed rest may not only cure a herniation, but also may heal an acute sprain and thereby prevent prolonged disability from a chronic sprain.

Surgery should be resorted to in acute cases when symptoms fail to subside with palliative measures and in cases of recurrent episodes which incapacitate the patient.

Discs are now removed through small exposures with the least interference possible to the stability of the back. They are in many cases removed through the interlaminar spaces. In cases where more extensive pathology is expected or encountered, subtotal or total laminectomies must be done.

Where x-rays reveal anomalous lesions in the lumbar region or where an unstable fifth lumbar vertebra is found at the time of surgery, a fusion or combined operation is indicated. In many clinics the operation is carried out jointly by a neurosurgeon and an orthopedist. Common defects which are associated with an unstable lumbar vertebra and are in most cases indications for a combined operation are: spina bifida occulta; six lumbar vertebrae; an increased lumbosacral angle; spondylolisthesis; and sacralization of the fifth lumbar vertebra. The patient's occupation is also a factor in considering the type of surgery. Many cases with associated lumbosacral arthritis or spondylitis with a static back pain should have a combined operation.

**BIBLIOGRAPHY**

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In describing the penetrating agent in gun shot or artillery shell fragment wounds, the terms "bullet" or "shell fragment", respectively, should be used. Only if a wound has been found to be complicated by penetration of small "shrapnel balls" (the development of which by Henry Shrapnel gave this projectile its name), should the term "shrapnel" be employed.