

INTERVERTEBRAL DISK LESIONS ARE THE MOST COMMON CAUSE OF LOW BACK PAIN WITH OR WITHOUT SCIATICA*

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SO-CALLED IDIOPATHIC low back pain with or without sciatic radiation is the most frequent condition seen in the adult orthopedic clinic. In spite of the fact that orthopedic surgeons have devoted much time and thought to this condition, the pathologic changes which are responsible for the symptoms are, for the most part, unknown. Consequently, the diagnosis of low back conditions is largely a matter of speculation. Hundreds of articles have been written on the subject and many classifications of low back pain have been offered. Over 20 years ago a diagnostic study of a series of 300 patients whose principal complaint was low back pain or sciatica led me to conclude that the great majority of these patients were suffering from strains of the lumbosacral or sacroiliac joints (Key¹). In spite of the fact that half of these patients were studied in Boston, where the sacro-iliac joint was then at its zenith as a cause of low back pain, the lumbosacral strains were found to outnumber the sacro-iliac strains by over four to one. It was further stated that while about one-third of the patients presented evidence of hypertrophic arthritis in the roentgenogram, the pain was not due to the arthritis *per se*, but was caused by strain.

The patients were classified as follows:

1. Lumbosacral strain of sudden onset (pain predominantly unilateral in the low back and often referred to the superior gluteal and sciatic nerves), 35 to 40 per cent.
2. Lumbosacral strain of gradual onset (pain as in 1), 20 to 25 per cent.
3. Postural type of lumbosacral strain (pain midline and bilateral in the low back and not referred), 20 to 25 per cent.
4. Sacro-iliac strains, 15 to 20 per cent.

It was stated that the pathology of the above conditions was not known, but it was suspected that the lesions of traumatic and gradual lumbosacral strains were true sprains with tearing or stretching of the ligaments or joint capsules and that the referred pains were due to irritation of the nerve roots by synovitis or exudate in the adjacent joints. It was further stated that the prognosis in all of these low back strains was, as a rule, good, but that chronic and recurring cases usually require a longer time for cure.

In the intervening 20 years I have read a considerable part of the voluminous literature on low back pain and sciatica, but until recently I have not been sufficiently impressed to adopt any important changes, either in the classification or methods of treatment outlined in that paper, except that I have grad-

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ually eliminated the sacro-iliac strains. At no time have I accepted the various current explanations of low back pain, such as fasciitis, insufficiency of the vertebrae, facet syndromes, instability of the lumbosacral spine, tight fascia lata, fibrositis, sacralized transverse processes and other congenital anomalies in this region: spondylitis, sacro-iliac subluxations, apophyseal subluxations, apophyseal arthritis, ligamentous strains in this area, focal infections, *etc.*

When Barr and Mixer² reported their work on protrusion of the nucleus pulposus, I, like most orthopedic surgeons, agreed that they had discovered the cause of the pain in a small percentage of the patients with low back pain and sciatica, but I was not at all interested in turning my patients over to a neurologic surgeon in order that he might inject lipiodol and search for a filling defect in their spinal canals. What happened to those patients in whom no filling defect was found? In what percentage of the spinograms were the examinations negative? Did these patients develop symptoms caused by the lipiodol? Did patients with protruding disks get well without operation? In vain I watched the literature for answers to these questions and also for convincing reports on the end-results of disk operations.

Our patients with low back pain had been getting along pretty well and the first duty of the physician is to do no harm. Experience had shown us that the great majority of our patients with low back pain, with or without sciatica, either continued their normal activities during the period of pain or were able to resume them after a variable period of conservative treatment at home and the more resistant cases were hospitalized and a very few of these were operated upon as a last resort. But conservative treatment and time were given a chance to effect a cure before surgery was even contemplated. The lipiodol injection and spinogram seemed to me to be a rather formidable procedure and I wanted none of it in my practice.

When Spurling, Dandy, Semmes, Love and other neurologic surgeons began operating upon these patients on the basis of the history and physical examination, I became seriously interested in the subject and learned to perform the operation. As practically all of my disk operations are done under local anesthesia, I soon discovered why orthopedic surgeons had not discovered disk protrusions long ago. It is because they had done little or no work in the spinal canal and did not know or appreciate the significance of the fact that the nerve roots within the canal are exquisitely sensitive as compared with the peripheral nerves. Realization of this fact immediately focuses one's attention on an intraspinal cause when dealing with referred pain and it is found that a relatively slight lesion within the canal can cause severe symptoms.

It soon became evident that the protrusion of the disk was a satisfactory explanation of the symptoms in patients with the typical disk syndrome, but what of all of the other patients with low back pain of varying degree and in whom the pain may be localized in the low back or at times be felt in the buttocks, thigh, leg or foot? If these are not disk lesions, what are they?

Even before I accepted a lesion of an intervertebral disk as a frequent

cause of this condition, I had gradually eliminated sacro-iliac strains as a cause of low back pain and sciatica. This left the traumatic and the postural type of low back pain. Both originate in the lumbosacral area (fourth and fifth lumbar and first sacral vertebra) and may be of sudden or gradual onset and begin with or without known cause. In the traumatic type the pain is predominantly unilateral and also tends to be referred to the buttocks, posterior thigh, calf and even to the toes. In the postural type the pain is in the midline and bilateral in the lumbosacral region and tends not to be referred.

The physical findings in these patients vary directly with the severity of the symptoms present at the time of the examination and all transitions exist between the patient with a complaint of mild unilateral low back pain who is completely negative on physical examination and one with a typical disk syndrome with severe back and sciatic pain, marked muscle spasm and pain on movement, limitation of movement of the back and lower extremities and sensory and reflex changes in the involved lower extremity.

It is further to be noted that the symptoms may vary greatly from time to time and even from day to day and while in some patients the symptoms and signs may persist for weeks or months, in others even 24 hours' rest in bed may produce a marked change in the clinical picture. It, thus, may be possible to trace the various transition stages between the mild unilateral low back pain and the typical disk syndrome in a single patient if he is studied over a period of time and his symptoms become aggravated or subside during the period of observation. Since the above is true, why are not all of these traumatic type of lumbosacral strains due to lesions of an intervertebral disk? No other cause has ever been demonstrated. As is stated above, it is pure speculation to attribute the symptoms to any of the various diagnoses under which these conditions have been treated in the past. A disk lesion is the most logical explanation of the dramatic relief which is sometimes obtained by manipulation of the low back.

The postural type of lumbosacral strain is characterized by a history of pain in the midline and across the low back and this pain is not referred to the lower extremities. On physical examination these patients exhibit tenderness on pressure in the lumbosacral region and the pain is aggravated by hyperextension of the low back. In most instances the symptoms are not very severe and the patients do very well under conservative treatment. However, in an occasional patient with a lumbosacral strain of the postural type operative treatment is advisable and in about 25 such instances I have explored the spinal canal in the lumbosacral region and have found and removed disks which protruded in the midline and in most, if not all, of these the operation was followed by relief of the pain. These cases are similar to those reported by Dandy.³

In the postural type lumbosacral strains also there are all transitions between the mild and the severe cases and it may be possible to follow the changes in a single patient if he is examined at intervals while his symptoms

are becoming quiescent or aggravated. If this is true, why are not all of these postural types of lumbosacral strains caused by lesions of an intervertebral disk? Certainly no other cause has been demonstrated. Twenty years ago I wrote vaguely of "irritation of the posterior sacrum caused by pressure of the articular processes of the last lumbar vertebra which in hyperextension glide down over their facets to impinge on the sacrum" (Key¹). This was unsatisfactory then, but nothing better has been offered until we have realized the frequency and significance of lesions of the intervertebral disks. There is no question but that the intervertebral disk is not only subject to degenerative changes, but it is the most vulnerable structure to injury in the low back.

It is, thus, evident that I now believe that in practically all patients with idiopathic low back pain the cause of the pain is within the spinal canal and that in over 90 per cent of the cases this is a lesion of the intervertebral disk. It is probable that in many of the mild cases the back pain originates in the disk itself, because frequently at operation under local anesthesia pain has been produced by pressure on the disk or on the adjacent periosteum or ligament or by manipulating an instrument within the disk and thus moving the adjacent vertebrae. Also, it is significant that in most instances the back pain appears first and the gluteal or sciatic pain begins some days or weeks later or may not appear until after one or more episodes of back pain. It is possible that some of the back pain is due to irritation of the nerve roots and is referred along the posterior primary division of the involved spinal nerve.

The problem of diagnosis, then, is first to determine whether or not the patient's pain originates in the low back. This can be done by the history and physical examination. In my experience if pain in the low back is the dominant symptom the pain is rarely caused by genito-urinary or pelvic disease. Many gynecologists and urologists have spoken and written freely on gynecologic and kidney or prostatic low back pain, but I practically never see these patients. If the pain is in the lumbosacral region and this area is tender on deep pressure and if the pain is aggravated by certain movements of the low back or lower extremities, then it originates in the low back. The exceptions are so rare as to be negligible for all practical purposes. Malingering and psychoneurotic backache must be ruled out, but these are not considered as a part of idiopathic low back pain.

If the pain originates in the low back it may be due to a destructive disease of the bone, such as a neoplasm or tuberculosis, to an ankylosing arthritis or to a caudal tumor, to a fracture, or to a spondylolisthesis, and I suspect that in spondylolisthesis the pain is due to the lesion in the disk. All of these conditions, except caudal tumors, can be diagnosed roentgenologically, unless they are examined very early in the disease. As a group, they comprise less than 10 per cent of the cases of low back pain and over half of these are spondylolisthesis and less than a tenth of them are caudal tumors.

This leaves over 90 per cent of the patients with low back pain and over 98 per cent of those with so-called negative roentgenograms in the idiopathic group. It is my opinion that in all of these the lesion is intraspinal in origin.

and is due to a lesion of the intervertebral disk. No other pathology has ever been demonstrated as the cause of the pain. It is understood that hypertrophic arthritis, a thickened ligamentum flavum, congenital anomalies of the spine and so-called unstable lumbosacral joints and the other conditions mentioned above are rejected as causes of low back pain. The diagnosis is made from the history and physical examination and no lumbar puncture or spinogram is necessary or even advisable. Roentgenograms may offer confirmatory evidence in that if the lesion is chronic or recurrent the involved disk may be narrowed and the adjacent bone may be eburnated and its margins may be hypertrophied. This ridging of the posterior margin of the vertebral body is considered a part of the disk lesion.

This does not mean that all of these patients should be operated upon and the offending disk or disks removed. As a matter of fact, in only about 10 per cent of these patients is an operation the treatment of choice. In the great majority of them the symptoms either subside spontaneously or yield to conservative treatment and in the remainder the pain and disability are not sufficient to warrant the operation.

It may be argued that in many of these patients no rupture or obvious protrusion of the disk is found at the operation. This does not prove that the disks were normal and Dandy's⁴ concealed disk is a very real and important contribution to this phase of the problem. I, with many others, have been too slow in accepting it. Its recognition permits the surgeon to operate with more assurance that the cause of the patient's pain will be found and relieved.

It is also argued that some patients continue to have pain after the operation. This, too, is true and can be explained by (1) incomplete removal of the offending disk; (2) removal of the wrong disk or of only one disk when two or more are causing symptoms; (3) recurrence or protrusion of more disk material from the operated disk; (4) later protrusion of a neighboring disk; (5) the presence of a ridge of bone at the margin of the offending disk; (6) adhesions following the operation; (7) arachnoiditis or nerve damage from pressure by the disk; and (8) a tumor may have been missed. Many of these unrelieved cases should be operated upon a second time and at this operation a hemilaminectomy should be performed if necessary, and the lower lumbar canal explored thoroughly in an effort to find and remove the cause of the pain. In my experience a spinal fusion has not relieved the pain in patients who have persistent pain and disability after an unsuccessful disk operation and I have now abandoned this procedure as a cure for idiopathic low back pain.

The spinal nerve roots lie close to the anterior wall of the canal and are not subject to pressure by a thickened ligamentum flavum or the lamina. It is thus difficult to explain the relief sometimes obtained by the so-called decompression operations. The relief may be due to the careful freeing up of the nerve roots rather than to the decompression.

The diagnosis of idiopathic low back pain is no longer a problem, because

the term is synonymous with a lesion of an intervertebral disk in the affected area. And the same is true of most of those vague unexplained pains in the cervical and dorsal regions in which no pathology or only hypertrophic changes in the vertebrae can be demonstrated. As stated above, hypertrophic changes in the vertebrae are not the cause of pain unless we include the ridging of the vertebral margins beneath the nerve roots which sometimes occurs in old chronic disk lesions, and I consider this part of the disk lesion. It is not the same as the marginal lipping which is so commonly seen in the roentgenogram and does not occur unless the disk is damaged. There will, of course, be an occasional rare exception to this rule.

It is, thus, immediately recognized that the patient with idiopathic low back pain with or without sciatica has a lesion of an intervertebral disk and the problem is to relieve his symptoms in the simplest and safest manner. If our conservative measures fail we can then resort to surgical removal of the cause of the pain and offer him a reasonable chance of a cure. This point of view must be accompanied by the knowledge that in many of these patients the symptoms subside spontaneously, and the firm conviction that in most of the others they can be relieved by conservative treatment. The fact that they may recur is not an adequate reason for operation unless the recurrences have been so frequent and severe that the patient's comfort and welfare are seriously affected by the condition. The operation is an elective major surgical procedure and should not be undertaken lightly.

CONCLUSION

The conditions which we have called low back strains and classified as idiopathic low back pain are lesions of the intervertebral disks in this area.

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DISCUSSION.—DR. GEORGE E. BENNETT, Baltimore, Md.: You have just heard a keynote address on one of the planks of the platform of low back pain. It is very interesting that Doctor Key has keynoted on the same subject on different occasions. It is also interesting to have him summarize his statements with the fact that a large percentage of cases of low back pain are the result of disk lesions but that only ten per cent require operative interference. This statement we should weigh well. I should like to be here about 20 years from now, as I believe Doctor Key would retract some of the statements he made today, as he did some of the statements he made 20 years ago.

I do not wish to discuss the pros and cons of disk lesions. I have one of the cervical spine. I have had symptoms for 20 years and am still doing pretty well, and no neurosurgeon I know wishes to operate upon it. This is a broad subject and I believe orthopedic