

Herniated nucleus pulposus: Nonoperative approach stressing proper body positioning

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Patients with acute radicular symptoms from a herniated nucleus pulposus are commonly offered one of three treatment modes: conservative care, surgery, or chemonucleolysis. This article proposes a hypothetical model for inflammation and nerve root pressure that results in pain. With this method, proper body positioning allows the normal healing process to occur. Nineteen patients underwent a standardized course of nonoperative management stressing this correct positioning. Of these patients, 90 percent experienced a complete resolution of their symptoms and were able to return to their prior occupations. The average treatment period was 9 weeks.

Three major treatment options are currently available for patients with radicular pain of a herniated nucleus pulposus: (1) surgical discectomy; (2) intradiskal injection of chymopapain¹; or (3) conservative treatment. Prior to 1934, when Mixter and Barr² first described their use of laminectomy for the treatment of herniated disks, there was only conservative care. The latter, at that time, consisted primarily of rest, heat, analgesics, and, as an option for the osteopathic profession, supplemental manipulative treatment. Recently, intradiskal injections of chymopapain have been added to the list of treatments approved for disk disease.

These patients are commonly offered a trial period of conservative therapy, to allow time for a satisfactory resolution of symptoms before either of the intrusive alternatives is recommended.

Conservative care, however, is not a single recognized treatment, because all nonsurgical/non-intradiskal injection treatments are included under this general term. Further complicating the matter, new techniques, such as ultrasound treat-

ment, transcutaneous nerve stimulation, application of ice, acupuncture, various kinds of traction, and use of muscle relaxants have now been added to the traditional conservative measures.

It is not surprising, therefore, that reported results have shown great inconsistency. For example, in 1949 Colonna and Friedenbergs³ reported that 29 percent of the patients in their nonoperative group who were managed conservatively became pain free. Pearce and Moll,⁴ in 1967, noted satisfactory results with conservative treatment in 70 percent of their patients. More recently, Johnson and Fletcher⁵ described a 5-year followup study that demonstrated a 95-percent success rate for their conservative treatment program for lumbosacral radiculopathy secondary to disk derangement.

With such divergent results ascribed to conservative management of the herniated nucleus pulposus, there must be major differences in how these patients were treated. It was decided to define a standardized method of nonoperative treatment and then evaluate its effect on a group of patients with hernia and nucleus pulposus. A theoretical model of sciatic pain secondary to a herniated nucleus pulposus was developed, and a method of treatment was defined. This treatment was carried out on 19 consecutive patients. This paper represents a preliminary study to find the natural course of healing of a herniated nucleus pulposus. Future plans involve a study comparing results in two groups of patients—one treated with manipulation and one without.

Proposed model

With herniation of a nucleus pulposus, there may be direct pressure from disk elements or indirect pressure from surrounding connective and supporting tissue on a nerve root exiting the spinal canal, thus producing local physical injury to the axons of a nerve root. This nerve root, or foraminal portion of a peripheral nerve, is basically a mixed conduit that contains both motor and sensory fibers. When these fibers are impinged upon, there may be a certain amount of degradation of muscle function; for example, with an L5 root impairment there may be impaired dorsiflexion, or reduced strength in the large toe extensor. Similar damage

to sensory fibers will result in numbness or loss of sensation in the affected dermatomes; during its acute phase, the radicular pain of sciatica will occur. Because deep tendon reflexes utilize both sensory and motor elements, damage to either will interfere with these reflex arcs, resulting in an impairment of the Achilles or patellar deep tendon reflex.

Such interruptions of nerve transmission, if minor, may take the form of a transient block, as in neurapraxia, which will commonly disappear in 6 to 8 weeks and leave no permanent damage. If the pressure or trauma to the axon is greater, it may cause degeneration distally, resulting in a reasonably permanent functional loss of axonal transmission—axonotmesis. The ultimate degree of recovery from such damage will depend on the severity and the location of the causative trauma.

These physiologic characteristics of nerve damage explain the sensory or motor loss but do nothing to explain the etiology of pain. The mechanism of pain is not well established, but inflammation of the nerve root, possibly associated with a chemical or autoimmune response, has been suggested.^{6,7} Thus, steroids have been used with some success to treat radicular pain by controlling local inflammation.⁸⁻¹⁰ In time, and with no new trauma, inflammation should disappear spontaneously, with the result that pain also disappears.

In the hypothetical model, along with disk herniation, there is sufficient physical trauma to the nerve root from disk or the surrounding structures to cause either a temporary or permanent blockage of motor and sensory fibers, along with inflammation and acute radicular pain. If the hypothetical patient practices faulty body mechanics or poor body positioning at the stage when these conditions are present, nerve root pressure and inflammation will increase, and so will the patient's level of pain. If the patient regularly practices good body mechanics and there is no additional new trauma to the root, inflammation will resolve.

Therefore, the patient must be educated in the theory and practice of correct body mechanics and posture from the onset of treatment, to avoid additional microtrauma to damaged nerve roots. It is only after the patient has learned to avoid additional pain in this manner that steroidal medication for inflammation should be introduced. With the elimination of additional trauma to the nerve root and the abatement of the inflammatory response, the patient would be expected to be pain free. If there is then any permanent damage to the nerve roots or to motor or sensory fibers, it would be

reflected in a corresponding motor, sensory, or reflex loss.

When radicular pain has lessened, the patient is started on abdominal strengthening exercises. Progression into the rehabilitation phase is begun.

Materials and methods

Patient selection

The patients accepted for this study were required to have classic signs and symptoms of an acute herniated nucleus pulposus: acute onset of unilateral radicular pain, positive straight leg-raising tests, and a consistent history of sensory or deep tendon reflex loss.¹¹ They were also required to have lumbar normal x-ray films for their age and one positive, objective test confirming a herniated nucleus pulposus or nerve root involvement. Because no single test will demonstrate these in all persons, the objective test could be any one of the following: a positive myelogram, computerized axial tomography (CAT) scan for a herniated nucleus pulposus, or electromyographic examination (EMG) showing nerve root loss.

Patients who qualified were admitted to the program chronologically upon their agreement to abide by its rules and conditions, although each was free throughout the period to request reevaluation for surgery. The end point for patients in the study was reached when they were free of symptoms, had returned to their previous life-styles, and were discharged from clinical care. Patients who did not have a satisfactory response to the program underwent surgery.

Patient education

First, patients received a full explanation of the physiologic basis of their pain. They were told that their buttock or leg pain was due to nerve root inflammation, and they were further informed that their pain should cease when this inflammation was resolved. They also learned that they could increase or decrease the amount of pain they experienced simply by altering their body positions.

Through a series of trial-and-error experiments with each patient, an individualized "position of comfort" was identified. (A position of comfort is a body position, which patient must find on his own, that causes the least amount of pain or that, in some cases, eliminates pain altogether.) Once these positions of comfort were identified, the principal rule throughout the remainder of the program became to use the position of comfort as much as possible. Patients repeatedly received these instructions from both the physician and physical

therapists throughout the remainder of treatment.

Exercises

Except for a few subjects early in the study, patients were immediately started on flexibility exercises and the pelvic tilt. As their symptoms resolved and pain diminished, they were moved cautiously into an exercise routine designed to increase their abdominal strength. The cardinal rule for exercises was "no pain, during or following exercise." When a specific exercise caused pain, it was discontinued as premature for that patient at that time, to be reintroduced further along into the program.

Rest

Patients were instructed that to receive maximum benefit from their position of comfort, they should rest in it for 10 or 15 minutes as often as possible through the day, at least 3 and preferably 6 or more times per day if their schedules allowed. The resting position was used to maximize comfort and avoid pain through proper positioning of the body. Patients were urged to continue using their rest positions at their work, as possible, after they returned to their job.

Medication

All pain medication and muscle relaxants were withdrawn when the patient entered the program. The use of analgesics would have masked pain, allowing patients to inflict additional, though unfelt, microtrauma on the damaged nerve root. Pain was thus employed in its normal role, as a warning to the body that trauma was occurring. By not using this class of medication, patients quickly discovered for themselves those positions that increased their levels of discomfort and learned to avoid them.

Steroids were withheld until the patients were completely familiar with the concept of avoiding pain by proper positioning and rest, because it was feared that premature introduction of this medication would produce relief followed by a recurrence of symptoms. Steroids were offered only to those patients who failed to achieve satisfactory resolution of pain by fundamental body positioning and rest alone.

Patients were offered steroids via the oral and/or the epidural route. Oral steroids (prednisone) were administered at initial doses of 60 mg. per day in divided doses for 2 to 4 days; then, they were tapered off slowly over the next 2 weeks. No patient was allowed to continue on a regimen of oral

steroids for longer than 2 weeks. Epidural steroids (methylprednisolone acetate) were administered at 80 mg., diluted in 20 to 60 cc. of normal saline solution.

Occupational accommodations

Some patients were able to continue their normal occupational pursuits during a major portion of therapy. For these, however, changes in the work routine were often necessary. Those who normally sat often had to stand for much of the day to achieve maximum pain control. Sometimes it was necessary to intersperse their work with short periods of supine rest in their position of comfort. Patients who had normally engaged in light-to-moderate manual labor could resume their work as long as they eliminated all activities requiring sitting and bending forward at the waist while standing. Even with these modifications, however, several patients were forced to take substantial periods of sick leave to comply with the requirements of the program.

Other modalities

For patients who experienced increased radicular pain when walking, a trial period with a tight lumbar corset was offered, to increase mechanically the wearer's abdominal pressure. If the pain was decreased by this measure, its use was continued; otherwise, it was discontinued. If a patient was seen initially in the hospital on consultation, no physical therapy modalities such as ultrasonography or traction were used after discharge.

Results

Nineteen patients, 11 male and 8 female, participated in the study. Their ages ranged from 20 to 60 years, with the average age 43 years. Of the 19 patients, 17 (90 percent) experienced full resolution of their symptoms and returned to their former lifestyles. The 2 remaining patients ultimately required surgery for relief of pain.

Each of the two treatment failures was an atypical case. A 42-year-old man was forced by his occupation to continue making frequent long-distance drives throughout the treatment period, thus exacerbating his pain and thwarting the key element of the program. The second case involved a 54-year-old woman who, after spending 1 week of hospitalization with rest in her position of comfort and receiving both oral and epidural steroids, reported no decrease in leg pain. At surgery, a free fragment of an extruded disk was found in her root canal.

Of the 19 patients in the study, 12 received steroids at some point. A total of 6 received oral medication, 3 epidural and only 1 following oral steroids. The remaining 7 received no medication of any kind. We found that steroids administered as described to be a valuable aid in the reduction of nerve root pain.

The average treatment period for program participants was 9 weeks. The shortest was 4 weeks and the longest 22 weeks.

All participants were encouraged to continue to employ proper back mechanics and to keep up their abdominal strengthening exercises. To date, 16 of the original 17 who completed the program have remained active and have not had surgery. One of the 17 is presently being considered for surgery due to a recurrence of the radicular pain.

Discussion

In this study, radicular and back pain associated with the herniated nucleus pulposus resolved in 90 percent of the patients subjected to the conservative management techniques described. This result closely approached the 95 percent success rate achieved by Johnson and Fletcher⁵ with conservative measures such as bed rest, anti-inflammatory drugs, spinal support, and abdominal exercises.

It was noted early in the study that back discomfort developed in some participants after their radicular pain had resolved. Because many of these patients had initially mentioned only leg pain, the new pain was assumed to be of a muscular origin, the result of stresses introduced by altered back mechanics and gait and somatic dysfunction. It was decided to begin introducing limited exercise during the program's initial phase. After this change, late-onset back pain ceased to be a problem.

The position of comfort varied from patient to patient and sometimes for a patient during the course of treatment. The most popular position of comfort was supine, with the legs elevated on a cushion or chair so that the hips and knees were in approximately 90 degrees of flexion. In practical usage this is usually translated into "a pillow under the knees," which is usually insufficient. Another popular position required the use of a small foam pad placed under the hips, which shifted the body into a pelvic tilt position.

Because this was a baseline study to examine this approach to treatment, manipulation was purposely omitted from the study. There will be a future study designed specifically to evaluate the independent effectiveness of manipulative therapy

in regard to the herniated nucleus pulposus.

Nor was this study designed to evaluate the role of steroids or the varied effects of their route of administration. Clinically, however, I now believe that their high-dose application after proper patient education often resulted in dramatic improvements in radicular pain. Here again, this observation was based on patients who meticulously followed prior instructions on body positioning and the avoidance of pain.

Comment

Before these results and methods can be translated directly into clinical practice, the time and human factors must be taken into account. With this method the average time for healing was over 2 months (9 weeks). During this period, a significant number of the patients had a major portion of their radicular pain for approximately 1 month. A great deal of physician and therapist time was spent teaching the patients the principles of this treatment. For some physicians in private practice, their time or the therapist's time is not available. For some patients, the duration of discomfort in the healing period is not acceptable; for them, surgery may be a more acceptable choice. Although these factors do not show up in the study, they must be taken into account in clinical practice.

This treatment alternative requires time and effort on the part of both physician and patient. According to the results gained in our program, however, it would clearly be effort well spent. On the basis of the results achieved, this technique appears to provide a reasonable approach to the nonoperative treatment of a herniated nucleus pulposus.

1. Fager, C.A.: The age-old back problem. New fad, some fallacies. *Spine* 9:326-8, Apr 84

2. Mixter, W.J., and Barr, J.S.: Rupture of the intervertebral disc with involvement of the spinal canal. *N Engl J Med* 211:210-5, 2 Aug 34

3. Colonna, P.C., and Friedenberg, Z.B.: The disc syndrome. Results of the conservative care of patients with positive myelograms. *J Bone Joint Surg* 31A:614-8, Jul 49

4. Pearce, J., and Moll, J.M.H.: Conservative treatment and natural history of acute lumbar disc lesions. *J Neurol Neurosurg Psychiatr* 30:13-7, Feb 67

5. Johnson, E.W., and Fletcher, F.R.: Lumbosacral radiculopathy. Review of 100 consecutive cases. *Arch Phys Med Rehabil* 62:321-3, Jul 81

6. Marshall, L.L., Trethewie, E.R., and Curtain, C.C.: Chemical radiculitis. A clinical, physiological and immunological study. *Clin Orthop Rel Res* 129:61-7, Nov-Dec 77

7. Murphy, R.W.: Nerve roots and spinal nerves in degenerative disk disease. *Clin Orthop Rel Res* 129:46-60, Nov-Dec 77

8. Dilke, T.F.W., Burry, H.C., and Grahame, R.: Extradural corticosteroid injection in management of lumbar nerve root compression. *Br Med J* 2:635-7, 16 Jun 73

9. Winnie, A.P., Hartman, J.T., and Meyers, H.L., Jr.: Pain clinic. II. Intradural and extradural corticosteroids for sciatica. *Anesth Analg* 51:990-1003, Nov-Dec 72

10. Brown, F.W.: Protocol for management of acute low back pain with or without radiculopathy, including use of epidural and intrathecal corticosteroids. In Symposium on the lumbar spine: American Academy of Orthopaedic Surgeons. C.V. Mosby Co., St. Louis, 1981

11. Smyth, M.J., and Wright, V.J.: The classic. Sciatica and the intervertebral disk: An experimental study (reprint). *Clin Orthop Rel Res* 129:9-21, Nov-Dec 77

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