

LUMBAR DISC HERNIATION

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ABSTRACT

Lumbar disc herniation is the most common diagnosis among the degenerative abnormalities of the lumbar spine (affecting 2 to 3% of the population), and is the principal cause of spinal surgery among the adult population. The typical clinical picture includes initial lumbalgia, followed by progressive sciatica. The natural history of disc herniation is one of rapid resolution of the symptoms (four to six weeks). The initial treatment should be conservative, managed through medication and physiotherapy, sometimes associated with percutaneous nerve root block.

Surgical treatment is indicated if pain control is unsuccessful, if there is a motor deficit greater than grade 3, if there is radicular pain associated with foraminal stenosis, or if cauda equina syndrome is present. The latter represents a medical emergency. A refined surgical technique, with removal of the extruded fragment and preservation of the ligamentum flavum, resolves the sciatic symptoms and reduces the risk of recurrence over the long term.

Keywords – Lumbar disc herniation; Ligamentum flavum; Sciatica; Surgical treatment

INTRODUCTION

Lumbar disc herniation consists of displacement of the content of the intervertebral disc (the pulpous nucleus) through its external membrane (the fibrous ring), generally in its posterolateral region. Depending on the volume of herniated material, there may be compression and irritation of the lumbar nerve roots and the dural sac, represented clinically by the pain known as sciatica. This pain has been known since ancient times, but its relationship with disc herniation was only discovered at the start of the twentieth century, when it was described by Mixter and Barr⁽¹⁾.

Today, disc herniation is the most common diagnosis among the degenerative abnormalities of the lumbar spine, and it is the principal cause of spinal surgery. Factors such as greater access to medical care, early requests for imaging examinations and the safety of surgical procedures have led to high rates of surgical treatment, a situation that is generally self-limiting.

The treatment for lumbar disc herniation evolved from transdural resection to the conventional approach^(2,3), followed by microsurgery and endoscopic and percuta-

neous surgery. Today, lumbar disc herniation is the condition that most often leads to spinal surgery, especially among men around the age of 40 years⁽⁴⁾.

This review had the aim of discussing the principal epidemiological, diagnostic and treatment aspects of lumbar disc herniation.

EPIDEMIOLOGY

Disc herniation occurs mainly between the fourth and fifth decades of life (mean age of 37 years), although it has been described in all age groups⁽⁵⁻⁸⁾. It has been estimated that 2 to 3% of the population may be affected, with prevalence of 4.8% among men over 35 years of age and 2.5% among women over this age.

Because it is so common, it has become considered a worldwide health problem, because of the incapacity that it causes⁽⁹⁾.

Although greater risk of disc herniation has been attributed to smoking and exposure to repetitive loads and prolonged vibration, studies have shown that the difference is small, when populations exposed to these factors are compared with control groups^(10,11).

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Genetic predisposition has been the subject of some recent studies. These have investigated genes such as the vitamin D receptor (VDR)^(12,13), the gene that codes for one of the polypeptide chains of collagen IX (COL9A2)⁽¹⁴⁾ and the human *aggrecan* gene (AGC), which is responsible for coding for proteoglycan, the most important protein component of structural cartilage, which supports the biomechanical functions of this tissue⁽¹⁵⁻¹⁷⁾.

PATHOGENESIS OF SCIATICA

The origin of sciatic pain is probably multifactorial, involving mechanical stimulation of the nerve ends of the external portion of the fibrous ring, direct compression of the nerve roots (with or without ischemia) and a series of inflammatory phenomena induced by the extruded nucleus⁽¹⁸⁾.

The factor that triggers sciatic pain is the mechanical compression of the nerve root caused by the disc herniation. Consequently, the membrane is sensitized to pain through ischemia and other phenomena^(19,20). Studies have shown that the threshold of neuron sensitization for a compromised root is around half of what it is for non-compromised segments^(21,22).

There is a difference in the levels of inflammatory cell infiltration between extruded and non-extruded disc herniations, such that it is lower in the latter^(6,7). It is believed that rupture of the posterior longitudinal ligament caused by extruded herniation exposes the hernia to the vascular bed of the epidural space, and inflammatory cells originating from these vessels on the periphery of the herniated disc material may have an important role in irritating the nerve roots and inducing sciatic pain. This may explain why extruded herniations present greater clinical impairment and greater frequency of reabsorption⁽⁷⁾. Thus, it can be said that mechanical compression effects predominate in patients with contained herniation, while the inflammatory component predominates in patients with uncontained (extruded) herniation.

Clinical picture

The typical clinical picture of disc herniation includes initial lumbalgia that may evolve to lumbar sciatica (generally after one week) and may finally persist as pure sciatica. However, because of the large numbers of possible presentations of acute or chronic forms, a careful watch for atypical forms of presentation is needed, with readiness to conduct a differential diagnosis. Although disc herniation is the main cause of sciatic

pain, other possibilities such as tumors, instability or infection need to be ruled out. Adequate physical examination is essential for this, and it may also include determining the vertebral space where the herniation is located, by means of careful evaluation of dermatomes and myotomes.

What is important to emphasize is that, in the natural history of sciatica due to disc herniation, the symptoms are greatly resolved after around four to six weeks. This is the reason why the initial treatment should always be conservative, and it needs to be explained to patients that the process has a favorable course.

Imaging diagnostics

Because radiography is routine and inexpensive, it should form part of the imaging evaluation. Although the clinical picture may be clear and suggestive of disc herniation, the possibility that other abnormalities detectable via radiography might coexist should not be forgotten. Orthostatic and dynamic examinations in flexion and extension are important complementary assessments for achieving an analysis of the spinal column that is more complete.

The first-choice examination method is magnetic resonance imaging (MRI). In Brazil, there is still an insistence on the use of axial computed tomography but, although this is capable of identifying disc herniation, it does not come close to the quality and even less so to the sensitivity of MRI. The detailed information on bone and soft tissue that MRI provides, which may help not only in achieving the correct diagnosis but also even in the therapeutic proposals, make this an indispensable examination for correctly assessing patients.

On MRI, hernias are classified according to their shape, as shown in the following summarized morphological description. The disc material, which comes mainly from the pulposus nucleus, is displaced beyond the intervertebral limits and may take on three different shapes: protrusion, extrusion or sequestration.

Protrusion is when the height of the hernia (in the axial slice) is less than the length of the base in any of the planes (Figure 1). Extrusion is when the length of the base is less than the height of the hernia (Figure 2), while sequestration is when there is no continuity between the herniated material and the intervertebral disc⁽²³⁾ (Figure 3).

Protrusion may be focal, which is interpreted as focal protrusion, or broad and concentric, which is called concentric protrusion (the term bulging protrusion is also used in some reports) (Figure 4).

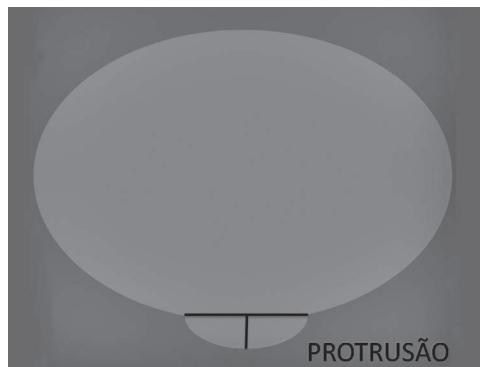


Figure 1 – Protrusion: base greater than height

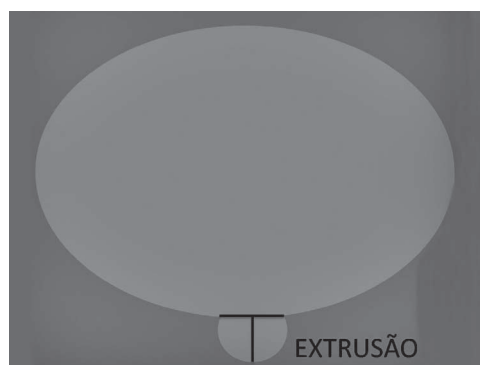


Figure 2 – Extrusion: height greater than base

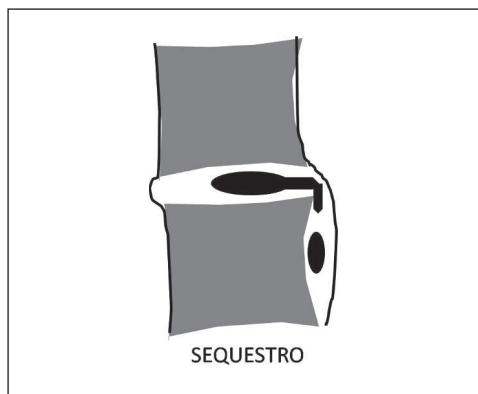


Figure 3 – Sequestration: no continuity with the disc

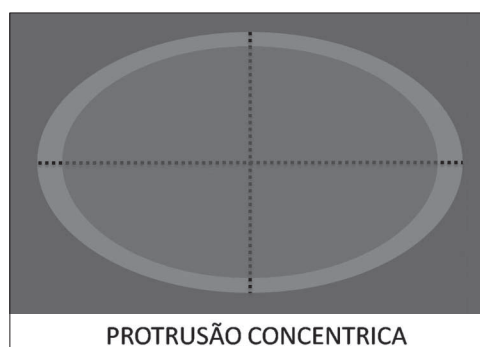


Figure 4 – Focal and concentric protrusion

TREATMENT

Conservative treatment

Lumbar disc herniation is a condition that has a benign nature. The aim of the treatment is to relieve pain and stimulate neurological recovery, with early return to activities of daily living and to work. Young patients with sequestered hernias and mild neurological deficits whose hernias are small, with little disc degeneration, are the ones who benefit most from conservative treatment⁽²⁴⁾. Sciatic crises may be so severe that patients are incapacitated and, at such times, treatment should aim to gradually reduce the pain, while physical activity levels should be increased, avoiding absolute rest. NSAIDs are the medications that should be used most, since these exactly meet the physiopathological needs (which are basically problems of inflammation), while pure analgesics remain an additional therapeutic resource.

As mentioned earlier, the natural history of sciatica is characterized by rapid relief of symptoms over a mean period of four to six weeks, with recurrence in approximately 5 to 10% of the cases, regardless of the type of treatment administered⁽²⁵⁾.

One alternative to help the conservative treatment is blockage of the affected root using anesthetics and corticoids. These act directly on the hernia, through reducing its volume, and on the root, through reducing its inflammatory response⁽²⁶⁻²⁸⁾. In a study carried out by the Spinal Surgery Group of Cajuru University Hospital, 70 patients with lumbar disc herniation and radiculopathy who had been presenting painful conditions for up to eight weeks were evaluated. After three months of blockage, 77% of the patients were asymptomatic. It could be concluded that transforaminal anesthetic blockage was an effective and safe alternative for treating sciatic pain secondary to lumbar disc herniation⁽²⁹⁾.

In a systematic review of the literature on lumbar transforaminal blockage for treating sciatic pain, Buenaventura *et al* found level II-1 evidence for short-term relief (six months or less) and level II-2 evidence for long-term relief (more than six months)⁽³⁰⁾. Our preferred approach today is to start the treatment of acute pain using this type of blockage.

Conservative treatment includes support physiotherapy with analgesia and relaxation, particularly through exercises and stretching. There is no evidence to justify the use of electrical stimulation in its wide variety of forms (TENS); the published studies show that there are no significant grounds that establish any value for electrical stimulation⁽³¹⁾.

Surgical treatment

The aim of surgical treatment is to decompress nerve structures. The indications for surgical treatment are as follows:

Absolute indications: cauda equina syndrome or significant paresis.

Relative indications: sciatica that does not respond to conservative treatment for at least six weeks; motor deficit greater than grade 3; and sciatica for more than six weeks or nerve root pain associated with foraminal bone stenosis.

Over the last few years, there has been much discussion about the balance of advantages between early surgery and prolonged conservative treatment. There are published papers showing that the clinical results in the study groups were similar after two years of evolution, but that the recovery was faster in the group with early surgery. These authors have shown that surgical treatment is economically favorable, since it enables early return to work^(32,33).

SURGICAL TECHNIQUES

Although traditional discectomy is still the technique used by some surgeons, minimally invasive operations have been gaining attention over recent years, while microdiscectomy may be a halfway position between the two endpoints⁽³⁴⁾.

Two surgical approaches have been proposed. There is no longer any place for the traditional surgery known as "laminectomy". What is studied today is the relative advantage of minimally invasive or percutaneous procedures over microdiscectomy. The favorable results from microdiscectomy, both over the short term (length of the operation, bleeding, symptom relief and complication rate) and after 10 years of follow-up, still make this the preferred technique. Some studies comparing the two techniques have recently been published, but without being able to establish significant differences between them⁽³⁵⁾. In a randomized study that analyzed the two procedures over a two-year period, there was a result favoring microdiscectomy⁽³⁶⁾.

There has also been discussion about extensive removal of the disc fragments and curettage of the disc space, versus removal of the herniated fragments alone, with minimal invasion of the disc space^(37,38).

Watters and McGirt⁽³⁵⁾ found evidence favoring removal of the herniated fragments alone, considering the duration of the operation and the return to work activities.

Comparing the two tactics, significantly greater incidence of lumbar pain was found when aggressive disc removal was performed than when the conservative technique was used (28% versus 11.5%). Biomechanical studies have demonstrated that larger lesions of the disc space accelerate the degenerative disease. Removal of greater amounts of the disc during the surgical procedure may be associated with worse long-term clinical results, with regard to the appearance of lumbalgia. However, there is greater recurrence of disc herniation, at a rate of around 7%, when the conservative technique is used⁽³⁹⁻⁴¹⁾.

This has an impact, especially in economic terms, when making a decision to perform additional, complementary surgery (arthrodesis or arthroplasty). There has been much discussion on whether this would only be applicable to young discs with a height that is still normal, in which instability could theoretically occur. Well selected cases with a history of significant previous lumbalgia and high discs could benefit from these procedures. However, it needs to be made clear that arthrodesis or arthroplasty do not have any place in the conventional treatment for disc herniation.

Preservation of the ligamentum flavum

After lumbar discectomy has been performed, there is a process of periradicular healing, with accumulation of fibrous material, in replacement for the peridural fat⁽⁴²⁾. This allows the roots and dural sac to be mobilized freely in the peridural space, without compression or adhesions. Peridural fibrosis may attach the roots and dura mater to the surrounding tissue, thereby impairing nutrition and the dynamic activity of the segment. The changes to arterial and venous flow in structures sensitive to mechanical deformation, such as the ganglion of the dorsal root, has a considerable clinical impact that is manifested in the form of pain, paresis and paresthesia⁽⁴³⁾.

The ligamentum flavum forms an anatomical barrier for the roots, dura mater and epidural fat, through protecting these structures from the compression caused by the surrounding tissue. For this reason, its preservation may result in a better prognosis with regard to formation of epidural fibrosis following the discectomy⁽⁴⁴⁾.

An association between fibrosis and spinal operation failure syndrome ("failed back" syndrome) has been demonstrated in 24% of the cases⁽⁴⁵⁾.

Revision surgery to deal with this problem raises the risk of neurological lesions and has an unfavorable prognosis. Medical treatment of fibrosis is ineffective. Multiple surgical strategies and certain synthetic devices have been used to prevent fibrosis, but with unsatisfactory results. For this reason, prevention or inhibition of the formation of peridural fibrosis is considered to be one of the most important prognostic factors for success in the surgery.

Favorable assessments were made in a study conducted by the Spine Group of Cajuru University Hospital after a minimum of ten years of postoperative follow-up, and this was attributed to the microsurgical technique, among other factors. This technique included preservation of the ligamentum flavum (Figure 5). These results were similar to those published by Ozer *et al*⁽⁴⁶⁾ and Askar *et al*⁽⁴⁷⁾.

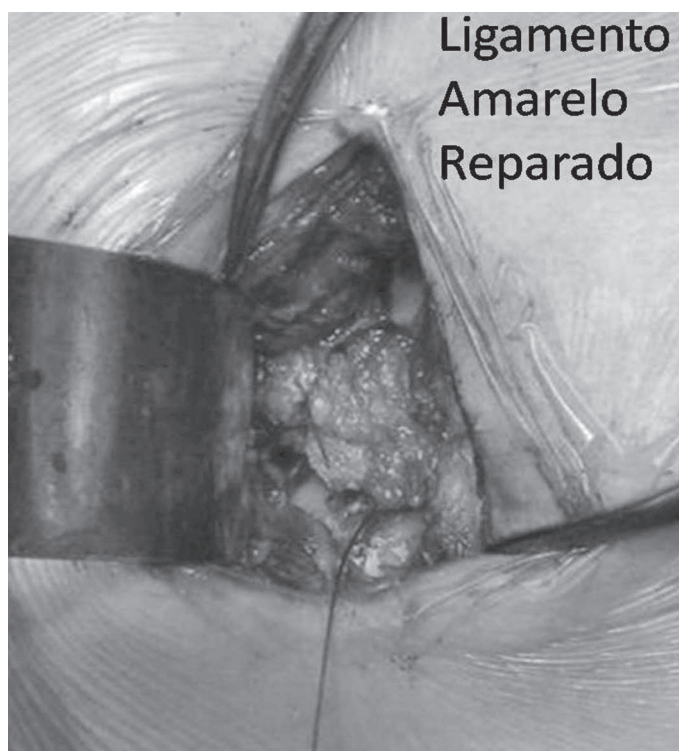


Figure 5 – Detail of suturing of the ligamentum flavum

CLINICAL RESULTS FROM DISCECTOMY

The results from conventional discectomy have been variable. Over the short term, with two years of follow-up, 90% of the results have been found to be good. Conversely, in longer-term studies (six years), the propor-

tion of unsatisfactory results has been found to be as high as 60%^(41,47). However, in a methodologically important study for which the abbreviation is SPORT⁽⁴⁸⁾, it was demonstrated that patients with lumbar disc herniation and radiculopathy who underwent early surgery had better assessment results in relation to the parameters that were considered. This difference became significant after six weeks of follow-up, reached its maximum benefit after six months and was maintained for four years.

In the study carried out by the Spine Group of Cajuru University Hospital, an analogue pain scale and the Oswestry index were used to evaluate the results after ten years among patients who underwent discectomy. It was shown that 87.9% of the results were good, in relation to irradiated pain.

When only patients with more than 15 years of follow-up were included, the frequency of good results was lower. It was found that 21.9% of the cases presented moderate functional incapacity, which is related to progression of the underlying disease, i.e. degeneration of the intervertebral disc⁽³⁴⁾.

OTHER METHODS

Over the last few years, there has been a gradual trend towards treatments for disc herniation that are less invasive, including percutaneous decompression, laser decompression and, most recently, decompression using a bipolar radio frequency device, also known as nucleoplasty. Although these reduce the intradisc pressure, their real benefit is still a matter of controversy⁽⁴⁹⁻⁵¹⁾.

CONCLUSION AND RECOMMENDATIONS

Disc herniation is a pathological condition with an extremely benign course.

Conservative treatment is effective in 80% of the patients, within four to six weeks.

In cases in which pain is difficult to control, foraminal block is the best option.

Surgical indications should be proposed if conservative treatment fails, or if the neurological symptoms progress.

In such cases, microdiscectomy (under a magnifying glass or through a microscope) with preservation of the ligamentum flavum has been shown to be effective for preventing complications, avoiding peridural fibrosis and reducing symptomatic relapses.

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