

Review Article

Surgical Treatment Options in Lumbar Disc Herniation

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Abstract

Correct structural anomalies of the spine. The correction of the structural anomaly that causes back pain, when that is the cause. For example, when a herniated disc compresses a nerve root, and all non-surgical treatments have failed, removing the herniated disc material allows compression to be eliminated.

Keywords: Lumbar disc herniation; Spine; Horsetail syndrome; Foot drop

Introduction

Scientific evidence of its effectiveness

Some methods of evaluation, scientifically optimal, cannot be applied to the case of surgery due to their own characteristics. For example, it is not acceptable to stop operating on a group of patients in whom surgery is necessary, according to the currently accepted criteria, to demonstrate that those who are not operated on are paralyzed.

Yes, there are studies on the definition of the criteria that should suggest the convenience of operating. The recommendations of the Clinical Practice Guidelines based on the available scientific evidence have considered these studies and the experts' criteria to establish the indications mentioned below. Although the criteria for operating each type of structural anomaly of the spine are mentioned in the corresponding section, the generic criterion is to operate only when it is demonstrated that:

- There is a compression of the nerve roots or the medulla; sufficiently important to leave sequels in case it does not resolve quickly (this is the case of the intervention for "horsetail syndrome due to herniated disc")
- There is a compression of the nerve roots that, although it will not necessarily leave sequels, causes symptoms and lasts more than 6 weeks without improving despite the non-surgical treatments, and
- The characteristics of the clinical manifestations and the result of the physical examination show that the compression is undoubtedly due to the structural anomaly detected.

In patients with lumbar disc herniation or lumbar spinal stenosis with motor involvement that causes dorsiflexion paresis or "foot drop" (which makes it difficult for the patient to walk on the heel), although

most are treated surgically, different studies conclude that there is no scientific evidence solid that supports that surgery is more effective than conservative treatment. They show that the motor deficit recovers more quickly in patients treated with surgery, but after a year there are no differences between patients undergoing surgery or conservative treatment, so the surgical criterion must be determined more than by the loss of strength, for the evolution and characteristics of pain.

Risk and contraindications

Some of the recommendations based on the available scientific evidence establish that the risk of infection or hemorrhage during a first intervertebral disc operation is less than 1%, although this risk increases a lot with older patients or when it is not the first disc operation.

The real risk is that the operation does not have satisfactory results. Some of the recommendations based on the available scientific evidence establish that, among patients with disc herniation but without evident signs of nerve compression by physical examination or electromyogram, less than 40% of those who undergo surgery obtain satisfactory results. The scientific studies carried out show that the main cause of surgical failure is to operate on patients who should not be and that the stricter the selection of patients who refer to surgery, the better the results of surgery.

Another risk of surgery is post-surgical fibrosis. It is accepted that the less aggressive the surgery and the less bleeding during the operation, the lower the risk of it appearing.

On the other hand, surgery requires a minimum state of general health. Some general diseases, such as cardiac, pulmonary or metabolic, can prevent it.

Discectomy

It is a technique to operate herniated discs. It consists of exclusively extracting the herniated disc material, without breaking or extracting the vertebral bone. The scientific studies carried out show that discectomy is effective for the surgical treatment of cases of herniated disc that must be operated on. Often, it is necessary to slightly enlarge the conjunct hole to access the disc material that is extracted in a discectomy, being called the discectomy procedure with laminotomy.

Microdiscectomy

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Conceptually, it is a discectomy that is performed with a very small incision and surgical manipulation; therefore, to see the surgical field during the operation, a microscope is necessary. It is less aggressive than a discectomy and requires a very short recovery period. Scientific studies have shown that microdiscectomy is effective for the surgical treatment of cases of herniated disc that must be operated on. In cases that really should be operated, and when it is technically possible to use this technique, microdiscectomy is the procedure of choice.

It obtains results similar to those of the discectomy, shortening the time of hospitalization and recovery, with fewer complications (such as infections) and, in addition, reducing costs.

Even so, and although in the 3 months following the microdiscectomy the pain and the degree of disability improve markedly, it is frequent that five years after the surgery there is a certain degree (small and non-limiting) of pain and disability.

In patients in whom after a successful lumbar microdiscectomy pain radiating to the leg persists and an MRI shows a mass that compresses the nerve root at the operated level, it is not recommended to operate immediately, especially if the image suggests that it is edema or inflammation, because in most cases that mass disappears spontaneously (i.e., without surgery) over the next three months.

Interspinous devices

It is a surgical technique indicated specifically in certain cases of symptomatic spinal stenosis. It involves placing a small implant between the spinous processes of the vertebrae through a small incision in the patient's back. Generally, implantation does not require general anesthesia and can be performed under local anesthesia. Its objective is to keep the posterior portion of the vertebrae separate and open the spinal canal. Conceptually, it keeps the vertebrae in the position they are in when the patient is sitting. In fact, this procedure is indicated for patients with spinal stenosis in which, when sitting or flexing the spine forward, their pain disappears.

In the case of patients in whom an interspinous device is indicated, the latest studies show that the clinical results obtained by this technique, laminectomy and arthrodesis after 1 and 2 years are similar in terms of pain improvement, incapacity, psychological affectation and patient satisfaction.

The placement of an interspinous device is less aggressive than traditional surgery, has fewer surgical complications, leads to less blood loss and duration of the operation, and shortens the hospital stay. This makes it possible to apply to patients in whom traditional surgery, due to its aggressiveness, is impossible (for example, due to cardiovascular diseases that discourage prolonged surgery). In return, the probability that the patient needs to be operated on again over the next two years is greater if an interspinous device is placed than if a laminectomy is performed (with or without an arthrodesis), and even greater if they are placed in two vertebral levels.

However, in patients in whom an interspinous device is initially placed and subsequently require a laminectomy, the clinical results are similar to those in patients who undergo a laminectomy.

Different studies have evaluated and compared two of these devices: the X-Stop and the Superior. Their conclusions reflect that the results of both devices are very similar; significantly improve (for at least two years) the radiated pain, back pain and the degree of disability, and generate a high degree of satisfaction among patients.

Also the rate of side effects is similar between the two types of implant.

The placement of the X-Stop device requires open surgery, while the Superior is placed percutaneously or through a minimal incision, which reduces bleeding and hospital stay. However, the study that compared both devices was funded by the company that manufactures the Superior, which precludes ruling out that the importance of this advantage for the patient has been exaggerated in practice.

Arthrodesis

It consists of fixing two vertebrae. It can be done by placing a bone graft between both vertebrae ("non-instrumented arthrodesis") or by using metal plates to fix both vertebral bodies ("instrumented arthrodesis"). It is used in cases of spondylolisthesis or scoliosis that must be operated. Sometimes, also after doing a laminectomy, to avoid the instability of the vertebra whose lamina is extracted. Scientific studies show that, in cases of herniated discalque should be operated, it obtains worse results than discectomy, microdiscectomy, laminotomy or the laminectomy.

On the other hand, it was formerly used to treat cases of disc degeneration, since it was suspected that this degeneration or the "instability" that it caused were responsible for the pain. However, the studies conducted question that intuitive interpretation. In fact, scientific evidence shows that arthrodesis is not more effective, neither in the short nor long term, than intense physical exercise for the treatment of chronic low back pain associated with disc degeneration.

Today only the possibility of performing a lumbar arthrodesis in cases of back pain in which the symptoms lasts-at least-two years despite all the treatments applied, if other non-surgical treatments that have proven be effective. However, there is considerable commercial pressure to operate these patients, and to use instrumented surgical techniques that require more complex and expensive instrumentation, although the more complex the instrumentation, the greater the risk and the probability of complications, and the results are worse.

Chemoneucleolysis

It is a technique for the surgical treatment of herniated discs. It consists of injecting a substance - called "chemopapain" - inside the disc. This substance destroys the nucleus pulposus. This decreases disc pressure and compression on the nerve root and, in addition, destroys the substances contained in the nucleus pulposus and triggers the neurogenic inflammation. Scientific studies have shown that this technique is effective, although less than discectomy and that it acts more by destroying the substances that cause neurogenic inflammation than by reducing the volume of the hernia. In fact, in 70% of patients in whom the technique is effective, the volume of the herniated material remains unchanged.

Although it can be controlled, there is a risk of an allergic reaction to chemopapain that can become lethal. This risk, and the development of the microdiscectomy, have meant that chemoneucleolysis is currently performed less frequently.

Percutaneous nucleotomy

It consists of extracting the nucleus pulposus from the intervertebral disc through a small incision in the skin. Scientific studies have shown that it is not effective, and now it is no longer applied.

Nucleoplasty or placement of nucleus pulposus prosthesis.

It involves removing the nucleus pulposus and placing a prosthesis

in its place. Initially, it was developed for the treatment of disc fissures, although there is considerable commercial pressure to promote its use in cases of "disc degeneration". The scientific studies carried out are of very poor methodological quality and do not support its effectiveness in the treatment of any of these conditions.

Ozone therapy

Initially developed for the treatment of herniated disc and involves injecting a gas (ozone) inside the disc. There is a notable commercial pressure to apply this technique, which led to the injection of ozone (in the disc or out of it - in the facet joint or in the muscle) - to be applied in other cases. However, no study suggests that this technique is effective.

IDET (Intradiscal Electrothermal Coagulation)

They are two techniques developed for the treatment of pain originated in the intervertebral disc. They consist of placing electrodes in the intervertebral disc and heating them, in order to burn the nerves responsible for transmitting the pain originated in it and, eventually, to join the fibers of the fibrous envelope of the disc (in cases of disc fissure).

The available scientific studies have not shown the efficacy or effectiveness of IDET or PIRF, so there is no scientific basis to recommend its use. On the contrary, they show that this technology carries significant risks for patients without there being evidence of their effectiveness.

Indications

The criteria by which surgery can be proposed for each type of structural anomaly are indicated in the corresponding section. Next, the indications of the surgical techniques described above are explained.

In cases of disc hernia that must be operated, the restrictive selection of those cases, limited exclusively to those that present criteria that allow predicting the success of the operation, is even more important than the technique used. However, when it is necessary to operate, it is recommended:

The discectomy or, even better, the microdiscectomy if trained doctors are available in its realization. The laminotomy -isolated or in combination with the discectomy- can be applied. Laminectomy is only indicated in exceptional cases and arthrodesis should be avoided [1,2].

Chemonucleolysis is less effective than microdiscectomy or laminotomy, and has complications that, although rare, are potentially dangerous. It can be considered when it has been ruled out that the patient is allergic to chemopapain, as a last step before indicating surgery [3].

Percutaneous nucleotomy is not effective and should not be used.

In cases of disc affections, such as fissure or degeneration, no reliable data suggests the effectiveness of ozone therapy, IDET, PIRF or placement of nucleus pulposus prosthesis, so these techniques cannot be recommended and should not be used [4].

In cases of spinal stenosis that must be operated, some of the recommendations based on available scientific evidence advise laminectomy, eventually completed with arthrodesis. In cases in which the pain subsides when the patient feels (and not in other cases of spinal stenosis), the technique of choice is the placement of an interspinous device.

In exceptional cases of spondylolisthesis in which it is necessary to operate, some of the recommendations based on the available scientific evidence advise the arthrodesis [5].

In cases of scoliosis that must be operated on, arthrodesis with instrumented fixation and bone graft is recommended.

Conclusion

Within the surgical possibilities of lumbar pathology, once the possibilities of medical treatment and rehabilitation and pain unit have been exhausted. The adequate selection of each patient to the technique is essential for the surgical existence and the favorable evolution of the patient.

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