

Epidural steroid block in herniated disc: a systematic review and meta-analysis

Abstract

Aim and purpose: Back pain secondary to herniated disc is very common throughout the world, leading to frequent absence from work activities, economic and financial losses, in addition to causing major affective-motivational changes. Initial treatment is based on analgesic and anti-inflammatory therapy. However, in most cases, it evolves chronically and requires surgery or minimally invasive procedures like epidural steroid injections. Therefore, the purpose of this study was to verify the reduction of pain intensity in patients with herniated disc who underwent epidural block with steroids, in addition to assessing tolerability and abandonment with the institution of this treatment, identifying if such an injection reduces the need for surgical procedure.

Methods: This paper proposes, through a systematic literature review and meta-analysis, to establish the effectiveness of epidural steroid for the treatment of lumbar disc herniation.

Results and Discussion: Although several authors have advocated the effect of epidural steroids on reducing the intensity of low back pain and the need for surgery for the treatment of herniated discs, this issue is still controversial. We selected 7 papers, of which 5 showed effectiveness of the technique above 56%.

Conclusion: The papers showed an important reduction in pain intensity and indication of surgery, besides safety and tolerability

Keywords: sintervertebral disc displacement, anesthesia, epidural, adrenal cortex hormones, analgesic, anti-inflammatory, physiotherapeutic therapy, psychic, social, economic, laminectomy, meningitis, arachnoiditis

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Introduction

Herniated disc is a common pathology of the spine with an estimated incidence of 13% to 40% throughout life.¹ In some cases, it has spontaneous resolution or with analgesic, anti-inflammatory, and physiotherapeutic therapy, however, it can evolve chronically with great psychic, social, economic, and quality of life repercussions.² Surgical treatment, such as laminectomy, is a therapeutic alternative that demands great resources and infrastructure. In Canada, for example, the estimated waiting time for orthopedic surgery is around 33.7 weeks and for neurosurgeries 33.0 weeks. This delay in treatment may worsen symptoms, leading to chronicity of the pain through the activation of the pain modulating system and memory effect.² In another aspect, the economic effects are overwhelming and occur in two ways, primarily due to the individuals' withdrawals due to incapacity with a decrease in the productive sector and, secondly, the heavy expenditure on surgical procedures and prolonged rehabilitation. In this context, epidural steroid injection has been used in cases of disc herniation with the aim of alleviating painful symptoms, improving quality of life, reducing the distance from productive activities and reducing the number of surgical procedures worldwide. In addition, it is a less invasive procedure and with lower morbidity and mortality compared to the surgical procedure.² However, there are reports of serious complications such as arachnoiditis and meningitis.³ Recently, transforaminal injection of small volumes of steroids has been used to treat low back pain secondary to herniated disc with good therapeutic response.²⁻⁷ Steroids can be classified as glucocorticoids and mineralocorticoids, and glucocorticoids are most widely used for

epidural injection.

These drugs have several substrates of action for the anti-inflammatory effect. An important action is the blockade of phospholipase A2 with inhibition of the release of arachidonic acid, reducing, therefore, the production of cyclooxygenase and lipo-oxygenases with subsequent reduction of the formation of prostaglandins, thromboxanes, and leukotrienes, mediators with important participation in the cascade and in the pathophysiology of pain. It was also verified in experimental models that betamethasone may decrease the expression of substance P, suggesting a possible direct effect of steroids on pain mediators. In addition, methylprednisolone has demonstrated the suppressive effect of impulse transmission on C-unmyelinated fibers without affecting the transmission of Aβ myelin fibers, leading to a decrease in edema and venous congestion with reduction of ischemia and pain.³ In order to perform the epidural block, there are many techniques described, but three are the most used: transforaminal, caudal, and interlaminar. Currently, the most accepted and best-performing steroid injection technique is fluoroscopy-guided transforaminal injection, which can be performed at the cervical, thoracic, or lumbar level, emphasizing that when in skilled hands, there is a lower risk of accidental dural puncture.²⁻⁸ Epidural injection with steroids is absolutely contraindicated when there is hypersensitivity to these substances, systemic or puncture site infection, anticoagulant therapy or coagulopathy and local neoplasia. Relative contraindications are: congestive heart failure, decompensated diabetes mellitus, pregnancy, and immunosuppression. The most common risks described with

this technique are: infection, epidural hematoma, nerve damage, allergic reactions, adrenal insufficiency, edema, pneumothorax, total subarachnoid anesthesia, and post-puncture low back pain.³

Recently, some studies have shown a significant reduction in the need for surgeries for extruded disc herniation with the advent of transforaminal epidural block with steroids.^{2,3} Other studies show a decrease in morbidity and mortality, time of hospitalization, reduction of costs, and improvement in quality of life with the use of this technique, reaffirming results found by other authors.⁴ On the other hand, laminectomies continue to be performed on a large scale, with high morbidity and mortality and other consequences, such as prolonged recovery time and returning to daily activities. These factors contribute to increased costs of treatment and compromise the quality of life of the subject. According to findings by some investigators, the estimated total cost for a herniated disc surgery is approximately \$ 2,050, while the cost of steroid transforaminal epidural injection is \$ 230, which is equivalent to 11% of the first [2]. Additionally, it is worth mentioning that the long waiting time for the surgical procedure can lead to the establishment of chronic pain that is difficult to treat, a fact indisputably recognized at the present time. Many scientific papers have been published regarding this subject, however, with small samples and lack of conclusive parallel between minimally invasive procedure and surgical procedure. The present study seeks to systematize information from previously published papers that deal with less invasive techniques for the treatment of herniated disc. Therefore, the objective of this study was to verify the reduction of pain intensity in patients with herniated disc who underwent epidural block with steroids, in addition to assessing tolerability and abandonment with the institution of this treatment, identifying if such an injection reduces the need for surgical procedure.

Material and methods

This is a Systematic Review of the literature conducted through electronic search of randomized controlled trials published up to September 2014 in the English language, in the Medline (via Ovid and Pubmed), LILACS and High wire databases, and in the clinical trials registry of the Cochrane Collaboration and Biological Abstracts, using DeCS descriptors: epidural steroid injection, lumbar disc herniation, steroid. Studies of meta-analyses and reviews were

evaluated in order to find unidentified articles in the electronic search. Initially, a large bibliographical review was carried out on the matter, where three reviewers evaluated the findings. The relevant studies that met the inclusion criteria were obtained in full with subsequent selection of relevant papers. Discrepancies were resolved by consensus. Each study had a data extraction record,⁹ and the data were obtained by at least two independent reviewers. Inclusion criteria were: randomized controlled trials on the effect of steroids in patients with a diagnosis of lumbar disc disease, regardless of gender or age, administered epidurally with N > 10 patients, published by September 2014. The quality of the studies was assessed through the assignment confidentiality criteria of the Cochrane Collaboration⁷ and the Jadad Quality Scale.¹⁰ The classification of the studies was done by at least two reviewers and discrepancies were solved by consensus. The existence of heterogeneity in the selected studies was assessed through the I_2 statistics (inconsistency measure), confirmed by the hypothesis test for homogeneity between the studies, the Cochran Q test (at a 5% significance level) and visual inspection of the forest graph. The present study consists of systematic literature review and meta-analysis, therefore, approval from the research ethics committee is waived. It is important to note that there is no conflict of interest.

Results

Initially, 288 citations were identified in scientific papers, where 28 papers were classified as potentially relevant. After selection through the abstracts, 17 papers were chosen, which were read in full by the three independent reviewers. Through the inclusion and exclusion criteria and after consensus among the reviewers, seven papers were selected to compose the systematic review. The selected studies presented different methodologies, making it difficult to group them. In two of the seven papers selected, pain reduction was observed after injection of an epidural steroid in 56% of the patients;²⁻¹¹ in three studies, pain improvement after the proposed treatment occurred in more than 80% of the patients.⁴⁻⁶ However, in two studies the pain improvement was less than 50%: 41%¹² and 27.5%,¹³ respectively. The papers selected for this Systematic Review are summarized in Table 1. The existence of heterogeneity in these studies is visualized in (Figure 1) (Figure 2).

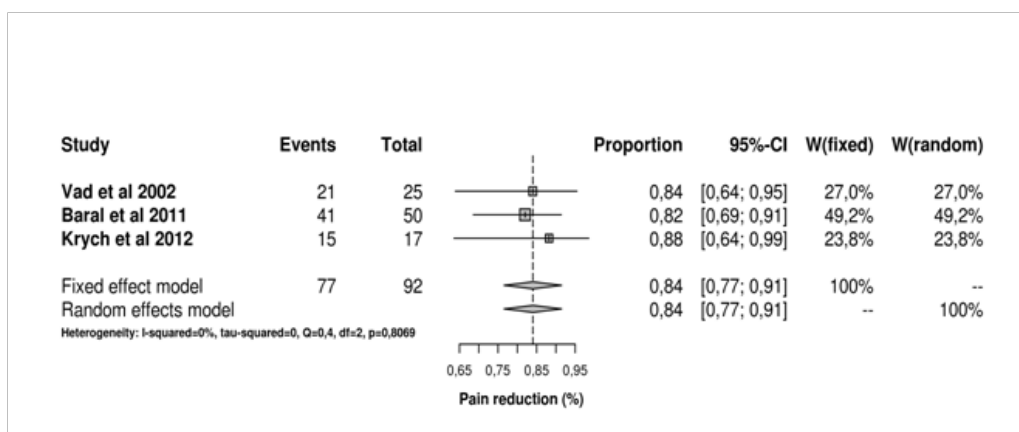


Figure 1 Forest graph to visualize the existence of heterogeneity in the selected studies.

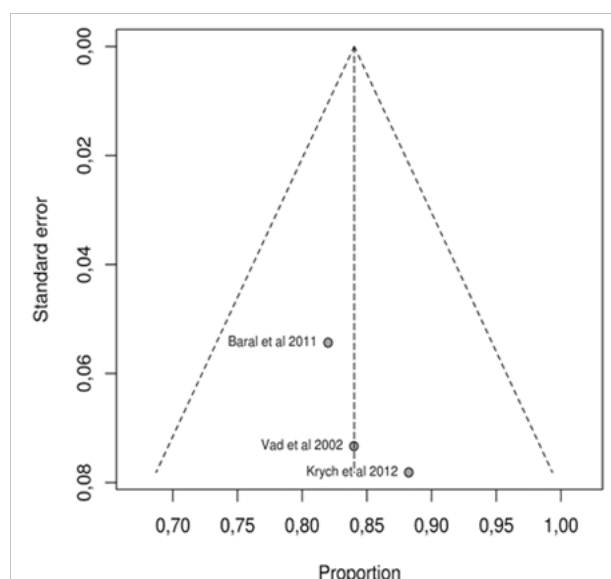


Figure 2 Funnel graph to visualize the existence of heterogeneity in three studies.

Table 1 Studies on epidural block with steroids for herniated disc selected for the Systematic Review

Title	Journal	Author	Objective	Results
Transforaminal epidural steroid injections prevent the need for surgery in patients with sciatica secondary to lumbar disc herniation: a retrospective case series	Canadian Journal of Surgery	Manson et al. ²	To assess the efficacy of transforaminal steroid injection in reducing surgical intervention in patients with radiculitis and/or radiculopathy secondary to lumbar disc herniation and to determine which patient characteristics influence the outcome of the injection.	There was no difference in the waiting time observed between patients who received transforaminal steroid injection and those who underwent a surgical procedure. We found 51 patients who avoided surgery after transforaminal steroid injection and 40 patients who needed surgery after injection.
Transforaminal Epidural Steroid Injections in Lumbosacral Radiculopathy	Spine	Vad et al. ⁴	To investigate the therapeutic value of transforaminal steroid injection compared to the injection of saline solution at the trigger points in patients with lumbosacral radiculopathy secondary to disc herniation whose non-pharmacological treatments failed. To compare the results of steroid epidural injection with discectomy in patients with lumbar disc herniation involving more than 25% of the medullary canal cross-section and with continuous symptoms of disability after 6 months or more of non-invasive treatment.	There was success in 84% of patients receiving Transforaminal Steroid Injection at a 16-month observation period, achieving the maximum improvement at 6 weeks compared to 12 weeks at the trigger point saline injection, where a 48% success rate was observed.
Treatment of Lumbar Disc Herniation: Epidural Steroid Injection Compared with Discectomy	The Journal of Bone and Joint Surgery	Buttermann ¹¹	To evaluate the effectiveness of epidural steroid injection for low back and root pain in patients from Nepal who attended the orthopedic center.	Patients who underwent Discectomy showed a success rate of 92% to 98% in treatment during the follow-up period, while the epidural steroid injection group had a success rate of 42% to 56%.
Effectiveness of epidural steroid injection for the management of symptomatic herniated lumbar disc	Nepal Med Coll J	Baral et al. ⁶		Epidural steroid injection is simple, safe, effective, and minimally invasive in the management of symptomatic herniated disc.

Table Continued

Epidural Steroid injection for lumbar disc herniation in NFL Athletes	The American College of Sports Medicine	Krych et al. ⁵	To demonstrate the effectiveness of epidural steroid injection in the treatment of lumbar disc herniation in a group of soccer players of the National Team. To determine how the administration of epidural steroids affects the outcome of patients with lumbar radiculopathy secondary to disc herniation. In this regard, this study aims to measure the effect of epidural steroids on the primary outcome measure of pain and function.	Return of 89% of the players to the field after epidural steroid injection.
The Impact of Epidural Steroid Injections on the Outcomes of Patients Treated for Lumbar Disc Herniation	The Journal of Bone and Joint Surgery	Radcliff et al. ¹²		A high percentage of patients changed from surgical to non-surgical treatment in the epidural steroid injection group (41% of the steroid injection group versus 12% of the control group) $p < 0.001$.
Plasma disc decompression compared with fluoroscopy-guided transforaminal epidural steroid injections for symptomatic contained lumbar disc herniation: a prospective, randomized, controlled trial.	Journal of Neurosurgery Spine	Gerszten et al. ¹³	To compare the clinical improvement of symptomatic disc herniation during 2 years of follow-up in patients who were treated with plasma disc decompression and those who received fluoroscopy-guided steroid epidural transforaminal injection.	Patients of plasma disc decompression had a greater reduction in pain scores and improvement of the Oswestry Disability Index than those who received steroid transforaminal injection.

Discussion

Although several authors have advocated the effect of epidural steroids on reducing the intensity of low back pain and the need for surgery for the treatment of herniated discs, this issue is still controversial.²⁻¹¹ Several clinical trials have been undertaken to establish the efficacy of epidural steroids in the treatment of lumbar disc herniation.²⁻¹³ In this context, it is worth noting the results found in a study that demonstrated a high proportion (84%) of success when using epidural triamcinolone in patients with a diagnosis of lumbar disc hernia.⁴ Another study comparing the results of epidural steroid injection with a modality of minimally invasive treatment, discectomy, in patients with lumbar disc herniation showed a higher success rate (92% to 98% versus 42% to 56%) with the discectomy.¹¹ On the other hand, other studies reinforce the role of epidural steroids in the treatment of herniated disc, showing high success rates. In this sense, it is worth mentioning a study that showed the effect of methylprednisolone, at the dose of 80 mg via the epidural route, on reducing root symptoms in 84% of the patients studied.⁴ In addition, in another clinical trial, triamcinolone used at doses ranging from 80-160 mg via epidural route also showed a high proportion (89%) of pain reduction.⁵ In order to increase knowledge about minimally invasive techniques for the treatment of low back pain, a group of investigators devised a study that aimed to measure the effect of epidural steroids on pain reduction and functional limitation.¹² A high percentage of patients who migrated from the surgical treatment to the epidural steroid injection group (41% of the steroid injection group versus 12% of the control group) was observed in this study.

On the other hand, it was verified in a prospective study that plasma disc decompression promoted a greater reduction in pain and improvement of the quality of life when compared with epidural steroid injection.¹³ However, it is worth mentioning that the measurement of pain is complex due to subjectivity and the various psychic components that compose it. Although there are several scales and questionnaires, often the best parameter is the clinical improvement of

the patient with the return to their usual activities and work. Therefore, the greatest limitation found in this systematic review was the fact that there are studies with very different methodologies and the difficulty in homogenizing the results, as shown in Figures 1 and 2, in addition to a limited number of patients in some of the reviewed publications. The benefit provided by minimally invasive techniques, such as epidural block with steroids, in reducing surgical procedures for the treatment of extruded disc herniation is evident due to the reduction of costs and recovery time of patients, in addition to avoid the development of chronic pain with all their affective-motivational and cognitive-evaluative repercussions. In this context, the improvement of the pain symptomatology in more than 56% of the patients in five of the seven works evaluated is extremely relevant. In addition, it is important to emphasize the results found in two studies^{12,13} that did not show the superiority of the epidural block compared with the surgical technique or plasma administration. In these two studies, however, a reduction in pain intensity was observed in 27.5% and 41%, respectively, in the groups that used steroid epidural block.^{12,13}

Conclusions and Recommendations

Despite the lack of homogeneity, the articles selected showed an important reduction in pain intensity and surgical indications, as well as a desirable level of safety and tolerability. On the other hand, new studies must be carried out in order to homogenize the methodologies used, to evaluate the functional issue of the subject and to demonstrate the great benefit of minimally invasive techniques, such as epidural administration of steroids, in the treatment of lumbosciatalgia due to herniated disc.

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Conflict of interest

The author declares there is no conflict of interest.

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