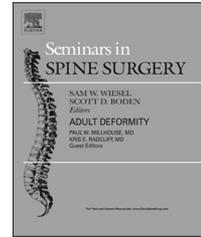


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# Non-operative management: An evidence-based approach



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## ABSTRACT

Symptomatic lumbar disc herniation is a common problem encountered in both surgical and non-surgical practices. The decision between surgical and non-surgical management of this entity can be challenging for both the patient and the treating physician. A variety of non-surgical treatment options exist, many with poor evidence supporting their efficacy. Treatment algorithms are available to promote improved outcomes and cost-effectiveness and reduce unnecessary interventions. In the absence of progressive neurologic deficit or cauda equina syndrome, non-surgical treatments for symptomatic lumbar disc herniations are typically implemented for at least 6 weeks with good results. The following is an evidence-based review of the non-surgical management of symptomatic lumbar disc herniation.

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## 1. Introduction

Lumbar disc herniation can be extremely painful and cause significant morbidity and loss of function. Fortunately, up to 90% of cases of sciatica from lumbar herniated discs resolve in about 12 weeks.<sup>1,2</sup> Emergency room visits, primary care and specialty assessments, medications, imaging, physical therapy, chiropractic, acupuncture treatments, epidural steroid injections, and surgery all contribute to the direct cost of treating this condition. Indirect costs associated with this condition may include absence from work, short- and long-term disability, and reduced work capacity secondary to pain and/or weakness. Conservative treatment is recommended to reduce pain and improve function in this time period while the body hopefully will resorb the disc material. Several conservative options exist, but the data is unclear as to which are truly efficacious.

## 2. Medications

Numerous medications, including acetaminophen, non-steroidal anti-inflammatory drugs (NSAIDs), muscle relaxers, steroids, narcotics, neuroleptics, and anti-depressants, are used

to treat back pain and radicular symptoms that result from lumbar disc herniation. Although not specific to the diagnosis of lumbar disc herniation, a recent double-blinded randomized controlled trial found difference in recovery time following an episode of acute low-back pain when comparing acetaminophen at doses up to 4000 mg to placebo.<sup>3</sup> NSAIDs are often utilized as a first-line treatment, but there is limited data supporting their benefit.<sup>4–6</sup> Caution must also be exercised in patients with a history of gastroesophageal reflux, peptic ulcer disease, kidney disease, and hypertension when prescribing these agents. Oral corticosteroids are also commonly prescribed for acute disc herniations and lower back pain, but data regarding their efficacy is limited.<sup>7,8</sup> Tri-cyclic anti-depressant medications show some slight short-term benefit in reducing radicular leg pain.<sup>9</sup> Membrane-stabilizing agents such as gabapentin and pregabalin show modest benefit.<sup>10</sup> Long-term use of opioid medication is not supported.<sup>11</sup>

## 3. Physical therapy overview

Physical therapy (PT) provides a means of maintaining activity in a monitored setting with exercises that are aimed

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at reducing pain and improving function. It is also non-invasive and poses little risk in the hands of trained therapists.

PT can be broken down into passive and active modalities. Passive modalities include heat and cold therapy, electrical nerve stimulation, ultrasound, low-power laser, massage, and traction. Active modalities include various strengthening and stretching exercises, as well as aerobic exercises.

Data on the true benefit of PT is lacking.<sup>12,13</sup> Regardless, given the systemic benefits of maintaining an active lifestyle, it seems reasonable to recommend maintaining an active lifestyle, within a patient's pain tolerance.<sup>14</sup>

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## 4. Passive physical therapy modalities

### 4.1. Traction

When used independently or in addition to other PT modalities in patients with sciatica related to herniated discs, both manual and mechanical tractions are similar in effectiveness to sham treatment, PT alone, exercise, ultrasound, and laser therapies.<sup>15</sup> Studies revealing traction to be superior to other methods have significant design limitations, with the majority of studies being very low to moderate in quality.<sup>15</sup> It is also important to note that adverse effects, such as pain, can be experienced after traction.<sup>15</sup>

### 4.2. Superficial heat and cold

There is a limited evidence that indicates that heat reduces short-term low-back pain and disability, and there is inadequate data to make a recommendation for or against the use of cold.<sup>16</sup> Patients with confirmed radiculopathy or disc herniation have not been included in these studies, and so recommendations specific to lumbar disc herniation cannot be made. Reports of burns and skin discoloration (erythema ab igne) with heating pads can occur and caution should be exercised if patients are using these devices at home.<sup>17</sup>

### 4.3. Massage

Massage therapy may have some use in the treatment of low-back pain, but more research is needed.<sup>18</sup> As with superficial heat and cold modalities, patients with sciatica have not been included when reviewing massage's effects on pain and disability.<sup>18</sup> The data is poor and incomplete for massage as an effective treatment for lumbar disc herniation, especially in the long term.

### 4.4. Electric nerve stimulation

Both transcutaneous and percutaneous electric nerve stimulation (TENS and PENS) may improve sciatica pain compared with sham treatment, with PENS being the most effective at providing short-term pain relief, functional improvements, and sleep.<sup>19</sup> However, these results have not been reproduced on a large scale.

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## 5. Active physical therapy modalities

### 5.1. McKenzie method

The McKenzie method for the treatment of low-back and radicular pain focuses on finding a directional preference or position that reduces radicular symptoms and "centralizes" pain symptoms to the lower back. Once this position is determined, a patient's therapy regimen is focused around that directional preference. With regard to improving pain and reducing disability in the short term, the McKenzie method is superior to NSAIDs, educational booklets, back massage and back care advice, strength training, spinal mobilization, and general exercises.<sup>20</sup> Data is insufficient to make conclusions regarding its long-term efficacy.<sup>20</sup> The strongest evidence for centralization likely lies in its power of prognostication; the occurrence of centralization of sciatica symptoms is generally indicative of a good prognosis, while the failure of pain to centralize indicates a poor prognosis.<sup>21</sup>

### 5.2. Core-stabilization exercises

Evidence for core-stabilization exercises in the setting of lumbar disc herniation is limited, as most literature examines its effects on nonspecific back pain only. There is some evidence that core-stabilization exercises may help herniated-disc-related back pain, but the study focusing on this examined patients who were receiving a number of other treatments simultaneously, including epidural steroid injections.<sup>1</sup> Further, the study was an outcome-based study with no controls.<sup>1</sup> There is also some evidence that core-stabilization exercises reduce pain and increase function in patients with recurrent lumbar disc herniation following discectomy, but in each case a number of other treatment modalities were used in combination with the stabilization exercises and the study quality was poor.<sup>22-24</sup> It is currently not possible to make substantial conclusions regarding the efficacy of core-stabilization exercises in patients with pain from lumbar disc herniation.

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## 6. Osteopathic manipulative therapy

A number of studies have examined osteopathic manipulative therapy's (OMT) effects on low-back pain, but the vast majority of these studies do not focus on patients with disc herniations or radicular symptoms. In fact, most studies and reviews specifically exclude these patients.<sup>25,26</sup> High-quality studies are limited. OMT directed at treating sciatic pain caused by lumbar disc herniation, consisting of soft tissue lumbar and gluteal stretching, soft tissue stretching, low-amplitude passive articular maneuvers of the lumbar spine, and high-velocity thrusts to lumbar articulations, has been found to be safe and equally effective as chemonucleolysis twelve months out from time of treatment.<sup>27</sup>

## 7. Lumbar spinal manipulation

A variety of practitioners perform spinal manipulations on patients with low-back and radicular pain. A meta-analysis including a number of studies on patients with either verified or suspected disc herniation found no difference in the effectiveness of spinal manipulative therapy (SMT) used by osteopathic physicians, chiropractors, and physical therapists.<sup>28</sup>

Patients may question the safety of lumbar spine manipulations, and so it is valuable to know the risks involved. The most common side effect of lumbar SMT is local discomfort,<sup>29</sup> while the most devastating complications are cauda equina syndrome (CES) and clinically worsened disc herniation.<sup>30</sup> Liberally calculated risk of developing a worsened herniation or CES when performed by osteopathic physicians, chiropractors, and physical therapists is less than one in 37 million, though this number is doubled when manipulations performed under anesthesia are included in the calculation.<sup>30</sup> Thus, it is reasonable to consider lumbar spinal manipulations to be safe.

Quality studies on the efficacy of SMT in the treatment of symptomatic lumbar herniated discs are lacking. SMT was previously thought to have greater short-term pain relief than sham SMT,<sup>31</sup> though a more recent review refutes this and is unable to make strong recommendations for or against its use in low-back and radicular pain due to poor quality evidence.<sup>32</sup> The updated review examines studies including patients with radiculopathy, but it excludes two studies that exclusively evaluate patients with sciatica.<sup>32</sup>

### 7.1. Epidural steroid injections

The use of epidural corticosteroids as treatment of sciatica was documented first in 1952. Since that time the utilization of epidural steroid injections has increased exponentially and has become commonplace in treatment of symptomatic lumbar disc herniation. The use of fluoroscopy has allowed for more accurate and safer epidural access. The rationale for injection of steroids into the epidural space is to provide an anti-inflammatory effect on inflamed neural structures. There are presently several hypotheses regarding the mechanism of action of epidural steroids without a proven explanation.

In 1990, Saal et al.<sup>33</sup> demonstrated elevated levels of Phospholipase A2 at the interface between the herniated nucleus pulposus and spinal nerves. The presence of inflammatory markers suggests that inflammation plays a role in the nociception process secondary to disc herniations. This lends credence to the use of epidural corticosteroids in the treatment of this condition. Corticosteroids are shown to block several sites along the inflammatory cascade such as the inhibition of prostaglandins, interference of leukocyte functions, and C-fiber conduction.<sup>34,35</sup>

The three techniques for injection into the epidural space are the caudal approach, the interlaminar approach, and the transforaminal approach. These techniques have been in clinical use for decades in the treatment of discogenic radicular pain.

The caudal and interlaminar procedures were initially performed without radiographic assistance. This "blind technique" has fallen out of favor with current pain management practice guidelines. The transforaminal approach may be performed only with radiographic assistance. Most clinicians use multiplanar fluoroscopy to perform spinal procedures, allowing for live injection of contrast to ensure correct needle placement. With injection of contrast dye under live fluoroscopy, epidural flow of medication, as well as the absence of suboptimal vascular or intrathecal flow, can be confirmed.

The efficacy of lumbar epidural steroid injections has been assessed in medical literature for over 40 years. The caudal approach is performed by advancing a needle into the sacral hiatus below S2 to avoid puncture of the thecal sac (Fig. 1). A large volume of steroid with lidocaine and/or saline is then injected. Caudal epidural steroid injections have been studied extensively. In 2011, Manchikanti et al.<sup>36</sup> found a significant improvement in pain in 120 patients with lumbar disc herniation treated with fluoroscopically guided caudal epidurals versus a control group. A 1-year follow-up study of 120 patients also found benefit from caudal epidurals for disc-related lower back pain, with or without injection of steroid, although a trend towards longer improvement was seen in the steroid group.<sup>37</sup> Parr et al. in 2012 published a systematic review of caudal epidural injections in treatment of chronic low-back pain. They concluded there was good evidence of short- and long-term relief of chronic pain secondary to disc herniation or radiculitis.<sup>38</sup>

The lumbar interlaminar approach involves advancement of a needle between the lamina to either side of the interspinous ligaments, and through the ligamentum flavum (Fig. 2). A loss of resistance to pressure in a syringe is felt when the needle is through the ligament flavum and in the epidural space. Dilke et al. treated 100 patients



**Fig. 1 – Caudal epidural steroid injection. A spinal needle is placed via the sacral hiatus and advanced below S2. Contrast flow shows contrast extending cephalad in the epidural space.**

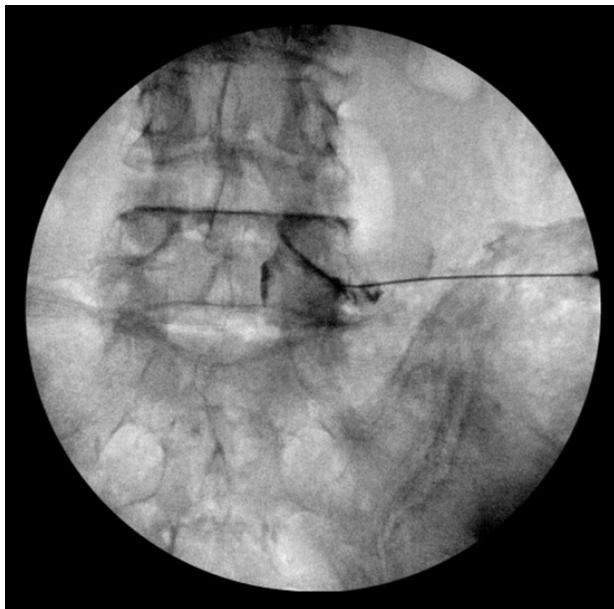
with low-back pain and sciatica with interlaminar epidurals. They determined that 60% of the receiving treatment group had improvement at 3 months versus control.<sup>39</sup> Carrette et al. in 1997 studied 158 patients with sciatica and disc herniation treated with interlaminar epidural steroids injections. This group found that the epidural steroid group had significant reduction in leg pain at 6 weeks after injection.<sup>40</sup> These studies were flawed due to the lack of fluoroscopic guidance. Butterman<sup>41</sup> published a highly respected study comparing fluoroscopic interlaminar epidural steroid injections to surgery for disc herniation in 2004. He studied 169 patients with documented large lumbar disc herniations comparing treatment outcomes over 3 years. The discectomy group had outcomes of pain relief greater than 90% at 3 years. In the epidural group up to 56%

of patients had good pain relief at 3 years and this group had avoided surgery.

Lumbar transforaminal epidural steroid injections are perhaps the most frequently performed and studied of the 3 epidural techniques. The technique involves placement of a spinal needle either above or below the spinal nerve via an oblique angle (Fig. 3). This approach allows for injection into the ventral epidural space, closer to the intervertebral disc. In 2013, the North American Spine Society authored a position paper on lumbar transforaminal epidural steroid injections.<sup>42</sup> The consensus position, after comprehensive review of medical evidence, is that transforaminal epidural steroid injections are recommended for the treatment of radicular pain related to lumbar disc herniation. In 2010, Ghahreman et al. evaluated 150 patients diagnosed with lumbar disc herniation



**Fig. 2 – L5-S1 interlaminar epidural steroid injection. The needle is placed via a right-sided paramedian approach. Contrast is confirmed to be in the epidural space by lateral (A), contralateral oblique (B), and antero-posterior (C) images.**



**Fig. 3 – Right L5 transforaminal epidural steroid injection. Note the flow of contrast along the right L5 peripheral nerve, nerve root sheath and into the epidural space. Epidural flow is noted medial to the pedicle.**

and radicular pain. The treatment group received epidural steroid injections and received a significant benefit from the injections in comparison with the control groups.<sup>43</sup> Riew et al.<sup>44</sup> in 2000 assessed efficacy of selective nerve root injections in patients with lumbar disc herniation. They determined that the group receiving selective nerve root injection with bupivacaine and betamethasone had a lower rate of surgery than the injection group receiving bupivacaine alone. The treatment group avoided surgery for 13–28 months after injection. The role of epidural steroid injections in prevention of surgery was further assessed recently by Bicket et al.<sup>45</sup> This group found a small but significant reduction in need for surgery with epidural steroid injections.

Multiple studies comparing the various techniques have been published. In 2006, Schaufele et al.<sup>46</sup> compared transforaminal to interlaminar epidural injections for lumbar disc herniation and found that the transforaminal injection group had greater improvement than the interlaminar group. Chang Chien et al.<sup>47</sup> conducted a systematic review of both injection techniques in 2014. They concluded that transforaminal injections had a better short-term improvement over interlaminar injections, while, conversely, interlaminar injections had slightly better functional outcomes. Lastly, Manchikanti et al.<sup>48</sup> compared all three procedures in a systematic review. Their conclusion was that all three procedures had strong short-term efficacy and moderate evidence of long-term efficacy.

## 8. Conclusion

Given the statistically favorable course for most painful lumbar disc herniations, a trial of conservative therapy is

indicated including acetaminophen, NSAIDs, physical therapy, manipulation, or possibly a lumbar epidural steroid injection. Decompressive surgery is reserved for those who present with cauda equina syndrome or progressive weakness, or who fail these treatments. While a number of options exist, the evidence to support these treatments is still an area that requires additional research.

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