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Is Dexamethasone Epidural Injection Effective In Relieving Radicular Pain In An Adult Population?

Christine M. Unger, PA-S
A SELECTIVE EVIDENCE BASED MEDICINE REVIEW
In Partial Fulfillment of the Requirements For
The Degree of Master of Science
In
Health Sciences- Physician Assistant

Department of Physician Assistant Studies
Philadelphia College of Osteopathic Medicine

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ABSTRACT

Objective: The objective of this selective EBM review is to determine whether or not dexamethasone epidural injections are effective in treating radicular pain in an adult population.

Study Design: Review of three randomized controlled trials, two of which were published in 2012 and one in 2010, all English language.

Data Sources: Three randomized controlled trials comparing dexamethasone epidural injections to saline injections. All articles were found using PubMed, Medline, and OVID.

Outcomes measured: Researchers measured pain associated with radicular pain using the Short McGill Pain Questionnaire, Numeric Pain Scale, and Oswestry Disability Index.

Results: All three randomized controlled trials did display significant radicular pain relief with the use of an epidural steroid injection as compared to a saline injection. These three studies however did not display that dexamethasone was the most successful in treating radicular pain.

Conclusions: These three RCTs studies displayed significant radicular pain relief by receiving epidural steroid injection. Further research is warranted to compare the safety and efficacy of epidural injections verses physical therapy.

Key Words: Radicular Pain, Epidural injections for radicular pain, epidural injections for sciatica, dexamethasone.
Introduction

Radicular pain is produced by a nerve root impingement within the body\textsuperscript{1,2}. A common type of radicular pain is sciatica neuralgia\textsuperscript{3}. It impacts 5.3\% of men and 3.7\% of women per lifetime\textsuperscript{4}. This pain impacts individuals and how they complete activities of daily living such as: cleaning, exercising and working in a high intensity job. Low back pain accounts for 2.5\% of office visits per year and cost 38 to 50 billion dollars on the national bill\textsuperscript{5}. Low back pain office visits consist of: strains, sprains and radicular pain\textsuperscript{5}.

Radicular pain is commonly caused by inflammation, mechanical compression, piriformis syndrome, vascular compression, spinal stenosis, synovial cyst, infection or tumors\textsuperscript{1,2}. Lumbar radicular pain is most commonly caused by herniation of a vertebral disc\textsuperscript{6}. Lumbar radicular pain impacts many individuals every day. These individuals who suffer from radicular pain may experience sharp and radiating pain, decreased deep tendon reflexes, atrophy of posterior muscles and motor weakness\textsuperscript{1}. Every day many individuals use a plethora of treatments to rectify radicular pain, such as: bed rest, physical therapy, NSAIDS, Spinal Manipulations and epidural injections\textsuperscript{6}. Today, patients are using different types of epidural injections to relieve the pain caused by radiculopathy.

Epidural injections are one of the most common intervention in managing low back pain in the United States\textsuperscript{3}. Research shows that epidural injections are effective in treating lumbar radicular pain, but some doctors still question the impact of these injections on short term and long term pain relief. It is also debatable if the epidural injections provide short or long term pain relief\textsuperscript{7}.
Objective

The objective of this selective EBM review is to determine whether or not dexamethasone injections are effective in relieving radicular pain in an adult population.

Methods

Randomized control studies were selected based on those that included males and females 18 and older who were experiencing radicular pain. Articles were used to compare the efficacy of dexamethasone epidural injections to an experimental group who is receiving saline solutions. Pain was the outcome measured in all three randomized control trials, which was measured by the McGill Pain Questionnaire, Numeric Pain Scale, and Oswestry Disability Index.

A search was conducted via PubMEd, Medline and OVID using key words: radicular pain, epidural injections for radicular pain, epidural injections for sciatica and dexamethasone to find articles pertinent to the topic of radicular pain and epidural injections. All three of these studies were used in peer-reviewed journals and were written in English. These studies were chosen because they were relevant, and focused on an outcome important to the patient (POEMs). The included studies were randomized controlled trials that were published after 1996. The inclusion criteria was randomized and controlled trails that measure radicular pain relief using epidural steroid injections. The exclusion criteria were published before 1996 and did not specifically measure radicular pain in and adult population in an objective way. Table 1 describes each of the three randomized control trials. All three articles recorded results using Mann-Whitney U test, P-values, CI’s, means, standardized deviations, categorical variables, Chi Squared and T-test.
Table 1 Demographic & characteristics of included studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Type</th>
<th># of Pts</th>
<th>Age (yrs)</th>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
<th>W/D</th>
<th>Intervention</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park$^8$ (2010)</td>
<td>RCT</td>
<td>106</td>
<td>18-80</td>
<td>Patients age 18-80, diagnosed with lumbar radicular pain based on appropriate distribution of pain and MRI showing a nerve root compromise</td>
<td>Patients chronically using oral steroid medication, oral, peripheral, or epidural steroid use in the last 3 months, oral temperature &gt; 100.5 F, pregnancy, cognitive impairment, inability to consent, use of aspirin, Plavix, Coumadin, or heparin in the previous two weeks, history of bleeding disorders and history of lumbar surgery and axial pain.</td>
<td>0</td>
<td>Epidural injection of 7.5 mg of dexamethasone disodium phosphate or epidural injection of 40 mg of Triamcinolone acetonide.</td>
</tr>
<tr>
<td>Cohen$^9$ (2012)</td>
<td>RCT</td>
<td>84</td>
<td>18-70</td>
<td>Patients were 18-70 years old, have radicular pain for more than 4 weeks and no more than 6 months, leg pain that is more severe or as severe as back pain, failure of conservative treatment, MRI displayed pathologic disc ailments</td>
<td>Patients have coagulopathy or systematic infections, unstable medical or psychiatric condition, previous spinal surgery, previous epidural steroid injection and allergy to contrast die.</td>
<td>0</td>
<td>60 mg of methylprednisolone acetate plu. 5ml of saline or 4 mg of Etanercept in 2 ml of normal saline solution.</td>
</tr>
<tr>
<td>Manchikanti$^7$ (2010)</td>
<td>RCT</td>
<td>70</td>
<td>&gt;18</td>
<td>Disc herniation, or radiculitis, &gt;18 years old, 6 months of functioning-chronic limiting low back pain, lower extremity pain, understood protocol, gave voluntary informed consent, participated in outcome consent</td>
<td>Previous lumbar injury, radiculitis secondary to Spinal stenosis, disc herniation, uncontrollable or unstable opioid use, uncontrolled psychiatric disorders, uncontrolled medical illness, anything that could interfere with interpretation of results, pregnant women or lactating, adverse reaction to local anesthetic</td>
<td>0</td>
<td>Lumbar interlaminar injection with local anesthetics and steroid or one lumbar interlaminar epidural injection with local anesthetic.</td>
</tr>
</tbody>
</table>
OUTCOMES MEASURED

The outcomes measured were patient oriented evidence that matters (POEMs). The outcomes were measured by using several data collections methods. In the study by Park et al\textsuperscript{8}, researchers, patients, and workers were kept blind to who was receiving dexamethasone injections and which individuals were receiving the triamcinolone acetate epidural injections. All individuals were evaluated using McGill Pain Questionnaire and Oswestry Back Disability Index to measure the efficacy of epidural injection in treating radicular pain.

In the study by Cohen et al\textsuperscript{9}, all patients, clinicians, and workers were kept blind to who was receiving the epidural steroids verses the saline solutions. All patients were evaluated using Oswestry Disability Index and Numeric Pain Scale. The third study that was evaluated was Menchikanti et al\textsuperscript{7}, where all patients, clinicians, and workers were kept blind to who was getting the local anesthetic and steroid and those who received the anesthetic. Outcomes in the Menchikanti study were measured using the Numeric Rating Scale, and Oswestry Disability Index.

Results

The three RCTs that were utilized for this literature review, evaluated the efficacy of epidural steroid injections on relieving radicular pain in individuals 18 and older. Each trial randomized participants into groups that were given either an epidural injection of saline or steroid. Pain relief was measured by Numeric Pain Scale, Oswestry Disability Index and McGill Pain Questionnaire to determine efficacy of the intervention.

The Park et al\textsuperscript{8} study used the Mann-Whitney U test to compare the pain scores between the treatment and control groups. A P-value of $\leq 0.05$ was considered significant. This study did
not display a significant difference between intervention and control pain scores. Before the injections were given, the adults in the Triamcinolone group had a higher pain score than the dexamethasone group. One month after the injections, the triamcinolone group had a reduction in pain score by 71% and the dexamethasone group had a pain score reduction of 40%. Although this study reported that both dexamethasone and triamcinolone displayed significant pain relief, triamcinolone did so to a much greater degree.

In the study by Cohen et al. results displayed that leg and back pain was improved in both randomized groups, however; the intervention receiving the steroids had a larger decrease in radicular pain. CI of 95% was considered significant in this study. Data after 1 month included: mean change with steroids -3.57 (95% CI, -4.43 to -2.71) etanercept -2.98 (CI, -4.41 to -1.55) and saline -2.48 (CI -3.59 to -1.37)9. Data also reported a mean baseline Numeric Rating Scale for leg pain as 2.54 (CI, 1.36 to 3.69) for steroids, 3.56 (2.35 to 4.72) in etanercept and 3.78 (CI 2.72 to 4.85) in saline group9.

The Oswestry Disability Index in this trial illustrated the more significant difference between the groups, in comparison to the pain scale9. The steroid group mean score was 22.43 (SD, 16.72), the etanercept group was 38.27 (SD 24.69) and the saline group was 28.80(SD 21.22)9. P-values were considered significant if <.059. When these three groups were compared, the steroid and etanercept groups had a P-value of .002 which was deemed significant9. The steroid group, when compared with the saline group, had a P-value of .23 which was not significant for pain relief9. The P-value for saline versus etanercept was considered significant with at .049. The adults within this study were able to reduce their consumption of angesic medication by 50%9.
In the study by Manchikanti et al\textsuperscript{7} data was analyzed using the Chi-Squared Statistic and T-test. The T-test was used to compare mean scores that were utilized to assess pre and post-treatment results of the average pain scale. The Manchikanti et al\textsuperscript{7} study showed that group 2, with the steroid and anesthetics intervention, had more significant pain relief at the 6 month follow up verses the 3 month follow up\textsuperscript{7}. 50% pain relief was noticed after 6 months\textsuperscript{7}.

**Table 2: Displays the efficacy of steroid injections when compared to the control for the three studies.**

<table>
<thead>
<tr>
<th>Study</th>
<th>CER</th>
<th>EER</th>
<th>RBI</th>
<th>ABI</th>
<th>NNT (1/ABI)</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Park</td>
<td>1</td>
<td>.36</td>
<td>-.64</td>
<td>-.64</td>
<td>1</td>
<td>P&lt; .05</td>
</tr>
<tr>
<td>Cohen</td>
<td>.50</td>
<td>.75</td>
<td>.5</td>
<td>.25</td>
<td>4</td>
<td>P &lt;.05</td>
</tr>
<tr>
<td>Manchikanti</td>
<td>.74</td>
<td>.86</td>
<td>.162</td>
<td>.12</td>
<td>9</td>
<td>P &lt;.001</td>
</tr>
</tbody>
</table>

\textit{CER= Controlled event rate; EER= Experimental event rate; RBI= Relative Benefit Increase; ABI= Absolute Benefit Increase; NNT= Numbers needed to treat}

Table 2 displays that the three randomized controlled trials as a whole show significant reduction in pain relief when using a steroid epidural injection.

**Table 3: Displays the Mean Pain scores compared from baseline to 1 month between Cohen and Parks Study.**

<table>
<thead>
<tr>
<th>Injection</th>
<th>Baseline</th>
<th>1 month</th>
<th>P-Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dexamethasone</td>
<td>7.4 ± 1.4</td>
<td>4.1 ± 1.9</td>
<td>P &lt;0.05</td>
</tr>
<tr>
<td>Triamcinolone</td>
<td>8.3 ± 0.9</td>
<td>2.4 ± 0.9</td>
<td>P &lt;0.05</td>
</tr>
<tr>
<td>Saline</td>
<td>4.75</td>
<td>4.01</td>
<td>P= 0.40</td>
</tr>
<tr>
<td>Steroids</td>
<td>5.30</td>
<td>3.49</td>
<td>P= 0.40</td>
</tr>
<tr>
<td>Etanerccept</td>
<td>6.08</td>
<td>4.41</td>
<td>P= 0.40</td>
</tr>
</tbody>
</table>
Table 3 shows that some degree of pain relief was noted in between treatment groups, but it was not significant. In order for pain relief to be deemed significant a $P$-value $\leq 0.05$ was needed.

**Discussion**

This review investigated three randomized controlled studies and their intervention of epidural injections on radicular pain in an adult population. All three randomized control trials showed that there was significant difference in radicular pain relief between adults receiving a saline solution versus a steroid epidural injection. These trials did not demonstrate a significant or clinical significance in using dexamethasone in radicular pain relief.

The aforementioned studies did not all focus on the efficacy of dexamethasone epidural injections on radicular pain. This could be a major limitation. The three studies took into consideration steroid injections and the efficacy of treating radicular pain, but did not mainly focus on dexamethasone. More studies are needed to be done in order to finalize a conclusion on whether or not dexamethasone epidural injections are successful in treating radicular pain. Studies that compared the efficacy of dexamethasone to other steroid injection such as: triamcinolone and hydrocortisone would make a more conclusive decision on the efficacy of dexamethasone injections on relieving radicular pain.

Other limitation in this study included; not all adults wanted pain relief for similar reasons. Some adults wanted pain relief so they could perform their jobs more effectively and accurately, while others want to enjoy activities of daily living more pain free. Another limitation in these studies was that all participants may not have interpreted the questionnaire the same and each individual reacts and perceives pain differently. Another issue was that the Owestry
Disability Scale was originally created to measure pain in individuals who suffered from low back pain, therefore it may not be effective in evaluating and studying radicular pain.

**Conclusion**

In conclusion, these three randomized trials did not display that significant pain relief can be established by using dexamethasone epidural injections. These three studies showed that some pain relief can be seen in patients who received steroid injection but not significant enough to say that steroid injections are successful in treating radicular pain. Further research needs to be conducted in an adult population suffering from radicular pain who have tried different methods of pain relief such as: dexamethasone injections, physical therapy, and oral steroids. Research also should be conducted in a more specific age group rather than a broad category like an adult population. Lastly, a research study that compares all the different types of steroid epidural injections would need to be conducted, in order to prove that dexamethasone is the most successful method for treating radicular pain.
References

1. Lumbar Radicular Pain. Available at:

2. Radiculopathy. Available at:


