

## Interlaminar epidural steroid injections for low back pain in rural Ontario

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**Introduction:** We sought to document the efficacy of interlaminar epidural steroid injections (ESIs) for the relief of low back pain in a rural population.

**Methods:** We conducted a prospective observational cohort study with brief follow-up telephone interviews at 1, 3 and 6 months after interlaminar ESI.

**Results:** A total of 47 ESIs were administered to the 24 participants. In an intention-to-treat analysis, pain relief was achieved in 78.7%, 55.3% and 27.7% of participants at 1, 3 and 6 months.

**Conclusion:** Interlaminar ESIs, without fluoroscopic guidance, were effective for up to 3 months of symptom relief.

**Introduction :** Nous avons cherché à déterminer l'efficacité des infiltrations épidurales interlaminaires de stéroïdes pour réduire la lombalgie chez une population rurale.

**Méthodes :** Pour ce faire, nous avons mené une étude de cohorte observationnelle prospective au moyen de brèves entrevues téléphoniques de suivi après 1, 3 et 6 mois.

**Résultats :** Au total, 47 infiltrations épidurales ont été administrées à 24 participants. Dans le cadre d'une analyse par intention de traiter, 78,7 %, 55,3 % et 27,7 % des participants ont rapporté un soulagement de la douleur à 1, 3 et 6 mois, respectivement.

**Conclusion :** Les infiltrations épidurales interlaminaires sans guidage fluoroscopique peuvent procurer un soulagement des symptômes pendant jusqu'à 3 mois.

### INTRODUCTION

Radicular low back pain (lumbar pain with neurologic signs and symptoms) constitutes 4%–5% of cases of back pain seen by general practitioners.<sup>1</sup> Because this subgroup of patients with low back pain includes those who may need surgical referral or intervention, they merit a particular focus.

Clinical findings and radiographic imaging allow us to categorize these patients into those with lumbar disc herniation (LDH) and/or lumbar spinal stenosis (LSS). Degree of pain does not consistently correlate with severity of imaging-detected spinal pathologies, and most initial episodes resolve with conservative treatment.<sup>2,3</sup> The frequency of spontaneous resolution varies according to diagnosis, with symptoms

improving without operative intervention in 80% of patients with LDH and up to 45% of patients with LSS.<sup>4</sup>

Lumbar disc herniation involves mechanical compression from herniated disc material, whereas LSS encompasses the degenerative narrowing of the central canal, lateral recess or neural foramen.<sup>4</sup> In both cases, inflammation is widely believed to play a causal role in instigating radiculopathy.<sup>2,3,5–9</sup> Epidural steroid injections (ESIs) may therefore have a role in the treatment of radicular low back pain, after the failure of conservative management.<sup>3,4,6–8</sup>

There are 3 primary methods for the injection of corticosteroids into the epidural space: caudal, transforaminal and interlaminar ESI.<sup>7,10–12</sup> Caudal ESI involves the injection of medication through the sacral hiatus, transforaminal

ESI uses the neural foramen to target a specific nerve root and interlaminar ESI enters the epidural space between the laminae.<sup>6,7,10,11,15</sup> Although transforaminal ESI is generally considered the most effective, its safety profile mandates the use of fluoroscopic guidance, which may not be feasible in a rural setting.<sup>4,6,7,12,14,15</sup> Interlaminar ESI, on the other hand, is also considered effective and can be administered without real-time imaging guidance.<sup>6,11,12,16–22</sup> The technique is similar to that used by rural generalists performing lumbar punctures and by rural general practitioners and anesthesiologists for epidural analgesia during labour.<sup>11,15</sup>

Although widely considered safe,<sup>15,22,23</sup> the value of ESI as a clinical practice remains a subject of debate. Some literature supports the efficacy of ESI for short-term pain reduction,<sup>23,24</sup> other publications point out important flaws, such as a lack of cost-effectiveness, the absence of substantial improvement and — in 1 case — the worsening of outcomes.<sup>9,25–27</sup> Most research findings fall in between these 2 conclusions.<sup>28–31</sup>

This prospective study investigates the efficacy of interlaminar ESIs in treating low back pain in a rural population. It is a follow-up to a previous 5-year retrospective study that demonstrated substantial improvement of symptoms following interlaminar ESIs.<sup>15</sup>

## METHODS

### Setting

The Sioux Lookout Meno Ya Win Heath Centre serves a population of 30 000 in northwestern Ontario.

### Data collection and analysis

This research was approved by the Sioux Lookout Meno Ya Win Research Review and Ethics Committee.

Patients who presented for ESI at an outpatient clinic at the Sioux Lookout Meno Ya Win Heath Centre between October 2011 and December 2014 were invited to participate in this study. Exclusion criteria were local infection or full anticoagulation therapy with warfarin. After informed consent, key demographic characteristics for each participant, as well as the number of previous injections, analgesic usage, history of back surgery and current level of pain using numeric pain scale measures were recorded. Patients were contacted by telephone 1, 3 and 6 months postinjection and asked to rate their

current level of pain as less, greater or the same as it had been preinjection. Patients were able to receive subsequent injections if medically indicated.

Data were collected in Microsoft Excel, and analysis was completed with Excel and IBM SPSS (version 20.0 for Windows). Means and frequencies were calculated as appropriate.

### Method of injection

Epidural steroid injections were performed by 2 experienced general practitioners/anesthesiologists. Before injection, patients were briefed on the potential risks and benefits associated with the procedure. The interlaminar approach was used without real-time imaging guidance. The patient was seated in lumbar flexion, and the correct level was identified using the iliac crest as indicative of the L3–L4 level. In the case of patients with a history of back surgery, the location of injection was raised or lowered a level accordingly. The subcutaneous injection of 4 mL of 1% lidocaine was followed by the interlaminar advancement of a 17-gauge Tuohy needle and the identification of the epidural space using the loss-of-resistance technique. Then, 1 mL of 80 mg/mL methylprednisolone acetate with 4 mL of normal saline was injected. Instructions for postinjection care were provided.

## RESULTS

### Study population

Twenty-four patients gave informed consent and were enrolled in the study. Patient characteristics are provided in Table 1. Thirteen (54.2%) were women, and the mean age was 50.4 (standard deviation [SD] 13.3) years. Lumbar disc herniation was the most common diagnosis, occurring in 17 (70.8%) participants, followed by LSS, which affected 16 (66.7%). Eleven (45.8%) patients were diagnosed with both LDH and LSS. On average, each participant had received about 1 ESI before the commencement of the study (mean 0.9, range 0–6 injections). All patients were taking oral analgesics for low back pain at the beginning of the study. Fourteen (58.3%) used narcotics, 10 (41.7%) used acetaminophen and 9 (37.5%) used NSAIDs, with 8 (33.3%) using a combination therapy. Hypertension and diabetes were the most common comorbidities, with each affecting 9 (37.5%) participants. Other observed comorbidities included psychosocial factors (16.7%), coronary artery disease (8.3%) and peripheral vascular disease (4.2%) (Table 1).

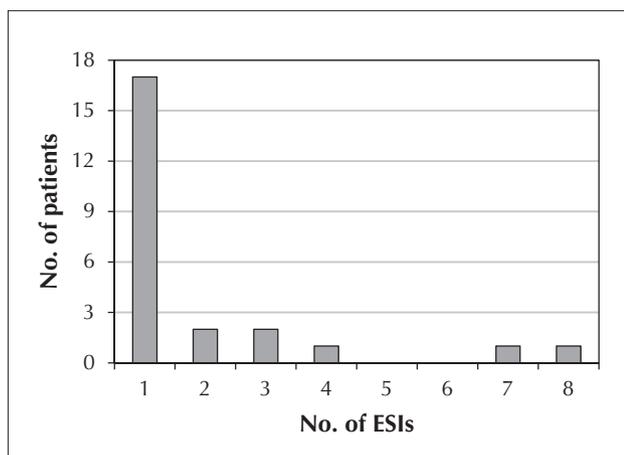
## Pain relief

A total of 47 ESIs were administered to the 24 participants, with 17 (70.8%) receiving a single injection and 3 (12.5%) receiving 4 or more injections (Fig. 1). The mean score on the numeric pain rating

**Table 1: Characteristics of participants receiving interlaminar epidural steroid injections, *n* = 24**

Characteristic	No. (%) <sup>*</sup>
Age, yr, mean ± SD	50.4 ± 13.3
Sex	
Male	11 (45.8)
Female	13 (54.2)
Radiographic diagnosis	
LDH	17 (70.8)
LSS	16 (66.7)
LDH and LSS	11 (45.8)
Spondylolisthesis	3 (12.5)
Osteoarthritis	3 (12.5)
Back surgery	6 (25.0)
Analgesic use	
Narcotics	14 (58.3)
NSAIDs	9 (37.5)
Acetaminophen	10 (41.7)
Other analgesics	3 (12.5)
Combination therapy	8 (33.3)
No. of previous injections, mean ± SD	0.9 ± 1.5
Comorbidities	
Hypertension	9 (37.5)
Type II diabetes	9 (37.5)
Psychosocial factors (anxiety, depression, drug use)	4 (16.7)
Coronary artery disease	2 (8.3)
Peripheral vascular disease	1 (4.2)

LDH = lumbar disc herniation; LSS = lumbar spinal stenosis; NSAID = nonsteroidal anti-inflammatory drug; SD = standard deviation.  
\*Unless stated otherwise.



**Fig. 1.** Number of epidural steroid injections (ESIs) administered per patient during the course of the study (47 ESIs in 24 patients).

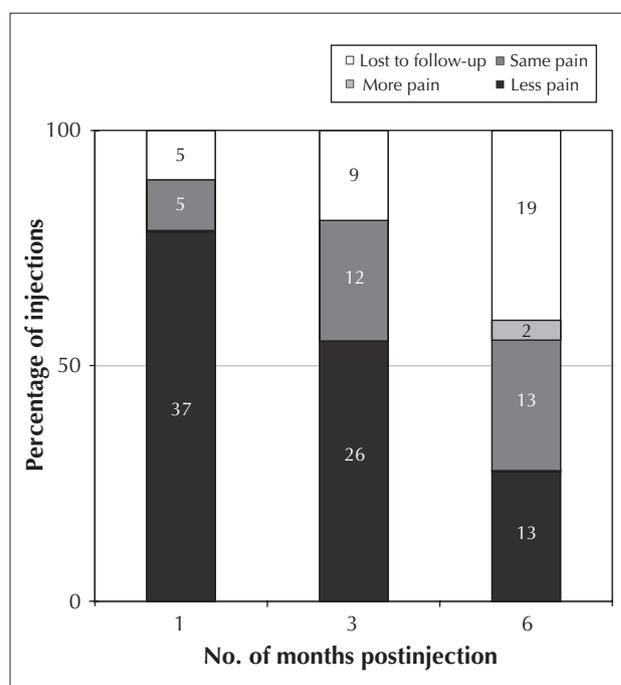
scale before interlaminar ESI was 6.48 (SD 1.94) out of 10. Adverse reactions to treatment were reported after 3 injections; 2 were headaches and 1 was new bilateral radicular pain.

Of those who received a single injection, 3 were lost to follow-up within a month and were excluded from further analysis. Two patients receiving multiple injections were lost to follow-up within a month of receiving a subsequent injection. Of the 42 injections with follow-up data, 37 (88.1%) were associated with reduced pain from baseline after 1 month, and the remainder were associated with no change in level of pain. The number of injections associated with pain relief fell to 26 (68.4%) of the 38 injections with follow-up data after 3 months; again, all remaining injections were associated with no change in pain level. After 6 months, of the 28 injections with follow-up data, 13 (46.4%) were associated with continued pain relief and 2 (7.1%) with increased pain relative to baseline.

In an intention-to-treat analysis (including those lost to follow-up), pain relief occurred in 78.7%, 55.3% and 27.7% at 1, 3, and 6 months (Fig. 2).

## DISCUSSION

Our results show that interlaminar ESI, without fluoroscopic guidance, can effectively decrease low back pain for up to 3 months.



**Fig. 2.** Outcomes at 1, 3 and 6 months after epidural steroid injection as a proportion of the number of injections (*n* = 47).

Although the analgesic effects of interlaminar ESIs are only short term, there is a lack of consensus in the literature on exactly how short this term is. At one end of the spectrum, Brown<sup>32</sup> found that only 35.3% of patients who received a standard interlaminar ESI experienced effective pain relief after 6 weeks, and Ghai and colleagues<sup>14</sup> reported this percentage to be 16.7% after 6 months.<sup>14,32</sup> Other researchers have found that the effects of interlaminar ESI last at least 6 months,<sup>5,21,22</sup> 3 months,<sup>19</sup> 35 days<sup>16</sup> or 10 days.<sup>20</sup> In a previous retrospective study at our hospital, Mashari and colleagues<sup>15</sup> found that 80% of the 88 patients with follow-up data experienced improvement after receiving an interlaminar ESI. The present study reports a reduction of symptoms for up to 3 months after injection in 55% of patients.

Of the prospective studies found in our literature search, only Rivest and colleagues<sup>17</sup> explicitly described administering interlaminar ESIs in the absence of real-time imaging guidance, making this study of particular interest to the present study.<sup>16–22</sup> The rates of pain relief reported by Rivest and colleagues<sup>17</sup> — with 61% of patients with LDH reporting improvement after 2 weeks compared with only 38% of patients with LSS — are lower than the rates found in both of the studies carried out at our institution.<sup>15,17</sup> This difference could be due to the exclusion of patients who had experienced low back pain for less than 6 months in the study by Rivest and colleagues,<sup>17</sup> given that the effectiveness of ESI diminishes with increasing duration of symptoms.<sup>6,7,17</sup>

Two patients in this study experienced headaches after receiving an interlaminar ESI. This is noteworthy because needle misplacement, which is associated with post-dural puncture headache, is estimated to occur in 8%–40% of interlaminar ESIs administered without real-time imaging guidance.<sup>4,7,23,31,33</sup>

### Limitations

This study has a number of limitations, including a small sample and the absence of a control group. Spontaneous improvement of symptoms often happens with LDH and LSS, and this can be erroneously attributed to interlaminar ESI.<sup>4</sup> Also, initial pain assessment was done using numeric pain scale measures, but subsequent telephone follow-up used categorical measures (i.e., pain better, worse or the same). This was done to simplify the nature of the often long-distance follow-up telephone interviews but limited the statistical analysis that could be performed on the data.

## CONCLUSION

Interlaminar ESI was associated with pain reduction for up to 3 months for most patients. Interlaminar ESI can be administered in a context where fluoroscopic guidance is not available, such as in remote and rural communities.

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