



## ORIGINAL ARTICLE

# Comparison of the efficacy of epidural steroid injection applied in cervical and lumbar regions

## Servikal ve lomber bölgelere uygulanan epidural steroid enjeksiyonunun etkinliğinin karşılaştırılması

Halil ÇETİNGÖK,<sup>1</sup> Meltem KANAR<sup>2</sup>

### Summary

**Objectives:** Epidural injections have been used for many years in the treatment of chronic pain in patients with chronic back-leg pain and chronic neck-arm pain. We aimed to compare the efficacy of lumbar and cervical epidural steroid injections on pain palliation, duration of pain relief and patient satisfaction.

**Methods:** This is a Retrospective, observational single-center study. A total of 159 patients (96 females, 63 males) who were performed epidural steroid injections in cervical and lumbar regions were included in the study. The patients were divided into two groups as lumbar epidural steroid injection "Group 1" and cervical epidural steroid injection "Group 2". We retrospectively evaluated the patients for numerical rating scale (NRS) prior and after the injection, the duration of the pain relief, whether any complication occurred related to injection and patient satisfaction.

**Results:** 130 patients in Group 1 and 29 patients in Group 2 were evaluated. Median NRS before the procedure: 8 in Group 1, 7 in Group 2 and median NRS after the procedure: 3 in Group 1, 4 in group 2. Patient satisfaction with the procedure 56.15% in Group 1 and 48.62% in Group 2. Mean duration of pain relief 7.23 months in Group 1 and 8.17 months in Group 2. There were no statistically significant difference in the evaluated parameters between the two groups.

**Conclusion:** It was observed that the pain relief, duration of pain relief and patient satisfaction were similar for cervical and lumbar epidural steroid injections.

Keywords: Chronic pain; clinical efficacy; epidural steroid injection; interlaminar; transforaminal.

### Özet

**Amaç:** Epidural enjeksiyonlar, kronik bel-bacak ağrısı ve kronik boyun-kol ağrısı olan hastalarda kronik ağrı tedavisinde uzun yıllardır kullanılmaktadır. Lomber ve servikal epidural steroid enjeksiyonlarının ağrı palyasyonu, ağrı sağaltımı süresi ve hasta memnuniyeti üzerindeki etkinliğini karşılaştırmayı amaçladık.

**Gereç ve Yöntem:** Bu retrospektif, gözlemsel tek merkezli bir çalışmadır. Servikal ve lomber bölgelere epidural steroid enjeksiyonu yapılan toplam 159 hasta (96 kadın, 63 erkek) çalışmaya dahil edildi. Hastalar lomber epidural steroid enjeksiyonu "Grup 1" ve servikal epidural steroid enjeksiyonu "Grup 2" olarak iki gruba ayrıldı. Hastalar enjeksiyon öncesi ve sonrası sayısal derecelendirme skalası (NRS), ağrı sağaltımı süresi, enjeksiyona bağlı gelişebilecek komplikasyonlar ve hasta memnuniyeti açısından geriye dönük olarak değerlendirildi.

**Bulgular:** Grup 1'de 130, Grup 2'de 29 hasta değerlendirildi. İşlem öncesi medyan NRS: Grup 1'de 8, Grup 2'de 7 ve işlem sonrası medyan NRS: Grup 1'de 3, Grup 2'de 4; İşlemden hasta memnuniyeti Grup 1'de %56,15 ve Grup 2'de %48,6; ortalama ağrı sağaltımı süresi Grup 1'de 7.23 ay ve Grup 2'de 8.17 ay idi. Her iki grupta da işleme bağlı majör komplikasyon görülmedi. Değerlendirilen parametrelerde iki grup arasında istatistiksel olarak anlamlı bir fark yoktu.

**Sonuç:** Servikal ve lomber epidural steroid enjeksiyonları için ağrı palyasyonu, ağrı sağaltım süresi ve hasta memnuniyetinin benzer olduğu gözlemlendi.

Anahtar sözcükler: Kronik ağrı; klinik etkinlik; epidural steroid enjeksiyonu; interlaminar; transforaminal.

<sup>1</sup>Division of Pain Medicine, Department of Anesthesiology, İstanbul University İstanbul Faculty of Medicine, İstanbul, Turkey

<sup>2</sup>Division of Pain Medicine, Department of Anesthesiology, Ministry of Health Elazığ Fethi Sekin City Hospital, Elazığ, Turkey

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**Correspondence:** Dr. Halil Çetingök. İstanbul Üniversitesi İstanbul Tıp Fakültesi, Anesteziyoloji Anabilim Dalı, Algoloji Bilim Dalı, İstanbul, Turkey.

**Phone:** +90 - 212 - 531 31 47 **e-mail:** halilcetingok@yahoo.com

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## Introduction

Chronic pain of spinal origin is one of the major health problems that affect the physical and psychological conditions of the patients.<sup>[1]</sup> Supplementing conservative treatments with administration of drugs such as corticosteroids and local anesthetics to the epidural space provide significant improvements in patients' pain palliation.<sup>[2]</sup> The aim of epidural steroid injection is to take advantage of the anti-inflammatory effect of steroids which are phospholipase A2 enzyme inhibitors. In addition to the anti-inflammatory effects of steroids, they have other properties such as membrane stabilization through inhibition of ectopic impulses, inhibition of ion permeability, hyperpolarization of spinal neurons, inhibiting transmission of C fibrils which can explain the relaxing effects on non-inflammatory conditions.<sup>[3,4]</sup>

In many meta-analyzes including randomized controlled trials, epidural steroid administration was considered effective in the management of chronic spinal pain, however, in some studies, it was concluded that the efficacy was not sufficient except for radicular pain due to disc herniation.<sup>[2,5]</sup> During the first cervical epidural steroid injection was administered in 1961, the number of publications and publications supporting the efficacy of cervical epidural steroid injection is limited compared to the lumbar region.<sup>[6]</sup> Although injections of cervical and lumbar epidural regions are performed by similar methods, these regions differ anatomically. The question arises whether the differences in the anatomical structure of these regions make a difference in the effectiveness of epidural injections.

In this study, we aimed to compare the efficacy of lumbar and cervical epidural steroid injections on pain palliation, duration of pain relief and patient satisfaction at short-term and mid-term.

## Material and Methods

### Study Design and Setting

Following the approval of the ethics committee, patients who were performed epidural steroid injections to the cervical or lumbar spinal canal between the dates October 2016 and January 2018, were included in the study. The study designed as retrospective observational single-center study and the information about the patients was obtained from the medical records and the patients themselves through telephone interviews at September 2018. Inclusion and exclusion criteria of the patients are shown in Table 1.

### Procedure

All procedures were performed in the operating room, under aseptic conditions and under the guidance of C-arm fluoroscopy by the same experienced pain medicine specialist. Transforaminal epidural route was preferred in patients with unilateral radicular pain and imaging and clinical findings at one or two vertebral levels, and interlaminar epidural route in patients with bilateral, multiple vertebral spinal nerve level findings. Non-invasive blood pressure, pulse oximetry and electrocardiography monitoring of the patients were performed before the intervention and intravenous vascular access was obtained. Patients

**Table 1.** Inclusion and exclusion criteria

Inclusion criteria	Exclusion criteria
<ul style="list-style-type: none"> <li>• Adults ≥18 years of age</li> <li>• ASA I-II</li> <li>• The patient has to have failed conservative treatment and had a cervical or lumbar epidural injection with this indications:</li> <li>• Radiculopathy</li> <li>• Central spinal canal stenosis</li> <li>• Neural foraminal stenosis</li> <li>• Disc pathology with imaging and clinical findings</li> </ul>	<ul style="list-style-type: none"> <li>• Severe signs of systemic infection,</li> <li>• Local infection at the site of operation</li> <li>• Severe neurological deficit</li> <li>• Bleeding disorder</li> <li>• Taking medication that increased the tendency of bleeding</li> <li>• Pregnancy</li> <li>• Allergy to any of the drugs used during the procedure</li> <li>• Degenerative spine disease</li> <li>• Facet joint syndrome</li> <li>• Failed back or neck surgery syndrome</li> <li>• Refusal to give informed consent</li> </ul>

**Table 2.** Demographic characteristics of the patients

	<b>Group 1 lumbar (n=130)</b>	<b>Group 2 cervical (n=29)</b>	<b>Total lumbar and cervical (n=159)</b>	<b>p</b>
Age (Mean±SD)	52.33±13.82	52.96±10.83	52.45±13.29	0.813*
Gender				
Male	53 (40.8%)	10 (34.5%)	63 (39.6%)	0.531**
Female	77 (59.2%)	19 (65.5%)	96 (60.4%)	
The type of technique				
Interlaminar	10 (7.7%)	6 (20.6%)	16 (10%)	
Transforaminal	120 (92.3%)	23 (79.4%)	143 (90%)	

\*: Mann-Whitney U test; \*\*: Chi-square test; SD: Standard deviation.

were positioned supine for cervical transforaminal and prone for cervical interlaminar, lumbar interlaminar and lumbar transforaminal epidural interventions. Skin was wiped using povidone iodine-based solution and covered under aseptic conditions. Skin and subcutaneous soft tissue were anesthetized with 2 ml 1% lidocaine. 1–2 mg midazolam and 50–75 µg fentanyl were used for sedation. Needle direction and depth was monitored under fluoroscopy. Contrast agent was injected 1–2 ml in cervical and 2–3 ml in lumbar epidural region to confirm the location of the needle and rule out dural puncture or intravascular flow. A mixture of 80 mg triamcinolone acetate and 0.25% bupivacaine solution were injected 2 ml at each level for lumbar transforaminal injections and 8 ml for lumbar interlaminar injections. A mixture of 8 mg of dexamethasone and 0.5% lidocaine solution were injected 2 ml at each level for cervical transforaminal injections and 6 ml for cervical interlaminar injections. Patients were observed for at least four hours after injections and discharged after the absence of motor or any neurological deficit.

### Study Outcomes

The numerical rating scale (NRS) (NRS; range=0 to 10 points; 0=“no pain” and 10=“worst pain”)<sup>[7]</sup> was used to evaluate pain. NRS scores of the patients before and after the procedure were obtained from the medical records. Patients were questioned on the phone for the duration of pain relief, whether any complication occurred related to injection and overall satisfaction rates with epidural steroid injection procedure.

### Statistical Evaluation

SPSS 21.0 (IBM Corporation, Armonk, NY) statistical program was used. Quantitative variables were expressed as means and standard deviations or as medians and interquartile range, as appropriate. Frequency was used for qualitative data. Quantitative variables were compared between groups by the Mann–Whitney U test, and categorical data by the Pearson chi-square test. P-values <0.05 were considered to be statistically significant.

### Results

A total of 159 patients (96 females, 63 males) who were performed epidural steroid injections of cervical and lumbar regions in due to radiculopathy, who were accessible with phone and medical records available were included in the study.

The patients were divided into two groups as lumbar epidural steroid injection Group 1 (130 patients) and cervical epidural steroid injection Group 2 (29 patients). Demographic characteristics of the patients and which technique is used (Transforaminal or Interlaminar) are shown in Table 2. There was no significant difference between the groups in terms of age and gender.

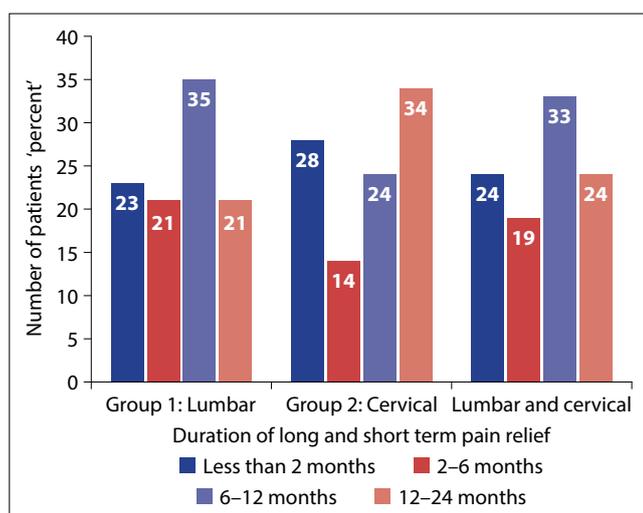
We retrospectively evaluated the patients for numerical rating scale (NRS) prior and after the injection, the duration of the pain relief, whether any complication occurred related to injection and patient satisfaction. Results of the evaluation are shown in Table 3.

No significant difference was found between lumbar and cervical region in terms of pain relief as-

**Table 3.** Results of the evaluation

	Group 1 lumbar (n=130)	Group 2 cervical (n=29)	Total lumbar and cervical (n=159)	p
Pre-procedure NRS				
Median (IQR)	8 (1)	7 (1)	8 (1)	0.059*
Min–Max	4–9	4–9	4–9	
Post-procedure NRS				
Median (IQR)	3 (3)	4 (4)	3 (3)	0.298*
Min–Max	0–9	0–8	0–9	
Decrease in NRS				
Median (IQR)	4 (3)	3 (4)	4 (3)	0.064*
Min–Max	0–8	0–9	0–9	
Complications	None	None	None	1**
Average duration of pain relief (months) (Mean±SD)	7.23±6.14	8.17±8.53	7.40±6.62	0.979*
Satisfaction rate (%) (Mean±SD)	56.15 (29.85)	48.62 (34.61)	54.77 (30.79)	0.287*

\*: Mann-Whitney U test; \*\*: Chi-square test; NRS: Numerical rating scale; SD: Standard deviation; IQR: Interquartile range; Min: Minimum; Max: Maximum.



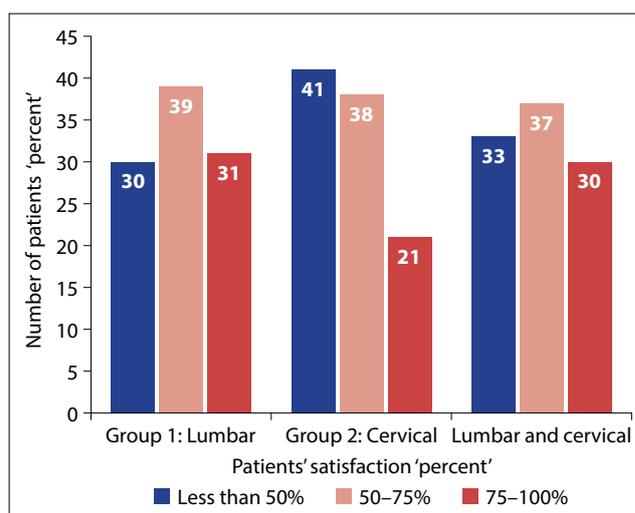
**Figure 1.** Duration of pain relief.

essed by NRS scores (p=0.064). There were no major complications in any of the patients.

There were no statistically significant difference between the regions in terms of satisfaction and duration of pain relief (p=0.287, p=0.979) (Fig. 1, 2).

### Discussion

Spinal colon, vertebral structures and epidural space differ anatomically in cervical, thoracic, lumbar and sacral regions. Ligamentum flavum is quite thin in the cervical region and often does not fuse in the midline.<sup>[8]</sup> This anatomical difference may cause no loss of resistance during injection. Epi-



**Figure 2.** Patient satisfaction with epidural steroid injection.

dural distance narrows from lumbar (5–6 mm) to thoracic (3–5 mm) level and the narrowest part is at the level of C3–C6 (2 mm) cervical vertebra.<sup>[8]</sup> The vertebral artery exits the subclavian artery and extends laterally just before the cervical spinal nerves. Vertebral artery and the radicular and medullary branches of the vertebral artery are very close to the transforaminal space and threats during transforaminal injection.<sup>[9]</sup>

When the studies on cervical epidural injections are evaluated; in a retrospective study by Slipman et al.,<sup>[10]</sup> 20 patients were evaluated with foraminal stenosis due to cervical spondylosis who were per-

formed transforaminal epidural injection for radicular pain. Transforaminal epidural injection was performed on average 2.2 times and the patients' follow up period was approximately 21.2 months. They reported that VAS scores decreased from 6.9 to 2.0 and sixty percent had good and very good results. Kesikburun et al.<sup>[11]</sup> reported that in 64 patients who were performed cervical transforaminal epidural injection, patients' VAS (visual analogue scale) scores decreased from 8.6 to 3.2 two weeks after the injection, 52 patients (81.2%) had more than 50% pain palliation, and that the duration of treatment lasted an average of 13.3 months.

Lee et al.<sup>[12]</sup> investigated the effect of cervical interlaminar epidural steroid injection in 45 patients with neck pain due to central cervical spinal stenosis. Neck pain evaluated by NRS was significantly reduced at 1., 2., and 3. months after ESI, and a successful response ( $\geq 50\%$  pain reduction) was achieved in 58% of patients three months after the procedure, and also 56% of the patients were satisfied with the results of treatment. Kwon et al.<sup>[13]</sup> evaluated the short-term results of 76 patients who were performed cervical interlaminar epidural steroid injections in a non-randomized study evaluating prognostic factors and reported that patients with pain due to disc herniation had better results than patients with spinal stenosis. On the other hand, Fish et al.<sup>[14]</sup> evaluated patients with cervical radiculopathy who were performed epidural steroid injections and found that those with central canal stenosis had better functional results than those with disc herniation.

In our study; After cervical interlaminar and transforaminal epidural steroid injections, the median NRS (numerical rating scale) values of the patients decreased from 7 to 4, the mean duration of pain relief lasted 8.17 months, and 48.62% of the patients were satisfied with the treatment. It was also observed that there were no major complications in our series. Although there are controversial and non-overlapping results regarding cervical epidural steroid injections, the decrease of nrs value to 3 is valuable and it is thought to be useful in selected patients according to our study.

When the studies on lumbar epidural injections are examined; Lutz et al.<sup>[15]</sup> reported that 70% of patients

receiving lumbar transforaminal steroids had more than 50% reduction in pain scores. In a retrospective study of Taşkaynatan et al.<sup>[16]</sup> 80 patients with low back and radicular leg pain due to lumbar disc hernia reported a 72% positive response to transforaminal epidural steroid injection and the mean duration of injection efficacy was 12 months. They also stated that there was an inverse correlation between pre-injection symptom duration and duration of action and efficacy of the injection. Manchikanti et al.<sup>[17]</sup> published a review of placebo and active controlled trials investigating the short- and long-term efficacy of caudal, interlaminar and transforaminal epidural injections for the treatment of disc herniation. In the review, the findings suggest that epidural injections reduce pain scores and improve vital functions in the short term, whereas the long-term efficacy is moderate. In addition, prospective randomized controlled study Riew et al.<sup>[18]</sup> reported that nerve root injections reduced the rates of surgery planned for the treatment of lumbar radicular pain and that the efficacy continued during 5-year follow-up.<sup>[19]</sup>

In our study, the median NRS values of patients after lumbar epidural steroid injection decreased from 8 to 3. The mean duration of pain relief was 7.23 months and patients were generally satisfied with the treatment and no major complications were observed. Results were similar to other studies.

There was a significant decrease in NRS scores after epidural steroid injection. Although the pain relief of epidural steroid injection and satisfaction of the lumbar region procedure were slightly higher, and the duration of pain relief in the cervical region was slightly longer, there was no statistically significant difference between the two regions in terms of pain reduction and duration of pain relief.

### Limitations

The retrospective design of the study, the time of interview with patients after the procedure was not the same for each patient, the drugs used by the patients before and after the procedure are not under our control, differences of the steroid types (the use of dexamethasone in the cervical region and triamcinolone in the lumbar region) and the variety of indications (central stenosis, foraminal stenosis, radicular pain...) were the limitations of our study.

## Conclusion

Although lumbar and cervical vertebral column anatomy and accordingly epidural intervention techniques are different; The clinical effects (rate of pain relief, duration of pain relief, major complications, and patient satisfaction) of cervical and lumbar epidural injections are similar. Future randomized, controlled, prospective studies are thought to contribute positively to the guiding of cervical and lumbar epidural steroid applications.

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