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ORIGINAL ARTICLE

Efficacy of cervical epidural steroid injection with or without local anesthetic on pain and disability

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SUMMARY

Objectives: Cervical epidural injections are frequently applied in the treatment of radicular pain caused by cervical disc herniation. This study aimed to investigate and compare the effectiveness of cervical epidural steroid injection and cervical epidural steroid + bupivacaine injection using Neck Disability Index (NDI) and Visual Analog Scale (VAS) scores.

Methods: A total of 91 patients were included in the study. Patients who received cervical epidural steroid and cervical epidural steroid + bupivacaine were classified as Group I and Group II, respectively. Demographic characteristics, pain duration, and baseline VAS (VAS_0) and ND_I (NDI_0) scores were recorded. Patients were also evaluated at the first and sixth months, and VAS_1, NDI_1, VAS_6, and NDI_6 scores were assessed.

Results: Demographic characteristics and mean pain durations of the groups were similar, and VAS and NDI scores did not differ significantly at baseline, the first, and sixth months. Within each group, the VAS_6 score was significantly lower than VAS_0 (p=0.01) and VAS_1 (p=0.01) scores, while the NDI_6 score was also significantly lower than NDI_0 (p=0.01) and NDI_1 (p=0.01) scores in Group I. Similarly, the VAS3 score was significantly lower than VAS_0 (p=0.01) and VAS_1 (p=0.01) scores, and the NDI_3 score was significantly lower than NDI_0 (p=0.01) and NDI_1 (p=0.01) scores in Group II.

Conclusion: Our findings showed that the combination of epidural steroid + bupivacaine in cervical interlaminar epidural injections yields similar clinical effects to those of steroid alone, providing comparable improvement in functional status.

Keywords: Bupivacaine; cervical disc herniation; cervical epidural injection; epidural steroid; local anesthetic.

Introduction

Neck pain is a commonly encountered symptom in the general population. Cervical disc herniation is one of the common causes of neck pain in adults. The severity of the condition can range from mild to severe and, in some cases, may even pose a threat to life. Cervical disc herniation is more common in women, and its prevalence increases with age, being most frequently observed in individuals aged 30–50 years.[1–3]

Neck pain can be treated using conservative methods and interventional approaches. Cervical epidural steroid injection (ESI) is commonly used to treat neck pain and radicular pain in the upper extremities. Numerous studies have investigated the use of interlaminar ESI for neck pain and demonstrated its effectiveness in reducing pain and improving outcomes.[3–7] Local anesthetic injections with epidural steroids are widely used as an alternative to surgery.[1,3,6,8,9] They may even prevent the need for surgery in some patients.[5]

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With the hypothesis that the combination of steroids and long-acting local anesthetics may produce an additive effect in interlaminar ESIs, the present study was aimed at comparing the duration of analgesia and improvement in functional status between routine ESI and epidural steroid + bupivacaine injection in patients with cervical disc herniation.

Materıal and Methods

Ethical approval was obtained from our institutional ethics committee (Approval number: 06.01.2023-129). Records of patients who applied to the algology clinic between January 2015 and December 2021, underwent cervical interlaminar epidural injection because of cervical radicular pain, and were followed up for 6 months were retrospectively evaluated. The study was conducted in accordance with the Declaration of Helsinki. The files of patients included in the study—diagnosed with cervical disc herniation and having a history of neck and/or upper extremity pain accompanied by neurological changes (sensory changes [paresthesia and hypoesthesia], motor changes [loss of muscle strength and atrophy], decrease or loss of deep tendon reflexes) on physical examination and confirmed by magnetic resonance imaging (MRI)—were reviewed. Patients aged 18–75 years with complaints of functionally limiting neck and/or upper extremity pain for at least 3 months because of cervical disc herniation were included in the study. Patients with a history of neck surgery, cervical spinal stenosis with myelomalacia, cervical region infection, cancer, or fracture; psychiatric history that hindered communication; pregnant patients; and those with laboratory evidence of coagulopathy and sepsis were excluded from the study.

A total of 93 patient files were retrospectively analyzed. Because of intravascular contrast agent spread in one patient and vasovagal syncope development in another patient, the procedure had to be terminated. These patients were excluded from the study, and a total of 91 patients (66 females and 25 males) were included in the evaluation.

Demographic variables including age, sex, and body mass index (BMI) and Visual Analog Scale (VAS) and NDI scores, validated in the Turkish population, were examined.[2,10] Pain assessment involved recording changes in the VAS, whereas functional assessment used the NDI. Values were obtained at baseline (VAS_0 and NDI_0), at 1-month post-treatment (VAS_1 and NDI_1), and at 6 months post-treatment (VAS_6 and NDI_6) during routine evaluations. A 10-cm VAS was used for pain assessment. Absence of pain was scored as "0" and unbearable pain was scored as "10."

In the retrospective evaluation, patients were divided into two groups to compare the efficacy and clinical outcomes of two different injections administered in our clinic. Group I included patients who received a 5-mL solution consisting of 0.5% bupivacaine (5 mg, 1 mL), 2 mL dexamethasone (8 mg), and 2 mL 0.9% NaCl during cervical interlaminar epidural injections. Group II included patients who received a 5-mL solution consisting of 2 mL dexamethasone (8 mg) and 3 mL 0.9% NaCl.

Cervical epidural injections were administered in the prone position, and the patient's neck was flexed by placing a pillow under the chest. Blood pressure, electrocardiogram, and pulse oximetry were monitored noninvasively. The cervical spine region was cleaned with aseptic preparation and draped in a sterile fashion. The C7–T1 interspace level was determined through fluoroscopy in the anteroposterior view. After skin infiltration with 2% lidocaine using a 1.5-inch (38 mm) 21G needle, an 18-Gauge 3.5-inch (10 mm) Tuohy needle was inserted at the midline of the C7–T1 interspace, and loss of resistance techniques (saline) were used to reach the epidural space. The position of the needle was verified by fluoroscopy in anteroposterior (Fig. 1) and lateral images (Fig. 2). Negative aspiration was performed in case of inadvertent vascular distribution, and 1 cc of contrast was injected from real-time anteroposterior and lateral view to verify the epidural space. Subsequently, 2 mL of dexamethasone mixture (8 mg) and 1 mL of 0.5% bupivacaine (5 mg), made up to 5 mL with 0.9% NaCl, or 2 mL of dexamethasone (8 mg), made up to 5 mL with 0.9% NaCl, was injected. Following the procedure, the patient was kept under observation for 60 min for follow-up of complications.

Statistical Analyzes

Shapiro–Wilk test was used to check the conformity of variables to normal distribution. Inde-

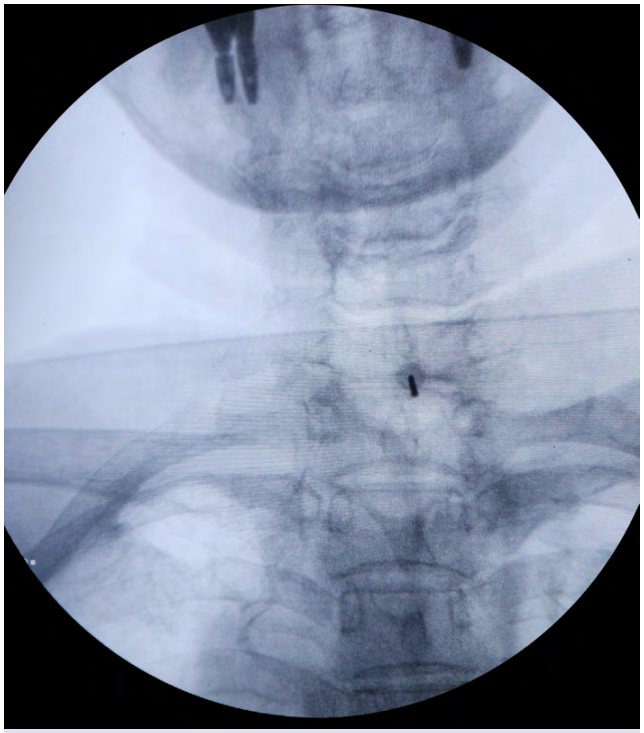

Figure 1. Anteropsterior fluoroscopy view of needle.

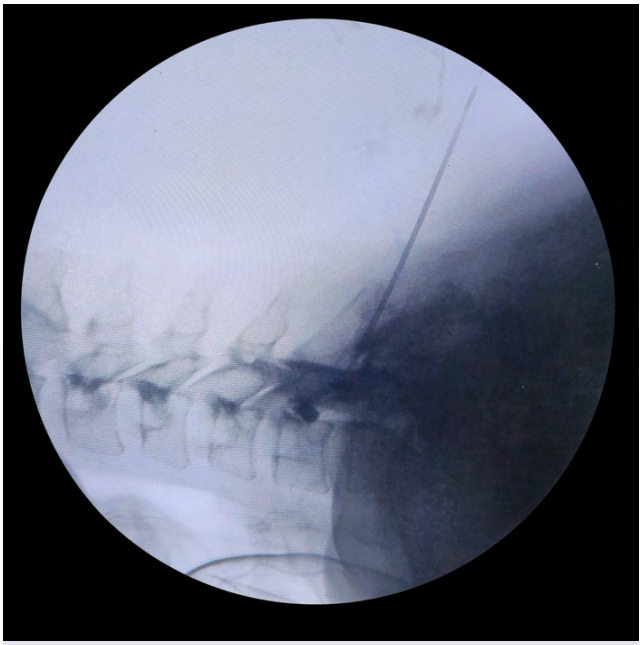

Figure 2. Lateral fluoroscopy view of needle.

pendent samples t-test was used to compare the data between sexes and VAS and NDI scores between the groups. Paired samples t-test was used to compare VAS and NDI scores measured at different time points within the groups. SPSS 25.0 software package (IBM Corporation; Armonk, NY, USA) was used for all analyses. A p value <0.05 was considered statistically significant in all analyses.

Results

The study included 91 patients (66 females and 25 males) who presented with complaints of neck pain for at least 3 months and sought outpatient care at the algology department of our institution. The mean age of the patients was 51.21±12.60 years (males: 52.90±13.68 years; females: 50.56±12.21 years), and there was no significant difference between the sexes (p=0.428). There was no significant difference between the treatment groups in terms of demographic characteristics and mean pain duration (Table 1). Comparison of disc herniation levels between each group showed no significant differences (p=0.729).

Of the 91 patients included in the study, 46 (50.5%) were administered bupivacaine during the procedure (Group I), whereas 45 (49.5%) were not (Group II). Comparisons of VAS and NDI scores between the groups are presented in Table 2.

Within each group, the NDI_6 score was significantly lower than NDI_0 and NDI_1 scores in Group I (p=0.01 and p=0.01, respectively) and Group II (p=0.01 and p=0.01, respectively). No significant difference was found in NDI_0, NDI_1, and NDI_6 scores between the groups (Table 2).

Table 1. Demographic characteristics of the participants included in the study

Parameter	Group I (n=46)	Group II (n=45)	p
Age (years)	53.5±14.30	49.22±10.38	0.138
Weight (kg)	77.87±14.22	72.20±12.84	0.049*
Height (cm)	162.82±7.10	166.62±8.68	0.026*
BMI (kg/m^2)	29.31±5.62	26.09±4.92	0.005*
Symptom duration (months)	57.30±80.07	38.64±48.94	0.184

Kkg: Kilogram; cm: Centimeter; BMI: Body mass index; *: Significant difference (p<0.05).

Table 2. Comparison of the investigated parameters between groups

Parameter	Group I (n=46)	Group II (n=45)	p
Symptom duration (months)	57.30±80.07	38.64±48.94	0.184
VAS_0	8.13±1.12	7.75±1.00	0.098
VAS_1	4.36±2.40	4.64±2.72	0.611
VAS_6	4.13±2.56	4.62±2.71	0.376
NDI_0	31.91±5.55	31.4±5.65	0.502
NDI_1	16.5±9.77	18.04±11.98	0.262
NDI_6	15.32±10.17	17.95±11.98	0.261

VAS: Visual Analog Scale; NDI: Neck Disability Index; BMI: Body mass index; Group 1, with bupivacaine; Group 2, without bupivacaine; kg: Kilogram; cm: Centimeter; *: Significant difference (p<0.05).

Table 3. Comparison of VAS_0 and VAS_1, VAS_0 and VAS_6, NDI_0 and NDI_1, and NDI_0 and NDI_6 values for both groups

Groups	Mean±SD	95% Confidence Interval		p
		Lower	Upper	
VAS0 vs. VAS1				
Group I (n=46)	3.76±2.58	2.99	4.53	0.001*
Group II (n=45)	4.00±2.85	3.15	4.85	0.001*
VAS0 vs. VAS6				
Group I (n=46)	15.41±10.80	12.21	18.62	0.001*
Group II (n=45)	16.59±11.54	13.16	20.01	0.001*
NDI0 vs. NDI1				
Group I (n=46)	3.11±2.45	2.37	3.85	0.001*
Group II (n=45)	3.13±2.45	2.40	3.87	0.001*
NDI0 vs. NDI6				
Group I (n=46)	13.36±10.19	10.30	16.42	0.001*
Group II (n=45)	13.44±10.22	10.37	16.51	0.001*

VAS: Visual Analog Scale; NDI: Neck Disability Index; SD: Standard deviation; Group 1, with bupivacaine; Group 2, without bupivacaine; *: Significant difference (p<0.05).

Within each group, the VAS_6 score was significantly lower than VAS_0 and VAS_1 scores in Group I (p=0.01 and p=0.01, respectively) and Group II (p=0.01 and p=0.01, respectively). No significant difference was found in VAS_0, VAS_1, and VAS_6 scores between the groups (Table 3).

None of the patients experienced a sudden adverse event requiring intensive medical treatment.

Discussion

Cervical interlaminar injection is commonly used in the treatment of neck pain and is an effective method for treating cervical radicular pain.[3–7,11] There is Level I evidence from numerous randomized controlled trials supporting the effectiveness of steroid and local anesthetic combination in the treatment of chronic spinal pain.[12] In this study, we evaluated the efficacy of adding bupivacaine, a long-acting local anesthetic, in addition to steroid use in cervical epidural injections. Although we observed a significant decrease in VAS and NDI scores, the addition of bupivacaine did not offer any advantage compared with that of steroids alone.

Although there are studies on the use of bupivacaine in the lumbar region, there are gaps in the literature on the use of bupivacaine in epidural injections, particularly in the treatment of neck pain and radicular pain due to cervical disc herniation.[13,14] Tafazal et

al.[13] evaluated the effectiveness of adding steroids to bupivacaine injections and found that adding corticosteroids to periradicular bupivacaine injections for sciatica did not provide any additional benefit compared with that of bupivacaine alone. However, Riew et al.[14] reported that the mixture of corticosteroid and bupivacaine in lumbar selective nerve root injections was significantly more effective than bupivacaine alone in reducing the need for surgical intervention.

The mechanism of action of local anesthetics and steroids has been described in many studies.[8,13,15–18] Local anesthetics reduce processes that affect neuronal plasticity by decreasing peripheral nociceptive afferents of central neurons.[15] Local anesthetics are used in epidural injections because they may facilitate the opening of possible adhesions between the spinal root and nearby structures. Therefore, they are used as a diluent along with corticosteroids to increase the injection volume.[19,20] Additionally, when local anesthetics are used in combination with steroids, they exhibit rapid analgesic properties in epidural injection procedures.[20] Furthermore, there are studies suggesting that reducing the dose of steroids at the cervical level may minimize systemic effects while maintaining efficacy.[21] Therefore, the present study was aimed at investigating the difference in efficacy between steroids alone and the combination of steroids and local anesthetics in cervical interlaminar epidural injections.

The use of bupivacaine was not superior in the present study. Although local anesthetics are commonly used as a diluent with steroids to increase the injection volume,[19,20] the concentration and volume of bupivacaine used here may not be sufficient to produce a significant effect.

Studies on the duration of effectiveness of cervical epidural injections report contradictory results. In a systematic review on the effectiveness of cervical epidural injections, Benyamin et al.[22] reported that three studies yielded positive results for short-term relief (<6 months), two studies yielded positive results for long-term relief, and one study did not report any long-term relief. However, some studies have also demonstrated that cervical epidural injections provide adequate long-term relief.[23,24] Long-term relief can be achieved when appropriate patient assessments are done and judicious repeated injections are administered.[3,24] In the present study, the effect of cervical interlaminar epidural injections lasted for at least 6 months in both groups, similar to those in other studies.[8,11] Therefore, studies recommend that patients with significant pain reduction after the first cervical epidural injection repeat the injections when their pain returns.[8,24]

There is significant clinical and experimental evidence indicating that local anesthetics and steroids generally provide long-term relief on an individual basis.[18,20,25] Although local anesthetics are used for both diagnostic and therapeutic purposes in cervical epidural injections, their neural and cardiac toxicities must be considered.[26,27]

Fluoroscopy-guided interlaminar epidural injections are used to prevent or minimize these complications. Fluoroscopy-guided interlaminar epidural injection is an important method for determining the appropriate localization in the epidural space.[26] Fluoroscopy allows the doctor to check needle placement.[18,26] The midline interlaminar approach to the epidural space may reduce the risk of intravascular injection.[28]

Nevertheless, various complications can also develop under fluoroscopy guidance. Indeed, in the present study, the procedure was terminated in one patient because of blood aspiration occurring twice during the procedure, raising concerns about the potentially catastrophic consequences of intravascular local anesthetic injection;[28] thus, the patient was excluded from the study. Machikanti et al.[29] conducted a prospective assessment of complications in the cervical region and reported that the incidence of intravascular entry was 4.1%. Despite negative aspiration, fluoroscopy allows the confirmation of whether the contrast distribution is vascular or not.[28] Additionally, one of our patients developed vasovagal reaction immediately after the procedure and the procedure was terminated. This patient was excluded from the study. Vasovagal reaction is a common complication during cervical epidural injections.[30] Botwin et al.[26] performed cervical epidural interlaminar injections in 157 patients and reported the rate of vasovagal reaction as 1.7%.

The addition of bupivacaine during cervical interlaminar procedures may lead to local anesthetic complications, which may increase patients' long-term pain levels, reduce functionality, increase the need for medication use, and ultimately limit their access to medical care because of disability. As demonstrated in the present study, while the use of bupivacaine may provide minimal benefit in reducing pain, it also carries the risk of unwanted side effects.

The results of this retrospective study demonstrate that adding long-acting local anesthetic to steroid treatment during cervical interlaminar epidural injections does not provide additional benefit in patients diagnosed with cervical disc herniation, whether they have upper extremity pain or not. In addition, attention should be paid to possible complications of local anesthetics before and after the procedure.

Strengths of this Evaluation

This study demonstrated that cervical interlaminar epidural injections can be safely performed using local anesthetics under fluoroscopy guidance. As demonstrated in this study, cervical interlaminar epidural injections of steroids with or without local anesthetics provide relief lasting up to 6 months. Long-term prospective studies are needed to evaluate whether the reduction in pain persists for a longer duration.

Limitations

The limitations of this study include the absence of a placebo group, a small sample size, and the lack of a prospective design. Because this study was retrospective, the impact of oral medication use on pain and functionality after cervical interlaminar epidural injections could not be conclusively determined. Further, this study did not use additional cervical interlaminar epidural injections as needed. The pain pattern of patients in the radicular group may reflect pain from the upper arm and shoulder more than cervical radicular pain. To differentiate this, electroneuromyography support may be used in future studies, and imaging methods may be used when needed. In addition, further studies with larger populations are needed so that the findings of the present study can be generalized.

Conclusion

The results obtained in this retrospective study showed that cervical interlaminar epidural steroid±local anesthetic injections have a significant effect in relieving pain and improving functional status in patients with neck and/or upper extremity pain caused by cervical disc herniation.

Ethics Committee Approval: The Çukurova University Faculty of Medicine Non-Interventional Clinical Research Ethics Committee granted approval for this study (date: 06.01.2023, number: 129).

Informed Consent: Written informed consents were obtained from patients who participated in this study.

Conflict-of-interest issues regarding the authorship or article: The authors declare that there is no conflict of interest.

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