# Cervical Epidural versus Cervical Facet Injection for Patients with Chronic Cervical Pain

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**Abstract**

Chronic spine pain poses a peculiar diagnostic and therapeutic challenge due to multiple pain sources, overlapping clinical features and nonspecific radiological findings. Facet joint injection is an interventional pain management tool for facet-related spinal pain. Also, epidural injections for managing chronic neck pain are one of the commonly performed interventions. This study aimed to compare methods for pain relief in patients with chronic neck pain. This randomized clinical study included 80 patients suffering from chronic cervical pain where 40 patients had cervical facet injections and other 40 patients had epidural cervical injections. The pain intensity evaluated by Numeric Rating Scale, Korean version of Neck Disability Index for assessing functional level, total opioid, non-steroidal consumption, VAS Score, nausea & vomiting were assessed 0 hour, 2 hours, 4 hours, 6hours, 12 hours, 18 hours, and 24 hours post operative. There was no statistical significance between the two study groups regarding demographic data, operative data, verbal numerical rating score, pain intensity, care, neck disability index, opioids consumption, NSAID consumption and complications (nausea and vomiting) incidence as the p-value was > 0.05. Cervical epidural injection and cervical facet injection have been proven to be easy and good interventional management and safe choice to improve the pain degree and lifestyle of the patient and it's daily activities.

**Key words:** ***Epidural, Cervical Facet Injection, Chronic Cervical Pain.***

## Introduction

Chronic spine pain poses a peculiar diagnostic and therapeutic challenge due to multiple pain sources, overlapping clinical features and nonspecific radiological findings [1]. Facet joint injection is an interventional pain management tool for facet-related spinal pain, this technique is the gold standard for identifying facet joints as the source of spinal pain [2].

The major indications for facet injections include strong clinical suspicion of the facet syndrome, focal tenderness over the facet joints, low back pain with normal radiological findings, post-laminectomy syndrome with no evidence of arachnoiditis or recurrent disc disease, and persistent low back pain after spinal fusion [3].

The contraindications are more ancillary, with none being absolute. Like any synovial joint degeneration, inflammation and injury can lead to pain on motion, initiating a vicious cycle of physical deconditioning, irritation of facet innervations and muscle spasm [4]. Image-guided injection of local anesthetic and steroid into or around the facet joint aims to break this vicious cycle and thereby provide pain relief [5].

Numerous modalities of treatments have been described in managing chronic persistent neck pain with or without upper extremity pain, with exploding costs creating a health care financial crisis. Epidural injections for managing chronic neck pain are one of the commonly performed interventions. Cervical

epidural injections have been used to treat radicular pain from herniated discs, spinal stenosis, chemical discs, chronic pain secondary to postcervical surgery syndrome, and chronic neck pain of discogenic origin [6].

Epidural injections in the cervical spine are performed either by interlaminar or transforaminal approaches. Cervical epidural steroid injections, specifically utilizing the transforaminal approach, have been associated with significant complications. These complications are much more severe and significant with the transforaminal approach. However, significant complications also have been reported with interlaminar epidurals with spinal cord damage and quadriparesis [7].

Complications of fluoroscopically guided interlaminar cervical epidural injections have been reported to be much less frequent and major complications are extremely rare. The safety of interlaminar epidurals may be due to vulnerable arteries and ischemic neurologic injuries after transforaminal epidural injections. Huston reviewed both interlaminar and transforaminal epidural injections in the cervical region. Even though the prevalence of dural puncture is higher with interlaminar epidural injections, other major complications are less stout [8]. So, we the aim of this work was to compare methods for pain relief in patients with chronic neck pain, to compare advantages and disadvantages of cervical epidural versus cervical facet injection in patients suffering chronic neck pain.

## PATIENTS AND METHODS

This randomized clinical study included 80 patients suffering from cervical pain at least 3 months before procedure and failed pharmacological treatment, with age between 20 - 70 years old, and ASA I, II and III. But we excluded patients with systemic infection, with skin infection, with bleeding tendency, with neurological disorders and with any deformities that obstacle the procedure. The patients were classified into two groups, the first group for cervical epidural and the second group for facet injection, 40 patients were undergone cervical facet injection. Those patients were suffering cervical joints pain from C5-6 and C6-7 and were classified by their origin of pain.

### Technique

In cervical facet group (F group), patients were lying down on the prone position. Under the C-arm fluoroscopic guide, C5-6 and C6-7 cervical joints were identified. The mixture of 2 mL of 2% lidocaine with 2 ml of beta methasone (6 mg/ml) was injected into the joints unilaterally or bilaterally according to complaints of patients [9]. The analgesic effects were evaluated by reduction of numeric rating scale (NRS) of pain before and immediately after blockade.

In epidural group (E group), the translaminar or interlaminar approach is considered the safest and most effective technique for cervical epidural placement of local anesthetic and corticosteroids. The patient was in a sitting or horizontally in a lateral or prone position. This procedure was performed with fluoroscopic guidance. The patient was placed in an optimal flexed cervical spine posture stabilized with enough resistance to prevent movement of the head during the procedure.

For both groups, the skin was prepared with an antiseptic solution and placed the middle and index fingers on each side of the spinous processes at C5-6 or C6-7 spinal levels. The midline of the selected interspace was identified by palpating the spinous processes above and below where midline needle entry was intended. LA, such as lidocaine, was used to mark the intended site of skin entry. One mL of lidocaine was used to infiltrate the skin and subcutaneous tissues, as well as both the supraspinous and interspinous

ligaments. We inserted a 25-gauge, 2-inch needle exactly into the targeted midline. After the LA has been given time to anesthetize the area, we hold the needle firmly at the hub with the left thumb and index finger. Then the palm of the left hand was placed firmly against the patient's neck, so that the left-hand acts as a unit to stabilize, protect, and control the needle's trajectory and its metered ingress from any unexpected patient activity. The needle was then advanced with the left hand, which is braced against the neck with the needle hub held tightly between the left thumb and forefinger. As the bevel passes through the ligament flavum and enters the epidural space, a sudden loss of resistance that we were appreciated; the plunger can then be effortlessly depressed under minimal, if any, pressure through the right thumb.

Needle position within the epidural space was checked by using fluoroscopic verification and by repeating the loss of resistance maneuver. Any significant pain or sudden increase in resistance during the injection suggests incorrect needle placement, so the injection was stopped and we assessed the position of the needle using fluoroscopy. If the needle remains satisfactorily placed and loss of resistance within the epidural space is confirmed without additional patient report of pain, gentle aspiration was checked to assure that the needle is not positioned in the subarachnoid space or that it's not intravascular. If cerebrospinal fluid (CSF) is aspirated, we repeated the block attempt at a different interspace. When the needle is correctly placed in the midline of the epidural space, then injection of the mixture of 2 mL of 2% lidocaine with 2 ml of betamethasone (6 mg/ml) was done.

**Methods**

All patients were subjected to full history taking including personal history (name, age, sex, occupation, residence and special habits of medical importance e.g smoking.), complain (taken in patient's own words), present history (onset, course, duration, site, diffuse or localized, nature of pain, radiation, severity, relation to movement, relation to rest, what increase, and what decrease pain), past history (similar condition, trauma, rheumatic disease, and previous surgery), medical history (DM, HTN), past medications (types, dose, duration of administration) and family history (similar condition in family members).

General examination included vital signs (pulse, blood pressure, temperature and respiratory rate), general appearance, height, weight & BMI, examination of skin for tightness, tenderness, ulcers or subcutaneous nodules and examination of lymph nodes. Neurological examination included speech, motor system examination (tone- power), reflexes, superficial & deep sensation and cranial nerve examination.

**Evaluation of Pain and Function**

The pain intensity was evaluated by Numeric Rating Scale (NRS) ranging from 0 (no pain) to 10 (worst possible pain). All patients were asked to provide the average severity of their symptoms over a recent 1 week. The Korean version of Neck Disability Index (NDI, %) was used for assessing functional level [10]. The Korean version of the NDI was validated as reliable measurement tool to evaluate the functional disability in Korean patients with cervical disorders [11]. The patients were examined at pretreatment, after 2 weeks, and 8 weeks to investigate pain reduction and functional improvement after treatment and to compare the difference of clinical outcomes between the Epidural group and the Facet group. Successful pain relief was defined if a 50% or more reduction of NRS score was achieved in comparison with pretreatment one. Successful functional improvement was defined if at least a 40% reduction of NDI was obtained [12].

The primary outcome included neck pain disability index preintervention (measured once within one day pre intervention), demonstrated adequate responsiveness in patients with neck pain and concomitant upper extremity referred symptoms. The secondary outcomes included total opioid and non-steroidal consumption preintervention (measured everyday preintervention), total ovoid and non-steroidal consumption post intervention (measured 1 month, 3-months, 6-months, and 12 months post intervention). VAS Score, Nausea & vomiting were assessed at 0 hour, 2 hours, 4 hours, 6hours, 12 hours, 18 hours, 24 hours post operative. The secondary outcome was defined as at least 50% pain relief associated with 50% improvement in functional status measured by VAS Score.

**Ethical Considerations**

Approval was taken from Al Fayoum University Institutional ethics committee to achieve this study. An informed and written consent was taken from each patient. All patients in this study were informed about the clinical research and were informed about how the operation is carried out. All data was collected by the researcher himself.

**Statistical Analysis**

Statistical analysis was performed using the SPSS Version 14.0 statistical package (SPSS, Inc., Chicago, IL). The results were compared within 2 groups using Chi-square test and Student t test. Results were thought to be statistically significant if the P value was $<0.05$.

**RESULTS**

Table (1) illustrates that there was non-statistical significance between the two study groups regarding the demographic and operative data of patients 'studies as the p-value was $> 0.05$. There was non-statistical significance between the two study groups regarding verbal numerical rating score, pain intensity, care and neck disability index as p-value $> 0.05$ at different time points.

Table (2) demonstrates that there was non-statistical significance between the two study groups regarding Lifting, read, headache, concentration, work, driving, sleep, and recreation comparison as p-value $> 0.05$ at different time points.

Table (3) demonstrates that there was non-statistical significance between the two study groups regarding opioids, NSAID and gaptin preintervention, postintervention and time of post intervention usage as p-value $> 0.05$ at different time points. There was non-statistical significance between the two study groups regarding Complications (nausea and vomiting) incidence as the p-value was $> 0.05$.

**Table (1):** Demographic, operative data, verbal numerical rating score, pain intensity, care and neck disability index comparison between the two study groups

| | **Epidural group (n=40)** | | **Facet group (n=40)** | | ***p-value*‡** |
|---|---|---|---|---|---|
| | **Mean** | **SD** | **Mean** | **SD** | |
| **Age** (years) | 47.43 | 9.70 | 46.13 | 8.61 | 0.528 |
| **Weight** (Kg) | 73.23 | 7.872 | 71.78 | 5.475 | 0.342 |
| | **Number** | **Percentage** | **Number** | **Percentage** | ***p-value* #** |
| **Sex** | | | | | |
| Male | 17 | 42.5 % | 14 | 35 % | 0.491 |
| Female | 23 | 57.5 % | 26 | 65 % | |
| **Surgical level** | | | | | |
| Single | 19 | 47.5 % | 12 | 30% | 0.383 |
| Double | 10 | 25 % | 11 | 27.5% | |
| Triple | 6 | 15% | 8 | 20% | |
| Quadruple | 5 | 12.5% | 9 | 22.5% | |
| **Verbal numerical rating score time point** | | | | | |
| | **Median** | **IQR** | **Median** | **IQR** | **p-value ‡‡** |
| Baseline | 80.00 | 13.75(70-83.75) | 80.00 | 10(70-80) | 0.730 |
| 1 week | 20.00 | 10(10-20) | 20.00 | 10(10-20) | 0.812 |
| 1 month | 20.00 | 10(10-20) | 20.00 | 12.5(12.5-25) | 0.182 |
| 3 months | 30.00 | 10(20-30) | 25.00 | 10(20-30) | 0.581 |
| 6 months | 30.00 | 5(30-35) | 32.50 | 5(30-35) | 0.925 |
| 9 months | 40.00 | 10(35-45) | 40.00 | 10(35-45) | 0.339 |
| 12 months | 40.00 | 10(35-45) | 40.00 | 10(35-45) | 0.254 |
| **Pain intensity time point** | | | | | |
| Baseline | 4.00 | 0(4-4) | 4.00 | 0.75(3.25-4) | 0.876 |
| 1 week | 1.00 | 0.75(3.25-4) | 0.50 | 1 (0-1) | 0.824 |
| 1 month | 1.00 | 1 (0-1) | 1.00 | 1 (0-1) | 0.900 |
| 3 months | 1.00 | 0 (1-1) | 1.00 | 0 (1-1) | 0.975 |
| 6 months | 1.00 | 1(1-2) | 1.00 | 1(1-2) | 0.828 |
| 9 months | 1.50 | 1(1-2) | 1.00 | 1(1-2) | 0.830 |
| 12 months | 2.50 | 1(2-3) | 2.50 | 1(2-3) | 0.916 |
| **Care time point** | | | | | |
| Baseline | 2.00 | 0(2-2) | 2.00 | 0(2-2) | >0.99 |
| 1 week | 0.00 | 0(0-0) | 0.00 | 0(0-0) | >0.99 |
| 1 month | 0.00 | 0(0-0) | 0.00 | 0(0-0) | 0.579 |
| 3 months | 0.00 | 1(0-1) | 0.00 | 1(0-1) | 0.369 |
| 6 months | 1.00 | 1(0-1) | 1.00 | 1(0-1) | 0.472 |
| 9 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.221 |
| 12 months | 1.00 | 1(1-2) | 1.00 | 1(1-2) | 0.942 |
| **Neck disability index time point** | | | | | |
| Baseline | 75.00 | 12.75(68-80.75) | 75.00 | 10.75(68-78.75) | 0.870 |
| 1 week | 71.00 | 15(63-78) | 73.00 | 14(66-80) | 0.238 |
| 1 month | 72.00 | 15.5 (63.25-78.75) | 74.00 | 12.75(67.25-80) | 0.185 |
| 3 months | 71.50 | 13.50(65-78.50) | 73.50 | 13.25(67.50-80.75) | 0.221 |
| 6 months | 72.50 | 11.5(66.25-77.75) | 73.00 | 11.75(69.25-81) | 0.244 |
| 9 months | 73.00 | 13.5(65.25-78.75) | 74.50 | 10.75(70.25-81) | 0.276 |
| 12 months | 74.00 | 14.25(64.5-78.75) | 75.00 | 11.5(69.25-80.75) | 0.365 |

***SD: standard deviation, ‡; independent sample t-test, #; Chi-squared test, IQR; Interquartile range, ‡‡; Mann-Whitney U test***

**Table (2):** Lifting, read, headache, concentration, work, driving, sleep, and recreation comparison between the two study groups

| **Lifting time point** | **Epidural group (n=40)** | | **Facet group (n=40)** | | **p-value ‡** |
|---|---|---|---|---|---|
| | **Median** | **IQR** | **Median** | **IQR** | |
| Baseline | 2.00 | 0.75 (1.25-2) | 2.00 | 1(1-2) | 0.638 |
| 1 week | 0.00 | 0(0-0) | 0.00 | 0(0-0) | 0.786 |
| 1 month | 0.00 | 0(0-0) | 0.00 | 0.75(0-0.75) | 0.619 |
| 3 months | 1.00 | 1(0-1) | 1.00 | 1(0-1) | 0.824 |
| 6 months | 1.00 | 0.75(0.25-1) | 1.00 | 1(0-1) | 0.812 |
| 9 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.804 |
| 12 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.782 |
| **Read time point** | | | | | |
| Baseline | 3.00 | 1(2-3) | 3.00 | 1(2-3) | 0.481 |
| 1 week | 0.00 | 0(0-0) | 0.00 | 1(0-1) | 0.608 |
| 1 month | 0.00 | 0(0-0) | 0.00 | 1(0-1) | 0.939 |
| 3 months | 1.00 | 1(0-1) | 1.00 | 1(0-1) | 0.601 |
| 6 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.787 |
| 9 months | 1.00 | 0(1-1) | 1.00 | 1(1-2) | 0.514 |
| 12 months | 1.00 | 0(2-2) | 1.00 | 0(2-2) | 0.321 |
| **Headache time point** | | | | | |
| Baseline | 3.00 | 1(3-4) | 3.50 | 1(3-4) | 0.644 |
| 1 week | 0.00 | 1(0-1) | 0.00 | 1(0-1) | 0.407 |
| 1 month | 1.00 | 1(0-1) | 0.50 | 1(0-1) | 0.608 |
| 3 months | 1.00 | 0(1-1) | 1.00 | 1(0-1) | 0.534 |
| 6 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.252 |
| 9 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.610 |
| 12 months | 2.00 | 1(1-2) | 2.00 | 1(1-2) | 0.430 |
| **Concentration time point** | | | | | |
| Baseline | 2.00 | 1(2-3) | 2.00 | 0(2-2) | 0.543 |
| 1 week | 1.00 | 1(0-1) | 1.00 | 1(0-1) | 0.635 |
| 1 month | 1.00 | 1(0-1) | 1.00 | 0(1-1) | 0.383 |
| 3 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.817 |
| 6 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.786 |
| 9 months | 1.00 | 0(1-1) | 1.00 | 1(1-2) | 0.820 |
| 12 months | 2.00 | 1(1-2) | 2.00 | 1(1-2) | 0.896 |
| **Work time point** | | | | | |
| Baseline | 2.00 | 1(2-3) | 2.00 | 1(2-3) | 0.597 |
| 1 week | 1.00 | 1(0-1) | 1.00 | 1(0-1) | 0.831 |
| 1 month | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.615 |
| 3 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.445 |
| 6 months | 1.00 | 0(1-1) | 1.00 | 0.75(1-1.75) | 0.605 |
| 9 months | 1.00 | 1(1-2) | 1.50 | 1(1-2) | 0.763 |
| 12 months | 2.00 | 1(1-2) | 2.00 | 1(1-2) | >0.99 |
| **Driving time point** | | | | | |
| Baseline | 3.00 | 1(2-3) | 3.00 | 1(2-3) | 0.742 |
| 1 week | 1.00 | 1(0-1) | 1.00 | 1(0-1) | 0.830 |
| 1 month | 1.00 | 1(0-1) | 1.00 | 1(0-1) | 0.829 |
| 3 months | 1.00 | 1(0-1) | 1.00 | 1(0-1) | 0.753 |
| 6 months | 1.00 | 0(1-1) | 1.00 | 0.75(0.25-1) | 0.879 |
| 9 months | 1.00 | 1(1-2) | 1.00 | 1(1-2) | 0.557 |
| 12 months | 2.00 | 1(1-2) | 2.00 | 1(1-2) | 0.975 |
| **Sleep time point** | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| Baseline | 2.00 | 1.75(1.25-3) | 2.00 | 1(2-3) | 0.815 |
| 1 week | 0.00 | 0.75(0-.75) | 0.00 | 0.75(0-.75) | >0.99 |
| 1 month | 0.00 | 1(0-1) | 0.00 | 0.75(0-.75) | 0.806 |
| 3 months | 0.50 | 1(0-1) | 0.00 | 1(0-1) | 0.476 |
| 6 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.525 |
| 9 months | 1.00 | 0(1-1) | 1.00 | 0(1-1) | 0.797 |
| 12 months | 1.50 | 1(1-2) | 1.00 | 1(1-2) | 0.842 |
| **Recreation time point** | | | | | |
| 1 week | 2.00 | 0(2-2) | 2.00 | 0(2-2) | 0.805 |
| 1 month | 1.00 | 0.75(0.25-1) | 1.00 | 0.75(0.25-1) | 0.865 |
| 3 months | 1.00 | 1(0-1) | 1.00 | 2(0-2) | 0.763 |
| 6 months | 1.00 | 1(1-2) | 1.00 | 1(1-2) | >0.99 |
| 9 months | 1.00 | 1(1-2) | 1.00 | 1(1-2) | >0.99 |
| 12 months | 2.00 | 1(1-2) | 2.00 | 1(1-2) | 0.917 |
| 1 week | 2.00 | 1(1-2) | 2.00 | 1(1-2) | >0.99 |

IQR; Interquartile range, ‡; Mann-Whitney U test

**Table (3):** Use of opioids NSAID and Gaptin pre and postintervention and complications comparison between the two study groups

| **Opioids** | Epidural group (n=40) | | Facet group (n=40) | | p-value # |
|---|---|---|---|---|---|
| | Number | Percentage | Number | Percentage | |
| Preintervention | | | | | |
| No | 33 | 82.5% | 33 | 82.5% | >0.99 |
| Yes | 7 | 17.5% | 7 | 17.5% | |
| Postintervention | | | | | |
| No | 36 | 90% | 37 | 92.5% | 0.692 |
| Yes | 4 | 10% | 3 | 7.5% | |
| Time of post intervention use | | | | | |
| No | 36 | 90% | 37 | 91.3% | 0.841 |
| After 9 months | 2 | 2% | 2 | 5% | |
| After 12 months | 2 | 2% | 1 | 3.8% | |
| **NSAID and Gaptin** | | | | | |
| Preintervention | | | | | |
| No | 22 | 55% | 24 | 60% | 0.961 |
| Gabapentanoid | 6 | 15% | 6 | 15% | |
| Ibuprofen | 4 | 10% | 3 | 7.5% | |
| Ketorolac | 8 | 20% | 7 | 17.5% | |
| Postintervention | | | | | |
| No | 21 | 52.5% | 21 | 52.5% | 0.978 |
| Gabapentanoid | 6 | 15% | 6 | 15% | |
| Ibuprofen | 4 | 10% | 3 | 7.5% | |
| Ketorolac | 9 | 22.5% | 10 | 25% | |
| Time of post intervention use | | | | | |
| No | 21 | 52.5% | 21 | 52.5% | 0.977 |
| 6 months | 4 | 10% | 3 | 7.5% | |
| 9 months | 7 | 17.5% | 7 | 17.5% | |
| 12 months | 8 | 20% | 9 | 22.5% | |
| **Complications** | | | | | |
| No | 32 | 80% | 31 | 79.5% | 0.955 |
| Yes | 8 | 20% | 9 | 20.5% | |

***#; Chi-squared test***

## DISCUSSION

Chronic neck pain is common in the adult general population, with a lifetime prevalence of 26% to 71%. Significant economic, societal, and health impact cannot be ignored as it is similar to the impact of low back pain and is recognized as a source of disability in the working population [13]. Epidural injections are used in managing spinal pain secondary to disc herniation, spinal stenosis, post-surgery syndrome, discogenic pain not from facet or sacroiliac joints, and multiple other conditions [14, 15]. Facet joint injections are used in managing facet joint pain [14, 16].

The most notable risk associated with epidural steroid injection is vascular trespass or unplanned injection into a vein or artery. Serious events, such as seizure, infarction of the brainstem or spinal cord, and death, presumably caused by vascular trespass with resultant distal embolization of a particulate steroid, have been reported [17-20].

The aim of the current study was to compare methods for pain relief in patients with chronic neck pain, to compare and contrast advantages and disadvantages of cervical epidural versus cervical facet injection in patients suffering chronic neck pain.

In the present study, the mean age in epidural group was 47.43 years and in facet group was 46.13 years with non-significant difference in between the two groups and that agreed with the results in the study done by Chae et al. who studied 130 facet and 148 epidural steroid injections found that the mean age in epidural group was 57.5 years and in facet group was 59.1 years with non-significant difference in between the two groups [21].

In our study, there was non-significant difference in between the two groups as regard to sex which was the same mentioned by Bureau et al. [22].

In the current study, there was no statistically significant difference between the two groups regarding pain intensity at baseline and even after 12 months and that coincided with Bureau et al. who concluded that there were no significant differences in reduction of the pain score and an improvement of functional status at one, three, and six months after the initial injection. They reported that the comparison between the two interventions remained inconclusive for a severe baseline pain level [22]. This also may be consistent with Chae et al. 2022 analysis showing that NRS and NDI scores in the severe pain group were significantly lower in the TFE than the facet joint (FJ) steroid injections three months after the initial injection [21].

But Bureau et al. enrolled a relatively small number of patients (a total of 56 subjects), which may have been insufficient to determine differences in meaningful pain relief and functional disability. Second, while short-term effects are also meaningful, they did not investigate long-term outcomes. Also, Authors included patients with spondylosis with or without CDH [22] and Chae et al. included patients with cervical radicular pain caused by facet stenosis, but we enrolled patients with chronic neck pain [21].

It is difficult to understand the exact mechanism underlying the effectiveness of FJ steroid injection in cervical radicular pain. Several studies suggested that the proximity of the facet joint ventral capsular recess to the intervertebral foramen and/or leakage of the medication from the facet joint into the epidural and/or foraminal spaces could contribute to the effectiveness of the FJ steroid injection. Kelekis et al. demonstrated an efficacious, feasible, and indirect cervical nerve root injection technique: puncture

of the facet joint capsule with subsequent distribution of the corticosteroid intra-articularly, peri-radicularly, and within the epidural space [23].

Won et al. mentioned that extra-FJ flow, including epidural leakage, showed high frequency at the lower cervical vertebrae, where there are many strains of capsular ligaments subject to peak FJ compression due to sliding [24].

Kim et al. suggested that IFSI could be effective in patients with cervical disk herniation. Unfortunately, the study group appeared to be inhomogeneous and the methodology was incompletely described for drawing any sound conclusions from that study [25]. In 2007, Richarme et al. presented preliminary results on contrast distribution following CT-guided intra-articular facet injections in 31 patients. Using this alternative approach, they obtained foraminal opacification in 21/31 (68%) patients and epidural opacification in 19/31 (63%) [26].

Conversely, our results agreed with a randomized controlled study by Anderberg et al. These authors assigned 40 patients had chronic cervical radicular pain from degenerative spondylosis, with a mean duration of symptoms of 31 months, to receive 1 fluoroscopically guided TFSI. The treatment group received an injection of mepivacaine and methylprednisolone, while the control group received an injection of mepivacaine and saline. There was a positive response in only 30% (6/20) of the patients in the treatment group at 3 weeks' follow-up. There were no significant differences in treatment results between the 2 groups [27].

But regarding epidural injection, Manchikanti et al. showed, in an active-controlled trial with a large number of patients and long-term follow-up, the efficacy of the local anesthetic lidocaine, as well as lidocaine with steroids. There was significant improvement at the end of 2 years in all parameters in 65% of patients who received local anesthetic alone and 57% of patients who received local anesthetic with steroid [28].

Manchikanti et al. performed another systematic review to compare the effectiveness of epidural and facet joint injections with saline solution, local anesthetics, or steroids in various regions of the spine, and reported equal efficacy of local anesthetic alone and local anesthetic with steroids with lack of saline solution effectiveness [29].

As regard to opioid in the epidural group, Mesregah et al. found that the opioid intake was assessed in terms of morphine equivalence at baseline, 3, 6, and 12 months after treatment. The opioid intake was significantly reduced in both groups within the follow up periods with no significant difference between the 2 groups [30].

In this study, there was non-statistical significance between the two study groups regarding neck disability index and that was in agreement with Chae et al. who found that NDI scores showed a significant improvement at one, three, and six months after the initial injection in both groups, with no significant differences between the groups during the follow-up period [21].

Regarding complications, there was no insignificant difference between the two groups. Similarly, Bureau et al. found that no adverse events occurred following the interventions. At the 4-week follow-up, in the intention-to-treat analysis, 1 subject of the TFSI group reported having tinnitus and vertigo since the intervention and 1 subject in each group reported having headaches during the 2 days following the

intervention. In the as-treated analysis, all the delayed adverse effects were reported in the TFSI group [22].

To the best of our knowledge, there are few studies on the effectiveness of FJ steroid injections. According to Dwyer et al. FJ injection may require the skillful injection of the needle into a narrow joint space and can be more traumatic than a medial branch block [31]. Cervical FJ injections have not been standardized because proper visualization of cervical anatomy using fluoroscopy can be difficult [32, 33]. In addition, the angles and morphological properties of FJ in the cervical region have not been fully evaluated [34].

Scanlon et al. performed a survey among the members of the American Spine Society. Among 1340 members, the response rate was 21.4% (287). In all, 78 complications were reported, including vertebrobasilar brain infarcts, cervical spinal cord infarcts, and 13 deaths [17]. Arterial embolism of particulate corticosteroids is the most frequently cited presumptive cause of brain and spinal cord infarcts [35].

## CONCLUSION

Chronic neck pain management is considered a challenge due to different etiology of it and anatomical consideration of cervical spine. Cervical epidural injection and cervical facet injection have been proven to be an easy and good interventional management and safe choice to improve the pain degree and lifestyle of the patient and its daily activities and there was no significant difference between the two approaches in management of chronic neck pain.

### Conflict of interest

All authors have no conflicts of interest that are directly relevant to the content of this review.

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### References

1. **Gustavsson C, Denison E, von Koch L (2011):** Self-management of persistent neck pain: two-year follow-up of a randomized controlled trial of a multicomponent group intervention in primary health care.
2. **Pearson AM, Ivancic PC, Ito S, et al. (2004):** Facet joint kinematics and injury mechanisms during simulated whiplash. Spine. 29(4), 390-397.
3. **Manchikanti L, Boswell MV, Singh V, et al. (2004):** Prevalence of facet joint pain in chronic spinal pain of cervical, thoracic, and lumbar regions. BMC musculoskeletal disorders. 5(1), 15.
4. **Kallakuri S, Singh A, Chen C, et al. (2004):** Demonstration of substance P, calcitonin gene-related peptide, and protein gene product 9.5 containing nerve fibers in human cervical facet joint capsules. Spine. 29(11), 1182-1186.
5. **Schoenfeld AJ, George AA, Bader JO, et al. (2012):** Incidence and epidemiology of cervical radiculopathy in the United States military: 2000 to 2009. Clinical Spine Surgery. 25(1), 17-22.
6. **Salt E, Wright C, Kelly S, et al. (2011):** A systematic literature review on the effectiveness of non-invasive therapy for cervicobrachial pain. Manual therapy. 16(1), 53-65.

7. **Van Zundert J, Huntoon M, Patijn J, et al. (2011):** Cervical radicular pain. Evidence-Based Interventional Pain Medicine: According to Clinical Diagnoses. 18-30.

8. **Richardson J (2004):** Atlas of interventional pain management. British Journal of Anaesthesia. 92(4), 604-605.

9. **Ghahreman A, Ferch R, Bogduk N (2010):** The efficacy of transforaminal injection of steroids for the treatment of lumbar radicular pain. Pain Medicine. 11(8), 1149-1168.

10. **Kwon B, Kim DH, Marvin A, et al. (2005):** Outcomes following anterior cervical discectomy and fusion: the role of interbody disc height, angulation, and spinous process distance. Clinical Spine Surgery. 18(4), 304-308.

11. **Song K-J, Choi B-W, Choi B-R, et al. (2010):** Cross-cultural adaptation and validation of the Korean version of the neck disability index. Spine. 35(20), E1045-E1049.

12. **Manchikanti L, Cash KA, McManus CD, et al. (2008):** Preliminary results of a randomized, equivalence trial of fluoroscopic caudal epidural injections in managing chronic low back pain: part 4-spinal stenosis. Pain physician. 11(6), 833.

13. **Falco F, Erhart S, Wargo BW, et al. (2009):** Systematic review of diagnostic utility and therapeutic effectiveness of cervical facet joint interventions. Pain Physician. 12(2), 323.

14. **Fernández-de-Las-Peñas C, Alonso-Blanco C, Hernández-Barrera V, et al. (2013):** Has the prevalence of neck pain and low back pain changed over the last 5 years? A population-based national study in Spain. The Spine Journal. 13(9), 1069-1076.

15. **Manchikanti L, Benyamin RM, Falco FJ, et al. (2015):** Do epidural injections provide short-and long-term relief for lumbar disc herniation? A systematic review. Clinical Orthopaedics and Related Research®. 473, 1940-1956.

16. **Manchikanti KN, Atluri S, Singh V, et al. (2012):** An update of evaluation of therapeutic thoracic facet joint interventions. Database of Abstracts of Reviews of Effects (DARE): Quality-assessed Reviews [Internet].

17. **Scanlon GC, Moeller-Bertram T, Romanowsky SM, et al. (2007):** Cervical transforaminal epidural steroid injections: more dangerous than we think? Spine. 32(11), 1249-1256.

18. **Bureau NJ, Moser TP, Gouvion A, et al. (2020):** CT fluoroscopy-guided transforaminal and intra-articular facet steroid injections for the treatment of cervical radiculopathy: injectate distribution patterns and association with clinical outcome. European radiology. 30, 5933-5941.

19. **Kim J, Kim K, Lee M, et al. (2021):** Correlation between intravascular injection rate, pain intensity, and degree of cervical neural foraminal stenosis during a cervical transforaminal epidural block. Journal of Pain Research. 3017-3023.

20. **Kloth DS, Calodney AK, Derby R, et al. (2011):** Improving the safety of transforaminal epidural steroid injections in the treatment of cervical radiculopathy. Pain Physician. 14(3), 285.

21. **Chae JS, Kim W-j, Jue MJ (2022):** Facet Joint Versus Transforaminal Epidural Steroid Injections in Patients With Cervical Radicular Pain due to Foraminal Stenosis: A Retrospective Comparative Study. Journal of Korean Medical Science. 37(25).

22. **Bureau N, Moser T, Dagher J, et al. (2014):** Transforaminal versus intra-articular facet corticosteroid injections for the treatment of cervical radiculopathy: a randomized, double-blind, controlled study. American Journal of Neuroradiology. 35(8), 1467-1474.

23. **Kelekis A, Filippiadis DK, Velonakis G, et al. (2014):** Fluoroscopically guided infiltration of the cervical nerve root: an indirect approach through the ipsilateral facet joint. Pain Physician. 17(4), 291.

24. **Won H-S, Jang H-Y, Moon H-S, et al. (2020):** Fluoroscopic findings of extra-cervical facet joint flow and its incidence on cervical facet joint arthrograms. Journal of Clinical Medicine. 9(12), 3919.

25. **Kim K-H, Choi S-H, Kim T-K, et al. (2005):** Cervical facet joint injections in the neck and shoulder pain. Journal of Korean medical science. 20(4), 659-662.

26. **Richarme D, Feydy A, Fayad F, et al. (2010):** Cervical radiculopathy: efficiency of CT-guided cervical facet joint corticosteroid injection: 47. Swiss Radiological Congress 2010, Schweizerische Gesellschaft für Radiologie, Schweizerische Gesellschaft für Nuklearmedizin, Schweizerische Vereinigung der Fachleute für medizinisch technische Radiologie. 10.

27. **Anderberg L, Annertz M, Persson L, et al. (2007):** Transforaminal steroid injections for the treatment of cervical radiculopathy: a prospective and randomised study. European Spine Journal. 16, 321-328.

28. **Manchikanti L, Cash KA, Pampati V, et al. (2014):** Transforaminal epidural injections in chronic lumbar disc herniation: a randomized, double-blind, active-control trial. Pain Physician. 17(4), E489.

29. **Manchikanti L, Nampiaparampil DE, Manchikanti KN, et al. (2015):** Comparison of the efficacy of saline, local anesthetics, and steroids in epidural and facet joint injections for the management of spinal pain: A systematic review of randomized controlled trials. Surgical neurology international. 6(Suppl 4), S194.

30. **Mesregah MK, Feng W, Huang W-H, et al. (2020):** Clinical effectiveness of interlaminar epidural injections of local anesthetic with or without steroids for managing chronic neck pain: a systematic review and meta-analysis. Pain Physician. 23(4), 335.

31. **Dwyer AD, Aprill C, Bogduk N (1990):** Cervical zygapophyseal joint pain patterns I: a study in normal volunteers. Spine. 15(6), 453-457.

32. **Silbergleit R, Mehta BA, Sanders WP, et al. (2001):** Imaging-guided injection techniques with fluoroscopy and CT for spinal pain management. Radiographics. 21(4), 927-939.

33. **Kulkarni AG, Sabet T, Ashley H, et al. (2006):** the swimmer's view for cervical facet joint injections. European Spine Journal. 15, 1150-1152.

34. **Senoglu N, Senoglu M, Safavi-Abbasi S, et al. (2010):** Morphologic Evaluation of Cervical and Lumbar Facet Joints: Intra-Articular Facet Block Considerations. Pain Practice. 10(4), 272-278.

35. **Malhotra G, Abbasi A, Rhee M (2009):** Complications of transforaminal cervical epidural steroid injections. Spine. 34(7), 731-739.