Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2024i1.865
*Biol. Clin. Sci. Res. J., Volume, **2024**: 865*
Original research article

COMPARATIVE PAIN SATISFACTION WITH TRANSFORAMINAL EPIDURAL STEROID INJECTION PLUS CAUDAL EPIDURAL STEROID INJECTION WITH CATHETER VERSUS TRANFORAMINAL EPIDURAL STEROID INJECTION PLUS LUMBAR INTERLAMINAR EPIDURAL STEROID INJECTION IN PATIENTS HAVING LOW BACKACHE WITH RADICULOPATHY OR RADICULAR PAIN

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(Received, 17th January 2024, Revised 10th April 2024, Published 25th May 2024)

Abstract: *Epidural steroid injections (ESI) have been used to treat radicular pain. However, no prospective research has been undertaken to determine the benefits associated with combining different epidural steroid injection techniques.* ***Objective****: This study was conducted to assess the efficacy of combining transforaminal epidural steroid injection (TFESI) with caudal epidural steroid injection (CESI) versus TFESI with interlaminar epidural steroid injection (ILESI) on patient pain, anxiety, and disability status in individuals suffering from radicular pain.* ***Methods:*** *A cross-sectional study was conducted in the National Hospital & Medical Centre Lahore from September 2022 to September 2023. Eighty patients with low backache and radicular pain who met the inclusion criteria were enrolled. The patients were randomly divided into Group A (TFESI + CESI, n=40) and Group B (TFESI + ILESI, n=40). Baseline demographic data were collected, and pain, anxiety, and disability were assessed using the Numerical Rating Scale (NRS), Hamilton Anxiety Scale, and Oswestry Low Back Disability Index, respectively. These parameters were measured at baseline, 2 weeks, 4 weeks, and 12 weeks post-intervention. Data were analysed using SPSS software, with comparisons made using the independent t-test and chi-square test, and a p-value of <0.05 considered statistically significant.* ***Results:*** *The mean age of the patients in Group A was 59.4 ± 10.2 years, while in Group B, it was 57.6 ± 11.1 years. Most patients were females, accounting for 58 (72.5%) of the study population. There was a significant decrease in the mean NRS score at 2, 4, and 12 weeks compared to the baseline value in Group B (p=0.01). Similarly, the mean Hamilton Anxiety Score and Oswestry Disability Score were significantly reduced after the intervention in Group B (p=0.04, p=0.01, respectively). Comparable findings were observed in Group A, with significant decreases in the mean NRS score at 2, 4, and 12 weeks (p=0.02) and substantial reductions in the Hamilton Anxiety Score and Oswestry Disability Score (p=0.001, p=0.03, respectively).* ***Conclusion****: This study found that combining CESI and TFESI with catheter offered a slightly more effective pain reduction than TFESI and ILESI after 12 weeks. The clinical effects of combining CESI with TFESI were similar to those of combining TFESI with ILESI in treating radicular pain. Both methods significantly reduced pain scores and improved anxiety and disability status in both groups.*

Keywords: Anxiety, Caudal Epidural Steroid Injection, Disability, Interlaminar Epidural Steroid Injection, Pain, Radicular Pain, Transforaminal Epidural Steroid Injection

Introduction

Chronic lumbosacral radicular pain (CLRP) is a prevalent complaint in pain and spine clinics. Treatment is complicated for individuals who are unresponsive to medicine or physiotherapy, and epidural steroid injection (ESI) is one regularly utilised strategy to reduce radicular complaints. (1).These hinder the formation of prostaglandins (2), disrupting nociceptive c fibres and decreasing swelling around the nerve root (3).

There are multiple routes to ESI, including transforaminal ESI (TFESI), interlaminar ESI (ILESI), and caudal ESI (CESI) (4, 5).The efficacy of the three injection techniques has been demonstrated. In previous studies (6).Related research has found that TFESI proved more helpful than CESI for pain reduction in herniated discs or radicular fatigue (7).Nevertheless, one new meta-analysis and systematic review found that TFESI may be marginally recommended above CESI (8).Additionally, one retrospective investigation found that adjunctive CESI on TFESI significantly reduced pain more than TFESI alone (5).

Unluckily, no prospective research has been undertaken to determine the benefits associated with combining epidural steroid injection techniques. Thus, this study was conducted to assess the efficacy of combining therapy TFESI with CESI versus TFESI with ILESI on patient pain anxiety and disability status suffering from radicular pain.

Methodology

This cross-sectional study was conducted in *National Hospital & Medical Centre Lahore* from September 2022 to September 2023. Eighty patients diagnosed with low backache, radiculopathy, or radicular pain who met the inclusion criteria were enrolled. The patients were divided into two groups of 40 each. Inclusion criteria comprised patients aged 18-65 with low backache, radiculopathy, or radicular pain who provided written informed consent.

[Citation: Waheed, H., Saqib, M., Mufti, S.S., Mushtaq, S., Ghafoor, A.U.R., Bashir, K., (2024). Comparative pain satisfaction with transforaminal epidural steroid injection plus caudal epidural steroid injection with catheter versus tranforaminal epidural steroid injection plus lumbar interlaminar epidural steroid injection in patients having low backache with radiculopathy or radicular pain *Biol. Clin. Sci. Res. J.*, **2024***: 865*. doi: https://doi.org/10.54112/bcsrj.v2024i1.865]

Exclusion criteria included contraindications to epidural steroid injections, coagulopathy, infection at the injection site, and pregnancy or lactation.

Group A received a combination of transforaminal epidural steroid injection (TFESI) and caudal epidural steroid injection (CESI) with a catheter. For the TFESI, injections were administered at the affected nerve root level under fluoroscopic guidance. 80 mg of methyl predisolone was administered in total in group A.

Group B received TFESI and lumbar interlaminar epidural steroid injection (LIESI), both administered under fluoroscopic guidance.80 mg of methyl predisolone was administered in total in group B.

To relieve lumbar irritation, a pillow was put beneath the iliac crest. After setting up the fluoroscope, the injection site was prepped with a sterilising solution. The needle insertion location was anaesthetized using a local anaesthetic. A 16 G epidural needle was utilised in each patient. All operations were performed under a fluoroscope. The needle route was traced using fluoroscopy, and 1mL of Omnipaque was administered to ensure epidural flow and prevent intravascular, intrathecal, or soft-tissue infiltration. After assessment of reaching the intended injection location, anteroposterior and oblique radiographs were acquired to validate the distribution of the contrast material. All procedures were carried out by a consultant in pain medicine, who was aided by a trainee in pain medicine.

Baseline demographic data, including age, gender, duration of pain, BMI, and height, were collected for all patients. Pain and disability levels were assessed using the Numerical Rating Scale (NRS) for pain, the Hamilton Anxiety Scale for anxiety, and the Oswestry Low Back Disability Index for disability. These parameters were measured at baseline, 2 weeks, 4 weeks, and 12 weeks post-intervention.

Data were analysed using SPSS software. Descriptive statistics summarised the demographic data, with continuous variables expressed as mean ± standard deviation and categorical variables as frequencies and percentages. Comparisons between the two groups were made using the independent t-test for continuous variables and the chi-square test for categorical variables, with a p-value of <0.05 considered statistically significant.

The study received approval from the institutional review board of *National Hospital & Medical Centre Lahore*, and informed consent was obtained from all participants before enrollment. This methodology adheres to international standards, ensuring the reliability and reproducibility of the study findings.

Results

A total of 80 patients were enrolled in our investigation and fulfilled our inclusion criteria. The mean age of the patients in Group A was 59.4 ± 10.2 years, while that in Group B was 57.6 ± 11.1 years, with a p value of 0.34. Other details of the patient's demographics are given in Table 1.

Table 1 Patient Demographics

Variable	Group A N=40	Group B N=40	P value
Mean age in years	59.4 ± 10.2	57.6 ± 11.1	0.34
Gender			
Male	13(32.5)	9(22.5)	0.52
Female	27 (67.5)	31(77.5)	0.46
Duration of pain in months	5.2 ± 3.6	4.3± 2.2	0.82
Mean BMI ($kg/m^{2)}$	29.8 ± 7.45	31± 8.32	0.12
Mean height in cm	161.4 ± 12.3	159.4 ± 11.6	0.64

The majority of the patients in our study were females, amounting to 58 (72.5%) of the total study population. The mean BMI of patients in Group A was 29.8 ± 7.45 kg/m2,

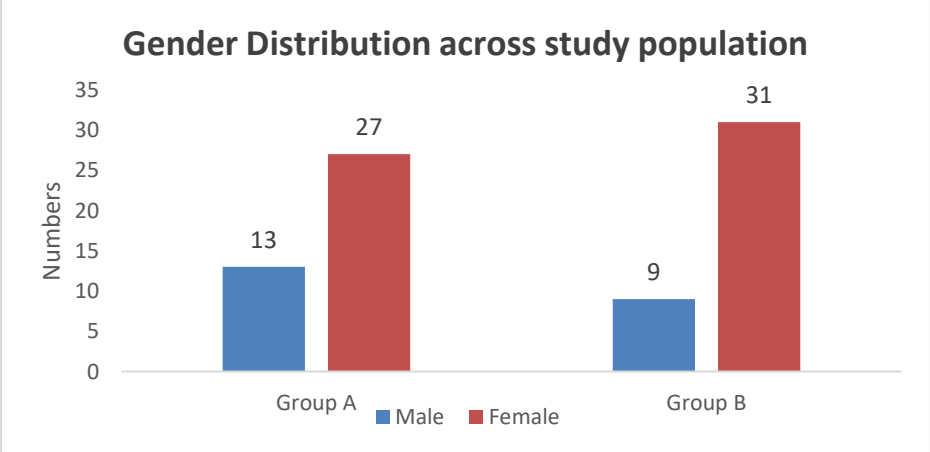

Figure 1 shows the study population gender distribution.

while in Group B, it was 31± 8.32 kg/m2, with a p value of 0.12. The mean height in group A was 161.4 ± 12.3 cm, while in group B, it was 159.4 ± 11.6 cm (p = 0.64). Both groups were comparable in demographics, as indicated by the associated p-value against each variable.

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Table 2 Baseline parameters before the intervention

Variable	Group A	Group B	P value
Mean NRS Score	8.2 ± 1.5	8.3 ± 1.4	0.42
Mean Hamilton Anxiety Score	13.3 ± 7.4	14.1 ± 6.9	0.12
Mean Oswestry Low Back Disability Score	39.8 ± 8.7	40.3 ± 9.2	0.34

When baseline parameters were assessed before the intervention utilizing NRS sale, the Mean Hamilton Anxiety Score and the Mean Oswerty Low Back Disability Score of both groups were found comparable, as indicated by their P values (Table 2).

Table 3 Parameters after the intervention

Variable	After 2 weeks	After 4 weeks	After 12 weeks	P value
Group B				
Mean NRS Score	6.3 ± 1.1	4.2 ± 0.9	3.5 ± 0.7	0.01
Mean Hamilton Anxiety Score	11.1 ± 3.2	8.9 ± 2.6	6.3 ± 2.2	0.04
Mean Oswerty Low Back Disability Score	33.2 ± 6.4	27.4 ± 4.2	22.3 ± 3.5	0.01
Group A				
Mean NRS Score	6.1 ± 1.3	4.1 ± 1.2	3.3 ± 0.9	0.02
Mean Hamilton Anxiety Score	10.9 ± 3.4	8.8 ± 2.9	6.1 ± 2.5	0.001
Mean Oswerty Low Back Disability Score	32.1 ± 6.1	26.3 ± 4.3	21.7 ± 3.8	0.03

Table 3 shows the effect of the intervention on patient pain anxiety and disability level as judged according to the scale described above. There was a significant decrease in the mean NRS Score at 2,4 and 12 weeks as compared to the baseline value (p=0.01) in group B. Similarly, the mean Hamilton anxiety score and Oswerty disability score were also significantly reduced after the intervention, as shown by their p-value (P =0.04, P=0.01 accordingly) in group B.
Our analysis revealed findings comparable to those of group A to group B. After the treatment, group A participants' anxiety, pain, and disability scores decreased significantly. The mean NRS Score in group A significantly reduced at 2, 4, and 12 weeks in comparison to the baseline value (p=0.02). Similarly, the mean Hamilton anxiety score and Oswerty disability score were also significantly decreased following the intervention, as demonstrated by their p values (P = 0.001, P = 0.03 respectively) in group A.

Discussion

This was the first prospective trial to assess the clinical effects of combined CESI and TFESI with catheter (Group A) to TFESI paired with a lumbar interlaminar epidural steroid injection(ILESI) (Group B) to treat radicular pain. This study found that a combination of CESI and TFESI with catheter offered a slightly more effective reduction of pain than TFESI and ILESI after 12 weeks. 72.5% of the study population comprised females. In a study, females comprised the majority of the sample. (9).
Exploring the epidural space of the TFESI is somewhat challenging in a significantly deteriorated and constricted foramen. (10).Likewise, the TFESI injection volume can potentially impact the results. Prior research has shown that greater injected epidural volumes give significant pain relief. (11).A higher injection volume may remove waste materials through the epidural space, lowering the erroneous signal of the troubling nerve and boosting the circulation to the ischemic nerve (12)The Greater the number of vertebrae exposed by the administered volume, the better the result.
Bicket et al. verified that the more significant the number of vertebrae exposed by the administered volume, the better the result. (13).Farhadi et al. suggested that a greater injection volume was required for effective pain management (14).
This study found that both groups achieved almost the same level of pain alleviation, as shown by their mean NRS scores after 12 weeks. This might be attributed to the efficacy of combined procedures peaking at 12 weeks, then gradually wearing off due to steroid action, instabilities, and the recurrence of softening epidural adhesion and fibrosis. (15, 16).Lately, retrospective research indicated that coupled caudal and TFESI in herniated discs provided significantly more significant pain reduction and better patient satisfaction than alone TFESI after one year (5)These results align with our study's findings, as both groups' pain and patient satisfaction improved.
In a study done by Savas et al. l (17) Pain, anxiety, and disability scores were reduced in the intervention group (TFESI group), but the mean pain, anxiety level, and disability scores obtained in our study were much improved in our study patients compared to that study. This can be explained in many ways. First, the combined drugs used in our research gave better results, and Savas's injection volume was much lower than our study's. Previous studies have shown that ILESI with TFESI can effectively treat lumbar radiculopathy by reducing pain and improving functioning.(8, 18). All these results are in line with the findings of our study.
Many studies have shown that anxiety levels among patients decreased after TFESI alone or in combination with lumbar or caudal epidural injection. Nelson et al. discovered that patients receiving cervical and lumbar interlaminar epidural steroid injections had lower anxiety levels. (19).These findings are in accordance to the results of our study. In contrast to the findings of our research, Rosenberg et al. l. Found no significant difference in pain alleviation, anxiety

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level and disability status improvement in their study population after TFESI injection.(20)**.**
Our study had many limitations that should be considered while interpreting these results. First, the small sample size limits the generalization of the findings.Second, the limited sample size reduces the research's statistical significance. The research also has other limitations, including a lack of consideration for different complications that occurred in the study population.

Conclusion

We conclude that the clinical effects of combined CESI and TFESI with catheter to TFESI paired with ILESI to treat radicular pain are more or less the same. Both methods significantly reduced the pain scores and improved the anxiety and disability status in both groups as compared to their baseline values. This study found that a combination of CESI and TFESI with catheter offered a more effective reduction of pain than TFESI and ILESI after 12 weeks.

Declarations

Data Availability statement
All data generated or analyzed during the study are included in the manuscript.
Ethics approval and consent to participate.
Approved by the department concerned. (PMD-2022-087-27)
Consent for publication
Approved
Funding
Not applicable

Conflict of interest

The authors declared an absence of conflict of interest.

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Concept & Design of Study

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