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Original Article

Adjuvant Per-Operative Triamcinolone use in Lumbar Disc Surgery to Alleviate Post-Operative Pain

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ABSTRACT

Objective: To study the adjuvant per-operative epidural administration of Triamcinolone in lumbar disc surgery to alleviate post-operative pain.

Study Design: Quasi-experimental study.

Place and Duration of Study: Department of Neurosurgery, Combined Military Hospital, Rawalpindi Pakistan, from Oct 2021 to Sep 2022

Methodology: Hundred patients aged 20 to 80 years, of either gender, with a single-level prolapsed intervertebral disc and nerve root compression were included and underwent unilateral single-level decompression. A pre-operative MRI scan of the lumbo-sacral spine was done to confirm the diagnosis. All patients initially received conservative management (analgesics and physiotherapy) but failed to respond to it. They were divided into two groups by the lottery method. In Group A, an epidural steroid was administered, while Group B acted as the control. Pain was recorded pre-operatively at 24 hours and then at 1 and 2 weeks post-operatively using the Visual Analogue Scale.

Results: The pre-operative median VAS of Groups A and B was not significant at pre-operation. After 24 hours of operation, the median VAS of Group A patients was VAS 3 (1), while in Group-B it was 2 (1), (*p*-value of 0.001). After 1 week, the median VAS of Group-A patients was 2 (2) and Group- B was 3 (1), with a significant *p* value of 0.024. After 2 weeks, the median VAS of Group-A patients was 1 (1) and Group B was 2 (1), with a significant *p* value of 0.015.

Conclusion: Intra-operative epidural and foraminal administration of steroids in single-level lumbar disc surgery significantly reduces pain in the immediate postoperative period but has no benefit in the follow-up period.

Keywords: Discectomy, Post-operative pain, Triamcinolone acetate.

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INTRODUCTION

Lower back pain is a debilitating illness that affects 80% of the population at some point in their lives [1]. Among a vast array of causes, intervertebral disc degeneration leading to lumbar disc herniation is the most prevalent. Compression of the nerve root or thecal sac by disc material is not the only factor producing signs and symptoms.[2] In this context, inflammation plays a well-established role. When the contents of the disc, especially the nucleus pulposus, are extruded into the epidural space, they cause vasodilatation, increased vascular permeability, inflammatory cell infiltration, and cytokine signaling.[3] Locally, there is an increased concentration of COX2 and other inflammatory mediators. Discectomy is a commonly used surgical intervention for herniated lumbar disease, and postoperative pain control is an important aspect of management.[4,5]

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Conservative management with analgesics, steroids, and physiotherapy is all part of primary care for lumbar disc disease. Epidural steroid injections are one of the most commonly used non-surgical procedures for lumbar disc disease.[6,7] Patients who fail to respond to these modalities eventually require surgery. However, it is difficult to predict each patient's post-operative outcome in terms of pain management.[8,9] In patients treated by our team in our institution, this study seeks to highlight the early effectiveness of a combination of decompressive surgery and intra-operative epidural steroid injection in reducing post-operative pain. Effective management of postoperative pain reduces the use of intravenous analgesics, including narcotics and NSAIDs. Furthermore, it facilitates patients' early mobilisation and eventual return to work.

METHODOLOGY

ThE quasi-experimental study was conducted at the Department of Neurosurgery, Combined Military Hospital, Rawalpindi Pakistan, from October 2021, to September 2022 after approval from the Ethical

Committee and Institutional Review Board of the Hospital (ID 339/2021). The sample size was calculated using the WHO sample size calculator.10 The non-probability consecutive sampling technique was used to enrol the patients in the study.

Inclusion criteria: Patients aged 20 to 80 years, of either gender, having single level prolapsed intervertebral disc with nerve root compression, were recruited.

Exclusion Criteria: Patient with multi-level lumbar, recurrent disc, spinal instrumentation, spinal tumour surgery, fusion, or acute neurological deficit were excluded.

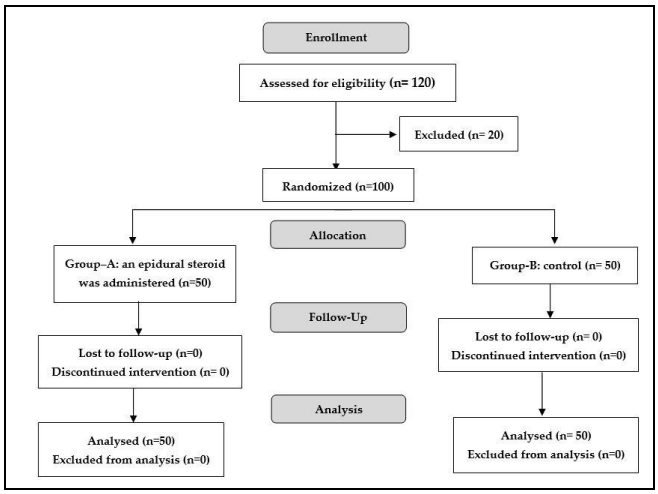

Figure: Patient Flow Diagram (n=100)

We included 100 diagnosed cases of prolapsed lumber intervertebral disc in our study and divided them into two groups by the lottery method (Figure).

The signs and symptoms were correlated with the prolapsed disc level, and a pre-operative MRI scan of the lumbo-sacral spine was done to confirm the diagnosis. All patients were initially given a conservative management (analgesics and physio-therapy) trial before enrolling in the study.

The clinical assessment of all patients was done by a consultant neurosurgeon from the operating team. Lumbar disc disease and its level were confirmed by plain magnetic resonance imaging of the lumbo-sacral spine. After the pre-anaesthesia assessment, informed written consent was obtained from all patients. Pain intensity was recorded pre-operatively, at 24 hours, 1 week, and 2 weeks post-operatively using the Visual Analogue Scale (VAS). The Visual Analogue Scale measured from 0 to 10, with 0 being no pain and 10 being the most pain ever felt. All patients were randomised into two groups using the lottery method. The patient was placed in a lateral decubitus position, with the affected side facing upwards and flexing hip and knee joints. The level of surgery. A straight cut was made along the middle of the affected disc space, and the paravertebral muscles were removed from the spinous process and vertebra lamina. Ligamentum flavum was excised, and the underlying thecal sac and nerve root were identified. Decompression (disectomy, foramenotomy, or laminectomy) was performed. Per-operatively, just after discectomy and decompression in Group-A, Triamcinolone acetonide (Kenacort), which is a mixture of 40 mg of Triamcinolone acetonide and 1 ml of normal saline, was put on the outside of the nose. Group -B served as a control, with no drug administered. Afterwards, the incision was closed in layers and shifted to the ward. Postoperatively, the doctor advised the administration of parenteral Paracetamol (1 gramme thrice daily). If the need arose, Tramadol 100 mg was also advised for parenteral administration. Physiotherapy was started the next day, and patients were discharged from the hospital when they were independently mobile. The patients were called for follow-up in the outpatient department after 1 week and then at 2 weeks. All patients were blind to randomization. All patients were operated on by a consultant neurosurgeon using the same technique; he was fully aware of the group, but the resident neurosurgeon, who was responsible for data analysis and follow-up, was completely blind to the group.

Statistical Package for the Social Sciences (SPSS) version 23.00 was used to analyse the data. Quantitative variables were expressed as median (IQR) and qualitative variables were expressed as frequency and percentages Mann-Whitney test was used to analyse the results, and the p value of ≤0.05 was considered significant.

RESULTS

A total of 100 patients were included in the study. The mean age of patients in Group A was 53.20±11.64 years. The pre-operative median VAS of Groups A and B was not significant at pre-operation, as the p value was 1.00. After 24 hours of operation, the median VAS of Group A patients was VAS 3(1), while in Group-B it was 2(1), with a p-value of 0.001. After 1 week, the median VAS of Group-A patients was 2(2) and Group- B was 3(1), with a significant p value of

0.024. After 2 weeks, the median VAS of Group-A patients was 1(1) and Group B was 2(1), with a significant *p* value of 0.015 shown in Table.

Table: Median Visual Analogue Scale Score of Low Back Pain (n=100)

	VAS Pre-operation	VAS after 24 hrs	VAS after 1 week	VAS after 2 weeks
Group-A	8(0)	3(1)	2(2)	1(1)
Group-B	8(0)	2(1)	3(1)	2(1)
p-value	1.00	0.001	0.024	0.015

DISCUSSION

Our study showed that intra-operative epidural and foraminal administration of steroids in single-level lumbar disc surgery significantly reduces pain in the immediate postoperative period but has no benefit in the follow-up period. Lumbar disc surgery for herniated discs is one of the most frequently performed procedures in neurosurgical practices.[11]

Several research studies emphasise the role of intra-operative epidural administration of steroids on post-operative pain management.[12,13] These studies differ in the types of steroid used and surgery, post-operative assessment of pain at different intervals, complications, patient mobilization, discharge from the hospital, and return to work.[14,15]

A comparative study compared the effects of epidural and intravenous applications of steroids after percutaneous endoscopic lumbar discectomy. Data for VAS was collected. In the epidural steroid cohort, there was a significant pain reduction at 1, 3, and 7 days after surgery compared to the intravenous cohort, but there was no statistical difference at 1, 6, and 12 months follow-up. This showed that applying an epidural steroid has a better effect on controlling short-term post-op pain after percutaneous endoscopic lumbar discectomy.[16]

Wilson-Smith *et al*. did a meta-analysis of 17 randomised controlled trials to find out how well giving steroid epidurals during lumbar disc surgery affected pain afterward, the use of opioid painkillers, and the length of hospital stay. A visual analogue scale was applied to assess the severity of the pain. Triamcinolone and dexamethasone had superior VAS outcomes at 24 hours. Paradoxically, methylprednisolone does not fare well at the 24-hour mark. Steroids have also been shown to reduce the length of hospital stays and post-operative opioid analgesia.[17]

A randomised control trial conducted assessed the efficacy of epidural injection of a steroid (betamethasone) in percutaneous endoscopic lumbar disc surgery. 126 patients from 17 to 75 years of age were enrolled and divided into groups. In group 1, patients were injected with normal saline after surgery, while in group 2, an epidural injection of betamethasone, lidocaine, and mecobalamine was used.[18] In another study the mean postoperative stay in hospital in groups 1 and 2 was 4.61+1.25 and 2.53+0.69 days, while the period of return to work was 4.31+0.47 and 3.14+0.52, respectively, indicating significant differences between the two groups. (*p*-value= 0.000). VAS and JOA sores after 24 hours, 7 days, and 1 month were better in group 2 than in group 1 (*p*-value = 0.000). However, no significant difference was noted at 6 months. (*p*>0.05). The clinical outcome, as evaluated by modified MacNab criteria, showed no significant difference between the two groups. (*p*-value=0.087). [19]

Another study compared the efficacy and complications of epidural steroid administration and placebo after herniated lumbar disc surgery. A total of 1006 patients were enrolled. The study included 502 patients in the epidural steroid group and 504 patients in the placebo group. The mean difference in VAS scores for lower back pain at 1 and 4 weeks post-op, leg pain at 1 and 4 weeks post-op, morphine consumption during the post-op period, and hospital stay was -0.53 (95% CI-1.42, 0.36), -0.89(95% CI-1.36, -0.42), - 0.63(95% CI -0.75,-0.50) score, -0.47(95% CI -0.78, -0.15) mg, and -0.89 (95% CI-1.49, -0.30) days lower compared to the placebo group.[20] In another study, intra-op epidural steroid administration reduces post-op morphine consumption in conventional surgical approaches for lumbar discectomy but not for MIS.[21]

A previous study evaluated the effect of epidural application of Triamcinolone during lumbar discectomy on post-operative pain. 30 patients received intra-operative steroids and were compared with 30 controls. The VAS for pain and the Oswestry Disability Index (ODI) were calculated pre-op, on the second post-operative day, and at 4 weeks. At day 2, the difference between the steroid application group and the control group in terms of objective functional impairment was significant (*p*<0.01). The steroid and control groups had a 30.6 vs. 36.2 ODI impairment (*p*<0.01). At 4 weeks, the steroid application group showed significantly less objective functional impairment and was also less disabled on ODI. 22 Our study

results are comparable to this study in the early post-operative period, but show no benefit from steroid use in the follow-up period at 2 weeks.

LIMITATIONS OF STUDY

At 6 and 12 months, the long-term efficacy of this adjunct treatment must be assessed. Patients must be closely monitored for complications associated with steroid treatment, especially superficial surgical site infections and deep infections.

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CONCLUSION

Intraoperative epidural and foraminal administration of steroids in single-level lumbar disc surgery, intraoperative epidural and foraminal steroids administration significantly reduces pain in the immediate postoperative period. However, it shows no benefit in pain control in the follow-up period.

Conflict of Interest: None.

Authors Contribution

Following authors have made substantial contributions to the manuscript as under:

SAA & HUK: Data acquisition, data analysis, data interpretation, critical review, approval of the final version to be published.

AAK & ZH: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

AR & BS: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

REFERENCES

1. Kim SK, Choe JY. Comorbidities and Health-Related Quality of Life in Subjects with Spine Osteoarthritis at 50 Years of Age or Older: Data from the Korea National Health and Nutrition Examination Survey. Medicina 2022; 58(1): 126. https://doi.org/10.3390/medicina58010126
2. 2. Berg AJ, Ahmadje U, Jayanna HH, Trégouët P, Sanville P, Kapoor V. The prevalence of lumbar disc degeneration in symptomatic younger patients: A study of MRI scans. J Clin Orthop Trauma 2020; 11(5): 932-936. https://doi.org/10.1016/j.jcot.2020.07.021
3. Amin RM, Andrade NS, Neuman BJ. Lumbar Disc Herniation. Curr Rev Musculoskelet Med 2017; 10(4): 507-516. https://doi.org/10.1007/s12178-017-9441-4
4. Xie G, Liang C, Yu H, Zhang Q. Association between polymorphisms of collagen genes and susceptibility to intervertebral disc degeneration: a meta-analysis. J Orthop Surg Res 2021; 16(1): 616. https://doi.org/10.1186/s13018-021-02724-8
5. Baldoni M, Gu W. Effect of fixed charge density on water content of IVD during bed rest: A numerical analysis. Med Eng Phys 2019; 70: 72-77. https://doi.org/10.1016/j.medengphy.2019.06.011
6. Zielinska N, Podgorski M, Haladaj R, Polguj M, Olewnik L. Risk Factors of Intervertebral Disc Pathology-A Point of View Formerly and Today-A Review. J Clin Med2021; 10: 409. https://doi.org/10.3390/jcm10030409
7. Ge Y, Chen Y, Guo C, Luo H, Fu F, Ji W, et al. Pyroptosis and Intervertebral Disc Degeneration: Mechanistic Insights and Therapeutic Implications. J Inflamm Res 2022; 15: 5857-71. https://doi.org/10.2147/JIR.S382069
8. Lama P, Le Maitre CL, Harding IJ, Dolan P, Adams MA. Nerves and blood vessels in degenerated intervertebral discs are confined to physically disrupted tissue. J Anat 2018; 233(1): 86-97. https://doi.org/10.1111/joa.12817
9. Wang Y, Che M, Xin J, Zheng Z, Li J, Zhang S. The role of IL-1β and TNF-α in intervertebral disc degeneration. Biomed Pharmacother. 2020; 131: 110660. https://doi.org/10.1016/j.biopha.2020.110660
10. Vo N, Couch B, Lee J, Sowa G, Kang J, Rebecca S. Actions of Prostaglandins on Human Nucleus Pulposus Metabolism Inferred by Cyclooxygenase 2 Inhibition of Cytokine Activated Cells. Neurospine 2020; 17(1): 60-68. https://doi.org/10.14245/ns.2040050.025
11. Rakan A, Aldurgham R, Al Abdallat A, Haddad S, Ibrahim J, Alqroom RY, et al. The Lead of Direct Adjuvant Intraoperative Foraminal Steroids' Infiltration. Anesth Essays Res. 2022; 16(2): 187-190. https://doi.org/10.4103/aer.aer_88_22
12. Khan AN, Jacobsen HE, Khan J, Filippi CG, Levine M, Lehman RA Jr, et al. Inflammatory biomarkers of low back pain and disc degeneration: a review. Ann N Y Acad Sci 2017; 1410(1): 68-84. https://doi.org/10.1111/nyas.13551
13. Liu Y, Wei J, Zhao Y, Zhang Y, Han Y, Chen B, et al. Follistatin-like protein 1 promotes inflammatory reactions in nucleus pulposus cells by interacting with the MAPK and NFκB signaling pathways. Oncotarget 2017; 8(26): 43023-43034. https://doi.org/10.18632/oncotarget.17400
14. Rao D, Scuderi G, Scuderi C, Grewal R, Sandhu SJ. The Use of Imaging in Management of Patients with Low Back Pain. J Clin Imaging Sci 2018; 8: 30. https://doi.org/10.4103/jcis.JCIS_16_18
15. Kim JH, van Rijn RM, van Tulder MW, Koes BW, de Boer MR. Diagnostic accuracy of diagnostic imaging for lumbar disc herniation in adults with low back pain or sciatica is unknown; a systematic review. Chiropr Man Therap 2018; 26: 37. https://doi.org/10.1186/s12998-018-0207-x
16. Liu XH, Du YM, Cong HJ, Liu GZ, Ren YE. Effects of Continuous Epidural Injection of Dexamethasone on Blood Glucose, Blood Lipids, Plasma Cortisol and ACTH in Patients With Neuropathic Pain. Front Neurol 2021; 11: 564643. https://doi.org/10.3389/fneur.2020.564643

17. Wilson-Smith A, Chang N, Lu VM, Mobbs RJ, Epidural Steroids at Closure After Micro-discectomy/Laminectomy for Reduction of Postoperative Analgesia: Systematic Review and Meta-Analysis. World Neurosurg 2018; 110: e212-e221.

https://doi.org/10.1016/j.wneu.2017.10.133

18. Korhonen T, Karppinen J, Paimela L, Malmivaara A, Lindgren KA, Bowman C, et al. The treatment of disc-herniation-induced sciatica with infliximab: one-year follow-up results of FIRST II, a randomized controlled trial. Spine 2006; 31(24): 2759-2766.

https://doi.org/10.1097/01.brs.0000245873.23876.1e

19. Costelloe C, Burns S, Yong RJ, Kaye AD, Urman RD. An Analysis of Predictors of Persistent Postoperative Pain in Spine Surgery. Curr Pain Headache Rep 2020; 24(4): 11.

https://doi.org/10.1007/s11916-020-0842-5

20. Prabhakar NK, Chadwick AL, Nwaneshiudu C, Aggarwal A, Salmasi V, Lii TR, et al. Management of Postoperative Pain in Patients Following Spine Surgery: A Narrative Review. Int J Gen Med 2022; 15: 4535-4549.

https://doi.org/10.2147/IJGM.S292698

21. Wong HK, Tan KJ. Effects of corticosteroids on nerve root recovery after spinal nerve root compression. Clin Orthop Relat Res 2002; (403): 248-252.

https://doi.org/10.1097/00003086-200210000-00036

22.Hu A, Gu X, Guan X, Fan G, He S. Epidural versus intravenous steroids application following percutaneous endoscopic lumbar discectomy. Medicine 2018; 97(18): e0654.

https://doi.org/10.1097/MD.0000000000010654