Efficacy of intraoperative epidural dexamethasone and bupivacaine in reduction of pain and disability following lumbar discectomy

Reza Saebi¹, Aidin Shakeri¹, Alireza Mohammadi¹, Mohsen Dalvandi¹, Alireza Kamali²

Departments of ¹Neurosurgery and ²Anesthesiology and Critical Care, Arak University of Medical Sciences, Arak, Iran

ABSTRACT

Background: In lumbar disc herniation, although surgery can provide relief from pain in the low back and lower extremities, many drugs can provide more relief; thus, the aim was the evaluation of epidural dexamethasone and bupivacaine efficacy in lumbar disc herniation surgery. Methods: A total of 42 cases were evaluated in a triple-blind randomized clinical trial study. Patients were divided into intervention and control groups based on permuted block randomization. The patient’s condition was assessed based on the Visual Analogue Scale (VAS) at 3, 6, 12, and 24 h and 1, 3, and 6 months after surgery. In addition, the patient’s disability was assessed by Oswestry disability index (ODI) at 1 and 6 months after surgery. Results: Of the 42 evaluated cases, age (44.0 ± 12.4, P = 0.4) and hospitalization duration (1.9 ± 0.3 days, P = 0.02) had statistically significant difference between two groups. The severity of low back pain before surgery was 2.9 ± 1.9 (P = 0.74), and 3 hours after surgery was 4.9 ± 1.9 in the control group and 2.8 ± 1.3 in the intervention group (P = 0.03), and there was a statistically significant difference between the two groups. In addition, based on the repeated measure test, there was no significant difference between the two groups. ODI value was before surgery 31.7 ± 8.3 (P = 0.77), 5.2 ± 2.4 (P = 0.9) at 1 month after surgery, and 4.5 ± 1.8 (P = 0.6) at 6 months after surgery, and there was no statistically significant difference between the two groups. Conclusion: Dexamethasone and bupivacaine can be effective in post-operation pain control, although this difference between the two groups was not statistically significant.

Keywords: Bupivacaine, dexamethasone, discectomy

Introduction

Low back and radicular pain in candidate cases for discectomy are common clinical manifestations of lumbar disc herniation.¹ Discectomy is one of the most common surgeries performed on the spine. In addition, cases under lumbar discectomy experience recurrent and/or persistent lower extremities or back pain following surgery.²,³

However, basic and clinical aspects of pain modulation and transmission have increased dramatically, and postoperative pains are insufficiently treated. This condition and this pain delay physical therapy and mobilization, increase hospitalization, and change patient perspective conditions.⁴ Increased postoperative pain has been related to complications, including myocardial ischemia, pulmonary embolism, deep venous thrombosis, decreased pulmonary function, postoperative chronic pain, and infections.⁵ Some studies have examined novel and additional postoperative analgesics, including intraoperative local anesthetics and/or corticosteroids.⁶

Address for correspondence: Dr. Aidin Shakeri, Department of Neurosurgery, Arak University of Medical Sciences, Arak, Iran. E-mail: shakeriaidinmd@gmail.com

Received: 20-04-2021 Revised: 12-08-2021 Accepted: 28-10-2021 Published: 14-05-2022

Quick Response Code:
Website: www.jfmpc.com
DOI: 10.4103/jfmpc.jfmpc_934_21

How to cite this article: Saebi R, Shakeri A, Mohammadi A, Dalvandi M, Kamali A. Efficacy of intraoperative epidural dexamethasone and bupivacaine in reduction of pain and disability following lumbar discectomy. J Family Med Prim Care 2022;11:1810-4.
For many years, epidural steroids have been administered as an additional drug in lumbar disc surgery. Novel approaches in this condition are an effort to decrease the late formation of scars and early postoperative inflammation to reduce postoperative pain. Ranguis et al. in a systematic review of 12 clinical trials examined subjects during 1992–2008 for reduction of postoperative pain of discectomy. Also, a study on 112 neurosurgeons in 2009 observed that 61% do not administer epidural steroids in lumbar discectomy. This indicates that the clinical effects of intraoperative steroids in lumbar discectomy are still controversial. Based on the importance of pain reduction in a candidate for discectomy, the aim of the study was the evaluation of epidural dexamethasone and bupivacaine in discectomy for postoperative pain control, as a clinical trial study.

Materials and Methods

Study oversight
The protocol was approved by relevant ethics committees and institutional review boards. Written informed consent was obtained from each patient before the study. This study was performed to evaluate dexamethasone and bupivacaine efficacy on postoperative pain of discectomy. In this study, patients with disc herniation presenting in Vliasr Hospital in Arak and satisfying the inclusion criteria were considered as the study group.

Study participants
In total, 42 patients with unilateral lumbar disc herniation presenting to Vliasr Hospital in Arak who were candidates for unilateral laminectomy surgery were considered as the study group. These patients were divided into intervention (N = 21) and control (N = 21) groups.

Study design and procedures
This study is a triple-blind (patients, surgeon, and postoperative clinical evaluator) randomized clinical trial study to evaluate the effects of dexamethasone and bupivacaine to reduce low back and leg pain and other postoperative symptoms associated with lumbar disc herniation.

We selected 42 patients for one-sided discectomy referring to Vliasr Hospital in Arak. By block random sampling, we divided the patients into two equal groups of control and intervention. Patients with complaints of radicular and low back pain were carefully examined and after matching the patients with MRI images and spinal X-rays were candidates for discectomy in the study.

Inclusion criteria were selected patients in the range of 17–75 years who were candidates for unilateral laminotomy and discectomy with a diagnosis of unilateral lobar disc herniation. Exclusion criteria consisted of multilevel disc herniation, spinal instability, patients with couda equina syndrome, and any pathology of the spine, including kyphosis and scoliosis, modal changes, or current or previous infection.

Sufficient information about the study was given to the patients; then, the forms related to Visual Analogue Scale (VAS) and Oswestry Disability Index (ODI) were delivered to the patients. Preoperative procedures were performed uniformly for patients. Patients were operated by a midline incision and unilateral laminotomy and discectomy. All surgical procedures for patients were performed in exactly the same way by a surgeon. At the end of the surgery, after discectomy and release of nerve root and checking foramina, patients were divided into two groups of intervention and control. For the intervention group, 2 cc of dexamethasone (8 mg) and bupivacaine (4 cc of 0.5% solution) impregnated gelfoam (2 × 1) was applied at the entrance of irritated nerve root foramina. In addition, for the control group, only 6 cc of normal saline impregnated gelfoam was used at the injured nerve root foramina.

Outcomes
In follow-up, we used VAS and ODI indices. The ODI consists of 10 questions that describe the severity of pain and limitations experienced by the patient in the positions of sleeping, sitting, standing, walking, resting, intercourse, activities, body moving, and personal activities determined based on the 0–5 Likert numbers. If the patient has no pain and limitations related to the mentioned activity, the score is 0. If severe pain causes inability to perform the mentioned activity, the score is 5. In total, the patient’s disability score is numerically between 0 and 50, and a higher score means the severity of the patient’s disability is higher. In addition, VAS as patients pain intensity scale is a numerical index from 0 to 10. This questionnaire was completed once before surgery, four times after surgery at intervals of 3, 6, 12, and 24 h after surgery, and twice at 1 and 6 months after surgery.

In addition, the total dose of opioids received by the patients in the hospital was also recorded. Morphine intake for patients with moderate to high pain intensity (VAS above 4) was injected intramuscularly. Patients get out of bed at the earliest opportunity and begin to walk, and were discharged 24–48 h after surgery.

Statistical analysis
After collecting the data, the information was analyzed by SPSS software (version 23) with Chi-square (Qualitative data) and Independent Sample T-test (Quantitative data). In addition, we used the repeated measure test for analytic evaluation of patients at follow-up.

Ethical considerations
1. The principles of confidentiality were observed at all stages of the study.
2. At all stages, researchers complied with the provisions of the Declaration of Helsinki.
3. No additional costs were imposed on patients.
4. In the process of treatment, no changes were made and routine treatment was performed on patients.

(Ethical Code: IR.ARAKMU.REC.1399.185, IRCT Code: IRCT20201003048906N1)

**Results**

**Basic and clinical characteristics**

In the 42 evaluated cases, the age was 44.0 ± 12.4 years, 40.7 ± 11.2 and 46.6 ± 13.0 years in the intervention and control groups, respectively (P = 0.4). Hospitalization duration was 1.9 ± 0.3 days, 1.8 ± 0.3 and 2.1 ± 0.3 days in the intervention and control groups, respectively (P = 0.02), and there was a statistically significant difference between the two groups. Regarding imaging, L3-L4, L4-L5, and L5-S1 levels were found in 1, 20, and 21 patients, respectively (P = 0.2) [Table 1].

**Visual analog scale**

Lower extremity pain intensity scores before surgery (P = 0.87), 3 h (P = 0.5), 24 h (P = 0.7), 2 weeks (P = 0.4), 1 month (P = 1.0), 3 months (P = 1.0), and 6 months (P = 0.3) after surgery did not have statistically significant difference between the two groups, but this index at 6 h (P = 0.04), and 12 h (P = 0.03) after surgery had significant difference [Table 2]. Based on the repeated measure test, there was no statistically significant difference between the two groups (P = 0.21) [Figure 1]. Low back pain severity scores before surgery (P = 0.74), 6 h (P = 0.5), 12 h (P = 0.6), 24 h (P = 0.7), 2 weeks (P = 0.6), 1 month (P = 0.8), 3 months (P = 0.6), and 6 months (P = 0.6) after surgery were not statistically significant different between the two groups. However, this index 3 h after surgery showed a statistically significant difference between the two groups (P = 0.03). Based on the duplicate data test, there was no statistically significant difference between the two groups [Table 3]. Based on the repeated measure test, there was no statistically significant difference between the two groups (P = 0.41) [Figure 1].

**Oswestry disability index**

ODI before surgery (P = 0.77) and 1 (P = 0.9) and 6 months (P = 0.6) after surgery did not have statistically significant differences between the two groups [Table 4]. Based on the repeated measure test, there was no statistically significant difference between the two groups of two (P = 0.70) [Figure 1].

**Analgesics**

Also, analgesics consumption in the intervention group was 2.3 ± 2.5 and in the control group was 3.5 ± 3.5 mg (P = 0.2), and there was no statistically significant difference between the two groups [Table 5].

**Discussion**

In candidate cases for discectomy, low back and radicular pain are common clinical manifestations of lumbar disc herniation.\(^1\)

**Table 1: Basic and clinical data of evaluated cases**

| Variables          | Intervention | Control | Total | Statistical Value |
|--------------------|--------------|---------|-------|-------------------|
| Age                | 0.4\(^1\)    |         |       |                   |
| Mean               | 42.3         | 45.6    | 44.0  |                   |
| SD                 | 11.9         | 13.0    | 12.4  |                   |
| Hospitalization duration | 0.02\(^1\) |         |       |                   |
| Mean               | 1.8          | 2.1     | 1.9   |                   |
| SD                 | 0.3          | 0.3     | 0.3   |                   |
| Disc Level         |              |         |       | 0.2\(^2\)         |
| L3-L4              | 0            | 1       | 1     |                   |
| L4-L5              | 8            | 12      | 20    |                   |
| L5-S1              | 13           | 8       | 21    |                   |

\(^1\)Independent Sample t-test. \(^2\)Chi-square

**Table 2: Lower extremities pain (VAS) in the follow-up of evaluated cases**

| VAS                  | Intervention | Control | Total | Statistical Value |
|----------------------|--------------|---------|-------|-------------------|
| Preoperational       | 7.5±1.7      | 7.3±1.9 | 7.4±1.8 | 0.87              |
| 3 Hours              | 1.5±1.4      | 2.4±1.7 | 2.0±1.6 | 0.09              |
| 6 Hours              | 1.3±1.0      | 2.0±1.2 | 1.6±1.1 | 0.04              |
| 12 Hours             | 0.9±0.9      | 1.5±0.9 | 1.2±0.9 | 0.03              |
| 24 Hours             | 1.2±0.8      | 1.4±1.1 | 1.3±0.9 | 0.6               |
| 2 Weeks              | 1.1±0.9      | 1.4±0.8 | 1.3±0.9 | 0.4               |
| 1 Month              | 1.2±0.8      | 1.2±0.9 | 1.2±0.8 | 1.0               |
| 3 Months             | 0.9±0.7      | 0.9±0.8 | 0.9±0.8 | 1.0               |
| 6 Months             | 1.0±0.7      | 0.7±0.8 | 0.8±0.7 | 0.3               |

\(^1\)Independent Sample t-test. \(^2\)Chi-square

**Figure 1:** ODI, lower extremities, and low back pain in follow-up of evaluated cases
Cases under lumbar discectomy experience recurrent and/or persistent lower extremities or back pain following surgery.[2,3] Novel methods for reducing postoperative pain are an effort to decrease the late formation of scars and early postoperative inflammation.[8] In the present study, it was observed that lower limb pain before discectomy was 7.4 ± 1.8 (P = 0.87), and 6 and 12 hours after surgery had a statistically significant difference in the two groups. Also, the severity of low back pain before surgery was 2.9 ± 1.9 (P = 0.74), and 3 hours after surgery, there was a statistically significant difference between the two groups (P = 0.03). In addition, based on the repeated measure test, there was no significant difference between the two groups. Samoladas et al.[9] evaluated epidural steroids in analgesia of discectomy and stated that none of the patients in the intervention group and 12 patients in the control group needed more analgesics (P = 0.01). Three hours after surgery, VAS was significantly lower in the intervention group compared to the control group (P < 0.05). Cai et al.[8] observed that epidural steroids were associated with reduction of three indices included as lower extremities and low back pain, morphine use, and hospitalization, which these studies were consistent with the present study.

Aminmansour et al.[10] reported that the lower extremity pain was lower in the dexamethasone group, although this difference was not statistically significant. However, we observed a statistically significant difference. Mirzai et al.[10] found that epidural methylprednisolone reduced low back pain and reduced opium use in discectomy candidates. Modi et al.[11] observed that epidural methylprednisolone reduced low back pain of the intervention group within 1 month after surgery in the intervention group. Debi et al.[12] observed that epidural methylprednisolone reduced back and lower limb pain in patients after unilateral lumbar disc surgery. Tavakol et al.[13] commented that dexamethasone can reduce VAS after discectomy. Ranguis et al.[7] in a systematic review of 12 clinical trials examined subjects during 1992–2008 for reduction of postoperative pain of discectomy. Also, a study on 112 neurosurgeons in 2009 observed that 61% do not administer epidural steroids in lumbar discectomy.[8] This indicates that the clinical effects of intraoperative steroids in lumbar discectomy are still controversial. However, based on most of the discussed studies, equal to our results, steroid administration can reduce early postoperative pain and introduce better conditions for these patients.

## Conclusion

Dexamethasone and bupivacaine combination can be effective in improving the pain score of patients after discectomy, which can be associated with reducing lower extremities and low back pain and lower analgesics administration after surgery; however, this difference was not statistically significant in all times interval.

## Acknowledgements

This work was performed in partial fulfillment of the requirements for Dr. Reza Saebirad in School of Medicine, Arak University of Medical Sciences, Arak, Iran.

## Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

## Financial support and sponsorship

Nil.

## Conflicts of interest

There are no conflicts of interest.

## References

1. Rasmussen S, Krum-Møller DS, Lauridsen LR, Jensen SEH, Mandle H, Gerlif C, et al. Epidural steroid following discectomy for herniated lumbar disc reduces neurological impairment and enhances recovery: A randomized study with two-year follow-up. Spine 2008;33:2028-33.
2. Ersayli DT, Gurbet A, Bekar A, Uckunkaya N, Bilgin H. Effects of perioperatively administered bupivacaine and bupivacaine-methylprednisolone on pain after lumbar

### Table 3: Low back pain (VAS) in the follow-up of evaluated cases

| ODI       | Preoperational | 3 Hours | 6 Hours | 12 Hours | 24 Hours | 2 Weeks | 1 Month | 3 Months | 6 Months | Total     | Sample t-test | P       | Repeated Measure t-test |
|-----------|----------------|---------|---------|----------|----------|---------|---------|----------|----------|----------|-------------|---------|-------------------------|
| Intervention | 3.0±2.0       | 2.8±1.3 | 2.2±1.3 | 1.9±0.9  | 1.6±1.2  | 2.3±1.5 | 2.3±1.1 | 1.5±0.9  | 1.7±0.8  | 32.1±9.3 | 0.74        | 0.41    |                         |
| Control    | 1.9±1.0        | 1.9±1.0 | 2.4±1.3 | 2.0±1.1  | 1.8±1.2  | 2.2±1.1 | 2.1±1.3 | 1.4±1.1  | 1.9±1.1  | 31.3±7.4 | 0.70        | 0.03    |                         |
| Total      | 4.9±3.0        | 4.7±2.4 | 4.6±2.6 | 3.9±2.0  | 3.4±2.4  | 4.5±2.6 | 4.4±2.4 | 2.9±1.2  | 3.6±1.9  | 63.4±16.7 | 0.74      | 0.03    |                         |

### Table 4: ODI condition in the follow-up of evaluated cases

| ODI       | Preoperational | 1 Month | 6 Months | Total     | Sample t-test | P       | Repeated Measure t-test |
|-----------|----------------|---------|----------|----------|-------------|---------|-------------------------|
| Intervention | 31.3±7.4      | 5.2±2.5 | 4.7±1.8  | 31.7±8.3 | 0.77        | 0.70    |                         |
| Control    | 32.1±9.3       | 5.2±2.3 | 4.4±1.9  | 31.7±8.3 | 0.74        | 0.70    |                         |
| Total      | 63.4±16.7      | 10.4±4.8 | 9.1±3.7  | 63.4±16.7 | 0.74        | 0.03    |                         |

### Table 5: Amount of analgesics consumed

| Analgesics | Preoperational | Independent Sample t-test |
|-----------|----------------|-------------------------|
| Mean±SD   | 2.3±2.5        | 3.5±3.5                 |
| Interven   | 2.9±3.1        | 0.2                     |
| Control    | 3.5±3.5        |                         |
| Total      | 6.4±6.0        |                         |
Saebi, et al.: Intraoperative epidural dexamethasone and bupivacaine
discectomy. Spine 2006;31:2221-6.
3. Aminmansour B, Khalili HA, Ahmad J, Nourian M. Effect of high-dose intravenous dexamethasone on postlumbar discectomy pain. Spine 2006;31:2415-7.
4. Lundin A, Magnuson A, Axelsson K, Kogler H, Samuelsson L. The effect of perioperative corticosteroids on the outcome of microscopic lumbar disc surgery. Eur Spine J 2003;12:625-30.
5. Barnett RA, Ochroch EA. Epidural analgesia: Management and outcomes. Ann Longterm Care 2003;11:33-9.
6. Cai J, Jiang W, Qiu B, Song Y. Efficacy and safety of epidural steroid injection following discectomy for patients with lumbar disc herniation: A protocol. Medicine 2020;99:e21220.
7. Ranguis SC, Li D, Webster AC. Perioperative epidural steroids for lumbar spine surgery in degenerative spinal disease: A review. J Neurosurg Spine 2010;13:745-57.
8. Cenic A, Kachur E. Lumbar discectomy: A national survey of neurosurgeons and literature review. Can J Neurol Sci 2009;36:196-200.
9. Samoladas E, Kapinas A, Papadopoulos DV, Gkiatas I, Papastefanou S, Gelalis ID. Intraoperative epidural application of steroid and local anaesthetic agent following lumbar discectomy: A prospective double blinded randomized controlled trial. J Clin Orthop Trauma 2019;10(Suppl 1):S143-6.
10. Mirzai H, Tekin I, Alincak H. Perioperative use of corticosteroid and bupivacaine combination in lumbar disc surgery: A randomized controlled trial. Spine (Phila Pa 1976) 2002;27:343-6.
11. Modi H, Chung KJ, Yoon HS, Yoo HS, Yoo JH. Local application of low-dose Depo-Medrol is effective in reducing immediate postoperative back pain. Int Orthop 2009;33:737-43.
12. Debi R, Halperin N, Mirovsky Y. Local application of steroids following lumbar discectomy. J Spinal Disord Tech 2002;15:273-6.
13. Tavakol K, Daneshi A, Karimzadeh SK. Effect of instillation of morphine and dexamethasone in epidural space on postoperative pain in discectomy operation. Armaghan Danesh 2007;12:107-15.