

## Research Article

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# The Effect of Bupivacaine on Pain Relief After Lumbar Decompression Surgery

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## Abstracts

**Aim:** there are many reports about the efficacy of analgesics in reducing postoperative pain after lumbar decompressive surgery. This study aimed to investigate the effect of subdermal and intramuscular injection of bupivacaine on the severity of postoperative pain after lumbar decompression surgery.

**Material and Methods:** in this randomized double-blind trial, 50 patients who candidate for lumbar decompressive surgery elective for this them. Bupivacaine (0.25%) in the intervention group and normal saline (40 ml) in the control group were injected subcutaneously and intramuscularly. Factors of age, size of surgical cutting, number of operating spaces, duration of operation, the rate of need to analgesia, and the severity of pain at times of 3,12 and 24 hours after surgery were assessed.

**Results:** the severity of pain in Bupivacaine group, in hours 3, 12 and 24 after postoperative surgery was less than control group (P value<0.05). Also, there was no significant difference between the two groups in terms of mean pain intensity using repeated measure design (P value<0.05). But within Bupivacaine group, pain severity significantly decreased during the 24 hours after surgery. (p<0.05)

**Conclusion:** Although bupivacaine (0.25%) results in reducing pain after surgery, more studies are recommended to investigate the effect of bupivacaine in combination with other drugs in cases of lumbar decompressive surgery. Also, it reduces pain during the 24 hours after surgery is very important.

**Keywords:** Bupivacaine; Pain relief; Lumbar decompression surgery

## Introduction

Lumbar decompressive surgery is indicated whenever pain and neural complications of herniated discs, despite conservative treatment, continue. Lumbar decompression is a common procedure for treatment of spine pathology [1]. Despite progresses in realizing postoperative acute pain entity in recent decades, still 80% of patients suffer from pain after surgery [2]. Undermanaged pain could lead to depression, autonomic over-reaction and joints stiff

ness [3,4]. Post laminectomy pain has been reported to be caused by some potential pathological changes occurring around the nerve tissue such as inflammation, edema, fibrosis and mechanical pressure on the posterior longitudinal ligament and central sensitization [5]. The origin of lumbar and back pain is irritation of no acceptors and mechanoreceptors of vertebrae, discs, duramater, facet capsules, muscles and ligaments [3,6]. By activating the

sympathetic system, uncontrolled postoperative pains may lead to complications and even death. Sympathetic activity increases myocardial oxygen consumption and causes cardiac ischemia and infarction [7]. Sympathetic activity may also decrease gastro-intestinal motility and depth of inspiration leading to paralytic ileus and respiratory complications [7]. Administration of non-steroidal anti-inflammatory drugs (NSAIDs) and opioids is a common method in postoperative pain control [8]. Using opioids alone is not effective in reducing these types of pains, so different drugs including corticosteroids and local anesthetics are also noted [9]. Although analgesics are usually used to control moderate to severe post-discectomy pains, but their side effects reduce their applying range [4]. Local anesthetics affect cell wall proteins and inhibit secretion and activity of prostaglandins and nociceptors stimulating lysosome enzymes [10]. On the other way, local anesthetics, by inhibiting the Na pumps, block the transit of neural messages along the nerve [11].

Local anesthetics for reducing pain Decreases the high costs of anti-inflammatory drugs, opioids and infusion pumps. Local infiltration of bupivacaine is a known method of postoperative pain reduction in many other surgical specialties effective in some [12,13], noneffective in others [14,15]. Combination of long acting anesthetic agent and corticosteroid can reduce postoperative discomfort [16]. As there are limited numbers of such studies in our country, we decided to perform the study to see whether it could lead to better pain control or not.

## Materials and Methods

This is a double blind randomized clinical trial performed on 50 patients with disc herniation and canal stenosis, referring to Rajaei hospital, Qazvin (2019), to evaluate the effects of local injection of bupivacaine in reducing postoperative pain. This study approved by ethical committee of Qazvin University of Medical Sciences with ethical number of IR.QUMS.REC.1395.119.

There is no conflict with ethical considerations. Also, the re-

search protocol was approved by the Iranian Registry of Clinical Trials (IRCT2017020625676N8). After signing the personal testimonial papers of participating in the clinical trial, 50 patients (class ASA I and II) randomly entered in groups: interventional and control. The interventional group (25 patients) was injected subdermal and intramuscular bupivacaine and the control group (25 patients) received only normal saline in the same way. Addicted patients and those with surgery duration more than 2.5 hours were omitted from the study. At the end of operation in the interventional group, bupivacaine 0.25% and in the control group, 40 ml normal saline were infiltrated subdermally and intramuscularly while the surgeon and educated nurse were not aware of the type of drugs injected. Before surgery, the patients were educated to use VAS (visual analogue scale) to point their postoperative pain severity. Pain severity was registered at hours 3, 12 and 24 by educated personnel (either nurse or physician). For those patients with VAS $\geq$ 4 morphine was injected intravenously and the dose used were documented in the clinical dossier.

## Statistical method

Kai score was used for qualitative factors analysis, T-test two independent samples, for quantitative factors and repetitive measures in SPSS-22 software was used for evaluation of pain intensity during different periods of time.

## Results

Information of 50 patients were analyzed. 26 (52%) received bupivacaine and 24(48%) received normal saline. In bupivacaine group the average age was 43.62 $\pm$ 11.41 and in saline group was 44.54 $\pm$ 15.25. Age range of patients was 25-72 years. 11 men (45.8%) and 15 women (57.7%) received bupivacaine. 13 men (54.2%) and 11 women (42.3%) received saline. There was no significant difference in regard to age ( $P=0.191$ ) and gender ( $P=0.290$ ) between the two groups. Other patient characteristics are shown in Table 1.

**Table 1:** Demographic characteristics of two groups.

Parameter	Rank	Bupivacaine	Normal Saline	P-Value
age	<42	(4/44%)12	(6/55%)15	191/0
>42	(9/60%)14	(1/39%)9		
Operated side	unilateral	(7/66%)2	(3/33%)1	531/0
bilateral	(1/51%)24	(9/48%)23		
Operated levels	One level	(3/54%)19	(7/45%)16	426/0
More than one level	(7/46%)7	(3/53%)8		
operation duration	<80 min	(1/57%)16	(9/42%)12	296/0
>80 min	(5/45%)10	(5/54%)12		
Analgesic dose	-	41/3 $\pm$ 53/4	64/3 $\pm$ 25/5	479/0
Pain severity (3 hours after operation)	-	46/2 $\pm$ 08/5	15/2 $\pm$ 88/4	760/0
Pain severity (12 hours after operation)	-	05/2 $\pm$ 73/3	15/2 $\pm$ 75/3	974/0
Pain severity (24 hours after operation)	-	65/1 $\pm$ 19/2	61/1 $\pm$ 42/2	629/0

No significant difference at 3, 12 and 24 hours were noted in the two groups (Table 2). We did not find significant difference in

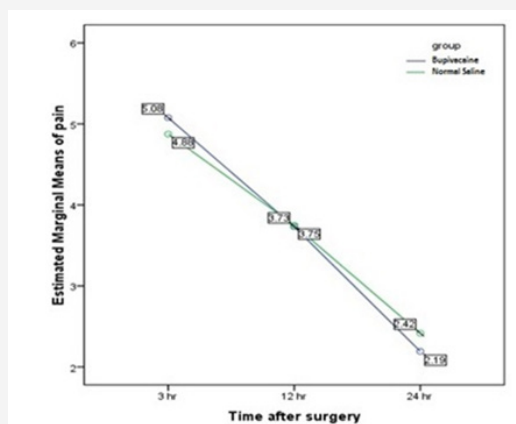
average pain severity between the two groups but in each group, pain severity during 24 hours after operation, decreased signifi-

cantly ( $p=0.0001<0.05$ ) Figure 1). Although during 12 to 24 hours after operation, bupivacaine reduced pain severity but, in both groups, changes in pain severity were close and showed no statistical difference ( $P=0.441$ ). Also, whole pain average during 24 hours

after operation, was  $3.66\pm 0.35$  in bupivacaine group and  $3.68\pm 0.36$  in saline group. So, no significant difference were found between the two groups ( $P=0.978$ ) (Figure 1).

**Table 2:** Comparison of groups regarding different parameters.

Parameter		Bupivacaine			Normal Saline		
		12 hours	24 hours	3 hours	12 hours	24 hours	3 hours
gender	male	91/1±36/2	11/2±36/3	29/2±45/4	86/0±08/2	75/1±62/3	55/1±38/4
	female	48/1±07/2	03/2±4	56/2±53/5	18/2±82/2	62/2±91/3	65/2±45/5
	P-value	659/0	446/0	279/0	310/0	747/0	233/0
age	<42	41/2±25/5	22/2±67/3	44/1±92/1	18/2±73/4	05/2±67/3	52/1±20/2
	>42	58/2±93/4	96/1±79/3	82/1±43/2	21/2±11/5	42/2±89/3	78/1±78/2
	P-value	748/0	886/0	441/0	678/0	813/0	408/0
Operated levels	One level	52/2±84/4	09/2±53/3	80/1±16/2	24/2±88/4	25/2±4	41/1±38/2
	More than one level	36/2±71/5	97/1±29/4	25/1±29/2	10/2±88/4	98/1±25/3	07/2±5/2
	P-value	435/0	413/0	865/0	0.999	433/0	863/0
operation duration	<80 min	74/2±25/5	16/2±8/3	86/1±44/2	02/2±42/4	15/2±42/3	40/1±17/2
	>80 min	04/2±8/4	95/1±6/3	22/1±8/1	27/2±33/5	19/2±08/4	82/1±67/2
	P-value	638/0	803/0	348/0	307/0	460/0	460/0



**Figure 1:** Mean of decrease pain at time of postoperative surgery.

The effect of bupivacaine on pain reduction in regard to patients' characteristics were not significant but in women and in ages below 42 and also in patients with one level surgery and operations lasting more than 80 minutes, bupivacaine mildly reduced the pain during 24 hours after operation.

## Discussion

In this study, we compared the effects of bupivacaine and saline (as placebo) injection in time intervals and found no significant differences in the two study groups, with regard to mean age, gender distribution, pain relief and analgesic drug requirement. Cook and Mullen (1979) firstly suggested local bupivacaine injection for lumbar post laminectomy pain relief. Teddy et al (1981) in a double-blind clinical trial found no significant difference in VAS grading

postoperative pain in "case" and "control" groups [17]. Rahmanian et al study (2015) also showed no significant difference in pain relief in "bupivacaine" and "saline" groups [18]. Donadi et al (2017) concluded that the local injection of magnesium sulfate and bupivacaine provided better pain control and analgesic effect was more significant [5]. Steel et al (1998) concluded that bupivacaine can reduce patients' pain score by more than 50% in the recovery room [19].

A reliable study to show the individual effects of bupivacaine on nociceptors is not available yet. Although in the present study normal saline 0.9% is supposed to be none effective on nociceptors but it may reduce the pain by decreasing the concentration of inflammatory mediators. Saline may also compress the nerve end-

ings, thereby blocking the conduction of nerve pulses and producing analgesia [20]. In study on cats (2007) normal saline was none effective on thermal, electrical and pressures no inceptor's [21].

In some studies, bupivacaine alone or in a combination with other drugs has been reported to be effective in reducing postoperative pain and the length of postoperative hospital stay [5]. Some recent studies have shown effectiveness of pregabalin in reducing pain and postoperative anxiety [22-24].

## Conclusion

With regard to previous studies and our present study, although bupivacaine alone had the effectiveness dose at less pain post-surgery, performing wider studies on the effect of bupivacaine combined with other drugs is suggested in lumbar spine surgery.

## Acknowledgement

None.

## Conflict of Interest

No conflict of interest.

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