# EFFECT OF PEROPERATIVE LOCAL LEVOBUPIVACAINE INFILTRATION TO PREVENT POSTOPERATIVE PAIN IN LUMBAR DISC HERNIECTOMY

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**ABSTRACT**

**Background:** It is aimed to search if peroperative levobupivacaine infiltration over the dorsal root can prevent postoperative pain.

**Materials and Methods:** This study was performed between the dates February 2010 - May 2012 in the Neurosurgical Department of Adıyaman Research and Application Hospital, in Turkey, among 120 patients who were operated for lumbar disc herniectomy. Half of them were given peroperative levobupivacaine (2 cc) on the related dorsal root, and the other half received serum physiologic (2 cc). After ten minutes, the operation continued. Postoperatively, the analgesic requirements of the patients were followed for 72 hours. The data is analyzed with Kolmogorov Smirnov analysis to check normal distribution. The data was convenient ($p>0.05$). Measurable data was analyzed with student t test and the comparison was made with chi-square ($\chi^2$). The data was evaluated in the confidence interval of 95% for both directions.

**Results:** The patients in the control group required analgesia immediately after the operation but in the levobupivacaine group the earliest analgesic requirement was after 4 hours, but some of the patients did not need any analgesic even up to 50 hours.

**Conclusion:** We propose that peroperative local anesthetic infiltration reduced significantly postoperative analgesic requirement.

**Key words:** lumbar disc herniectomy, levobupivacaine, postoperative analgesia, preemptive analgesia

## 1. INTRODUCTION

Herniated lumbar disc, defined as the herniation of nucleus pulposum through the sheared lamellae of annulus fibrosus, is one of the most commonly diagnosed abnormalities associated with low back pain (LBP) (1, 2), which can lead to work disability (3). For decades, lumbar discectomy has been one of the most common surgical practices performed by neurosurgeons as the complete treatment even though recently a trend against surgery appeared, since many patients still suffer from pain and they are not able to return to their daily physical activities. Insufficient pain treatment increase postoperative pain and complaints and the recovery is longer (4, 5).

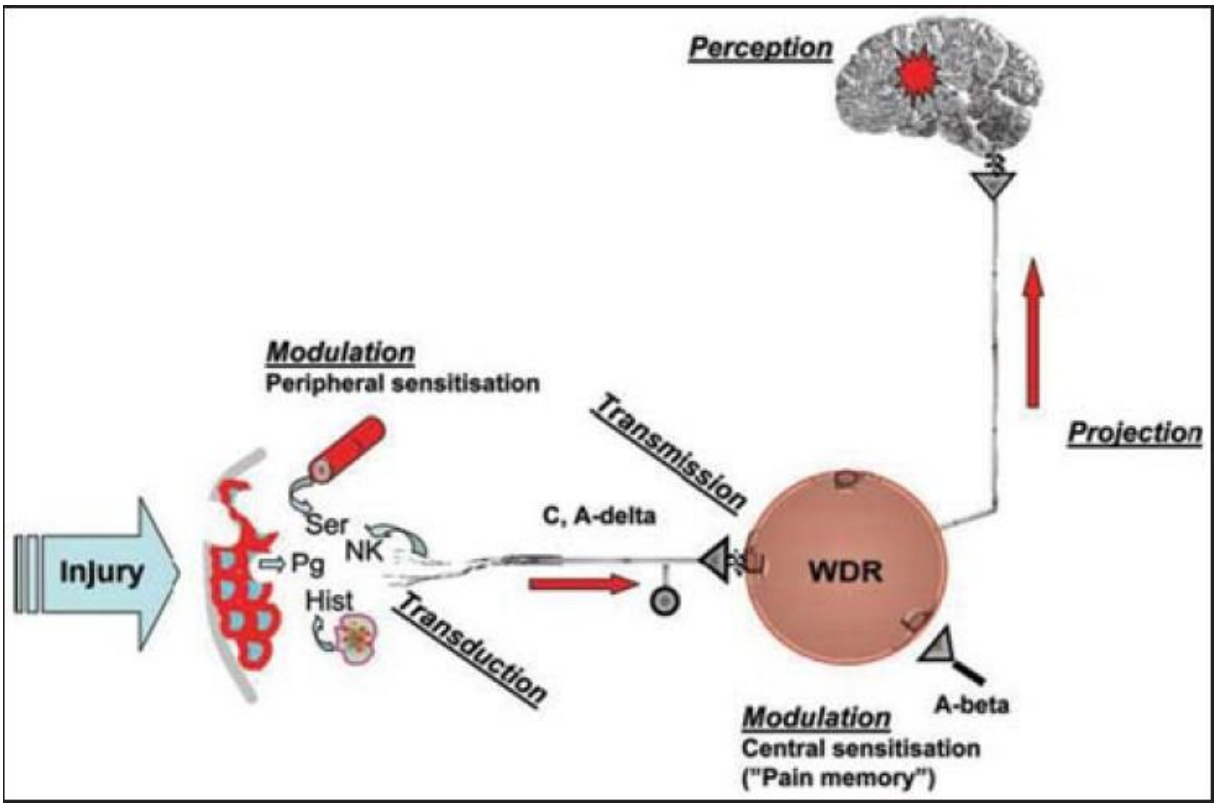


**Figure 1: Pain**

Tissue damage initiates a number of alterations of the peripheral and the central pain pathways. Central sensitization may outlast the stimuli that triggered the alterations and turn into a “pain memory”. In the dorsal horn, the pain signals are transmitted from the nociceptors to secondary nociceptive neurons (6).

Left untreated, acute pain can lead to long–term emotional and psychological distress and has the potential to develop

 

into a chronic pain state which is much more difficult to manage (7).

Although general anesthesia may attenuate synaptic transmission of afferent injury discharge from the periphery to the spinal cord and brain, it does not completely block it (8). Injury discharge initiates a cascade of processes leading to the transition from acute to chronic pain that include excitotoxic destruction of normally antinociceptive inhibitory neurons in the dorsal horn, glial reaction, afferent-maintained central sensitization, and a switch of gamma–aminobutyric acid interneurons in the dorsal horn from being normally antinociceptive to pronociceptive interneurons (9).

Within 3 distinct temporal phases of the perioperative period (preoperative, intraoperative, and postoperative), factors contributing to the development of acute postoperative pain and peripheral and central sensitization, include 1) genetic predisposition, psychological vulnerability, nongenetic environmental variables (e.g., expectations, cultural, dietary, and more), preoperative noxious inputs, and pain; 2) intraoperative nociceptive unmyelinated (C fibers and type IV) and myelinated (A-δ, type III, and contributing A-β and type II) afferents carrying injury discharges brought about by cutting skin, fascia and muscle, tendons, nerves, viscera, and bone; wound retraction; manipulation of organs; chemical irritation by sterilizing substances and by natural substances released from injured tissues, e.g., nerve growth factor; inflamed tissues; etc.; and 3) postoperative afferent inputs from regenerating wounded tissues including the inflammatory response and neuropathic ectopic neural activity from regenerating afferents nerves. Each of these factors is a potential target to reduce postoperative pain intensity and the transition to pain chronicity (10)

Central sensitization can occur for a variety of reasons, ranging from preoperative pain to intraoperative tissue injury and postoperative inflammatory processes that can occur immediately after surgery up to several weeks later (11).

Postoperative pain management has been tried to be improved by concepts such as preemptive, preventive, and multimodal analgesia. The concept of preemptive analgesia is to prevent nociceptive input from afferent stimuli to the central nervous system so that peripheral and central sensitization does not occur. Preventive analgesia is a wider concept to minimize sensitization induced by noxious stimuli. Multimodal analgesia is the administration of more than one drug acting by different mechanisms (12).

 

The preoperative use of analgesic drugs attenuates the development of pain (13).

Animal studies demonstrated that preemptive peripheral blocking of painful (nociceptive) stimuli to the central nervous system is beneficial in reducing postoperative pain (14).

Peripheral nociceptor input triggers central sensitization and enhances responsiveness of pain–transmission neurons. Spinal cord changes may sustain or amplify pain long after the original stimulus. Blocking painful input from the site of injury to the CNS (central nervous system) with local anesthetics prevents changes at the spinal cord level (15).

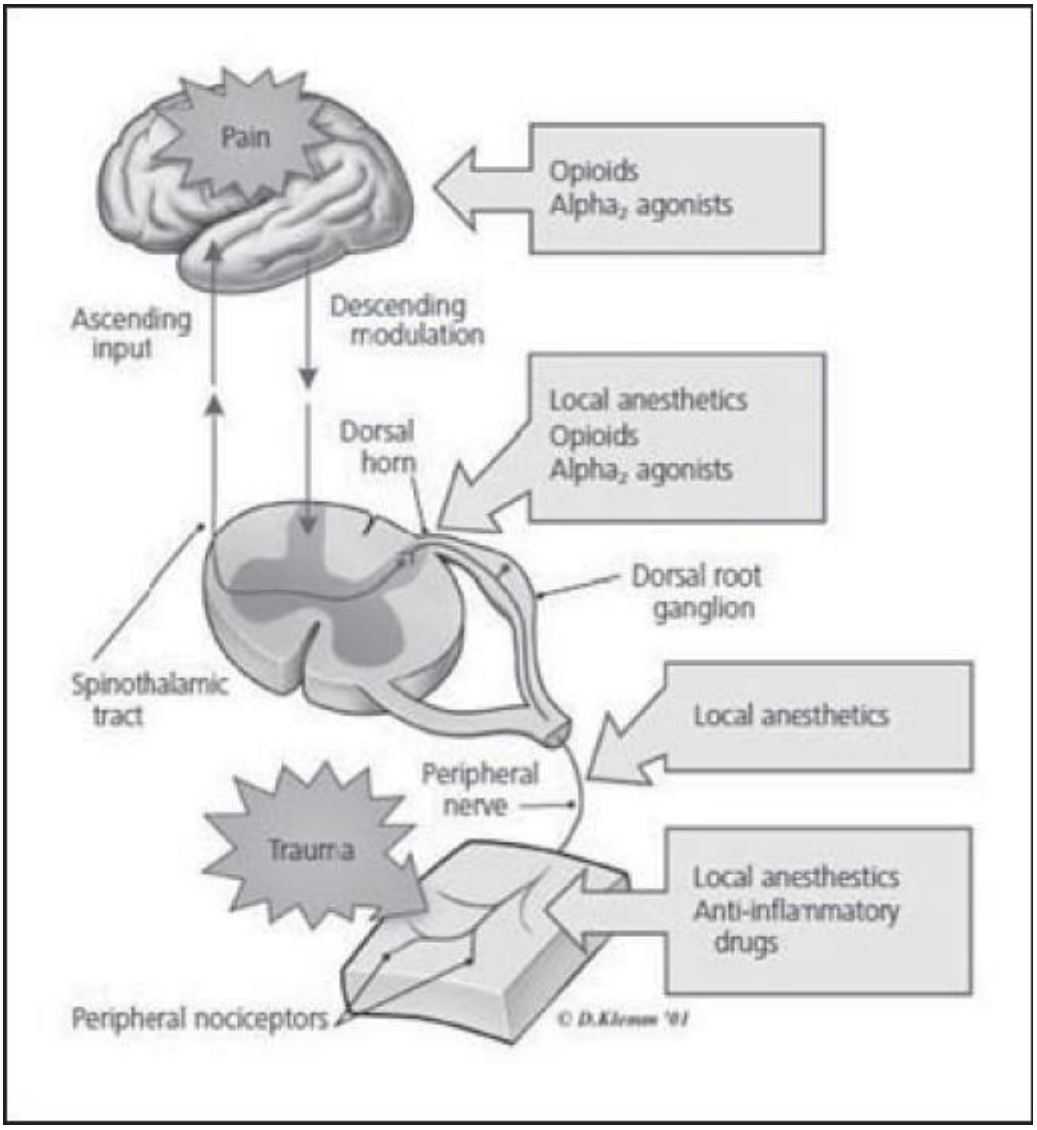


**Figure 2: The pain pathway and interventions that modulate activity at each point (16)**

 

Local anesthetics have been used in minimally invasive surgery for postoperative analgesia. They cause a reversible blockade in transmission of impulses along the central and peripheral neural pathways and induce analgesia. The administration of local anesthetics before the incision (preemptive analgesia) can decrease postoperative pain (17).

Preemptive analgesia, initiated before the surgical procedure to prevent pain in the early postoperative period has the potential to be more effective than a similar analgesic treatment initiated after surgery (18).

McQuay et al used preemptive opioid analgesics in orthopedic patients and found a delayed request for postoperative analgesics (19).

In minimally invasive surgery, local anesthetics are generally used for analgesia (20).

Ejlersen et al showed significant delay in analgesic remedication in a group receiving preincision local infiltration for hemorrhoidectomy (21).

The effect of nerve blocks on the postoperative analgesia depend on many factors such as type of surgery and local anesthetic, the concentration, volume, timing and the location for application. Preemptive single–injection rectus sheath block has provided better early postoperative pain scores and opioid consumption compared to general anesthesia alone (22).

In patients who had severe post–cesarean delivery pain after a standard spinal anesthetic containing bupivacaine 12 mg, fentanyl 10 μg, and morphine 200 μg., use of TAP (transverses abdominals plane) blocks reduced the need for escalating intravenous opioid doses and potential maternal opioid–related side effects (23).

The use of an anterior ethmoidal nerve block and dorsal periosteal injection of anesthetic solution during reduction of fractured nasal bones under general anesthesia resulted in the effective reduction of postoperative pain associated with reduction of nasal bone fractures (24).

The intraoperatively intraperitoneal administration of local anesthetic like levobupivacaine in laparoscopic surgery can reduce the intensity of postoperative pain (17).

Levobupivacaine, the pure S (−) enantiomer of bupivacaine, exerts its pharmacological action through reversible blockade of neuronal sodium channels.

 

Alpha1 glycoprotein is the main binding site for levobupivacaine. Protein binding of levobupivacaine is more (97%) than that of racemic bupivacaine (95%). Less than 3% of the drug circulates free in plasma.

Levobupivacaine is extensively metabolized with no unchanged levobupivacaine detected in urine or feces (25).

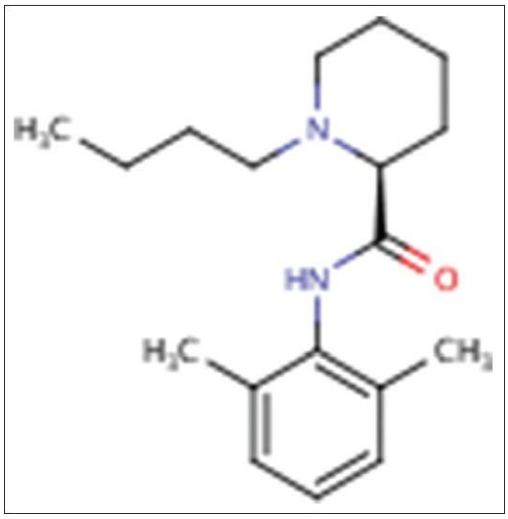


**Figure 3: Chemical structure of levobupivacaine**

Levobupivacaine ([2S]-1-butyl-N-[2, 6-dimethylphenyl] piperidine-2-carboxamide) is an amino–amide local anesthetic drug belonging to the family of n-alkyl substitute pipecoloxylidide. Its chemical formula is $C_{18}H_{28}N_2O$.

In this study, we tried to see the pre-emptive analgesic effect of the levobupivacaine injected on the dorsal root as local anesthetic to reduce post-laminectomy pain.

## 2. METHODS

This study was performed between the dates February 2010-May 2012 in the Neurosurgical Department of Adiyaman Research and Education Hospital among the patients who were reported for lumbar disc herniectomy. For the study, The Hospital Ethical Committee affirmed, and the written consent of all the included patients was taken. All the patients were followed for the postoperative 72 hours. Their pain was scored as VAS (visual analogue scales) score over 10, every 2 hours in the first postoperative day, every 4 hours in the second postoperative day, and every 6 hours at the third postoperative day. A score higher than 5 was decided for a need for an analgesic for which we used

 

tramadol (0.5 mg/kg). The patients were selected from those who did not have any concomitant problem or disease, without having any other treatment. It means they were kind of healthy patients having just one lumbar disc herniation.

Double blind prospective cohort study was planned. The surgeon did not know which injection was prepared. He either injected 2 cc serum physiologic or 2 cc bupivacaine (%7.5) during the operation after having controlled bleeding. After 10 minutes the operation continued. Postoperatively, the nurses who followed the pain score did not know either which patient received bupivacaine peroperatively. All the patients were operated.

The demographic data, the length of the operation, the postoperative analgesic period and total analgesic requirement were all noted.

For the statistics, SPSS 15.0 was used ($p<0.05$ was considered significant).

There was no statistical difference between the groups related to age and gender ($p>0.05$).

The control group and levobupivacaine group were compared by using Pearson Chi square test and there was a statistically significant difference between the two groups ($p= 0.001$).

## 3. RESULTS

80 (2/3) of the patients were female and 40 (1/3) were males. The youngest patient was 22 years old and the oldest was 48 years old (the mean age was 36). Their main complaints were back and leg pain preventing them from their daily activities. 70 % of the patients had been suffering more than 1 year. (Table 1)

**Table 1: Gender, Age, and Postoperative analgesic period (min)**

| Properties | Group | | p |
|---|---|---|---|
| | Control | Case | |
| Gender | Number (%) | Number (%) | |
| Female | 22, (37) | 38, (63) | 1.00 |
| Male | 21, (35) | 39, (65) | |
| Operation* | Number (%) | Number (%) | |
| BLDH | 12, (20) | 48, (80) | 1.00 |
| ULDH | 12, (12) | 48, (80) | |
| Age ** (Mean±Ss) | 35.5±7.4 | 36.0±7.7 | 1.37 |
| Period** (Mean Ss) | 62.3±56.0 | 29.2±12.0 | **<0.001** |

*: $\chi^2$ test **: student t test, Mean±Ss: Mean ± Standard deviation

 

50 of the female patients had their complaints on their right side, 28 patients L5-S1, 22 patients had right L4-5 disc herniation. From the other 30 patients who had their complaints from the left side, 18 had left side L5-S1, 12 patients had left L4-5 herniation.

In the male patients, 26 had their complaints on their right side, 14 of them L5-S1, 6 of them had right L4-5, 14 patients had left side complaints. 8 of them left L5-S1, 6 of them left L4-5.

In the bupivacaine group the earliest analgesic requirement was at 4$^{th}$ hour, the longest was 50 hours (the mean was 27 hours). In the control group they all needed analgesic in the first two hours. (Table 2)

**Table 2. Comparison of two groups for age and gender (p>0.05).**

| Groups | Age | Gender (M/F) |
|---|---|---|
| Control group N=60 | 35.52±7.41 (0.95) | 22/38 |
| Levo group N=60 | 36.03±7.67 (0.99) | 21/39 |
| P value | 0.708 | 0.849 |

## 4. DISCUSSION

Pain from surgical procedures occurs as a consequence of tissue trauma and may result in physical, cognitive, and emotional discomfort (26).

Most of the patients undergoing lumbar disc herniectomy usually suffer significant severe back pain and even show difficulty to return to their daily activities after lumbar discectomy (27).

Preoperatively administered diclofenac effectively reduces post craniotomy headache (28).

Intra–operative short–versus long–acting local anesthetics as preemptive analgesics in carpal tunnel surgery shortened significantly the time to the first postoperative pain in the lignocaine group (29).

The preemptive intravenous lidocaine, showed a significant reduction in fentanyl consumption and pain during the earlier postoperative time in abdominal surgery (30).

Torun et al(31) used lidocaine and Mordeniz et al (32) used bupivacaine to the dorsal root during the laminectomy operation and reported significant increase in the duration of postanalgesic period.

 

Gordon et al stated that preemptive bupivacaine as the long effect local anesthetic in amide group, is effective in delaying postoperative pain (33).

The pre-operative local infiltration of bupivacaine reduces pain, nausea, vomiting and opioid use in the first 24 h after inguinal hernia surgery under spinal anesthesia (34).

Preincisional bupivacaine infiltration reduced pain and lower postoperative opioid requirements in the early postoperative phase of pain following breast reduction (35).

Postoperative pain after total knee arthroplasty has been reduced on the first postoperative day with continuous intraarticular bupivacaine analgesia (36).

A single-dose epidural injection of 0.1% ropivacaine before lumbar spine surgery is effective for reducing early-postoperative pain without related complications such as transient motor weakness (37).

Preemptive analgesia with 0.75% ropivacaine causes significant reduction in pain perception, request for an analgesic and hospital stay before inguinal hernioplasty (38).

When compared to lidocaine, levobupivacaine increases postoperative analgesia following septoplasty (39).

Preemptive wound infiltration with levobupivacaine at the surgical site has provided effective pain control with reduced opiate dose after unilateral lumbar discectomy (27).

In this study, we used levobupivacaine (%7.5) which is the S (-) enantiomer of bupivacaine HCl, long acting local anesthetic of amide group to rescue post laminectomy pain. And we have found significant decrease in the postoperative analgesic requirement and increase in the postoperative analgesic period with just infiltrating 2 ml of levobupivacaine (%7.5) on the dorsal root peroperatively.

The authors declare no conflict of interest and no financial contributions.

 

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