Original Article

Preventive Effects of Pre- and Intra-operative Marcaine, Lidocaine, and Marcaine Plus Lidocaine on Pain Relief in Lumbar Disc Herination Open Surgery

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Abstract

Background: As marcaine is administered to a great extent due to minor complications and reasonable expenses and as discectomy is prevalently used in Iran, this study makes a comparison between effect of marcaine alone, lidocaine alone, and marcaine plus lidocaine on pain relief of patients undergoing lumbar disc open surgery. **Materials and Methods:** In a clinical trial study, 192 patients were selected and randomly divided into four groups. Patients in Groups 1–4 received 0.5 ml marcaine during surgery, 5 ml lidocaine 2% before incision, 5 ml lidocaine 2% before incision plus 5 ml marcaine during surgey and normal saline, respectively. After patients gained knowledge of visual analog scale (VAS) criteria, their severity of pain was measured and was recorded in their profiles, along with demographic details and history of diseases. After surgery and their transfer to their rooms, their severity of pain was measured and recorded again by using VAS criteria. Finally, difference between the four groups was compared by SPSS software. **Results:** The mean (±standard deviation) of postoperative pain in marcaine + lidocaine, marcaine, lidocaine, and normal saline was 3.5 ± 1.3, 3.5 ± 1.6, 36.1.9, and 4.2 ± 1.8, respectively, and we did not observe any significant difference in severity of pain after surgery in these groups (P = 0.15). The highest and lowest degree of satisfaction occurred in marcaine-lidocaine group and control group, respectively, (40 patients [83.3%] vs. 25 patients [52.1%]). **Conclusion:** Lidocaine-marcaine treatment reduces the need to opiates in cases of postoperative pain relief of discectomy and provides patients with great satisfaction.

Keywords: *Disc herination, lidocaine, marcaine, postoperative pain*

Introduction

Open surgery is one of the treatments for lumbar disc herniation in lumbosacral region,[1] which has been mainly prescribed as a standard method of treatment for patients suffering from lumbar disc herniation and responding to none of medical treatments.[2] Despite methods such as minimally invasive methods, percutaneous nucleotomy, and microendoscopic discectomy, open surgery still remains the most crucial option of treatment producing significantly satisfactory outcomes.[3] Nevertheless, it inflicts pain in patients after surgery and causes recurrence of lumbar disc herniation.[4] Inappropriate postoperative relief of pain is one of the main causes for prolonged hospitalization and incurs higher medical expenses. Other difficulties may also arise, including nausea, vomit, hypotension, and shiver.[4] Additionally, uncontrolled pains can cause results such as anxiety and depression, which play a significant role in reducing satisfactory outcomes of surgery and patients' satisfaction.[5]

These complications are prevented by employing different medical treatments such as analgesics (opiates and nonsteroidal anti-inflammatory drugs), anesthetics, and acupuncture.[6] More commonly, parenteral opiates are administered during and after surgery period. Nevertheless, since these opiates develop complications such as cardiovascular and respiratory problems in one hand and do not achieve the required efficiency in some cases, more convenient and effective medicines are preferred more greatly.[7-9]

One of these local anesthetics is lidocaine, which has been investigated extensively by a number of studies as regards control of postoperative pains.[10,11] Effectiveness of this medicine is reduced in a short period

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of time to the extent that its effect may be minimized during surgery, and subsequently, immediate pain is incurred.[12] Furthermore, marcaine (bupivacaine) produces an anesthetic effect for 3–8 h, which can relieve pain during and after surgery as studies suggest;[13-15] yet studies have not properly concentrated on effect of marcaine upon lumbar disc herniation.

Pain control is important after discectomy. severe pain after surgery can lead to uncontrolled and involuntary movements of patients. The development of these movements make unwanted side effects including some suture release, local bleeding, and infection and eventually lead to a drop in quality of operation. In addition, due to problems such as pain and urinary retention after discectomy, it was decided to create a way to reduce these problems in patients. Moreover, direct effect and side effects of lidocaine and marcaine alone and the combination of them were studied. As marcaine is administered to a great extent due to minor complications and reasonable expenses and as discectomy is prevalently used in Iran, this study makes a comparison between effect of marcaine alone, lidocaine alone, and marcaine plus lidocaine upon relief of pain among patients undergoing open surgery of lumbar disc. This study aim to put forward suggestions for relief of pain by using of Pre- and Intra-operative Marcaine, Lidocaine or both of them to provide these patients with the satisfaction of this surgery.

Materials and Methods

This study is a double-blind clinical trial, which was conducted in Hospital of Al-Zahra (Isfahan, Iran) from winter of 2012 (first month) to fall of 2014 (last month) within 24 months. The population consisted of patients who were candidates of lumbar disc herniation. These patients had the following properties: Consent to participation in this study, an age range of 20–60 years old, candidate for surgery by employing method of spinal anesthetics, lack of sensitivity to lidocaine, marcaine and similar medicines, no record of neurologic disorders, no other problem in lumbar region, and no addiction to drug. Patients were decided to eliminate from the study due to nonoccurrence of surgery, prolonged period of surgery (more than 2h), alteration in method of anesthetics, and occurrence of unintended complications.

At least 48 patients were selected for each group by using sample-size equation for making comparison among means, measuring standard deviation (SD) of pain severity which was 1.4 in other studies,[1] and taking 95% level of confidence, test power of 80%, and the minimum significant difference between groups, that is, 0.8 into consideration. Convenience sampling and block randomization were used.

After acceptance of proposal and permission grant of Ethics Committee, 192 candidates of discectomy surgery and receivers of spinal anesthetics were divided into four groups. As regards double-blind, patients and doctors were not aware of division of groups. The medicine was administered by the anesthesiologist outside of the concerned doctors. Patients in Groups 1–4 received marcaine, lidocaine, marcaine plus lidocaine, and normal saline, respectively. After patients gained knowledge of visual analog scale (VAS) criteria, their severity of pain was measured and was recorded in their profiles, along with demographic details and history of diseases.

Lidocaine group received 5 ml of lidocaine 2% after spinal anesthetics and before operative incision. Marcaine group received 5 ml of marcaine 5% after operative incision and after the end of surgery. 5 ml of lidocaine 2% and 5 ml of marcaine 5% were administered for lidocaine-marcaine group, respectively, before operative incision and during surgery.Moreover, the control group subcutaneously received 5 ml of distilled water lidocaine 2% after spinal anesthetics and before operative incision.

After surgery and their transfer to their rooms, their severity of pain was measured and recorded again by VAS criteria. Moreover, their postoperative urinary retention was considered. Finally, collected data were analyzed by using SPSS software version 18.0.1 (SPSS, IL, USA), and by performing Chi-square test, ANOVA, and variance analysis on the basis of replicated observations.

Results

In this study, 192 patients had the following properties [Figure 1]: 45.2 ± 10 (age range of 24–60 years old), gender (100 males [52.1%] and 92 females [47.9%]), and mean duration of surgery 56 ± 23.2 min. Table 1 shows the distribution of demographic variables in all four groups. On the basis of ANOVA, our groups did not show any significant difference in mean age and mean duration of surgery ($P > 0.05$). Similarly, results of Fischer's exact test and Chi-square did not show any significant difference in age range and gender distribution ($P > 0.05$).

Analysis of hemodynamic parameters during surgery shows no hemodynamic disorder including fall in blood pressure, tachycardia, bradycardia, and fall in O_2 sat among groups of patients.

Table 2 shows mean and SD of pain severity in all four groups before and after surgery. As ANOVA results suggest, severity of pain was not significantly different in all groups prior to surgery ($P = 0.061$). Moreover, we did not observe any significant difference in severity of pain after surgery in these groups ($P = 0.15$). Prior to surgery, the pain was not in the slight state (VAS <4), that is, 90 patients (46.9%) and (7< VAS <3) and 102 patients (53.1%) (VAS >7) experienced medium pain and severe pain, respectively. However, during surgery, no patient experienced severe pain (94 patients with slight pain and 98 patients with medium pain).

Results of Chi-square showed no significant difference in frequency distribution of pre- and post-operative pain

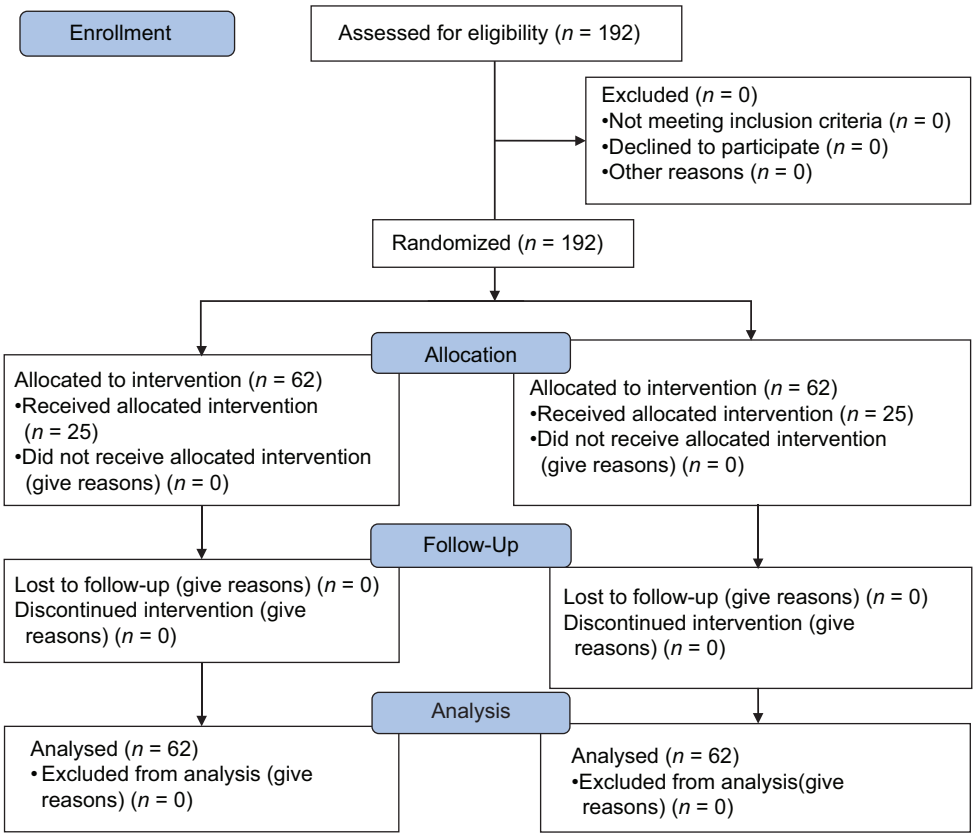

Figure 1: Consort study flow diagram

Table 1: Distribution of demographic variables in all four groups

Groups variables	Marcaine + lidocaine*	Marcaine**	Lidocaine***	N/S****	*P*
Mean age (year)	45.8±10.1	44.7±9.5	45±10.8	45.5±9.8	0.9
Age group *n* (%)					
<30	0 (0)	1 (2.1)	4 (8.3)	3 (6.3)	0.52
30-39	18 (37.5)	16 (33.3)	11 (22.9)	12 (25)	
40-49	10 (20.8)	15 (31.3)	14 (29.2)	15 (31.3)	
50-59	14 (29.2)	14 (29.2)	16 (33.3)	14 (29.2)	
≥60	6 (12.5)	2 (4.2)	3 (6.3)	4 (8.3)	
Sex					
Male	26 (54.2)	24 (50)	25 (52.1)	25 (52.1)	0.99
Female	22 (48.5)	24 (50)	23 (47.9)	23 (47.9)	
Mean of OT(time)	51.3±17.5	52.5±19.6	57.3±26.3	62.9±26.9	0.06

*Received 5cc lidocaine 2% + 5cc marcaine 0.5%, **5cc marcaine 0.5%, ***Received 5 cc lidocaine 2%, ****Received normal N/S as placebo, *****OT: Operating time

severity among the groups of study. Figures 2 and 3 show severity of pre- and post-operative pain, respectively.

Table 3 shows frequency distribution of additional opiates for postoperative pain relief, occurrence of urinary retention, and satisfaction of patient groups. Accordingly, control group more greatly received doses of opiates, that is, 17 patients (35.4%). Conversely, the least frequency was observed in marcaine-lidocaine group, that is, 4 patients (8.3%). Results of Chi-square test did not show any significant difference in additional opiates among groups of this study (P = 0.006). Moreover, 37 patients (19.3%) experienced urinary retention. Specifically, urinary retention was mostly observed in the control group (10 patients or 20.8% of patients). Contrarily, marcaine group experienced least cases of urinary retention (6 patients or 12.5%) (P = 0.31).

On the other hand, the highest and lowest degree of satisfaction occurred in marcaine-lidocaine group and control group, respectively, that is, 40 patients (83.3%) versus 25 patients (52.1%). Chi-square test and Kruskal–Wallis test suggested no significant difference in satisfaction of groups (P = 0.007). Moreover, there was no

Table 2: Mean and SD of pain severity in all four groups

Groups time	Marcaine + lidocaine*	Marcaine**	Lidocaine***	N/S****	*P*
Before	7.9±0.98	7.25±1.3	7.2±1.7	7.3±1.5	0.061
After	3.5±1.3	3.5±1.6	3.6±1.9	4.2±1.8	0.15

*Received 5cc lidocaine 2% + 5cc marcaine 0.5%, **5cc marcaine 0.5%, ***Received 5cc lidocaine 2%, ****Received normal N/S as placebo. SD: Standard deviation

Table 3: Frequency distribution of opiates among groups of this study

Groups variables	Marcaine + lidocaine	Marcaine	Lidocaine	N/S	*P*
Opioid					
Yes	4 (8.3)	10 (20.8)	7 (14.6)	17 (35.4)	0.006*
No	44 (91.7)	38 (79.2)	41 (85.4)	31 (64.6)	
Urine retraction					
Yes	8 (16.7)	6 (12.5)	10 (20.8)	13 (27.1)	0.31
No	40 (83.3)	42 (87.5)	38 (79.2)	35 (72.9)	
Patients satisfaction					
Excellent	40 (83.3)	36 (75)	31 (64.6)	25 (52.1)	0.007*
Good	8 (16.7)	12 (25)	17 (35.4)	23 (47.9)	

*Significant level of <0.05

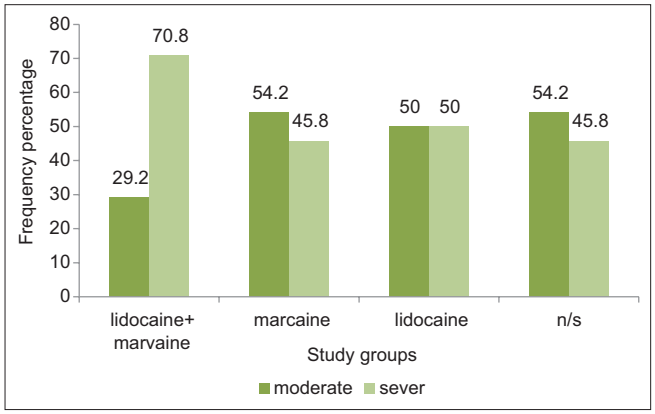

Figure 2: Severity of preoperative pain

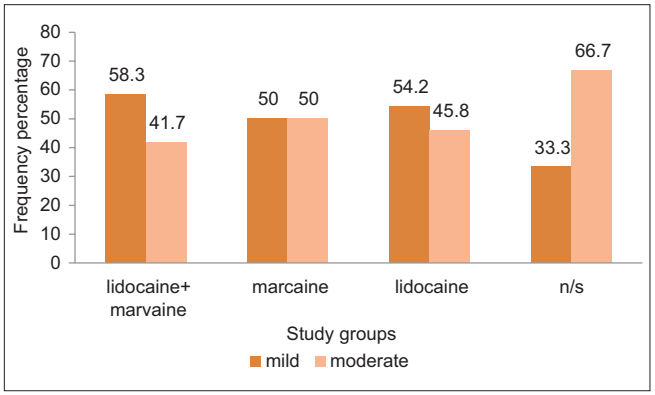

Figure 3: Severity of postoperative pain

significant difference in severity of pain before and after surgery, urinary retention, consumption of opiates, and satisfaction of patients as regards age and gender.

Discussion

This study attempted to make a comparison among preventive effects of marcaine alone, lidocaine alone, and marcaine plus lidocaine upon relief of pain among patients undergoing open surgery of lumbar disc, which is performed by using spinal anesthesia. Accordingly, we put forward suggestions for relief of pain to provide these patients with satisfaction of this surgery. Spinal anesthesia was widely welcomed by anesthesiologists, surgeons, and patients because of rapid effectiveness, convenience, and minor complications. This method is increasingly employed due to possibly difficult intubation, severe respiratory failure after general anesthesia, and request of patients despite distribution of other medicines. A variety of medicine is administered in cases of spinal anesthesia, including lidocaine and bupivacaine.[1] Today, lidocaine is widely prescribed for spinal anesthesia in cases of lower extremities surgery.[8] Period of sensory and motor block of this medicine lasts about 60 min, which can extend by adding other medicines including epinephrine, fentanyl, and/or lidocaine.[11] This study made a comparison among marcaine alone, lidocaine alone, and marcaine plus lidocaine upon relief of pain in comparison with the treatment of control group to determine their impact upon pain relief in discectomy. Our findings revealed no significant difference in pre- and post-operative pain relief. Conversely, additional opiates were significantly and widely distributed in control group relative to other groups, especially lidocaine-marcaine group.

On the other hand, lidocaine-marcaine group was most greatly satisfied while side effects including urinary retention were not significantly different among groups of this study.

A number of studies have investigated the impact of different medicine mixture upon postoperative pain of discectomy. For instance, Piat *et al*. compared injected morphine with sublingual buprenorphine as regards pain relief in surgery

on lumbar disc herniation. They suggested sublingual buprenorphine for postoperative pain relief because of higher effectiveness and greater feasibility.[16] Local anesthetics can relieve postoperative pain of neurosurgery by raising the threshold of electrical stimulation of neurons.[10] Kulacoglu *et al*. and Musoke *et al*. highlight impact of lidocaine upon pain relief during and after surgery of lumbar disc herniation.[12,15] Moreover, Musoke *et al*., Alhelail *et al*., and Fernandoz *et al*. put emphasis on its effect on pain of circumcision, neural block, and cataract, respectively.[1,8,15] Lidocaine is administered in cases of lower extremities surgery lasting 60 min, or less, and its effectiveness is increased by additives[6] including epinephrine, fentanyl, and bupivacaine.[3] All above-mentioned medicines have some complications; however, our study demonstrated the higher effectiveness of marcaine-lidocaine treatment in postoperative pain relief in discectomy.

Moreover, studies have concentrated on sensory and motor block of these medicines. As Shende *et al*. point out, fentanyl-marcaine mixture can improve sensory and motor block of spinal anesthetics in caesarean section.[17] Moreover, lidocaine-fentanyl mixture extends sensory and motor block period in spinal anesthetics.[18] Similarly, Palmer *et al*. suggest a combination of fentanyl and local anesthetics medicine for improvement in sensory and motor block of spinal anesthetics.[19] According to these findings, lidocaine-marcaine treatment reduces the need to opiates in cases of postoperative pain relief of discectomy and provides patients with great satisfaction.

Conclusion

Therefore, this treatment is recommended but in compliance with neurosurgeons and anesthesiologists and conditions of patients. In addition, further studies should be conducted to firm our findings. Low ability of patients for description of postoperative pain was one of the limitations of this study. Also they have been receiving other pain relief routinely. Since response to analgesic is different among individuals, therefore, more expanded and well designed researches is needed to confirm the role of these two drugs in pain relief.

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Conflicts of interest

There are no conflicts of interest.

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