



Investigating the effect of topical marcain 0.25% and lidocaine 2% on pain relief following herniorrafia

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ABSTRACT

Introduction: Pain is one of the major postoperative problems, and lack of proper pain management can lead to complications such as increased hospital stay, increased recovery time and more medical costs. There are several methods used to control postoperative pain, the most common of which are administration of analgesics and local anaesthetics at the site of surgery. Therefore, considering the reported side effects, this study tends to investigate the effect of two local anesthetic methods in patients undergoing herniorrafia. **Materials & Methods:** This study was performed as a clinical trial on 60 patients undergoing herniorrafia in Shariati Hospital of Tehran in 2018. All patients underwent general anesthesia and Liechtenstein. Patients were randomly divided into three groups: marcain, lidocaine, and control. Then, severity of pain was assessed based on VAS after one hour, in the afternoon on the operation day and the day after the operation. Frequency of prescribing pethidine was recorded based on VAS. Statistical analysis of the collected data was performed by one way ANOVA. **Results:** Three groups were not significantly different in terms of age. Pairwise comparison of groups revealed that severity of pain at the end of surgery and in the afternoon of the operation day was significantly different between marcain group and lidocaine group as well as postoperative marcain group and the control group ($P=0.001$); however, pain severity was not significantly different between lidocaine and control groups. **Conclusion:** marcain administration at the surgical incision site compared to lidocaine reduces pain severity and reduces the average administration of pethidine in patients.

Keywords: Herniorrafia, Marcain, Lidocaine.

1. INTRODUCTION

Pain was recognized as the fifth vital sign in 1990 (McCaffery & Pasero, 1997). Pain is an unpleasant sensation and a sensory experience associated with real or possible tissue damage and is caused by skin incisions in surgery and damage to soft tissues and nerves stimulates pain receptors and leads to feeling of pain (Tavakoli et al., 2007). Postoperative pain can be caused by neuroendocrine reflexes and increased sympathetic tone leading to complications such as increased flexibility, weakened immune system, reactive hypoglycemia (leading to delayed wound healing), increased myocardial oxygen consumption, ileus paralytic, reduced system function etc., (Hurley & Wu, 2010). Annually, more than 230 million people worldwide undergo surgery (Gerbershagen et al., 2014). On the other hand, postoperative pain control is one of the most effective ways to improve patient care quality. Successful postoperative pain control reduces hospital stay (Jennings et al., 2014). Effective pain management also reduces hospital costs and increases satisfaction with service recipients (Koduli et al., 2010). Inguinal hernia is a common clinical condition that its rate of incidence increases with age in both men and women. According to a report in the UK, one in every 100,000 people and 28 in every 100,000 people in the United States are infected (Rabe et al., 2012). Postoperative pain is one of the most common problems after hernia repair and up to 80% of patients need opioid treatment for pain control. Although administration of narcotics is one of the main methods of postoperative pain control, high doses of narcotics have several side effects such as respiratory apnea, ileus, nausea and vomiting. On the other hand, reducing the drug dose may increase the amount of postoperative pain in patients (Kurmann et al., 2015). Various methods are recommended for postoperative pain control after herniorrafia, one of which is topical administration of marcain (Waechter et al., 2001). Marcain is a long-acting amide that is widely used for local anesthesia (Kotelko et al., 1984). Effectiveness of lidocaine in reducing postoperative pain has long been considered and research has been done in this regard. Recent studies have shown that lidocaine can cause good pain relief for central pain (Sattari et al., 2015). Postoperative pain control can increase the patient's ability to leave the hospital early and prevent complications such as delayed wound healing, pulmonary complications, and reduce the length of hospital stay. Therefore, this study tends to compare intravenous lidocaine 2% and marcain 0.25% administered on the surgical incision site on pain severity of patients undergoing herniorrafia.

2. MATERIALS AND METHODS

The present study was a clinical trial, which began after approval by the ethics committee of Tehran University of Medical Sciences. The studied population included 60 patients with inguinal hernia referred to Shariati Hospital of Tehran University of Medical Sciences during 2018. Their disease was confirmed according to clinical and diagnostic criteria. Samples were selected based on purposive sampling method. Inclusion criteria included age between 20 and 60 years, ASA class II and I, and inguinal hernia. Exclusion criteria included: lack of consent to participate in the study, pregnancy, administration of psychiatric and narcotic drugs, inability to learn VAS scale, sensitivity to anesthetic drug. After selecting the patients, the researcher explained the objectives and procedures to the patients and asked them to complete the informed consent form if they wish to participate in the study. The sample size in each group was set at less than 20 people based on the following formula.

$$v = \frac{(z1^\alpha - 2 + z)}{(p0 - p1)}$$

The procedure was that the patients were divided into three groups based on random numbers. The night before the operation, VAS was explained for the patients the night before the operation. Pain severity was measured by nurses 1hour after surgery, afternoon of operation day and 24 hours after the surgery. The number zero indicated dissatisfaction and the number 10 indicated full satisfaction with pain relief (Figure 1).

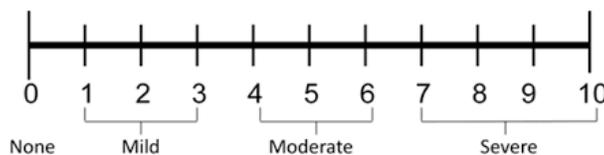


Figure 1 NRS

All surgical procedures were performed by Liechtenstein method and under general anesthesia. In the first group, 1 mg/kg marcain was injected subcutaneously 5 minutes before skin repair. In the second group, 4 mg/kg 2% lidocaine was injected subcutaneously before skin repair and no anesthetic was used in the third group. In the presence of pain in patients and their request, 25 mg pethidine was injected intravenously each time. The number of times pethidine was administered was recorded.

Finally, background information of patients was included in the researcher-made questionnaire, which was designed based on main objectives of the project and its validity was confirmed by 5 professors of the surgical department. The data was analyzed by SPSS software version 20. Using one-way ANOVA test for quantitative variables and Chi-square test for quantitative variables, it was analyzed ($p < 0.05$).

3. RESULTS

Of 60 patients enrolled in this study, 76.6% were men and 23.4% were women. The mean age of patients was 36 ± 10 years in the marcain group and 34.65 ± 8 years in the lidocaine group and 38.3 ± 1 years in the control group (table 1). Pair-wise comparison of groups by T-test showed that mean age was not significant in any of the groups (Figure 2).

Table 1 descriptive statistics

Variable		Marcain	Lidocaine	Control
Age		36 ± 10	34.65 ± 8	38.3 ± 1
Gender	Female	5 (25%)	5 (25%)	4 (20%)
	Male	15 (75%)	15 (75%)	16 (80%)

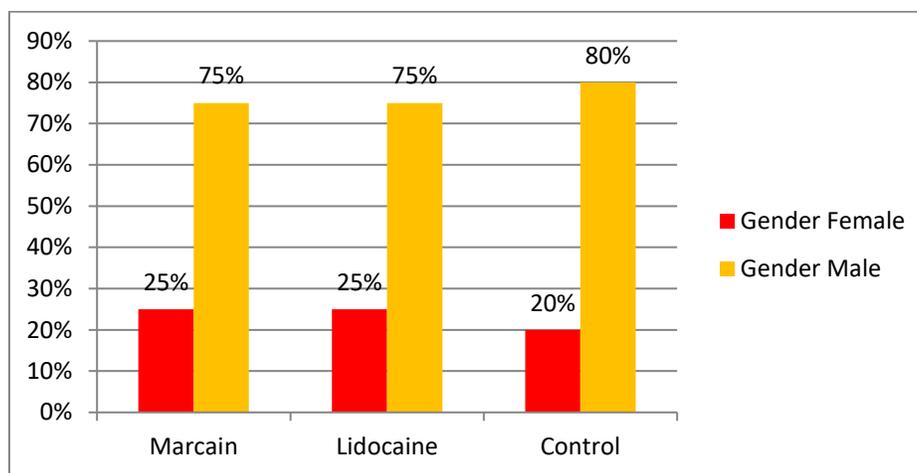


Figure 2 Demographic characteristics of the subjects in the group of marcain, lidocaine and control

Mean and standard deviation of VAS in three groups at the end of surgery (VASI), afternoon of operation day (VASII) and one day after surgery (VASIII) as well as pairwise comparison of groups based on VASI, VASII and VASIII are listed in Table 2. Pairwise comparison of groups revealed that pain severity at the end of surgery and in the afternoon of operation day was significantly different between marcain group and lidocaine group and between postoperative marcain group and control group ($P = 0.001$), while the difference in pain severity was not significant between lidocaine and control groups. Moreover, pairwise comparison of groups using T-test showed no significant difference between groups.

Table 2 descriptive comparison of VASI, VASII, VASIII in the studied groups

Group	VASI mean \pm SD	VASII mean \pm SD	VASIII mean \pm SD
Marcain	5.6 ± 1.4	6.6 ± 1.3	6.3 ± 1.9
Lidocaine	2.7 ± 1	8.3 ± 2	5.3 ± 1.9
Sig.	0.001	0.001	0.32
Marcain	5.6 ± 1.4	6.6 ± 1.3	6.3 ± 1.9
Control	6.7 ± 1.9	7.3 ± 1.3	6.5 ± 1
Sig.	0.16	0.33	0.42
Lidocaine	2.7 ± 1	8.3 ± 2	5.3 ± 1.9
Control	6.7 ± 1.9	7.3 ± 1.3	6.5 ± 1
Sig.	0.001	0.001	0.45

Table 3 lists the mean of pethidine administration in three groups. The highest rate of pethidine administration was 58 ± 32.6 in the control group, followed by lidocaine group (45 ± 20.3) and marcain group (28 ± 28). T-test for pairwise comparison of groups revealed that the difference in mean of pethidine administration on the operation day was significant between marcain group and postoperative lidocaine group as well as marcain group and control group; however, it was not significant between lidocaine group and control group.

Table 3 comparison of pethidine administration on operation day and after the operation in three groups

Group	Operation day mean \pm SD	The day after operation mean \pm SD
Marcain	38 \pm 28	32.6 \pm 21
Lidocaine	45 \pm 20.3	52 \pm 14
Sig.	0.016	0.1
Lidocaine	45 \pm 20.3	6.7 \pm 14
Control	58 \pm 32.6	57.5 \pm 34.5
Sig.	0.1	0.1
Marcain	28 \pm 28	6.4 \pm 1.4
Control	58 \pm 32.6	6.5 \pm 1
Sig.	0.0001	0.1

4. DISCUSSION

About 10% of people develop hernia during their lifetime. Abdominal hernia is a common disease that occurs in 1.7% in all ages and 4% in those over 45 years of age. The inguinal hernia is responsible for 75% of hernia (de Goede et al., 2015). Postoperative pain is one of the most common problems after herniorrafia, so that 80% of patients need postoperative analgesia after surgery (Kurmann et al., 2015). Therefore, we decided to investigate two local anesthesia methods in herniorrafia patients. Based on our most important results, it was found that the difference in pain intensity in the three groups was the difference between marcain group and other groups. Patients receiving marcain reported more pain relief than lidocaine and control groups, as well as lower need for pethidine. This means that postoperative marcain administration reduces pain severity compared to other two groups, and there is little difference between the groups. It was also found that marcain administration the day after operation had no effect on pain severity.

Maktabi et al. (2016) conducted a comparative study on the effect of intramuscular and subcutaneous bupivacaine and cutaneous ketamine on postoperative pain control in patients candidate for abdominally sterectomy under general anesthesia. They found that administration of intramuscular bupivacaine and ketamine was effective in reducing postoperative pain in patients candidate for abdominal hysterectomy, and administration of higher doses of ketamine and bupivacaine as a single dose resulted in a significant reduction in postoperative pain of patients compared to placebo group, which was consistent with the results of our study. Khoshrang (2012) compared the effect of administration of marcain 0.25% with lidocaine 2% at the surgical incision site on pain severity in patients undergoing cesarean section. It was found that topical administration of marcain 0.25% at the incision site of cesarean section compared to lidocaine 2% could reduce pain severity in the early hours after surgery and also reduce the need for painkillers, which is consistent with the current study.

Razavi et al. (2015) compared topical administration of marcain and magnesium in pain control after herniorrafia and found that marcain was more effective in postoperative pain relief and less morphine was needed to control pain, which is consistent with our study. Abd-Elseyed et al. (2015) in a double blind clinical trial comparing epidural clonidine and marcain in pain control after lumbar surgery revealed that clonidine was more successful than marcain in controlling pain and maintaining analgesia for a long time after surgery. Through inconsistent results, Aki et al. (2008) found that topical administration of tramadol before repairing skin had a better effect than marcain in analgesia of patients undergoing herniorrafia. Perhaps the reason for this is the timing of pain evaluation in patients. In this study, pain was evaluated on the day after surgery. In our study, it was found that marcain was not effective on pain on the day after the surgery (Kaki & Al Marakbi, 2008).

5. CONCLUSION

According to results of our study, pain severity in patients receiving marcain was less reported than in patients with lidocaine group and the need to administrate pethidine in patients was lower. Therefore, topical administration of marcaine is more effective in patients undergoing herniorrafia.

Abbreviations

ASA: American Society of Anesthesiologists

VAS: Visual Analogue Scale

ANOVA: Analysis of Variance

Financial disclosure and funding/support

There are no financial disclosure and funding/support.

Conflict of Interest

There is no Conflict of Interest.

Ethical approval

Ethical Code: IR.TUMS.1396.424

REFERENCES AND NOTES

1. Abd-Elsayed AA, Guirguis M, DeWood MS, Zaky SS. A Double-Blind Randomized Controlled Trial Comparing Epidural Clonidine vs Bupivacaine for Pain Control During and After Lower Abdominal Surgery. *Ochsner J*. 2015;15:133-42.
2. de Goede B, Timmermans L, van Kempen BJ, van Rooij FJ, Kazemier G, Lange JF, Hofman A, Jeekel J. Risk factors for inguinal hernia in middle-aged and elderly men: results from the Rotterdam Study. *Surgery*. 2015;157:540-6.
3. Gerbershagen HJ, Pogatzki-Zahn E, Aduckathil S, Peelen LM, Kappen TH, van Wijck AJ, Kalkman CJ, Meissner W. Procedure-specific risk factor analysis for the development of severe postoperative pain. *Anesthesiology*. 2014;120:1237-45.
4. Hurley RW, Wu CL. Acute postoperative pain. *Miller's Anesthesia*. 2010;7:2757-87.
5. Jennings PA, Cameron P, Bernard S, Walker T, Jolley D, Fitzgerald M, Masci K. Long-term pain prevalence and health-related quality of life outcomes for patients enrolled in a ketamine versus morphine for prehospital traumatic pain randomised controlled trial. *Emerg Med J*. 2014;31:840-3.
6. Kaki AM, Al Marakbi W. Post-herniorrhaphy infiltration of tramadol versus bupivacaine for postoperative pain relief: a randomized study. *Ann Saudi Med*. 2008;28:165-8.
7. Khoshrang H. Comparing the effects of local infiltration of lidocaine 2% and marcaine 0.25% on the severity of pain in patients after cesarean section. *J GuilanUni Med Sci*. 2012;21:86-94.
8. Koduli BSH, Oberoi YS, Jones SB. Management of Postoperative Pain. *Up-to-date* 2010;1-11.
9. Kotelko DM, Shnider SM, Dailey PA, Brizgys RV, Levinson G, Shapiro WA, Koike M, Rosen MA. Bupivacaine-induced cardiac arrhythmias in sheep. *Anesthesiology*. 1984;60:10-8.
10. Kurmann A, Fischer H, Dell-Kuster S, Rosenthal R, Audigé L, Schüpfer G, Metzger J, Honigmann P. Effect of intraoperative infiltration with local anesthesia on the development of chronic pain after inguinal hernia repair: a randomized, triple-blinded, placebo-controlled trial. *Surgery*. 2015;157:144-54.
11. Maktabi M, Kamali A, TaghaviJelodar H, Shokrpour M. Comparing the Effect of Topical and Subcutaneous Bupivacaine Infiltration with Cutaneous Ketamin on Postoperative Pain in Patients Candidating Abdominal Hysterectomy under General Anesthesia. *J Arak Uni Med Sci*. 2016;19:78-85.
12. McCaffery M, Pasero CL. Pain ratings: the fifth vital sign. *Am J Nurs*. 1997;97:15.
13. Rabe R, Yacapin CP, Buckley BS, Faylona JM. Repeated in vivo inguinal measurements to estimate a single optimal mesh size for inguinal herniorrhaphy. *BMCSurg*. 2012;12:1-4.
14. Razavi SS, Peyvandi H, Jam AR, Safari F, Teymourian H, Mohajerani SA. Magnesium versus bupivacaine infiltration in controlling postoperative pain in inguinal hernia repair. *Anesth Pain Med*. 2015;5.
15. Sattari H, Haghbin M, Etminan M, Dehghani A. Survey of the Effect of Intraoperative Intravenous Lidocaine Infusion on Postoperative Pain in Laparoscopic Cholecystectomy Surgery. *JRUMS*. 2015; 13:937-948
16. Tavakoli A, Nourouzi M, Haji zadeh E. Patients satisfaction from pain soothing after the surgery in Kerman hospitals (2005). *J Kermanshah Univ Med Sci*. 2007;11:33.
17. Waechter FL, Sampaio JA, Pinto RD, Alvares-Da-Silva MR, Pereira-Lima L. A comparison between topical and infiltrative bupivacaine and intravenous meperidine for postoperative analgesia after inguinal herniorrhaphy. *Am Surg*. 2001;67:447.

Data and materials Availability

All data associated with this study are present in the paper.

Peer-review

External peer-review was done through double-blind method.

Article History

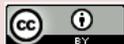
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