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Preemptive Effects of Lidocain on Postoperative Pain in Patients Undergoing Disc Operation: A Randomized, Double Blind, Placebo-Controlled Clinical Trial

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Abstract

Background: Postoperative pain is a major poorly managed problem in millions of operations performed all over the world each year. Since infiltration of the operative field with lidocain as a local anesthetic is very cheap, it is easily available, and there are few side effects, this study aimed to evaluate its efficacy on post-op-pain of patients undergoing open intervertebral disc surgery.

Methods: In this double blind clinical trial on 188 patients undergoing elective open intervertebral disc operation, the surgical incision site was infiltrated with 2 ml of 1/500,000 epinephrine for each centimeter in the control group and the same solution with 20 mg lidocain for each centimeter of the incision in the case group. Post-op-pain was measured with visual analog scale (VAS) in the 6th, 12th, 24th, and 48th hours.

Results: The mean age was 41.8±12.4 for the study group, and 43.5±15.6 for the control one. Statistical analysis revealed no significant difference in pain severity in females, but for males it was significant at the 6th and 24th hours. Interestingly, it was more severe in those receiving lidocain. The amount of narcotics used postoperatively revealed no significant difference in the groups.

Conclusion: Lidocain used locally before skin incision has no effect on reducing post-op-pain, post-op-narcotics demand, and duration of hospital stay.

Keywords: Disc herniation; Postoperative pain; Preemptive analgesia

Introduction

Pain accompanies several million surgical procedures performed worldwide each year and may persist long after tissue heals.[1,2] It is thought to be inadequately treated in one half of all surgical procedures.[3,4] It has been shown that preoperative pain control may decrease post-op-pain.[5] This is called preemptive analgesia. Specifically, preemptive analgesia may be defined as an antinociceptive treatment that prevents establishment of altered central processing of afferent input from the sites of injury.[6-11] Surgery is a special clinical setting where preemptive analgesia techniques may be the most effective approach as the onset of the intense noxious stimulus is well known.[5] It is essential to recognize that otherwise adequate levels of general anesthesia with a volatile drug such as isoflurane do not prevent central sensitization.[9] Thus, the potential for central sensitization exists even in unconscious patients who appear to be clinically unresponsive to surgical stimuli. In spite of all the proceedings in recognition of pathophysiology of pain, pharmacology of analgesics, and development of advanced techniques in the control of pain, postoperative pain is yet a major issue in patient care.[3,4] Pain increases the sympathetic activity, which in turn results in tachycardia, increased stroke volume, and heart demand. In addition, limited activity for fear of pain increases the possibility of deep vein thrombosis.[8] It is also a major psychological impact for the patient and the family.

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Postoperative pain relief has two practical aims, the first being subjective comfort, and the second restoration of function by allowing the patient to breathe, cough, and move more easily and improve postoperative outcome.[10,12] Preemptive analgesia has many different strategies.[9,10,13-19] Since infiltration of the operative field with lidocain as a local anesthetic is very cheap, it is easily available, and there are few side effects, this study aimed to evaluate its efficacy on post-op-pain of patients undergoing open intervertebral disc surgery.

Materials and Methods

This double blind clinical trial was conducted on 237 cases (131 men and 106 women) of radicular low back pain secondary to intervertebral disc herniation, during a 21 month period from January 2000 to October 2002, in Naghavi Hospital of Kashan University of Medical Sciences (KAUMS). None of the patients had a chronic pain disorder. Twenty four men and 25 women were excluded from the study for addiction to opium derivatives, frequent use of opium components and analgesics, hematoma, redness, hotness or any other sign of significant inflammation at the site of operation, or incomplete data. Anesthesia was started with 5 mg of sodium thiopenthal, 1.5 mg of succinylcholin, and 0.2 mg of atracurium, and continued with nitrous oxide 50%, and halothane 0.5% in oxygen. Intravenous fentanyl (1 microgram/kg/hour) was also used as analgesic. The patients were assigned to either of case or control groups on the base of a previously randomized list for both males and females. For the control group, 2 ml of 1/500,000 epinephrine was injected for each centimeter of the planned incision. For the case group, the same solution with 20 mg lidocain for each centimeter of the incision was prepared and infiltrated to the site of operation after induction of general anesthesia and a few minutes before the incision. The protocol was accepted and permitted by the ethics committee of the university and the consent form was filled and signed by all the patients assigned for the study. Pain was measured using a 100 mm Visual Analogue Scale (VAS) 6, 12, 24, and 48 hours postoperatively, while the patients were in supine position. The patients were unknown to the examiner. In the case of need, 50 mg pethedine or equal amounts of other opium derivatives were administered after measurement of pain severity. The length of operation, pain severity at the above-mentioned times, amount of opiods intraoperatively post operation, and length of admission were recorded for both groups. The recorded data were analyzed by SPSS software (version 13, Chicago, IL, USA), using T test for the amount of narcotics used, duration of hospital stay, age, and duration of operation, Chi Square for comparison of the number of different sexes, and ANOVA repeated measures for comparison of the severity of pain in groups and sexes. $P< 0.05$ was considered significant in this study.

Results

One-hundred and eighty eight patients with a mean age of 41.8±12.4 for the study group, and 43.5±15.6 for the control group were finally enrolled in the study,. The number of males to females, length of admission, and length of operation in the two groups were not significantly different ($P>0.05$; Table 1).

Table 1: Distribution of 188 patients in case and control groups and their characteristics.

	Case	Control
Sex:		
Male	53	54
Female	41	40
No. Of Right side discs	29	45
No. Of Left side discs	43	35
No. Of Bilateral cases	22	14
Days of Hospital Stay	5±2.4	5±2.2
Duration of Operation in Minutes	117±36.5	111.2±33.9
Age in Year	41.8±12.4	43.5±15.6

Figure 1 demonstrates pain severity in predetermined times in the two groups. Repeated measures analysis of variance revealed no significant difference between the control and case groups, although for males the difference in pain severity at the 6th and 24th hours was significant ($P<0.05$). The interesting point is that pain was more severe in those receiving lidocain.

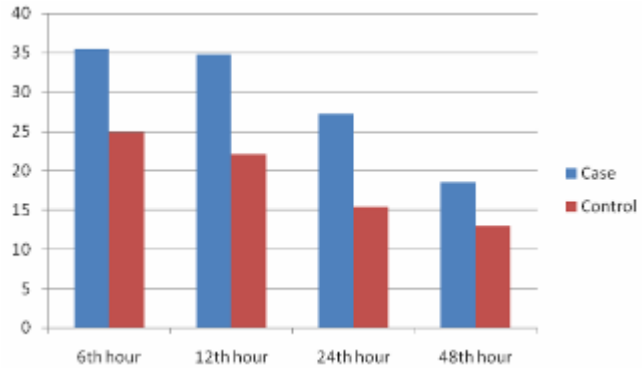

Fig 1: Pain score in control and case groups in different time intervals

Table 2: The amount of opiods used for the patients during and after operation.

	Male		Female	
	Case	**Control**	**Case**	**Control**
Intraoperative	2.4±0.8	2.3±0.6	2.3±0.5	2.7±0.7
Postoperative	11.4±15.3	12.5±16.0	8.4±10.3	8.1±12.8

The amount of narcotics [mean (mg)±SD] used postoperatively had no meaningful difference between the groups (Table 2).

Discussion

Pain severity diminishes in patients of both groups form the 6th to 48th hours, postoperatively (Fig. 1). There was no significant difference between the two groups in severity of post-op-pain, but pain was higher in the case group. For male patients, the difference was significant at the 6th and 24th post-op hours (P<0.05). This is in contrast with the baseline assumptions of preemptive analgesia, considering lesser post-op-pain perception with pre-injury use of medications by suppressing pain induction, conduction or perception.[1,19,20] Since all of the processes the patients underwent for disectomy procedure have been matched, it can be concluded that lidocain may act either as an injurious agent for the nerves[21] and adjacent tissues, exacerbating post-op-pain with release of pain-promoting (algogenic) substances from peripheral nerve endings and extraneural sources (e.g. substance P, prostaglandins, serotonin, bradykinin and histamine)[22], or it may result in hypersensitization of the nerve endings and cause increased perception of pain in a manner just like deafferentiation pain.[23] It has also been shown that local anesthetics cause depression of cortical inhibitory pathways, thereby allowing unopposed activity of excitatory components.[21] This may explain increased pain perception in the case group in the first post-op day and its subsequent disappearance.

In a study on thoracotomy patients with a similar discipline in use of lidocain, the authors found no difference in the amount of post-op medications and duration of hospital stay.[24] In another study, it was found that local anesthetics decreased the demand of analgesics but had no effect on the severity of pain.[25] They did not refer to any increased post-op pain after subcutaneous use of lidocain.

The main advantage of preemptive analgesia is the better control of post-injury pain. This subject was evaluated with the amount of narcotics used for relieving post-op-pain in patients. As seen in Table 2, there was no significant difference in the amount of narcotics administered to both groups although male patients, generally, had received more amounts of narcotics than females. Although the difference is statistically non-significant, it is interesting to note that male patients in the case group had received less narcotics than the controls, in contrast to females who had received a little more amount of narcotics in the case group. Considering the above-mentioned findings that male case group patients scored higher levels of pain while requested lesser amounts of narcotics may indicate better tolerance to pain. In a study on 119 patients undergoing thoracotomy and receiving 1% lidocain and epinephrine in the study group, and saline and epinephrine in the control group at the site of thoracotomy skin incision, there was no reduction in severity or type of pain during hospital stay.[24]

In a review of 80 randomized trials with 3,761 patients in which 1964 patients received pre-emptive treatment, 20 trials comparing pre-emptive with post-incisional application of peripheral local anaesthetics were analysed.[19,22] These were divided into trials of wound infiltration, peripheral nerve block and intraperitoneal infiltration. Sixteen trials compared preoperative incisional local anaesthetics with similar post-incisional administration. Quantitative analysis was possible for 14 of these trials. Visual Analog Score (VAS) between treatment groups was not significant. It was concluded that there was no evidence for improved pain relief with pre-emptive local anaesthetic wound infiltration compared with a similar post-incisional administration of medications.[19]

In a review of sixty-six studies with data from 3261 patients it was indicated that preemptive local anesthetic wound infiltration administration improved analgesic consumption and time to first rescue analgesic request, but not postoperative pain scores.[25]

In our study, female patients were scored higher levels of pain in comparison to male patients, and this was more significant in the control group. In one study on 2,298 Chinese patients for post-op-pain in rest and upon movement, it was shown that gender

difference is a major predictor of morphine consumption. Gender-related pharmacokinetics and/or pharmacodynamics, many gender specific and gender-dependent factors such as the mediation of endogenous opiates, neurotransmitters or hormones, may influence the patients' perception of pain.[26] Sex differences may in part result from the effects of steroids on opiate receptors in several areas of the brain and differences in the role of the opioid system in the stress response. It is possible that the sensitivity, quantity, and ratio of different classes of opioid receptors differ between males and females.[27,28]

As a whole, it can be concluded that lidocain used locally before skin incision has no effect on reducing post-op-pain, post-op narcotics demand, and duration of hospital stay. It may decrease the threshold of pain perception, and increase tolerance to it. This latter finding needs further investigations. Since different mechanisms are involved in production, conduction, and perception of pain in different parts of the nervous system, further studies on the effects of combined use of lidocain with other drugs in control of postop pain are recommended.

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