Preoperative analgesia with local lidocaine for cesarean delivery pain relief

LEILA SEKHAVAT\textsuperscript{1} & SHEKOUFEH BEHDAD\textsuperscript{2}

\textsuperscript{1}Department of Obstetrics & Gynecology, Shahid Sadoughi Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran and \textsuperscript{2}Department of Anesthesia, Shahid Sadoughi Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran

Abstract

Objective. The purpose of this study was to determine whether local analgesia at the incision site could reduce pain in women undergoing cesarean delivery or not.

Methods. One hundred and four women undergoing cesarean deliveries were randomized in two groups according to 10 ml of 2\% lidocaine (n = 52) or 0.9\% saline (n = 52) was injected at the abdominal incision prior to the performance of the cesarean section (CS). Postoperative pain treatment consisted of oral analgesia with mefenamic acid 500 mg. Morphine 5 mg was used for rescue analgesia. Pain intensity was self-evaluated with visual analog scale. Data were analyzed by SPSS software version 11.5 and p value \(<0.05\) was considered significant.

Results. Women in lidocaine group perceived a significant reduction in postoperative pain in the first hours after surgery. There was also significantly less opioid analgesic requirement in the lidocaine than control group 4 h after CS (19 vs 44 women, \(p = 0.001\)). No side effects were reported in either group.

Conclusion. Preemptive analgesia with lidocaine infiltration at the incision is a simple and efficient mode with few side-effects that may reduce pain and opioid requirements in women undergoing CS.

Keywords: Preoperative local analgesia, cesarean delivery, postoperative pain, lidocaine infiltration

Introduction

The management of postoperative pain has received much interest in recent years. The degree of postoperative pain, as ultimately perceived by the patient, is multifactorial and depends on variables such as type and duration of the operation, type of anesthesia and analgesia used, and the patient’s mental and emotional status (for example: laparotomy for cesarean delivery versus laparotomy for uterine cancer) [1]. There are many methods of postoperative pain treatment [2–4]. The traditional and most widely used is parenteral opioids. Parenteral narcotics in general are associated with nausea, vomiting, constipation, respiratory depression, and sedation [2]. Newer technologies, such as continuous epidural analgesia or patient-controlled analgesia, have adverse effects, are expensive, and require trained personnel and special equipment [3]. Another option for postcesarean pain management is to administer oral analgesics immediately after the procedure [4].

Preemptive analgesia is an analgesic regimen initiated before the onset of tissue trauma and could have effects that outlast the pharmacokinetic presence of the intervention and its efficacy. It is based on the theory of prevention of central pain sensitization. Different techniques of preemptive analgesia have been reported, including intramuscular, intravenous, epidural, and local anesthetics used in peripheral nerve block, intraperitoneal instillation, or wound infiltration [5,6].

Cesarean delivery is the most frequent major surgical procedure in obstetrics; and is unique in that the patient must recuperate from surgery while caring for a newborn infant, who makes it crucial that postcesarean care do not limit maternal functioning [7]. It would be of great value to optimize the postcesarean pain treatment. Recent works suggest that preemptive skin infiltration with local anesthetic may lead to reduced postcesarean pain [6,8].

The efficacy of lidocaine skin infiltration for the management of postoperative pain in C/S has not been studied. The purpose of our investigation was to determine whether local anesthesia with lidocaine skin infiltration could be used to decrease opioid requirement after cesarean delivery or not. However, other anesthetic drugs like bupivacaine are longer acting than lidocaine; we chose lidocaine because of its less side effects. Adverse drug reactions are rare when lidocaine is used as a local anesthetic and administered correctly, but bupivacaine is markedly cardiotoxic.

Method

This prospective, double-blind, placebo-controlled, randomized clinical trial was designed and conducted on 104 women undergoing cesarean delivery for various indications. All patients were referred to Shahid Sadoughi hospital in Yazd, from May 2006 to February 2007. The adopted protocol was approved by the hospital research and ethics committee. The efficacy of lidocaine skin infiltration for the management of postoperative pain in C/S has not been studied. The purpose of our investigation was to determine whether local anesthesia with lidocaine skin infiltration could be used to decrease opioid requirement after cesarean delivery or not. However, other anesthetic drugs like bupivacaine are longer acting than lidocaine; we chose lidocaine because of its less side effects. Adverse drug reactions are rare when lidocaine is used as a local anesthetic and administered correctly, but bupivacaine is markedly cardiotoxic.

(Received 3 July 2010; revised 31 October 2010; accepted 1 November 2010)

Correspondence: Leila Sekhavat, MD, Department of Obstetric & Gynecology, Shahid Sadoughi Hospital, Shahid Sadoughi University of Medical Sciences, Yazd, Iran. Tel: +009893518224001. Fax 009893518224100. Mobile: 00989131525637. E-mail: sekhavat@ssu.ac.ir

(C) 2011 Informa UK, Ltd. ISSN 1476-7058 print/ISSN 1476-4954 online DOI: 10.3109/14767058.2010.537410
committee (Institutional Review Board) in accordance with the Helsinki declaration. All women were interviewed individually by the researcher. Written informed consent was obtained from all the patients.

Sample size estimations were based on the results of a previous study, and assuming an $\alpha$ level of 0.05 and $\beta$ error of 0.8, 47 patients were needed per group to detect a 10 point difference on a 0–100 visual analog pain scale score. To account for possible loss to follow-up, it was decided to include 60 patients per trial arm.

Women were excluded from the study if they had a known allergy/hypersensitivity to lidocaine, systemic vascular disease, neurological disorder, diabetes mellitus, treatment with magnesium sulfate, the chronic use of narcotics or substance abuse, or more than two previous abdominal operations. The patients were randomly allocated to either the lidocaine group (52 women) or the control group (52 women). Randomization was performed with a computer-driven random number sequence and sealed in opaque envelopes. Prior to each operation, the surgeon was provided with a syringe containing a 10 ml solution of 2% lidocaine in the lidocaine group or 0.9% sodium chloride in the control group, which was injected subcutaneously in the line of the incision before start of the surgery. All 104 syringes with solutions were prepared by the pharmacy department and their contents 2% lidocaine or 0.9% sodium chloride were determined by random numbers generated by a computer. The codes of the solutions were disclosed for the investigators only after completion of the statistical analysis of the results. After the disclosure of the codes, it was found which women had received preemptive analgesia with 2% lidocaine and which had been treated by placebo.

All cesareans were performed under general anesthesia. In our hospital, general anesthesia was induced using thiopental 5mg/kg, and succinylcholine 1–1.5 mg/kg, with ventilation of 50% $\text{O}_2$ and 50% $\text{N}_2\text{O}$. All skin incisions were Pfannenstiel and kerr incision used for uterine. Following surgery, all women were treated in the postoperative care unit for 2 h. A stable hemodynamic condition, 1–2 l lactated Ringer solution during and after operation, was prepared for all of the patients. They were closely monitored in the recovery room. During their stay in the recovery room, analgesia with intravenous morphine 5 mg was provided at the patient’s request. Thereafter, the standard care for postoperative pain in the Department is based on previous experiences with cesarean delivery, oral mefenamic acid 500 mg at 4 h intervals [9]. Women are informed that they can receive a rescue dose of another morphine dose for breakthrough pain if further analgesia is needed before 4 h elapse. In such cases, they receive an intramuscular injection of morphine 5 mg. Starting from the second postoperative day, oral analgesia is provided only on patient request. During the first 12 h, pain intensity is evaluated every 2 h and at rest and then every 4 h if they were not slept. The self-report of pain is assessed by the patient on a validated 100 mm visual analog scale, as instructed by the nursing staff. This pain scale provides a validated and minimally intrusive measure of pain intensity, the scale ranges from ‘No pain’ (0) to ‘The most pain imaginable’ (100). Patients were instructed to place a mark on the line that indicated the level of pain experienced. The distance in millimeters from the low end of the visual analog scale and the patient’s mark was used as a numerical index of pain intensity. The questionnaires were filled out for each patient at the beginning of the study and after operation. In our department, women have oral feeding 6 h after cesarean section (CS), are mobilized on the morning hours following the operation and usually stay in the hospital for 48–56 h.

Analysis of data was performed with the SPSS 15.5 software. Statistical methods included Student’s $t$-test, Fisher exact test and $\chi^2$ test, and $p$-values less than 0.05 were considered as significant.

### Results

One hundred four women completed the study: 52 women received preemptive analgesia with 2% lidocaine and 52 were treated by placebo. Table I shows that there was no difference in the demographic and medical characteristics of both studied groups. As a result of the study design, the two study groups were also identical for indication of CS. No adverse reactions were noted following local injection in either group.

Table II presents the main data of the postoperative analgesic treatments and pain assessments. Nineteen women in the lidocaine group asked for additional analgesia in 2 h after cesarean while 44 women in the placebo group requested analgesia ($p < 0.001$). Furthermore, pain assessment in the recovery room and during the first two postoperative hours showed women in the lidocaine group experienced significantly less pain at the scheduled postoperative pain measurement intervals, by an average of less than 40 mm on the visual analog scale. The number of doses of mefenamic acid provided during the first postoperative day was similar, six in both groups. The requirement for analgesia on the second postoperative day was very low, an average of four analgesic doses, similar in both groups. There was no difference in hospital length of stay or in postoperative complications.

### Discussion

The current study shows that preemptive analgesia given by pre-incisional infiltration with 2% lidocaine has a significant and beneficial effect on pain perceived by women in the first 6 h postcesarean delivery. Half time of lidocaine is 90–120 min. During this period, average pain intensities in the lidocaine group were lower than 40 mm, while average pain scores in the placebo group were higher than 60 mm. This is of importance, because pain scores of 5–44 mm may be labeled as mild pain and from 45 to 74 mm may be labeled as moderate pain [10]. The results, therefore, indicate that lidocaine pre-incisional infiltration is an effective method in controlling pain.

### Table I. Maternal characteristics of study groups.

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Lidocaine ($n = 52$)</th>
<th>Placebo ($n = 52$)</th>
<th>$p$ value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year) (mean ± SD)</td>
<td>27.7 ± 7.1</td>
<td>29.1 ± 6.9</td>
<td>0.21</td>
</tr>
<tr>
<td>Parous (number (%))</td>
<td>11 (21.2)</td>
<td>10 (19.2)</td>
<td>0.40</td>
</tr>
<tr>
<td>Primi</td>
<td>41 (78.8)</td>
<td>42 (80.8)</td>
<td>0.30</td>
</tr>
<tr>
<td>Gestational age (week)</td>
<td>38.2 ± 1.4</td>
<td>38.5 ± 1.7</td>
<td>0.10</td>
</tr>
<tr>
<td>Indication (Number (%))</td>
<td>31 (59.6)</td>
<td>29 (55.8)</td>
<td>0.00</td>
</tr>
<tr>
<td>Elective</td>
<td>21 (40.4)</td>
<td>23 (44.2)</td>
<td>0.29</td>
</tr>
<tr>
<td>Operation time (minute)</td>
<td>21 ± 8.3</td>
<td>21.8 ± 7.8</td>
<td>0.00</td>
</tr>
<tr>
<td>Length of hospital stay (hour) (mean ± SD)</td>
<td>51.1 ± 3.2</td>
<td>52.3 ± 3.6</td>
<td>0.64</td>
</tr>
</tbody>
</table>
The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

References

1. Pan PH, Coghill R, Houle T. Multifactorial preoperative predictors for post cesarean delivery pain and analgesic require-
2. Faboyaa A, Unclesb D. Post cesarean delivery pain manage-
 186.
5. Moiniche S, Kehlet H, Dahl JB. A qualitative and quantitative
 systematic review of preemptive analgesia for postoperative pain
 relief. The role of timing of analgesia. Anesthesiology 2002;
 96:725–741.
 Preemptive analgesia and local anesthesia as a supplement to
7. Yost NP, Bloom SL, Sibley MK, Lo JY, McIntire DD, Leveno
 KJ. A hospital-sponsored quality improvement study of pain
 management after cesarean delivery. Am J Obstet Gynecol
 2004;190:1341–1346.
8. Peter H. Post cesarean delivery pain management: multimodal
9. American Academy of Pediatrics Committee on Drugs. The
 transfer of drugs and other chemicals into human milk. Pediatrics
10. Jensen MP, Chen C, Brugger AM. Interpretation of visual analog
 scale ratings and change scores: a reanalysis of two clinical trials
11. Lowensteina L, Zimmer EZ, Deutscha M, Paza Y, Yaniva D,
 Jakobia P. Preoperative analgesia with local lidocaine infiltration
 for abdominal hysterectomy pain management. Eur J Obstet
12. Davis MK, Esposito MA, Meyer BA. Oral analgesia compared
 with intravenous patient-controlled analgesia for pain after
 cesarean delivery: a randomized controlled trial. Am J Obstet
 Gynecol 2006;194:967–971.
13. Ranta PO, Ala-Kokkoa TI, Kukkonena JE, Ohtonen PA,
 Raudaskoskia TH. Incisional and epidural analgesia
 after cesarean delivery: a prospective, placebo-controlled,
 194.
 Single dose oral ibuprofen and diclofenac for postoperative pain.
 Cochrane Database Syst Rev 2000;CD
002067.
15. Victory RA, Noor M, Gajraj NM, Van Elstraete A, Pace NA,
 Johnson ER, White PF. Effect of preincision versus postincision
 infiltration with bupivacaine on postoperative pain. J Clin Anesth