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# Local Anesthetic Irrigation and Postoperative Pain in Patients Undergoing Breast Augmentation

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## Summary

**Objective:** To determine if the irrigation of the breast cavity with local anesthetics in patients who undergo breast augmentation surgery reduces rescue analgesic requirements and postoperative pain intensity level, measured with the visual analogue scale (VAS).

**Methods:** This study is a Placebo controlled non randomized clinical trial. In the intervention group (group 1) the breast cavity was irrigated with 1% lidocaine with epinephrine (7 mg/kg), 0.5% bupivacaine (3 mg/kg) and normal saline solution. In the second control group (group 0) the breast cavity was irrigated with saline solution. Anesthetic and analgesic techniques were standardized. The type (morphine, hydromorphone and meperidine) and total required dose of opioid rescue analgesic medication in the Post Anesthetic Care Unit (PACU) were also registered. Postoperative pain intensity level was also registered at the moment of consciousness recovery, thirty minutes, the first hour, two, six and twenty four hours of postoperative period.

**Results:** There was a difference in the number of patients requiring opioid rescue analgesia with morphine at PACU ($p<0.01$), 10% in the intervention group versus 50% in the control group. Likewise, there was difference in pain intensity level ($p<0.01$).

**Conclusions:** Local anesthetic irrigation in patients who underwent breast augmentation surgery reduces opioid rescue analgesia requirements and postoperative pain intensity level.

**Keywords:** Breast augmentation surgery; Analgesia; Visual analogue scale; Lidocaine; Bupivacaine

## Introduction

The number of plastic surgery procedures to be done in the world has increased steadily during the two latest decades, as well as the number of hospitals and ambulatory surgery to where these procedures are performed. The optimization of analgesia in these patients is directly associated with early discharge to home and with the early return of patients to work and daily activities [1-5]. What had been mentioned in literatures regarding strategies for the prevention and control of acute postoperative pain in patients undergoing breast augmentation is limited [4].

Various techniques have been described to control postoperative pain in this group of patients: continuous infusion of local anesthetics through catheters [6,7], irrigation of local anesthetics such as bupivacaine [7-9], or non-steroidal anti-inflammatory such as ketorolac [10,11] in the breast cavity, oral analgesia [12], simple analgesia via incision infiltration [12], or continuous local anesthetic such as bupivacaine and ropivacaine [13,14], intra-operative administration of corticosteroids [15-18], paravertebral block [16] and single or continuous epidural analgesia [17].

The techniques that include the use of infiltration or irrigation of local anesthetics - mainly of lidocaine , bupivacaine or ropivacaine - is still widely used as part of multimodal analgesia in different types of surgery, with a remarkable effectiveness and without reports of adverse effects [6] related to local anesthetics [11,13,14].

The use of local anesthetics given by the surgeon in the breast cavity before the introduction of the prosthesis is known and referred to case reports and letters to publishers, although its effectiveness has been assessed as only a limited number of controlled studies. It has been reported that irrigation technique of local anesthetics in breast surgery, using lidocaine and bupivacaine in the pocket created for the introduction of prosthesis prior to hemostasis with high levels of satisfaction of patients regarding the analgesia [7-9]. Patients undergoing this analgesic technique are discharged to home with optimal analgesia and this effect remains to the next day when you begin treatment with oral analgesics, and ask for return of patients to their daily activities.

The main objective of this study was to evaluate the effectiveness of the technique of the irrigation of the breast cavity with a solution consisting of lidocaine and bupivacaine, before the introduction of the prosthesis in patients classified as ASA I and II undergoing breast augmentation in the plastic surgery department of King Khalid University Hospital. We tried to determine whether the intervention mentioned decreases the need for opioids rescue analgesia in the PACU and also evaluate the postoperative pain level measured by VAS during the immediate postoperative period.

## Patients and Methods

This study, placebo-controlled, is a blind study for patients and those who analyzed the data. 80 Patients aged 18 to 50 years, classified in pre-anesthetic visit as ASA I and II, were scheduled for breast augmentation surgery under general anesthesia at King Khalid University Hospital, in the period between October 2009 and March 2011 after approval of the ethics committee of Faculty of Medicine. The appropriate sample size for

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the study was calculated based on historical data, in which about 60% of patients require the use of rescue analgesics in the PACU. Reduction is considered, as a significant if analgesics to decrease to 25%. The minimal sample was necessary to demonstrate difference of 36 participants in each group.

### Exclusion criteria

Patients with a history of intolerance or allergic reactions to local anesthetics. Patients who do not agree to participate in the study.

Informed consent was obtained from the patients during the pre-anesthetic visit. The assignment of patients to one of the two study groups (intervention and control) was conducted by researchers before the start of the surgical procedure, according to the computer to perform surgical sets to the procedure. In the intervention group breast cavity was irrigated with solutions of lidocaine1% with epinephrine (7mg/kg) plus 0.5% bupivacaine (3 mg/kg) and saline solution. In the control group breast cavity was irrigated with saline solution only. We collected the necessary data through questionnaires answered by the anesthesiologist in -charge during the surgical procedure and, subsequently, in the PACU for evaluation of pain intensity level according to VAS upon regaining consciousness, at thirty minutes, the first hour, two, six and twenty-four hours postoperative.

The anesthetic technique was standardized for all patients. All patients were monitored conventionally, were premedicated in the operative theatre with midazolam in a dose of 1-2 mg, induction underwent with intravenous propofol 2 mg/kg and rocuronium at a dose of 0.6 mg/kg. All patients received fentanyl infusions titrated according to the need of anesthesia, between 1 to 2 mic/kg per hour, and antiemetic prophylaxis with 10 mg of dexamethasone. Anesthetic maintenance was performed with fentanyl in titratable infusions with 1-2% alveolar concentration of sevoflurane. Residual muscle relaxant was reversed with the use of neostigmine. All patients received postoperative analgesia in the form of 75 mg diclofenac sodium im. Morphine at doses of 0.07 to 0.1 mg/kg and hydromorphone at doses 0.01 to 0.02 mg/kg when requested. Evaluation of pain intensity was made with the VAS starting from the time when the patient regained consciousness and had an adequate response to the question, and then, thirty minutes to one hour, two, six and twenty-four hours postoperative.

### Analysis of data

Comparisons between groups were performed with the null hypotheses of no difference. Quantitative variables were compared using the Student t test (means) or the Mann-Whitney U according to appropriate. Qualitative variables were compared with Chi- square test. All analysis was conducted with the help of a program state (State®, version 9.1; State Corporation, 4905 Lakeway Drive, College Station, Texas 77845 USA). A P value <0.05 is considered significant for rejecting the null hypotheses.

## Results

Eighty patients met the inclusion criteria and participated in the study, of whom 40 were assigned to the intervention group (group 1), which received irrigation of the breast cavity with the local anesthetic solution, and 40 were assigned to the control group (group 0) that received irrigation of the breast cavity with normal saline solution.

In analyzing the basic demographic data there was no statistical differences between the two studied groups except for the volume of breast prosthesis implanted which was 280 ml in group 0 (p <0.01), compared to 300 ml in group 1 but this was not clinically important (Table 1).

There was a significant difference in primary outcome of the number of patients requiring rescue analgesia with morphine in the PACU. In group 1, 10% (4/40) of patients required rescue morphine analgesia in the immediate postoperative compared with 50% (20/40) of those in group 0 (p <0.01). No statistically significant difference was found between the number of patients requiring rescue analgesia in PACU (hydromorphone, and meperidine) with 5% of patients requiring rescue analgesia with hydromorphone in group 0 versus 3% in group 1 (p = 0.55) and for meperidine, 3% of patients in group 0 versus 5% in group 1 (p = 0.55). No statistically significant difference was found between the total doses of morphine, hydromorphone, and meperidine administered as rescue analgesia in PACU (Table 2).

| variable | Group 0 Control (n = 40) | Group 1 Intervention (n = 40) | P value |
|---|---|---|---|
| Age (yr) | 33 ± 16.3 | 32 ± 11.4 | 1.00 |
| Weight (kg) | 57 ± 8.4 | 53 ± 9.2 | 0.14 |
| Duration of procedure (hr) | 3 ± 1.2 | 3 ± 1.1 | 0.57 |
| Volume of implanted prosthesis (ml) | 280 ± 25 | 300 ± 40 | 0.01* |
| Type of procedure<br>Simple<br>Combined | <br>11 (28%)<br>29 (72%) | <br>12 (30%)<br>28 (70%) | 0.81 |
| ASA class<br>I<br>II | <br>28 (70%)<br>12 (30%) | <br>33 (83%)<br>7 (17%) | 0.19 |

*Statistically significant

**Table 1:** Demographic data of studied groups (mean ± SD) and (%).

| Analgesics | Group 0 Control (n = 40) | | Group 1 Intervention (n = 40) | | P value | |
|---|---|---|---|---|---|---|
| | n (%) | Dose (mg) | n (%) | Dose (mg) | P1 | P2 |
| Morphine | 20 (50) | 4.8 ± 1.2 | 4 (10) | 5.5 ± 1.0 | 0.01* | 0.59 |
| Hydromorphone | 2 (5) | 0.3 ± 0.1 | 1 (3) | 1.0 ± 0.1 | 0.55 | 1.00 |
| Mepiridine | 1 (3) | 60 ± 11.5 | 2 (5) | 35 ± 10.2 | 0.55 | 1.00 |

*Statistically significant

**Table 2:** Opioid rescue analgesic requirements in PACU (mean ± SD).

Administration of intra-operative analgesics was according to the standardized protocol. However, when comparing the groups there were significant statistical differences between the total dose of hydromorphone administered with average dose of 0.8 mg in group 0 and 1.5 mg in group 1 (p = 0.03) (Table 3).

The postoperative pain intensity measured with VAS at all times (to regain consciousness, 30 minutes, the first hour, 2, 6 and 24 hours) indicated that was significantly lower in group 1. The median and range of VAS was: to regain consciousness (T0), 0 (1) in group 1 and 5 (2) in group 0 (p <0.01), 30 minutes (T30), 1 (3) in group 1 and 5 (2) in group 0 (p <0.01), the first hour (T1), 1 (2) in group 1 and 4 (2) in group 0 (p <0.01) at 2 hours (T2), 1 (2) in group 1 and 4 (1) in group 0 (p <0.01), the 6 hours (T6), 0 (1) in group 1 and 4 (2) in group 0 (p <0.01), and 24 hours (T24), 0 (1) in group 1 and 4 (1) in group 0 (p <0.01) (Table 4).

## Discussion

Breast reduction is one of the most frequently performed plastic surgical procedures all over the world; more than 160,500 patients underwent the procedure in 2005 in United States. Postoperative discomfort is one of the most famous side effects among those patients undergoing reduction mammoplasty who report this in the first 48 hours postoperatively [9].

Important factors such as patient education, preoperative planning,

| Analgesics | Group 0 Control (n = 40) | | Group 1 Intervention (n = 40) | | P value | |
|---|---|---|---|---|---|---|
| | n (%) | Dose (mg) | n (%) | Dose (mg) | P1 | P2 |
| Morphine | 32 (80) | 5.7 ± 1.4 | 31 (78) | 5.5 ±1.2 | 0.78 | 1.00 |
| Hydromorphone | 5 (13) | 0.8 ± 0.2 | 3 (8) | 1.5 ± 0.2 | 0.45 | 0.03* |
| Mepiridine | 2 (5) | 60 ± 9.5 | 3 (8) | 47 ± 10.5 | 0.64 | 0.32 |

P1: compares significance between number of patients
P2: compares significance between dose of opioids
*Statistically significant

**Table 3:** Intra-operative opioid analgesic consumption (mean ± SD).

| Time of VAS measurement | Group 0 Control (n = 40) | Group 1 Intervention (n = 40) | P value |
|---|---|---|---|
| T 0 | 5 (2) | 0 (1) | < 0.01* |
| T 30 | 5 (2) | 1 (3) | < 0.01* |
| T 1 | 4 (2) | 1 (2) | < 0.01* |
| T 2 | 4 (1) | 1 (2) | < 0.01* |
| T 6 | 4 (2) | 0 (1) | < 0.01* |
| T 24 | 4 (1) | 0 (1) | < 0.01* |

VAS: Visual Analogue Scale
T0: When regain consciousness
T30: 30 minutes postoperative
T1: First hour postoperative
T2: 2 hours postoperative
T6: 6 hours postoperative
T24: 24 hours postoperative
*Statistically significant

**Table 4:** Postoperative pain intensity measured with VAS at all times (Median & Range).

instrumentation, surgical technique modifications, optimal use of muscle relaxants during subpectoral dissection and effective analgesia contribute positively in reducing surgical trauma and bleeding, perioperative morbidity, and allow return of normal activity within 24 hours or less [19].

Evaluation of analgesic technique for irrigation, using a mixture of local anesthetics was not widely studied before and was not commonly accepted by some plastic surgeons. The technique of irrigation of local anesthetic in the breast cavity prior to the introduction of implanted prosthesis and after checking the proper hemostasis in patients undergoing breast augmentation, reconstruction and reduction of breast surgery, is known and widely practiced, but its effectiveness had been demonstrated in a limited number of studies that evaluated different compositions of mixtures with local anesthetics, such as bupivacaine and non-steroidal anti-inflammatory, such as ketorolac [4]. In literatures there are case reports and communications that suggest the effectiveness of these techniques and its contribution to improving the satisfaction of patients, to optimize analgesia and, with this, to promote early return to work and daily activities [1-5].

With recent developments in the field of analgesia, the question arises whether there is a role for placing local anesthetics, nonsteroidal anti-inflammatory drugs, or both into the breast implant pocket. Mahabir et al tested the effectiveness of locally administered intraoperative ketorolac and bupivacaine with epinephrine at reducing pain in the postoperative period. They observed that patients who received this mixture spent less time in the recovery room and used fewer analgesics postoperatively than the other patients. There were neither related surgical complications such as hematomas requiring reoperation nor other complications. They concluded that locally administered intraoperative ketorolac and bupivacaine with epinephrine significantly reduced pain in the postoperative period [11].

Also Culliford et al investigated the effect of intraoperative topical application of the long-acting local anesthetic agent bupivacaine (Marcaine) on postoperative pain, time to postanesthesia care unit discharge, and postoperative use of narcotic medication. They demonstrated that a single dose of intraoperative bupivacaine provides a safe, inexpensive, and efficacious way to significantly shorten the length of postanesthesia care unit stay and significantly decrease postoperative opioid analgesic use in patients undergoing ambulatory reduction mammoplasty [9].

Jabs et al reported the first study on the effect of bupivacaine infiltration in submuscular breast augmentation. They showed a quantitative pain reduction regimen that significantly decreasing the use of narcotics in the recovery room. The authors concluded that its advantage is significant, and they advocated its use in all breast augmentations [20].

The results of this study suggest the effectiveness of this technique to reduce the need to rescue analgesic for the immediate postoperative pain which was measured with VAS in patients undergoing breast augmentation. Importantly, no patient included in the present study had shown toxicity-related reactions or allergy to local anesthetics during or after the surgical procedure. Klein and Lillis have shown that buffered 0.5-0.1% lidocaine with 1:1 million epinephrine is adequate even for unsedated or very mildly sedated procedures including extensive liposuction. Both have found it safe to use 35 mg/kg of lidocaine if the concentration is quite dilute (i.e., 0.1% or less), and both feel that up to 50 mg/kg is probably safe also. The patient must be healthy and have good liver function [21,22]. Klein has found that absorption of lidocaine from subcutaneous fat is inversely proportional to the concentration of the solution, and that the peak concentration for dilute solution (0.05-0.1%) occurs at about 12-16 hours postoperatively [23]. Although anesthetic and analgesic technique was standardized, difference was found between the study groups when comparing the dose of hydromorphone administered as analgesic, which is explained by the individual preference of some anesthesiologists in the department for the utilization of higher doses than recommended in the instructions.

Morphine is known as the routine analgesic drug used in our department for the management of moderate to severe acute postoperative pain, so the result which showed statistical significantly differences in the number of patients requiring rescue analgesia with morphine has a clinical significance important in our context. The results obtained in this study are used to provide conclusive evidence proving the effectiveness of this technique and to make recommendation thereon to establish this practice as a routine. In future studies it is better to have a utility in addition, for measurement of plasma concentrations of local anesthetics to support the policy of the technique safety.

## Conclusions

Anesthesiologists engaged in perioperative management of tumescent liposuction should be aware of the potential risk of local anesthesia toxicity and related drug interactions. These, plus other possible perioperative complications such as pulmonary embolism, pulmonary edema, fluid imbalance, or hypothermia, mandate expansion of monitoring and resuscitative facilities when tumescent liposuction is performed. The results of this study suggest that irrigation a solution of local anesthetics like lidocaine and bupivacaine in the breast cavity, at therapeutic doses in patients undergoing breast augmentation can be an effective technique to reduce the need for rescue analgesics in the PACU. The technique is also considered effective in reducing the severity of postoperative pain experienced by patients, measured with VAS during the immediate postoperative period. This method should be applied under careful

informed consent with the patient.

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