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Original Article

Preemptive Local Anesthetic in Gynecologic Laparoscopy and Postoperative Movement-Evoked Pain: A Randomized Trial

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ABSTRACT **Study Objective:** To evaluate whether preemptive local anesthetics injected into the trocar areas reduce postoperative movement-evoked pain within an enhanced recovery program (ERP) in laparoscopic gynecologic surgery.
Design: A randomized and double-blinded trial with parallel assignments (Canadian Task Force Classification I).
Setting: The study was conducted in the gynecologic department at the University Hospital of Stavanger, Stavanger, Norway.
Patients: Twenty-four women eligible for elective laparoscopic surgery for a benign indication within an ERP were included.
Interventions: The women were randomized to preemptive local injections of either 0.5% bupivacaine (intervention group) or 0.9% saline (control group) at each trocar site.
Measurements and Main Results: The primary outcome measure of the study was movement-evoked pain 5 hours after surgery. The secondary outcome measures were pain at rest 2 and 5 hours after surgery and the use of rescue analgesics during the postoperative period. Pain was measured on a numeric rating scale of 0 to 10. Data were treated to a per-protocol analysis, and a $p < .05$ was considered significant.
Results: Twenty-three women completed the trial. The median score for movement-evoked pain 5 hours after surgery was significantly lower in the intervention group (1 vs. 3, $p = .044$). There was no difference in pain at rest after 2 and 5 hours and no difference in the requirement for rescue analgesics.
Conclusion: Preemptive local anesthetics in the trocar areas are shown to be beneficial in laparoscopic gynecologic surgery within an enhanced recovery program. Movement-evoked pain is far more intense than pain at rest. Journal of Minimally Invasive Gynecology (2016) ■, ■–■

Keywords: Enhanced recovery program; Laparoscopy; Movement-evoked pain; Postoperative pain; Preemptive local anesthetic

The increase in minimal access surgery has contributed to a considerable reduction in postoperative overnight stays. A substantial number of surgeries in the field of gynecology are now day case procedures. This has led to an increased need for optimal postoperative pain relief in order to mobilize the patients and return them to normal, daily activities as soon as possible. The concept of enhanced recovery after surgery (ERAS) was first described by Professor Henrik Kehlet in 1997 and later updated [1,2]. The enhanced recovery program (ERP), with its emphasis on early discharge from the hospital, has been shown to improve patient outcomes and cost-effectiveness [3-5].

Local anesthesia in surgical incisions has been used within the ERP to reduce the need for opiates during and after surgery. The use of opiates in the postoperative period has side effects of nausea and vomiting in 25% to 35% of patients, which, in turn, reduces mobilization and increases the length of their hospital stay [6]. Local anesthesia injected before incision (preemptive) may have an advantage over anesthesia given at wound closure. It has been shown that nociceptive stimuli can alter the electrophysiological processes in the neurons [7]. This alteration results in a lower pain threshold and an increased response to pain stimuli. By infiltrating a local anesthetic before the incision is made, these effects should in theory be avoided.

A review and meta-analysis [8] concluded that there is a statistically significant reduction in postoperative pain

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with the use of preemptive, incisional local anesthetic compared with placebo. The mean reduction in pain after 4 hours was only 0.95 cm (confidence interval, 1.55–0.35 cm) on a scale of 0 to 10. It is questionable if this difference is clinically significant. Two other reviews [9,10] conclude that there is no effect of local anesthetics. Most of the studies included in these reviews are on laparotomy.

The evidence of whether preemptive local anesthetics reduce postoperative pain in laparoscopic surgery is inconclusive [11-18]. Most studies do not distinguish between pain at rest or during movement. Movement-evoked pain is more clinically relevant in day case surgery because of the need for patients to be fully ambulatory. Movement-evoked pain is also far more intense than pain at rest [19]. The aim of our study was to evaluate whether preemptive local injections into the trocar areas are able to reduce postoperative movement-evoked pain within an ERP.

Materials and Methods

Design

The study was double-blinded, placebo controlled with parallel assignments. The intervention group was given a preemptive incisional injection of 5 mL bupivacaine (5 mg/mL), and the control group was given a 5-mL placebo injection (saline, NaCl 9 mg/mL). Bupivacaine is a long-lasting anesthetic with a half-life of 4 to 6 hours when injected into cutaneous and subcutaneous tissue. The anesthetic is effective within 1 to 3 minutes.

Participants and Recruitment

To indicate a clinically significant reduction of postoperative pain, a difference of 2 units on a 0 to 10 numeric rating scale (NRS) was considered appropriate for the sample size calculation. The statistically significant difference of 0.95 in a review article [8] was used to make the calculation. With a power of at least 80% and a p value $<.05$, a sample size of 20 women (10 for each arm) was considered appropriate. The trial recruited 24 women to cover for any loss to follow-up.

Participants were recruited from a single-center gynecologic department at the University Hospital of Stavanger, Stavanger, Norway. The hospital covers a heterogeneous population of approximately 350 000 people. Consecutive women who were eligible for day case, laparoscopic surgery on the investigating surgeon's list were asked to participate at the preoperative outpatient clinic. The inclusion criteria were healthy women (American Society of Anesthesiologists 1–2) with a benign indication for surgery. Exclusion criteria were chronic pain, regular use of analgesic medication, pregnancy, allergy to bupivacaine, or those unable to give written informed consent. Written informed consent was obtained on the day of surgery.

ERP

Laparoscopic surgery in the gynecologic department for all women in the trial was day case surgery and followed the following standardized ERAS protocol:

1. Preoperative fasting: 6 hours for solids and 2 hours for liquids
2. Consumption of 2 energy drinks in the evening and 1 in the morning before surgery
3. Premedication
   a. Paracetamol 1 g orally
   b. Cyclizine 50 mg orally
   c. Dexamethasone orally
   d. Oxycodone 10 to 20 mg orally
   e. Prophylactic antibiotics (when indicated)
4. Anesthesia
   a. Total intravenous anesthesia (propofol/remifentanil/rocuronium)
   b. Ketamine
   c. Parecoxib
   d. Bupivacaine 5-mg/ml local injections, 5 mL in each port site
   e. Oxycodone
   f. Droperidol
5. Postoperative
   a. Paracetamol 1 g × 4 orally
   b. Diclofenac 50 mg × 3 orally
   c. Oxycodone 2.5 mg intravenously/5 mg orally, rescue analgesics
   d. Thromboprophylaxis 5 hours postoperatively

All procedures were performed by the same senior surgeon to ensure conformity. For participants in the intervention group, 5 mL of the study drug (bupivacaine 5 mg/mL) was injected into the trocar areas (preemptively) just before skin incision. Participants in the control group had 5 mL saline preemptively injected into the trocar areas. The substance was deposited deep in the subcutaneous tissue, close to the fascia and the peritoneum. The injection was blind for the first trocar in the umbilical area, but for the other sites the injection was performed with laparoscope guidance. Two to 4 trocars were used depending on the type of surgery.

Measures

Postoperative pain was measured on a 0 to 10 NRS in which 0 is no pain and 10 is the worst imaginable pain. Movement-evoked pain 5 hours after surgery was chosen as the primary outcome measure. The objective of the ERP is to get the patients back to normal daily activity as soon as possible, and movement-evoked pain was considered the most relevant outcome measure. Secondary outcome