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Original Contribution

Randomized comparison of the feasibility of three anesthetic techniques for day-case open inguinal hernia repair☆,☆☆,★,★★,☆☆☆

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Abstract

Study objective: Comparison of local anesthetic infiltration (LAI), spinal anesthesia (SPIN) and total intravenous anesthesia (TIVA) for open inguinal herniorrhaphy. We hypothesized that patients receiving LAI could be discharged faster than SPIN and TIVA patients.

Design: Randomized, prospective trial.

Setting: University hospital day-surgery center.

Patients: 156 adult male patients (ASA 1–3) undergoing day-case open inguinal herniorrhaphy.

Interventions: Patients were randomized to either LAI (lidocaine + ropivacaine), SPIN (bupivacaine + fentanyl) or TIVA (propofol + remifentanil). Perioperative Ringer infusion was 1.5 mL/h. Urinary bladder was scanned before and after surgery. Interviews were performed on postoperative days 1, 7 and 90.

Measurements: Duration of surgery, duration of the patients' stay in the operating room and time until their readiness for discharge home. Patient satisfaction and adverse effects were registered.

Main results: Surgery lasted longer in LAI group (median 40 min) than in SPIN group (35 min) ($P = .003$) and TIVA group (33 min) ($P < .001$). Although surgery was shortest in TIVA group, TIVA patients stayed longer in the operating room than LAI patients ($P = .001$). Time until readiness for discharge was shorter in LAI group (93 min) than in TIVA (147 min) and SPIN (190 min) groups ($P < .001$). Supplementary lidocaine infiltration was given to 32 LAI patients, and IV fentanyl to 29 LAI and 4 SPIN patients. Ephedrine was required in 34 TIVA, 5 LAI and 5 SPIN patients. One SPIN and three LAI patients had to be given TIVA and another SPIN patient LAI to complete the operations. Urinary retention was absent. Discomfort in the scar (26%) three months postoperatively was not anesthesia-related.

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Conclusions: Logistically, LAI was superior because of the fastest recovery postoperatively. The anesthetic techniques were adequate for surgery in all but a few LAI and SPIN patients. Lack of urinary retention was probably related to the small IV infusion volumes.

1. Introduction

The choice of anesthesia for open inguinal herniorrhaphy may depend on the preference of the patient, the surgeon or on established routines in the health care unit.

Local anesthetic infiltration anesthesia is considered useful because the patient can ambulate soon after surgery [1–4] but its disadvantages include occasional pain from surgery and needle sticks for infiltration of acidic local anesthetic solution [5]. Both general and spinal anesthesia provide excellent anesthesia for surgery but they may be associated with intraoperative hemodynamic instability, nausea, and the occurrence of postoperative urinary retention [6–8]. Occurrence of postoperative urinary retention has been the main reason why the use of spinal anesthesia for inguinal hernia repair has fallen into disrepute [4,9,10] Bupivacaine seems to have maintained its popularity as the spinal anesthetic for inguinal hernia repair but unnecessarily large doses have often been used [6,11] prolonging the motor block and increasing the risk for problems with urinary bladder function.

Recovery and readiness for discharge after day surgery may be shortened by using short-acting drugs for general anesthesia, low-dose spinal anesthesia, infusing small volumes of fluids, treating hypotension with vasoconstrictors instead of fluids, avoiding the use of atropine and other anticholinergic drugs and infiltrating the surgical wound with a long-acting local anesthetic. But in spite of these efforts to optimize the conditions, i.e., choice of drugs and reduced volumes of IV fluids, the benefits of local anesthetic infiltration may overwhelm those of the other techniques in the overall day-surgery process, particularly with regard to time until readiness for discharge. We hypothesized that the patients receiving local anesthetic infiltration (LAI) could be discharged earlier than those receiving spinal anesthesia (SPIN) or total intravenous anesthesia (TIVA). Secondary outcome parameters were the duration of the patients' stay in the operating room, the incidence of postoperative urinary retention, and the patients' subjective satisfaction with the anesthetic technique and care in the operating room.

2. Materials and methods

The study was approved by the Surgical Ethics Committee of the Hospital District of Helsinki and Uusimaa (29 February, 2012, diary number 313/13/03/02/11). We assessed 369 adult male patients, scheduled for open unilateral inguinal herniorrhaphy in the day surgery center for eligibility to participate in the study. The most common refusal reason (76%) was the patient's own wish for a certain anesthetic technique, while some patients refused to have one of the presented three techniques. Other exclusion criteria were BMI > 40 kg/m^2, BMI < 15 kg/m^2, scrotal hernias, severe renal, cardiac or hepatic insufficiency, coagulation disorder, local anesthetic allergy, lack of co-operation due to cognitive impairment or inadequate ability to communicate because of linguistic problems.

Finally, 156 patients who gave written informed consent were randomized using the sealed envelope method into three anesthetic groups of 52 patients each. All included patients filled in a symptomatic index score sheet for benign prostatic hyperplasia [12] (IPSS, International Prostate Symptom Score).

The patients were premedicated with oral ibuprofen 600 mg, or acetaminophen 1000 mg if allergic to ibuprofen. They were asked to empty their urinary bladder before the transfer to the operating room. The postvoidal residual volume (PVR) was checked with an ultrasound bladder scanner (Bardscan II®, Mediwatch Ltd., Rugby, UK). If PVR was >200 mL, the patient was asked to void again.

In the operating room and postanesthesia care unit-1 (recovery room = PACU1) monitoring included ECG, noninvasive arterial blood pressure, heart rate, peripheral pulse oximetry, and supervision by an anesthesiologist intermittently and an anesthesia nurse continuously. The prescheduled rate of infusion of Ringer's acetate was 1.5 mL/kg/hour. The infusion was terminated when the patient was transferred to PACU2 ("easy chair resting area"). Patients operated in the afternoon received an extra hourly dose (1.5 mL/kg) of Ringer's acetate before induction of anesthesia. Midazolam 1–2 mg IV was administered to LAI and SPIN patients before anesthesia to relieve anxiety, as needed. For mean arterial pressure drop to ≤ 65 mmHg or by ≥ 20% from baseline, ephedrine 3–5 mg or phenylephrine 0.1 mg, and for heart rate < 40 beats/min, atropine 0.5 mg IV were administered.

2.1. Anesthesia

2.1.1. Local anesthetic infiltration (LAI)

First 15–18 mL of lidocaine 10 mg/mL with epinephrine 5 μg/mL was infiltrated in the skin and the subcutaneous layer of the incisional area. Then 15–18 mL of ropivacaine 7.5 mg/mL was injected into the deeper layers. The rest (left in both 20-mL syringes) of the local anesthetics was infiltrated under the fascia, around the