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Comparing two different techniques of rectus sheath block after single port laparoscopic surgery in benign adnexal mass patients: Surgical versus ultrasonography guidance—A randomized, single-blind, case-controlled study

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ABSTRACT

Objective: The purpose of this study was to compare the analgesic effect of surgical bilateral rectus sheath block (BRSB) and ultrasonography-guidance BRSB in patients undergoing single port laparoscopic surgery (SPLS) for ovarian cyst.

Study design: Seventy-five patients were randomly allocated into three groups: the control and ultrasound (US)-guidance group (n = 25, each) received BRSB with 10 ml of normal saline or 0.5% ropivacaine bilaterally under US guidance at the end of surgery, respectively; the surgical group (n = 25) received BRSB with10 ml of 0.5% ropivacaine bilaterally just before suturing the surgical site. All patients received intravenous fentanyl 50 μg for postoperative pain before emergence from anesthesia. Additional self-administered fentanyl and pain intensity were measured at postoperative 1, 6, 10 and 24 h.

Results: Demographic characteristics showed no significant group-wise differences. The cumulative amount of fentanyl delivered was significantly lower in the US-guidance and surgical BRSB groups (189.20 μg and 187.68 μg, respectively) than the control group (286.40 μg) on postoperative day 1 ($P < 0.001$). At 24 h, the median pain score was significantly lower only in the surgical BRSB group. In addition, opioid-related side effects were decreased in patients who received BRSB (control group 36% vs. US-guidance BRSB group 24% vs. surgical BRSB group 12%).

Conclusions: Both US-guided and surgical BRSB were effective for pain control in patients undergoing SPLS. Thus, surgical BRSB can be performed by gynecologists intra-operatively, for post-operative pain management.

Introduction

Single port laparoscopic surgery (SPLS) is a relatively new surgical technique, which is currently used in various fields of modern medicine including gynecologic operations [1–4]. Not only does SPLS have cosmetic advantages, it also improves patient satisfaction by reducing postoperative pain [5–7]. However, SPLS may still be associated with significant levels of postoperative pain, especially in the periumbilical region where the large-bore trocar is inserted. Postoperative pain can be well controlled with analgesics such as opioids. However, opioid use may cause other side effects such as nausea, vomiting and dizziness. Thus, ongoing studies are still focused on finding an alternative, safe method to relieve pain after laparoscopic surgery.

Bilateral rectus sheath block (BRSB) provides excellent analgesic effect for post-laparoscopic pain in gynecologic surgery [2,8]. Successful blockade of the terminal branches of lower thoracic

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nerves produces effective analgesia to the anterior abdominal wall [9]. BRSB has traditionally been administered percutaneously by a blind loss-of-resistance technique [10]. However, the loss-of-resistance technique cannot guarantee proper spread of local anesthetics at the lateral portion of the posterior rectus sheath, which is where the nerves enters the rectus sheath [11]. Studies have proven that this weakness can be overcome through the accurate injection of local anesthetics under US-guided BRSB [12,13].

Recently, a surgical approach to the BRSB has been introduced for postoperative pain control in major gynecological surgery [8]. For the surgical BRSB, the surgeon administers local anesthetics under direct visualization at the end of the operation, before closure of the anterior abdominal wall. However, the feasibility and efficiency of surgical BRSB has not yet been explored in gynecologic SPLS. Therefore, we compared the analgesic effects of surgical BRSB with US-guided BRSB in patients undergoing SPLS for ovarian cyst.

Materials and methods

Patients

This study was approved by the Institutional Review Board of Chungnam national university hospital (CNUH 2015-02-023). Written informed consent was obtained from all patients or patients' relatives prior to the surgery. The inclusion criteria were, as follows: (i) patients scheduled for a SPLS due to benign tumor of the ovary or the fallopian tube, (ii) patients between the ages of 20 to 70 years, (iii) patients with a physical rating of 1 or 2 based on the American Society of Anesthesiologists Physical Status, (iv) patients who had not undergone laparoscopic surgery within 2 months, and (v) patients free of clinically active infection. Exclusion criteria were, as follows: (i) hysterectomy via SPLS, (ii) chronic pelvic pain, (iii) abdominal pain of unknown origin (iv) suspected malignant tumor, (v) diagnosis of malignant tumor of any origin, (vi) ongoing psychiatric medication, (vii) pregnancy, (viii) a history of hypersensitivity to amide type local anesthetics, (ix) a history of hypersensitivity to opioid, and (x) risk of bleeding.

Eligibility criteria of pre-treatment laboratory data were as follows: white blood cell $\geq$4000 mm^{-3}, absolute neutrophil count $\geq$1500 mm^{-3}, platelet count $\geq$100 000 mm^{-3}, bilirubin level $\leq$1.5 times institutional upper limit of normal, aspartate aminotransferase/alanine aminotransferase $\leq$2.5 times institutional upper limit of normal, and serum creatinine $\leq$1.3 mg/dl. Pre-treatment evaluation included physical examination, assessment of the American Society of Anesthesiologists Physical Status, serum electrolytes, renal and hepatic function, complete blood count, electrocardiography and chest radiograph.

General anesthesia

All patients received general anesthesia with identical anesthetics. General anesthesia was induced with intravenous remifentanil (1 μg/kg) and propofol (1.5–2.5 mg/kg). Tracheal intubation was facilitated by rocuronium (0.6 mg/kg). Anesthesia was maintained with remifentanil and desflurane. All patients were mechanically ventilated under a volume-controlled mode with a target of 35 mmHg end-tidal CO_2. Standard monitoring was maintained throughout the procedure including ECG, noninvasive arterial pressure, arterial oxygen saturation, and end-tidal CO_2.

Surgical procedure

SPLS was performed by three well-trained gynecologic surgeons in the lithotomy position. A single 1.5–2 cm vertical incision was made within the outer limit of the umbilical folds. The base of the umbilicus was exposed via blunt dissection, and a scalpel was used for fascial incision while lifting the umbilicus. The commercial port was inserted only after confirming negative attachments or adhesions. Pneumoperitoneum was created with CO_2 (pressure up to 14 mmHg) and the patient was then placed in reverse Trendelenburg position with a slight left lateral decubitus during the surgical procedure.

Treatment

Patients were allocated randomly by a computer-generated list (Random Allocation Software, version 1.0, developed by M. Saghaei, Isfahan, Iran) into three groups: control, US-guidance BRSB, and surgical BRSB group. The test was masked from the participants until completion of the trial. Patients received either 10 ml of normal saline (control group) or 0.5% ropivacaine (ultrasound guidance BRSB group) bilaterally under US-guidance with a 22-guage spinal needle, as previously reported [13,14] (Fig. 1). Injection was performed only after US visualization of the needle tip and confirming proper spreading (lateral to the midline of the rectus muscle) with a 18 MHz linear probe (LA435: 6–18 MHz, Esaote, Genova, Italy). Patients in the surgical BRSB group received 10 ml of 0.5% ropivacaine bilaterally with a 22-gauge spinal needle, as previously reported [8] (Fig. 1). Surgical BRSB was performed just before suturing the surgical site. The control and US-guidance group received the injection at the end of surgery before emergence from anesthesia. All patients received

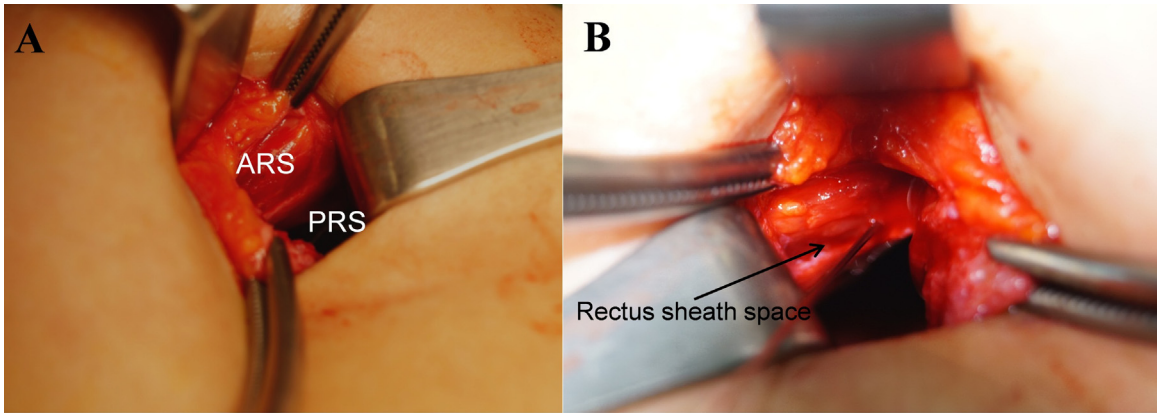

Fig. 1. Intraoperative photography (A) Images of surgical rectus sheath space. (B) The 23 G spinal needle is inserted under direct vision within the rectus sheath space. ARS, anterior layer of rectus sheath; PRS, posterior layer of rectus sheath.