

Perineural dexamethasone does not enhance the analgesic efficacy of ultrasound-guided subcostal transversus abdominis plane block during laparoscopic cholecystectomy

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BACKGROUND: Ultrasound-guided transversus abdominis plane (TAP) block is an adjunct therapy to provide effective postoperative analgesia in abdominal surgical procedures. Dexamethasone is a supplement agent that can improve the efficacy of local anesthesia. However, information about its additive effect is limited. This study aimed to compare the analgesic efficiency using ultrasound-guided TAP block with and without perineural dexamethasone for patients who underwent laparoscopic cholecystectomy.

METHODS: Sixty patients who underwent laparoscopic cholecystectomy were randomly divided into three groups: group I, controls; group II, TAP; and group III, TAP+perineural dexamethasone supplement. The requirement of additional analgesia and the first-time request of rescue-analgesia were recorded after operation and the numerical rating scale was evaluated at specific intervals.

RESULTS: Compared to group I, the first-time requirement of rescue-analgesia in groups II and III was significantly delayed (403.0 ± 230.9 , 436.0 ± 225.3 vs 152.3 ± 124.7 , $P < 0.01$). Compared with those in group I, patients in groups II and III were associated with lower numerical rating scale pain scores ($P < 0.01$) and less postoperative analgesic consumption ($P < 0.01$). There

was no significant difference in the variables mentioned above between groups II and III ($P > 0.05$).

CONCLUSION: Perineural dexamethasone has no additive/synergistic effect with subcostal TAP block on analgesic efficacy for the patients undergoing laparoscopic cholecystectomy.

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KEY WORDS: ultrasonography;
local analgesic;
laparoscopic cholecystectomy;
dexamethasone

Introduction

Laparoscopic cholecystectomy (LC) is a less invasive surgical procedure compared with laparotomy. However, many patients complain of mild to moderate pain after operation^[1,2] and analgesic management is necessary. Multimodal approaches^[3] including patient-controlled intravenous analgesia, epidural analgesia, and intraperitoneal injection of local anesthetics are applied in these patients.

In the recent years, ultrasound-guided transversus abdominis plane (TAP) block has been used as a satisfactory approach that provides postoperative analgesia for patients underwent laparoscopic surgeries.^[4-6] TAP block is safe; it diminishes or replaces the use of opioids; and it has a lower incidence of adverse effects including postoperative nausea and vomiting (PONV). Many clinicians are currently pursuing the accuracy of local anesthetic deposition under the guidance of ultrasonography.^[4-7] This new technique has elucidated the analgesic efficiency in laparotomic and laparoscopic procedures.^[8] However, clinical studies^[9,10] showed negative results in TAP block. Hence, analgesic quality, duration of analgesia, patient satisfaction, and different operational approaches

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TAP block with adjuvant for LC

must be further evaluated.

In addition, many local anesthetic adjuvants, such as clonidine, epinephrine, dexmedetomidine, and dexamethasone, have been used to enhance the analgesic effect and duration of similar blocks. Among them, dexamethasone is a more effective adjuvant for peripheral nerve block.^[11, 12] Because the data on the combination of perineural dexamethasone administration and TAP block are limited, we in this prospective, randomized and controlled study added dexamethasone to ropivacaine to determine whether it is able to enhance the analgesic efficacy of ultrasound-guided TAP block.

Methods

Patients

Sixty patients with American Society of Anesthesiologists (ASA) physical status I and II who had undergone LC from November 2013 to April 2014 were enrolled in the study. The study was approved by the local Clinical Research Ethics Committee and a written informed consent was obtained from all participating patients. Patients with systemic cardiovascular or endocrine diseases, coagulopathy, needle puncture site infection, body mass index (BMI) greater than 30, history of chronic pain, and hypersensitive or allergic to any medicine were excluded from the study. All of the patients were trained with the numeric rating scale (NRS) to evaluate pain intensity and diversity as well as with the Ramsay sedation scale to assess the degree of sedation.^[13]

Grouping criteria

Before surgery, the patients were randomly divided into three groups. Group I received general anesthesia without TAP block (control group, $n=20$); group II underwent bilateral ultrasound-guided TAP block with 30 mL of 0.375% ropivacaine after tracheal intubation, with 15 mL on each side (group TAP, $n=20$); group III underwent bilateral ultrasound-guided TAP block with 30 mL of 0.375% ropivacaine and 2 mL of dexamethasone (10 mg), with 16 mL on each side (group TAP plus dexamethasone, $n=20$).

Anesthetic technique

While a lactated Ringer's solution was administered through the peripheral vein, all patients received pretreatment with penehyclidine hydrochloride. Noninvasive blood pressure, electrocardiography, pulse oximetry, and biospectral index (BIS) were monitored. Anesthesia was induced through intravenous injection of 0.05 mg/kg midazolam as well as 2% propofol and remifentanyl with

a target controlled infusion system (TCI, Beijing Slgo Medical Technology Co., Ltd., Beijing, China). After the plasma effective concentration of propofol and remifentanyl reached 3.0 $\mu\text{g/mL}$ and 2.5 ng/mL, respectively, the unconscious patients were given rocuronium (0.6 mg/kg). Endotracheal intubation was performed after mask ventilation for 90 seconds. Mechanical ventilation was regulated by volume-controlled ventilation mode, tidal volume at 6-7 mL/kg, respiration rate at 10-12 per minute, and oxygen flow at 1.5 L per minute. During the operation, the effective concentration of propofol was maintained at 2 $\mu\text{g/mL}$ and remifentanyl at 2-4 ng/mL. Rocuronium was administered for muscle relaxation if needed. The TCI system was adjusted to target the blood pressure within the 20% range of baseline before the induction. The end-tidal carbon dioxide partial pressure (PETCO₂) was maintained between 30-40 mmHg and BIS was targeted in the range of 40 to 60. All patients received 4 port laparoscopic procedures.

When the vital signs were stable after endotracheal intubation, bilateral TAP block was performed in patients in groups II and III. After draping the related area around the costal margin and xyphoid, the subcostal approach was applied under ultrasonographic guidance with a Sonosite ultrasound machine (Sonosite M-Turbo®, Sonosite, USA) and a linear 5-13 MHz ultrasound transducer. The probe was placed on the anterior abdominal wall and inferior to the costal margin. At this level, the transverse abdominis muscle (TAM) was identified underneath the rectus muscle (RM). A 100-mm pajunk 19G needle (Medizintechnologie, Geisingen, Germany) was inserted through the RM from an anterior and medial position, advancing inferolaterally and adjacent to the border of the costal margin, about 2 cm beside the probe. The advancement of the needle was maintained within the ultrasound beam by the in-plane technique. While the needle tip was visualized at the border between the RM and TAM, negative aspiration was done, followed by 2 mL of normal saline injection to confirm the needle position. Afterwards, 15 mL of 0.375% ropivacaine (ropivacaine hydrochloride injection, 7.5 mg/mL, Sodertalje, Sweden) or 16 mL of mixed solution (15 mL of 0.375% ropivacaine and 1 mL of dexamethasone) was injected. Local analgesic agent diffused through ultrasonography as a hypochoic enlargement, and the peritoneum was pushed below by gravity derived from the local analgesic agent distributed around the thinner layer of TAM. The same procedure was performed to the contralateral site. A skilled anesthesiologist did the operation on all patients in groups II and III.

Postoperative care and pain assessment

All patients received total intravenous anesthesia

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