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Ropivacaine wound infiltration: a fast-track approach in patients undergoing thoracotomy surgery

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ABSTRACT

Background: Postoperative pain impairs enhanced recovery in patients after various surgeries. Local use of ropivacaine has become an effective strategy for postoperative pain management. The aim of this study was to assess the effectiveness and safety of wound infiltration with ropivacaine for postoperative analgesia as a fast-track approach in patients undergoing thoracotomy surgery.

Materials and methods: Forty adult patients with esophageal cancer scheduled for selective thoracotomy surgery were enrolled in this double-blind, randomized, controlled study. Patients were randomized (1:1) to receive ropivacaine or placebo wound infiltration before incision closure. Numerical rating score (NRS), postoperative analgesics consumption, length of hospital stay, time to anal exsufflation, defecation, ambulation, and patient satisfaction scores were recorded. Side effects including allergic reaction, nausea, vomiting, wound infection, and pneumonia were also assessed.

Results: NRS was significantly decreased in the ropivacaine group with less consumption of postsurgery analgesics. The ropivacaine group also showed shorter postoperative hospital stays, earlier anal exsufflation and ambulation, and higher patient satisfaction scores. However, there were no significant differences between the two groups regarding time of defecation. No allergic reactions occurred in either group. The incidences of nausea, vomiting, wound infection, and pneumonia were similar.

Conclusions: The present study showed that ropivacaine wound infiltration could be a safe and effective fast-track approach for patients undergoing thoracotomy surgery.

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Introduction

Thoracic surgeries are commonly associated with moderate to severe levels of postsurgery pain. Acute postthoracotomy pain is relatively more severe than that of upper or lower abdominal surgery,[1,2] which can cause pulmonary complications, such as pneumonia and atelectasis, due to restrictions in large-volume breaths, resulting in significant perioperative and long-term morbidity.[3,4]

Fast-track surgery with the goal of earlier ambulation, discharge, and rehabilitation was only introduced approximately 2 decades ago but has already attracted attention in almost all surgical fields. Perioperative pain management has become an important fast-track approach.[5] Of the multimodal pain management techniques, wound infiltration with a local anesthetic, has now been used worldwide in various surgeries, including but not limited to thoracic and abdominal surgeries and cesarean deliveries.[6-10] Ropivacaine is a local anesthetic agent (Fig. 1) that blocks the generation and conduction of nerve impulses by increasing the electrical excitation threshold, slowing nerve impulse propagation, and reducing the rate of rise of the action potential. Both bolus wound injection and continuous wound infiltration with ropivacaine are widely used in various clinic centers. However, the results of previous studies on wound infiltration with ropivacaine have not been consistent in patients undergoing thoracotomy surgery.[11-15] Studies investigating intercostal block with ropivacaine as a fast-track approach in thoracic surgery are few and remain to be further confirmed.

The present prospective, randomized, double-blind, and placebo-controlled clinical trial was conducted to test the hypothesis that ropivacaine wound infiltration could be a simple, effective, and safe fast-track approach in patients undergoing thoracotomy surgery.

Materials and methods

Patients

The study was conducted at The First Affiliated Hospital of Nanjing Medical University after approval from the institute's ethics committee. Written informed consent was obtained before enrollment. The inclusion criteria were being (1) aged 18 years or older and (2) scheduled for a thoracotomy surgery for esophageal cancer. The exclusion criteria were (1) allergy to ropivacaine, (2) emergency surgery, (3) history of previous thoracotomy surgery, (4) preoperative opioid consumption in the last 3 months, and (5) severe hepatic or renal dysfunction. A total of 40 eligible patients were enrolled and randomly assigned into two groups (20 patients in each group).

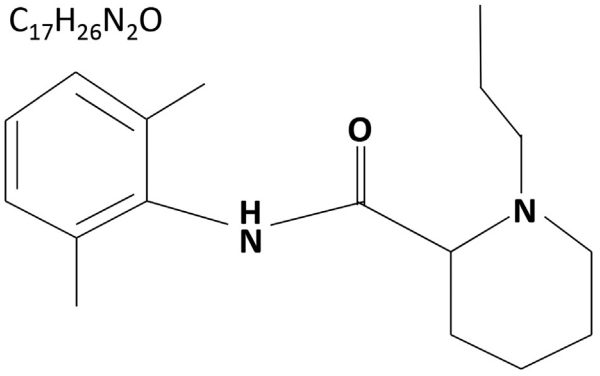

Fig. 1 – Molecular structure of ropivacaine.

Anesthesia

All patients received a standardized anesthetic regimen. 0.5 mg of atropine and 0.1 g of phenobarbital were administered briefly as premedication 1 hour before surgery. Routine monitoring included electrocardiography, pulse oximetry, invasive blood pressure, and arterial blood gas analysis. General anesthesia was induced with 0.05-0.1 mg/kg of midazolam, 1.5-2.0 mg/kg of propofol or 0.15-0.3 mg/kg of etomidate, 0.12 mg/kg of cisatracurium, 0.1 mg/kg of dexamethasone, and 2-4 μg/kg of fentanyl. Nonsteroidal anti-inflammatory drugs, dezocine, azasetron, and 6-8 μg/kg of fentanyl were administered prior to surgery. Maintenance of anesthesia was achieved with 0.06-0.1 mg/kg/min of propofol, 0.1-0.5 μg/kg/min of remifentanil, 8-12 μg/kg/min of atracurium, and 0.2-0.5 μg/kg/h of dexmedetomidine.

Intercostal wound infiltration

Ten milliliter of 0.75% ropivacaine (ropivacaine group) or normal saline solution (control group) was prepared and infiltrated subcutaneously along each side of the intercostal wound edges using a 23-gauge subcutaneous needle followed by skin closure with 4-0 silk. The anesthetists, surgeons, pain assessors, and patients were all blinded to the treatment allocation.

Monitoring and additional treatment

After recovery from anesthesia and tracheal extubation, the patients were transferred to the thoracic surgery ward for further monitoring and recovery care. Another anesthetist who was also blinded to the trial evaluated and recorded the postsurgery pain scores at 6, 12, 24, and 48 hours after surgery using a 11-point (0-10) numerical rating score (NRS).

All patients received patient-controlled analgesia with 0.2 μg/kg/h of fentanyl and 0.1 mg/kg/h of tramadol for 48 hours. Flurbiprofen axetil was administered and recorded as a rescue analgesic when requested by patients with an NRS $\geq$4.

Length of hospital stay, time to anal exsufflation, defecation and ambulation, patient satisfaction and incidences of allergic reaction, nausea and vomiting, incisional wound infection, and pneumonia were all recorded in the predesigned data collection form and double-checked by another anesthetist.