



Original research

Paravertebral block for video-assisted thoracoscopic surgery: Analgesic effectiveness and role in fast-track surgery



Teruya Komatsu ^{a,*}, Atsunari Kino ^b, Mari Inoue ^c, Terumasa Sowa ^a, Koji Takahashi ^d, Takuji Fujinaga ^d

^a Department of Thoracic Surgery, Kyoto University, Kyoto, Japan

^b Department of Anesthesiology, Nagara Medical Center, Gifu, Japan

^c Nutritional Support Team (NST), Nagara Medical Center, Gifu, Japan

^d Department of General Thoracic Surgery, Nagara Medical Center, Gifu, Japan

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ABSTRACT

Background: Appropriate postoperative analgesia is crucial in fast-track surgery, which is a multimodal therapeutic strategy that aims toward enhanced postoperative recovery and shortened hospital stay. Paravertebral block (PVB) has been reported to be as effective as thoracic epidural blockade (TEB), but PVB is not often employed for video-assisted thoracoscopic surgery (VATS) for 2 reasons. First, TEB is still the gold standard for thoracic surgery, and second, thoracoscopic insertion of a PVB catheter is challenging. **Methods:** In this retrospective observational study, 185 patients who underwent VATS and thoracoscopic paravertebral catheterization were analyzed. Postoperatively, the patients were continuously administered a local anesthetic (0.5% bupivacaine hydrochloride or 0.2% ropivacaine hydrochloride). Additionally, they were given an oral non-steroidal anti-inflammatory drug (NSAID) as needed. Intramuscular/intravenous pentazocine was administered as a rescue medication. The effect of pain control was measured in terms of the frequency of NSAID taken orally and the necessity for a rescue drug on postoperative days (POD) 0, 1, 2, and 3. **Results:** The mean age of the 185 patients included in the study was 67 years (Confidence Interval: 66–69). The mean frequency of NSAID use was 0.67 (0–3), 1.59 (0–4), 1.43 (0–4), and 1.33 (0–4) on POD 0, 1, 2, and 3, respectively. 32 (17.3%) and 3 patients (1.6%) were administered a rescue medication on POD 0 and 1, respectively. The most common postoperative complication was nausea/vomiting, which occurred in 17 patients (9.1%). **Conclusions:** PVB may greatly contribute to enhanced recovery after thoracic surgery owing to effective analgesia and fewer side effects.

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1. Introduction

Fast-track surgery and enhanced recovery after surgery (ERAS) are concepts related to perioperative care that were first introduced by Kehlet and colleagues in the 1990s, mainly in the field of elective abdominal surgery [1]. This approach mainly aims at a shortened hospital stay with accelerated postoperative recovery by attenuating the stress response to surgery [2,3]. Fast-track gastrointestinal surgery has been well discussed [3–5], but there have been few reports regarding fast-track programs for lung surgery [6,7].

In addition, consideration of analgesia is one component of fast-track surgery that should never be ignored [2]. Thoracic epidural blockade (TEB) has long been considered the gold standard for

thoracotomy pain. However, several studies of thoracic analgesia have suggested that paravertebral blockade (PVB) is as effective as TEB with a favorable side effect profile. [8–10] Although video-assisted thoracoscopic surgery (VATS) has recently been increasing in popularity, some authors have pointed out that optimal postoperative analgesia following VATS remains to be elucidated [11].

This study was designed to analyze the analgesic effectiveness of PVB for patients undergoing VATS and the potential for PVB as an alternative to TEB for fast-track surgery.

2. Materials and methods

2.1. Study design

This was a retrospective, non-randomized, uncontrolled study of a cohort of patients undergoing VATS.

* Corresponding author. Department of Thoracic Surgery, Kyoto University, 54 Shogoin-Kawahara-cho, Sakyo-ku, Kyoto 606-8507, Japan.

E-mail address: tk.thoracic@gmail.com (T. Komatsu).

2.2. Data collection

All relevant data were collected by reviewing the medical charts of patients undergoing VATS and PVB catheterization during the designated period.

2.3. Techniques used for VATS and subsequent PVB catheter insertion

Our VATS approach consisted of 3 incisions. The largest of these is a utility incision of about 5 cm located over the 4th or 5th interspace without a rib spreader being applied. The other 2 incisions measure approximately 10 mm and are made for inserting the thoroscopic video-probe and surgical instruments.

2.4. PVB catheterization

As is the case in a standard thoracotomy, an indwelling extrapleural catheter (typically used for epidural block: Epidural Catheterization Set, Allow International Inc., Pennsylvania, USA) is put in place just before the closure of each incision. At the posterior end of the small thoracotomy incision (the utility incision), the parietal pleura is incised vertically with electrocautery for 2 to 3 interspaces above and below the level of the thoracotomy. We usually incise the parietal pleura down to the 7th or 8th intercostal space, which is the same interspace as that of the lowest thoracoscopic port. By gently grasping the edge of the parietal pleura and applying traction downward, the parietal pleura is bluntly dissected and lifted away from the inner chest wall to form an extrapleural pocket. An 18-gauge catheter is then placed percutaneously into this extrapleural space under thoroscopic visualization. In its final position, the lower portion of the catheter is within the inferior part of the pocket and the tip is in the superior portion of the pocket. It is very important that the lifted parietal pleura is intact in the area of the extrapleural pocket so that the infused local anesthetic (LA) can easily spread throughout the extrapleural space without leaking through a torn area. Once the extrapleural pocket is filled, the LA induces an intercostal nerve blockade [12]. Following lung re-inflation, we administered the LA intermittently through the PVB catheter to reach a final dosage of 15 mL at the completion of chest closure. After the patient has been transferred back to the recovery room, a continuous infusion of 0.5% bupivacaine hydrochloride (Marcaine Plain; Astra, Osaka, Japan) or 0.2% ropivacaine hydrochloride (Anapeine; Astra, Osaka, Japan) is started through an infusion pump.

Postoperatively, patients were strongly encouraged to take a painkiller, if needed, to ensure a good cough effort and rigorous physiotherapy. An oral non-steroidal anti-inflammatory drug (NSAID, loxoprofen sodium hydrate, Loxonin; Daiichi-Sankyo, Tokyo, Japan) was used for this purpose. In case of an analgesic failure with the NSAID, intramuscular/intravenous pentazocine hydrochloride (Pentagin; Daiichi-Sankyo, Tokyo, Japan) was used as a rescue medication. The effect of pain control on postoperative days (PODs) 0, 1, 2, and 3 was measured by determining whether (1) patients were able to achieve a cough sufficient to clear the airway, (2) how often they took the NSAID, and (3) whether they were given a rescue drug to supplement the efficacy of the NSAID. Postoperative complications were also recorded.

2.5. Statistical analysis

Parametric data are presented as the mean with 95% confidence intervals, and non-parametric data as the median and interquartile range (IQR). Electronic software (Excel, Microsoft Corporation, Seattle, WA) was used for statistical analyses.

3. Results

Between May 2010 and December 2012, 185 patients underwent thoracoscopic PVB catheterization for pain management after VATS. Patient demographics, including surgical details and diagnosis, are shown in Table 1.

0.5% bupivacaine hydrochloride was administered to 115 patients and 0.2% ropivacaine hydrochloride to 70 patients. The mean frequency of oral NSAID use and the number of patients who received a rescue medication for 3 days following surgery are shown in Table 2. Five patients (2.7%) did not require any pain medication, and 175 patients (94.6%) were capable of a good cough in the recovery room or intensive care unit. Postoperatively, all of the patients could participate in a rigorous physiotherapy program. There were 2 cases of postoperative pneumonia and the patients were administered intravenous antibiotics (Table 3).

4. Discussion

Minimally invasive surgery, which is a laparoscopic technique used in abdominal surgery, is one of the most important modalities for performing fast-track surgery [2]. In the field of thoracic surgery, VATS is considered to be minimally invasive. According to the studies comparing VATS and open thoracotomy, VATS is associated with fewer in-hospital postoperative complications and a shorter hospital stay [13–15]. Therefore, VATS should play an important role in fast-track surgery. Another important consideration for fast-track surgery is optimal pain management, especially in the first 3 PODs [16,17], during which an epidural blockade is usually performed, as it is in colorectal surgery [2]. However, recent studies

Table 1
Patient demographics and perioperative data.

Age (years) ^a	67 (66–69)
BMI ^a	22.1 (21.7–22.5)
ASA score 2/3 (n)	152/33
Sex (male/female)	99/86
<i>Type of surgical procedure</i>	
Lobectomy	123
Bilobectomy	2
Lobectomy and wedge resection	2
Lobectomy and segmentectomy	1
Lobectomy and mediastinoscopy	1
Segmentectomy	27
Wedge resection	24
Decortication	1
Repair of pneumothorax	1
Ligation of the anomalous vessel	1
Exploration	2
Duration of surgery (min.) ^a	168 (159–178)
Intraoperative bleeding (ml) ^b	82.2 (68.8–95.6)
<i>Diagnosis</i>	
Non-small cell lung cancer	146
Small cell lung cancer	1
Carcinoid	2
Metastatic lesion	4
<i>Mycobacterium avium</i> complex infection	11
Pneumothorax	2
Giant bulla	2
Organizing pneumonia	4
Empyema	1
Abscess	1
Interstitial pneumonia	1
Hamartoma	1
Others	9
Duration of PVB catheter (Median) ^a	2 (1–2)
Day of discharge (POD) (Median) ^b	7 (5–9)

BMI: body mass index; ASA score: American Society of Anesthesiologists score.

^a Mean (95% confidence interval).

^b Median (interquartile range).

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