



# Clinical Evaluation of Ultrasound-Guided Thoracic Paravertebral Block (TPVB) Effect on Postoperative Analgesia in Patients with Breast Cancer after Radical Mastectomy

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## Abstract

**Objective:** To evaluate an ultrasound-guided thoracic paravertebral block (TPVB) on postoperative analgesia in breast cancer patients after radical mastectomy.

**Methods:** Sixty female breast cancer patients underwent radical mastectomy and were randomly divided into the TPVB group and the control group. With 30 cases in each, Patients in the TPVB group received a 20 ml of 0.5% ropivacaine under ultrasound guidance and those in the control group received the same volume normal saline. All patients received patient-controlled intravenous analgesia. Postoperative pain value, were recorded at 1<sup>st</sup>, 4<sup>th</sup>, 8<sup>th</sup>, 12<sup>th</sup>, 24<sup>th</sup> and 48<sup>th</sup> hour at rest and on movement using the Visual Analogue Scale (VAS). The consumption of sufentanil and adverse reactions were also evaluated. The incidence of chronic pain was investigated with telephone interview after 3 month and 6 month, postoperatively.

**Results:** Postoperatively at 1<sup>st</sup>, 4<sup>th</sup>, 8<sup>th</sup>, 12<sup>th</sup>, 24<sup>th</sup> hour patients in control group had significantly higher VAS values both at rest and on movement than those in the group treated with a thoracic paravertebral block ( $P < 0.05$ ). The opioid consumption in TPVB group were lower than that in control group ( $P < 0.01$ ). The incidences of nausea, vomit and chronic pain in TPVB group were significantly lower than those in control group.

**Conclusion:** Ultrasound-guided paravertebral block can provide good postoperative analgesia effects for breast cancer patients after radical mastectomy. It reduces the opioid consumption, adverse reactions, and incidence of chronic pain. Decreases postoperative pain values and the need for analgesics during the postoperative 24 h, has obvious advantages in chronic pain relief.

**Keywords:** Radical mastectomy; Ultrasound guidance; Thoracic paravenebral block; Postoperative analgesia

## Introduction

About 36% of patients with breast cancer can occur in acute pain after surgery, adverse reactions of conventional opioid analgesics are more, such as nausea, vomiting. With the use of ultrasound technology in nerve block in the paravertebral nerve block, thoracic paravertebral block, TPVB) has been widely applied to anesthesia and postoperative analgesia [1]. We aim to observe the effect of postoperative analgesia of thoracic paravertebral block (TPVB) on the patients with breast cancer undergoing radical mastectomy.

## Materials and Methods

### Objective

From Feb 2015 to Feb 2016, select 60 cases of radical mastectomy of breast cancer in women, American Society of anesthesiologists (ASA) grade I-III, aged 30-67 years old, weight 50~72 kg, the height of 150~170 cm. Exclusion of patients with a contraindication of thoracic paravertebral nerve block. 60 cases were randomly divided into two groups: the TPVB group and the control group, 30 cases in each group. 1 patient in TPVB group with thoracic paravertebral blocks failure, not included in the analysis. There was no significant difference in age, height, body mass and operation time between the two groups ( $P > 0.05$ ) (Table 1).

### Methods

The patients were entered into the operation room, opened the venous access, and connected with the monitoring of the electrocardiogram, blood pressure and pulse oxygen saturation. Intravenous midazolam 1 mg and sufentanil 5 ug. The patients in

Groups	Age (year)	Height (cm)	Kilogram (kg)	Operation time (min)
Control group	45 ± 12	157 ± 7	63 ± 9	130 ± 20
TPVB group	46 ± 11	160 ± 8	60 ± 8	120 ± 24

Table 1: General conditions.

the lateral decubitus position and the ipsilateral, conventional skin disinfection. High frequency linear probe (8~5 MHz) and stimplex 22G puncture needle (B, Braun) was needed by using MicroMaxx portable ultrasound (American SonoSite company). In the 3~4 thoracic spinous process, the long axis of the intercostal ultrasonic probe in parallel, differential rib plane and plane to plane by intercostal, intercostal puncture technique in lateral plane probe, confirm the needle end is located between the internal intercostal muscle and intercostal muscle under ultrasound, under transverse acoustic shadow, pumpback blood after the injection of 0.5% ropivacaine 20 ml to do the nerve block. The control group was injected with normal saline 20 ml by the same method. Test the anesthesia block plane after 20 min. The induction of anesthesia with sufentanil 0.5 ug/kg, propofol 2 mg/

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kg, after the patients lost consciousness, then give rocuronium 0.6 mg/kg. Maintain anesthesia with 1.5%-2% sevoflurane inhalation and remifentanyl 0.1-0.15 g/kg/min during surgery operation. Intermittent additional rocuronium to maintain anesthesia. Half an hour before the end of surgery, intravenous sufentanil 0.05 ug/kg, ramosetron 0.3 mg, dexamethasone 10 mg. Accept intravenous patient-controlled analgesia in all patients after surgery (PCIA), 1 ug/ml formula for sufentanil based, infusion at a rate of 1.5 ml/h, a single dose of 1.5 ml, lock time 10 min, the limit value of 7 ml per h, maintaining analgesia 48 h.

### Observation index

After 1, 4, 8, 12, 24, 48 h, observe and record the static and motion visual analogue scale (VAS) (0 points, painless; 10 points, unbearable pain), the dosage of sufentanil. The adverse reactions such as nausea and vomiting were observed. The patients were followed up for 3 months and 6 months after the operation. The pain duration was recorded. The digital grading method (NRS) was used to score the pain.

### Statistical Analysis

Using SPSS13.0 software to analyze the data, count data using  $\chi^2$  test, measurement data using *t* test. *P*<0.05 was statistically significant.

### Results

#### Postoperative analgesia effect evaluation

To evaluate the postoperative analgesic effect in group TPVB after 1, 4, 8, 12 h. static and dynamic VAS score lower than the control group, the difference was statistically significant (*P*<0.01); There was no significant difference in the two groups of patients after 48 h static VAS scores and 24 h, 48 h motor VAS scores (Tables 2 and 3).

#### PCIA sufentanil dosage

In TPVB group, the PCIA of sufentanil total dosage was less than the control group after 48h, the difference was statistically significant (*P*<0.01). In 0~24 h, in TPVB group, the PCIA of sufentanil total dosage was significantly less than the control group. The difference was statistically significant (*P*<0.01). The two groups had no statistical significance in 24~48 h with sufentanil total dosage difference (*P*>0.05) (Table 4).

#### Chronic pain evaluation

The incidence of postoperative pain in TPVB group after 3 months

Group	1 h	4 h	8 h	12 h	24 h	48 h
Control group	3.4 ± 1.3	4.3 ± 2.1	4.8 ± 1.2	4.5 ± 0.8	3.9 ± 1.1	2.5 ± 1.1
TPVB group	0.9 ± 0.5*	1.0 ± 0.6*	2.3 ± 1.2*	2.6 ± 1.0	2.7 ± 1.2*	2.3 ± 1.1

\*Compared with the control group *P*<0.01

Table 2: Static visual analogue scale (VAS).

Group	1 h	4 h	8 h	12 h	24 h	48 h
Control group	5.1 ± 2.4	6.1 ± 2.5	5.8 ± 2.2	5.2 ± 2.6	4.6 ± 2.2	4.2 ± 1.6
TPVB group	1.0 ± 0.6*	2.0 ± 1.1*	2.5 ± 1.3*	3.1 ± 1.5*	3.6 ± 1.5	3.1 ± 1.7

\*Compared with the control group *P*<0.01

Table 3: Motion visual analogue scale (VAS).

Group	STDAO (0~24 h)	STDAO (24~48 h)	STDAO (48 h~)
Control group	65 ± 11	51 ± 11	120 ± 15
TPVB group	40 ± 7*	45 ± 8	88 ± 10*

\*Compared with the control group *P*<0.01

Table 4: STDAO: Sufentanil total dose after operation.

was 13.8% and after 6 months was 6.9%. In the control group after 3 months was 36.7% and after 6 months 30%. The difference between the two groups was statistically significant (*P*<0.05).

### Discussion

Breast cancer surgery is more trauma, postoperative pain significantly, approximately 36% of patients with breast cancer after radical mastectomy can occur in acute pain after surgery inadequate analgesia may affect the postoperative recovery of patients, and may even become chronic pain [1,2]. General anesthesia for breast cancer radical surgery, postoperative PCIA alone is often difficult to achieve satisfactory analgesic effect, but also with the obvious adverse reactions. Therefore, multimode analgesia has become a common Choice.

For thoracic paravertebral block (TPVB), the traditional method of resistance loss and nerve stimulator location, failure rate is high, prone to vascular injury, pleural injury, pneumothorax and spinal injection [3]. Ultrasound can accurately locate the nerve, avoid vascular organ, observe the puncture needle path and local anesthetic diffusion range than the traditional blind puncture and nerve stimulator is more accurate, better effect, less dosage [4]. In this study, patients in the TPVB group under the guidance of ultrasound in ipsilateral 3~4 thoracic paravertebral nerve block to block the implementation, breast, chest wall muscle and the majority of the sensory afferent nerve. The rest and exercise VAS scores in group TPVB were significantly lower than those in control group after 24 h, while the total amount of Sufentanil in PCIA after operation was significantly less than that in control group. This shows that 0.5% ropivacaine 20 ml single thoracic paravertebral nerve block in reducing PCIA consumption of drugs and provides a good analgesic effect after operation at the same time. A study found that the use of opioid analgesia and less good postoperative effect on perioperative immune function less, is conducive to the recovery of patients with early recurrence or metastasis rate can be reduced after breast cancer surgery [5].

There was no significant difference in the two groups of patients with postoperative 48 h static and 24 h, 48 h motor VAS scores, which was consistent with the literature report [6]. Most studies suggest that only a single block of ropivacaine for a satisfactory analgesia within 24 h, the use of more long-acting local anesthetics or by continuous TPVB can satisfy the need of longer analgesia [7,8]. Postoperative acute pain control may be one of the risk factors for postoperative chronic pain, and the probability of chronic pain in patients with breast cancer was 20%-50% [9]. The incidence of chronic pain in 3 months and 6 months after operation was significantly better than that in control group and the TPVB group was significantly better than the control group.

Thoracic paravertebral nerve block can effectively relieve chronic pain after radical operation of breast cancer. Postoperative nausea and vomiting, as well as postoperative pain, is one of the most important postoperative discomforts [10]. The main risk factors for postoperative nausea and vomiting were female, motion sickness, non-smoking and postoperative use of opioid analgesics.

Therefore, patients with breast cancer after radical surgery are the high risk of postoperative nausea and vomiting. The results of this study showed that the incidence of postoperative nausea and vomiting in group TPVB was significantly lower than that in control group. Paravertebral nerve block can provide good postoperative analgesia, reduce the perioperative use of opioid drugs, so as to reduce the occurrence of postoperative nausea and vomiting, improve the comfort of patients.

## Conclusion

To sum up, the thoracic paravertebral nerve block under ultrasound guidance can provide good postoperative analgesia for patients with breast cancer radical operation, reduce the dosage and adverse drug reaction and reduce the incidence of chronic pain.

## References

1. Poleshuck EL, Katz J, Andrus CH, Hogan LA, Jung BF, et al. (2006) Risk factors for chronic pain following breast cancer surgery: A prospective study. *J Pain* 7: 626-634.
2. Gärtner R, Jensen MB, Nielsen J, Ewertz M, Kroman N et al. (2009) Prevalence of and factors associated with persistent pain following breast cancer surgery. *JAMA* 302: 1985-1992.
3. Lönnqvist PA, MacKenzie J, Soni AK, Conacher ID (1995) Paravertebral blockade. Failure rate and complications. *Anaesthesia* 50: 813-815.
4. Hara K, Sakura S, Nomura T, Saito Y (2009) Ultrasound guided thoracic paravertebral block in breast surgery. *Anaesthesia* 64: 223-225.
5. Exadaktylos AK, Buggy DJ, Moriarty DC (2006) Can anesthetic technique for primary breast cancer surgery affect recurrence or metastasis. *Anesthesiology* 105: 660-666.
6. Agarwal RR, Wallace AM, Madison SJ, Morgan AC, Mascha EJ, et al. (2015) Single-injection thoracic paravertebral block and postoperative analgesia after mastectomy: A retrospective cohort study. *J Clin Anesth* 27: 371-374.
7. Moller JF, Nikolajsen L, Rodt SA, Ronning H, Carlsson PS (2007) Thoracic paravertebral block for breast cancer surgery: A randomized double-blind study. *Anesth Analg* 105: 1848-1851.
8. Boezaart AP, Raw RM (2006) Continuous thoracic paravertebral block for major breast surgery. *Reg Anest Pain Med* 31: 470-476.
9. Tasmuth T, Kataja M, Blomqvist C (1997) Treatment-related factors predisposing to chronic pain in patients with breast cancer—a multivariate approach. *Acta Oncol* 36: 625-630.
10. Apfel CC, Läärä E, Koivuranta M, Greim CA, Roewer N (1999) A simplified risk score for predicting postoperative nausea and vomiting: Conclusions from cross-validations between two centers. *Anesthesiology* 91: 693-700.