

Use of general anesthetic only vs general anesthetic combined with paravertebral block for perioperative pain management after first rib resection

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Many patients with thoracic outlet syndrome develop a chronic pain syndrome (1). Some of these patients require surgical decompression of the thoracic outlet to alleviate their symptoms. Surgical decompression is accomplished by performing a first rib resection with cervical sympathectomy. There are 2 approaches to first rib resection, supraclavicular and transaxillary. The preferred surgical technique at Baylor University Medical Center is transaxillary (2–4). Postoperative pain management for patients with thoracic outlet syndrome is compounded by the fact that most of these patients are on long-term potent analgesics at home before the operation.

In an effort to improve the management of acute postoperative pain, a cervical-thoracic paravertebral regional block (PVB) was introduced into the anesthetic regimen (5, 6). This block has been used successfully in the management of postthoracotomy pain (7–9) and has been shown to be safe and effective (10). Postanesthesia care unit (PACU) nurses reported a noticeable improvement in pain management in the patients who had a PVB with first rib resection. Therefore, the goal of this retrospective study was to evaluate the efficacy and safety of PVB in the prevention and management of pain in patients who undergo a first rib resection with cervical sympathectomy.

METHODS

After institutional review board approval was obtained, the authors reviewed the charts of 68 consecutive patients who had received a transaxillary first rib resection with cervical sympathectomy for pain from thoracic outlet compression from January 1998 to June 2000. Data analyzed included prescribed preoperative pain medications, analgesia usage via a patient-controlled analgesia pump, and pain scores at hospital admission, PACU admission, and PACU discharge. Morphine equivalents were calculated for meperidine, fentanyl, and other narcotics. On the pain scale, 0 indicates no pain, and 10 denotes the worst pain imaginable. All scores were whole numbers. Three patients were admitted to the PACU with pain scores of 10. The PVB was assumed to have failed in these 3 patients, and they were excluded from analysis, leaving 26 patients in the general anesthesia (GA) plus PVB group and 39 patients in the GA-only group.

All patients received GA from the same anesthesiologist. The PVB was performed at the C7 and T1 levels with up to 10 mL of 0.5% ropivacaine injected at each site, for a total dose not exceeding 0.5 mg/kg.

Table 1. Comparison of demographics, narcotic usage, and pain score in general anesthesia-only group and general anesthesia plus paravertebral block group

Variable	GA only (n = 39)	GA + PVB (n = 26)	P value
Demographics			
Mean age (years)	37 ± 13	35 ± 11	
Weight (kg)	74 ± 18	72 ± 15	
Male/female	11/28	5/21	
No. of patients receiving preoperative narcotics	16	14	
Narcotic usage (morphine equivalents in mg)			
PACU	7.4 ± 4.9	6.7 ± 6.0	0.62
Postoperative day 1	24.2 ± 13.7	27.9 ± 15.6	0.32
Total	37.6 ± 22.5	45.8 ± 23.0	0.16
Pain score			
Pain on admission	5.7 ± 2.9	6.6 ± 2.5	0.24
Pain in PACU	3.7 ± 4.3	1.9 ± 3.0	0.07
Pain difference preop/postop	1.8 ± 5.1	4.6 ± 4.4	0.05
Pain at PACU discharge	4.4 ± 3.0	2.5 ± 1.8	0.004

Values are given as mean ± SD unless otherwise indicated.

GA indicates general anesthesia; PVB, paravertebral block; PACU, postanesthesia care unit.

Data were examined using nonparametric statistical analysis with the Wilcoxon signed rank test and repeated measures of variance. A *P* value <0.05 was considered significant.

RESULTS

The mean age, weight, and preoperative narcotic usage were similar in both groups (Table 1). Narcotic usage, as determined by morphine equivalents, was found to be similar in both groups when compared in the PACU, on postoperative day 1, and in

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Table 2. Postoperative narcotic usage by weight in patients who had and had not previously received chronic pain medications at home

	No home narcotics	Home narcotics	P value
PACU	0.09 ± 0.06	0.11 ± 0.09	0.28
Postoperative day 1	0.32 ± 0.18	0.40 ± 0.22	0.17
Total	0.48 ± 0.23	0.68 ± 0.39	0.02

Values represent morphine equivalents (mg/kg) and are given as mean ± SD. PACU indicates postanesthesia care unit.

total usage (Table 1). Both groups had similar preoperative pain scores. However, when pain scores were evaluated on PACU admission and discharge, there was a statistically significant decrease in pain for patients receiving PVB and GA compared with patients receiving GA alone. There was also a significant reduction in pain at PACU discharge in patients who received PVB plus GA when compared with pain on admission to the hospital. This was not significant in patients who received only GA (Table 1). Patients who received a PVB plus GA had no significant difference in narcotic use whether they were on preoperative chronic pain medications or not. Overall postoperative total narcotic usage based on weight was significantly higher in patients who were on chronic pain medications at home (Table 2).

DISCUSSION

Our study showed that PVBs for first rib resections result in a significant decrease in postoperative pain but no significant decrease in opioid usage. Some authors have questioned the consistency of analgesia results with PVB. Twenty-six of 29 patients in our series had successful PVBs. No patients experienced any toxic effects from the analgesic used for the PVB or any injection site-related complications. By comparison, another method used—an intercostal block with continuous infusion—has led to hypotension and bladder dysfunction (11–16).

We found that patients using preoperative pain medication had significantly higher narcotic requirements in the hospital than nonusers. Other factors may contribute to this finding, such as psychological, social, and behavioral issues related to chronic use.

Adding PVB to perioperative analgesia management has led to great satisfaction for our patients. PVB should be considered in all patients who are receiving a first rib resection with cervical sympathectomy.

1. Urschel HC Jr. The history of surgery for thoracic outlet syndrome. *Chest Surg Clin N Am* 2000;10:183–188.
2. Urschel HC Jr. The transaxillary approach for treatment of thoracic outlet syndromes. *Semin Thorac Cardiovasc Surg* 1996;8:214–220.
3. Urschel HC Jr, Razzuk MA. Neurovascular compression in the thoracic outlet: changing management over 50 years. *Ann Surg* 1998;228:609–617.
4. Urschel HC Jr, Razzuk MA. The failed operation for thoracic outlet syndrome: the difficulty of diagnosis and management. *Ann Thorac Surg* 1986;42:523–528.
5. Saito T, Den S, Cheema SP, Tanuma K, Carney E, Carlsson C, Richardson J. A single-injection, multi-segmental paravertebral block-extension of somatosensory and sympathetic block in volunteers. *Acta Anaesthesiol Scand* 2001;45:30–33.
6. Purcell-Jones G, Pither CE, Justins DM. Paravertebral somatic nerve block: a clinical, radiographic, and computed tomographic study in chronic pain patients. *Anesth Analg* 1989;68:32–39.
7. Richardson J, Sabanathan S. Thoracic paravertebral analgesia. *Acta Anaesthesiol Scand* 1995;39:1005–1015.
8. Richardson J, Sabanathan S, Mearns AJ, Shah RD, Goulden C. A prospective, randomized comparison of interpleural and paravertebral analgesia in thoracic surgery. *Br J Anaesth* 1995;75:405–408.
9. Baxter AD, Jennings FO, Harris RS, Flynn JF, Way J. Continuous intercostal blockade after cardiac surgery. *Br J Anaesth* 1987;59:162–166.
10. Conacher ID, Kokri M. Postoperative paravertebral blocks for thoracic surgery. A radiological appraisal. *Br J Anaesth* 1987;59:155–161.
11. Crossley AW, Hosie HE. Radiographic study of intercostal nerve blockade in healthy volunteers. *Br J Anaesth* 1987;59:149–154.
12. Sabanathan S, Smith PJ, Pradhan GN, Hashimi H, Eng JB, Mearns AJ. Continuous intercostal nerve block for pain relief after thoracotomy. *Ann Thorac Surg* 1988;46:425–426.
13. Deneuille M, Bissierier A, Regnard JF, Chevalier M, Levasseur P, Herve P. Continuous intercostal analgesia with 0.5% bupivacaine after thoracotomy: a randomized study. *Ann Thorac Surg* 1993;55:381–385.
14. Richardson J, Sabanathan S, Eng J, Mearns AJ, Rogers C, Evans CS, Bembridge J, Majid MR. Continuous intercostal nerve block versus epidural morphine for postthoracotomy analgesia. *Ann Thorac Surg* 1993;55:377–380.
15. Sabanathan S, Mearns AJ, Bickford Smith PJ, Eng J, Berrisford RG, Bibby SR, Majid MR. Efficacy of continuous extrapleural intercostal nerve block on post-thoracotomy pain and pulmonary mechanics. *Br J Surg* 1990;77:221–225.
16. Matthews PJ, Govenden V. Comparison of continuous paravertebral and extradural infusions of bupivacaine for pain relief after thoracotomy. *Br J Anaesth* 1989;62:204–205.