



Paravertebral block: review of the literature

MAJA KARAMAN ILIĆ¹
VIŠNJA NESEK ADAM¹
MARTINA MATOLIĆ¹
JANA KOGLER²
DIANA BUTKOVIĆ³

¹ Sveti Duh Univesity Hospital,
Department of Anesthesiology,
Reanimatology and Intensive Care

² University Hospital Centre Zagreb,
Department of Anesthesiology,
Reanimatology and Intensive Care

³ Childrens´ s Hospital Zagreb,
Department of Anesthesiology,
Reanimatology and Intensive Care

Correspondence:

Maja Karaman Ilić
Sveti Duh Univesity Hospital
Department of Anesthesiology,
Reanimatology and Intensive Care
E-mail: majakilic1@gmail.com

Abbreviations:

PVB – Paravertebral Block
MeSH – Medical Subject Headings
LA – Local Anesthetic
RCT – Randomised Control Trial
GA – General Anesthesia

Received May 5, 2015.

Abstract

Background: Paravertebral Block (PVB) is an established regional anesthetic technique. It is technically easy to perform and is being used increasingly for intra-operative and post-operative analgesia. This popularity is mainly due to the ease of the technique and fewer complications.

Materials and Methods: This is quantitative systematic review of literature database with the aim to assess the efficacy and safety of Paravertebral block in thoracic, abdominal and breast surgery.

Results: Six randomised control trials that included 386 patients were reviewed. Authors of reviewed articles reported 100% success in block effectiveness and low incidence of complications.

Conclusion: Paravertebral block is effective anesthetic/analgetic technique with very few complications

INTRODUCTION

Paravertebral Block (PVB) is an established regional anesthetic technique. The injection of local anesthetic in a space immediately lateral to where the spinal nerves emerge from the intervertebral foramina produces unilateral, segmental, somatic, and sympathetic nerve blockade which is effective for anesthesia and in treating acute and chronic pain of unilateral origin from the chest and abdomen.

PVBs are highly adaptable and, except for thoracotomy, may serve as the primary anesthetic for breast surgery, chest trauma, hernia repair, soft tissue mass excisions, and /or as a useful adjunct in laparoscopic surgery, cholecystectomy, nephrectomy, or other abdominal and thoracic surgery (1).

MATERIAL AND METHODS

The aim of this quantitative systematic review of literature database was to assess the efficacy and safety of PVB in thoracic, abdominal and breast surgery. The systematic search was conducted in the Central register of controlled trials of the Cochrane Library, MEDLINE and EMBASE according to the current recommendations of the Cochrane Collaboration (2). The search strategy consisted of a combination of free text words and Medical Subject Headings (MeSH) terms: 'paravertebral', 'thoracic surgery', 'abdominal surgery' and 'breast surgery'

The authors scanned the available articles by the initial search to exclude irrelevant studies.

Study eligibility was determined by reading the title and abstracts and obviously irrelevant trials were excluded at this stage.

The six studies that are included in review are in Table 1 (3, 4, 5, 6, 7, 8).

TABLE 1
Studies included in review.

Trial	No of patients	Type of surgery	Type	Details
Naja and colleagues (3)	60	Breast surgery	MPVB	Lidocaine 1%, bupivacaine 0.5%, fentanyl, clonidine, epinephrine
Wassef <i>et al.</i> (4)	30	Heniorraphy	MPVB	2%lidocain,epinephrin
Klein and colleagues (5)	60	Breast surgery	MPVB	Bupivacaine 0.5%, epinephrine
Richardson <i>et al.</i> (6)	100	Thoracic surgery	SPVB	0,5% bupivacain
Hadžić <i>et al.</i> (7)	50	heniorraphy	SPVB	0,75% ropivacain
Pusch and colleagues (8)	86	Breast surgery	SPVB	Bupivacaine 0.5%

MPVB – multiple paravertebral block
SPVB – single paravertebral block

RESULTS

The studies included in the review were randomised, control trials (RCT). Hadžić, Naja, Pusch and Klein reported 100% success in block effectiveness. The failure rate associated with PVB is not > 9%. Inadvertent vascular puncture (5,2%), hypotension (6%), epidural spread of Local Anesthetic (LA) (1,8%), inadvertent pleural puncture (1,8%) and pneumothorax (0,5%) were the recorded complications. Complications were higher in bilateral compared to unilateral block. Postoperative nausea and vomiting are significantly lower in patients given PVB compared to GA.

DISCUSSION

First PVB was performed in 1905 as an alternative to neuraxial block for obstetric procedures and became a popular technique for the provision of analgesia in the early part of the twentieth century (9,10).

The technique however remained neglected till the late 1970s. Renaissance for PVB began 1979 due to efforts from Eason and Wyatt who presented a reappraisal on Thoracic Paravertebral Block (TPVB) (11).

PVB is technically easy to learn with a high success rate, and is being used increasingly for not only intra-operative and post-operative analgesia but also as a sole anesthetic technique for carrying out various procedures. This popularity is mainly due to the ease of the technique and fewer complications.

Post-operative pain control is one of the major concerns in the post-operative care of patients undergoing thoracic surgery, especially when thoracotomy is required. In thoracic surgery PVB is placed at the level of the surgical thoracic incision, in most of the cases it is a unilateral block (12).

The injection of LA in the paravertebral space produces analgesia because of direct contact of LA with the spinal

nerve roots before they emerge from the intervertebral foramina.

The pain associated with thoracotomy surgery can be severe (13).

Pain stimuli arising from skin and muscles incision as well as from ribs are spread and conducted by intercostal nerves that are also important for the transition from acute to chronic pain from nociceptive to neurogenic and neuropathic pain.

The paravertebral block has also been used extensively for anaesthesia and analgesia for abdominal surgery, especially for ambulatory inguinal hernia repair (4, 14).

The injection of LA into the paravertebral space avoids the severe autonomic dysfunction seen with neuraxial techniques and allows the patient to mobilise earlier.

The paravertebral approach to analgesia after inguinal herniorrhaphy can provide analgesia that is superior to oral analgesia or local field blocks.

Breast surgery under the PVB showed satisfactory pain control with no need for supplementation of analgetics. Postoperative pain is effectively controlled and patients rated the experience as very satisfactory (15).

From the retrieved papers, with exception of reviewed articles, additional possibility for PVB application is observed.

Paravertebral blocks have been used less frequently for other abdominal procedures. A series of ten patients undergoing abdominal vascular surgical procedures was reported. Cardiovascular stability was noted upon incision, clamping of the aorta and throughout surgery in all patients (16).

No further intra-operative opioids or neuromuscular blocking drugs were required and postoperative analgesia was excellent.

The paravertebral block has also been used successfully as rescue analgesia for visceral pain after failure of

systemic analgesics for renal colic in an obstetric patient. Described experiences with liver surgery-pain control following radiofrequency ablation of liver mass (17) as well for percutaneous transhepatic biliary drainage were satisfactory (18).

The effect of PVB examined on the pain-relief and perioperative stress response in patients scheduled for open cholecystectomy showed less pain scores and less requirements on supplemental analgesics for three days postoperatively. A significant reduction in circulatory and hormonal response to stress was also seen (19).

In conclusion, based on the current evidence, PVBs for surgical anesthesia at the level of the thoracic and lumbar vertebrae are associated with less pain during the immediate postoperative period, as well as less postoperative nausea and vomiting, and greater patient satisfaction compared with GA. A modern approach to pain control should consider that reduction or elimination of pain, reduction of morbidity, length of stay and hospital costs.

REFERENCES

- VILA H J R, LIU J, KAVASMANECK D 2007 Paravertebral block: new benefits from an old procedure. *Curr Opin Anaesthesiol* 20: 316–8.
- LEFEBVRE C, MANHEIMER E, GLANVILLE J 2011 Searching for studies. In: Higgins J P T, Green S (ed). *Cochrane Handbook for Systematic Reviews of Interventions* Version 5.1.0 The Cochrane Collaboration. Available from www.cochrane-handbook.org.
- NAJA M Z, ZIADE M F, LÖNNQVIST P A 2003 Nerve-stimulator guided paravertebral blockade vs. general anaesthesia for breast surgery: a prospective randomized trial. *Eur J Anaesthesiol* 20: 897–903
- WASSEF M R, RANDAZZO T, WARD W 1998 The paravertebral nerve root block for inguinal herniorrhaphy--a comparison with the field block approach. *Reg Anesth Pain Med* 23(5): 451-6
- KLEIN S M, BERGH A, STEELE S M, GEORGIADIS G S, GREENGRASS R A 2000 Thoracic paravertebral block for breast surgery. *Anesth Analg* 90: 1402–5.
- RICHARDSON J, SABANATHAN S, MEARN S A J, SHAH R D, GOULDEN C A 1995 Prospective, randomized comparison of interpleural and paravertebral analgesia in thoracic surgery. *Br J Anaesth* 75: 405–8
- HADZIC A, KERIMOGLU B, LOREIO D, KARACA P E, CLAUDIO R E, YUFA M, WEDDERBURN R, SANTOS A C, THYS D M 2006 Paravertebral blocks provide superior same-day recovery over general anesthesia for patients undergoing inguinal hernia repair. *Anesth Analg* 102(4): 1076-81
- PUSCH F, FREITAG H, WEINSTABL C, OBWEGESER R, HUBER E, WILDLING E 1999 Single-injection paravertebral block compared to general anaesthesia in breast surgery. *Acta Anaesthesiol Scand* 43: 770–4
- RICHARDSON J, LONNQVIST P A 1988 Thoracic paravertebral block (review article) *Br J Anaesth* 81: 230–8
- KARMAKAR M K 2001 Thoracic paravertebral block (review article) *Anesthesiology* 95: 771–80
- EASON M J, WYATT R 1979 Paravertebral thoracic block—a reappraisal *Anaesthesia* 34: 638–42
- MATTHEWS P J, GOVENDEN V 1989 Comparison of continuous paravertebral and extradural infusions of bupivacaine for pain relief after thoracotomy. *Br J Anaesth* 62(2): 204-5 .
- RICHARDSON J, SABANATHAN S, JONES J, SHAH R D, CHEEMA S, MEARN S A J 1999 A prospective, randomized comparison of preoperative and continuous balanced epidural or paravertebral bupivacaine on post-thoracotomy pain, pulmonary function and stress responses. *Br J Anaesth* 83(3): 387-92
- KLEIN S M, PIETROBON R, NIELSEN K C, STEELE S M, WARNER D S, MOYLAN J A, EUBANKS W S, GREENGRASS R A 2002 Paravertebral somatic nerve block compared with peripheral nerve blocks for outpatient inguinal herniorrhaphy. *Reg Anesth Pain Med* 27(5): 476-80
- WELTZ C R, GREENGRASS R A, LYERLY H K 1995 Ambulatory surgical management of breast carcinoma using paravertebral block. *Ann Surg* 222(1): 19-26
- FALKENSAMMER J, HAKAIM A G, KLOCKER J, BIEBL M, LAU L L, NEUHAUSER B, MORDECAI M, CRAWFORD C, GREENGRASS R 2006 Paravertebral blockade with propofol sedation versus general anesthesia for elective endovascular abdominal aortic aneurysm repair. *Vascular* 14(1): 17-22
- CULP W C, PAYNE M N, MONTGOMERY M L 2008. Thoracic paravertebral block for analgesia following liver mass radiofrequency ablation. *Br J Radiol* 81(961): e23-5
- CULP W C J R, CULP W C 2005 Thoracic paravertebral block for percutaneous transhepatic biliary drainage. *J Vasc Interv Radiol* 16(10): 1397-400
- GIESECKE K, HAMBERGER B, JÄRNBERG P O, KLINGSTEDT C 1988 Paravertebral block during cholecystectomy: effects on circulatory and hormonal responses. *Br J Anaesth* 61(6): 652-6