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BEST EVIDENCE TOPIC

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Epidural analgesia versus paravertebral block in video-assisted thoracoscopic surgery

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Summary

A best evidence topic in cardiac surgery was written according to a structured protocol. The question addressed was: In patients undergoing video-assisted thoracoscopic surgery, is paravertebral block (PVB) superior to epidural analgesia (EP) in terms of pain control and its postoperative complication rates? Altogether, 153 papers were found using the reporting search, of which 4 represented the best evidence to answer the clinical question. The authors, journal, date and country of publication, patient group studied, study type, relevant outcomes and results of these papers are tabulated. At present, there are a limited number of studies directly comparing pain control and postoperative outcomes between PVB and EP, and no large-scale randomized trials have been reported. Three of the 4 papers are small prospective randomized trials, with a small cohort study featuring as the final piece of literature. There is no conclusive body of evidence to recommend either route as more efficacious from a pain control perspective; one study demonstrated significantly lower levels of pain with EP ($P = 0.01$), with a second study demonstrating significantly better pain control with PVB ($P < 0.01$) and a third failing to demonstrate any significant difference ($P = 0.899$). The frequency of requiring supplemental analgesia was similar between the PVB and EP cohorts (56% vs 48%, $P = 0.26$). PVB is associated with lower rates of postoperative complications compared to EP, specifically urinary retention (64% vs 34.6%, $P = 0.0036$) and hypotension (32% vs 7%, $P = 0.0031$; 21% vs 3%, $P = 0.02$). In summary, PVBs appear to offer an equivalent level of analgesic effect following video-assisted thoracoscopic surgery, with a more favourable side-effect profile, compared to EP. This does need to be contextualized in light of the scarcity of published material, with the available studies each containing a small number of participants.

Keywords: Video-assisted thoracoscopic surgery • Epidural analgesia • Paravertebral block

INTRODUCTION

A best evidence topic was constructed according to a structured protocol as fully described in ICVTS [1].

THREE-PART QUESTION

In [patients undergoing video-assisted thoracoscopic surgery], is [paravertebral block] superior to [epidural analgesia] in terms of [pain control and its postoperative complication rates]?

CLINICAL SCENARIO

A 67-year-old man is due for undergoing video-assisted thoracoscopic surgery (VATS). When deciding on the route of analgesia administration, one of your colleagues suggests epidural analgesia (EP), due to its long-standing reputation as the gold-standard method of pain control postoperatively. However, you are concerned about the well-recognized adverse effects associated with epidurals and, instead, are considering a paravertebral block (PVB). You decide to perform a literature review to provide some clarity and communicate the findings to your team.

SEARCH STRATEGY

A literature search was performed in MEDLINE (1950 to April 2018) using the PubMed interface with the terms [(video OR VATS) AND thoracic surgery] AND [epidural OR paravertebral OR PVB] AND [analgesia OR pain].

SEARCH OUTCOME

A total of 153 publications were found using the reported search strategy. Of these, 4 represented the best available

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Table 1: Epidural analgesia versus paravertebral block in video-assisted thoracoscopic surgery (P <0.05 is considered as statistically significant)

Author, date, journal and country Study type (level of evidence)	Patient group	Outcomes	Key results	Comments
Kosiński *et al.* (2016), Anaesthesiol Intensive Ther, Poland [2] Prospective-randomized trial (level 1b)	51 patients undergoing VATS lobectomy (n = 26 in PVB, n = 25 in EP groups)	Static (at rest) and dynamic (cough) pain scores	Significantly lower in PVB group P < 0.05	
		Supplemental analgesia (IV morphine)	No significant difference (days 0–3)	
		Urinary retention (%)	64.0 (EP), 34.6 (PVB) P = 0.0036	
		Hypotension (%)	32.0 (EP), 7.7 (PVB) P = 0.0031	
		Respiratory depression (%)	0 (EP), 0 (PVB)	
		Atelectasis (%)	4.0 (EP), 3.8 (PVB) P = 0.0542	
		Pneumonia (%)	0 (EP), 3.8 (PVB) P = 0.0331	
Okajima *et al.* (2015), J Anesth, Japan [3] Prospective-randomized trial (level 1b)	69 patients undergoing VATS lobectomy, segmentectomy or wedge resection (n = 36 in PVB, n = 33 in EP groups)	Hypotension (%)	21.2 (EP), 2.8 (PVB) P = 0.02	
		Nausea and vomiting (%)	30.3 (EP), 25.0 (PVB) P = 0.62	
		Pruritis (%)	3.0 (EP), 0 (PVB) P = 0.29	
		Frequency of supplemental analgesia (range)	1.0 (EP), 2.0 (PVB) P = 0.26	
		Pain scores (VAS): 7 checkpoints between 1 h and 2 days post-surgery	No statistically significant difference between EP and PVB	
		Overall satisfaction score (range)	5.0 (EP). 4.5 (PVB) P = 0.25	
Kashiwagi *et al.* (2015), Masui, Japan [4] Prospective-randomized trial (level 1b)	12 patients undergoing VATS for lung cancer (n = 6 in PVB, n = 6 in EP groups)	Pain scores (NRS): 12- and 24-h post-surgery	4.5 ± 1.05 (PVB), 2.7 ± 0.82 (EP) P < 0.01 (both 12- and 24-h post-surgery)	Results are only available from MEDLINE abstract (manuscript is only available in Japanese)
		Intraoperative transfusion (ml)	1331 ± 147 (PVB), 1693 ± 162 (EP) P < 0.01	
		Systolic blood pressure (mmHg)	87 ± 4.56 (PVB), 73 ± 4.34 (EP) P < 0.01	
Khoshbin *et al.* (2011), Innovations (Phila), Scotland [5] Cohort study (level 2b)	81 patients undergoing VATS for pleural aspiration ± pleurodesis, lung biopsies or bullectomy (number of patients in each group = not specified)	Pain score (mean)	2.9 (EP), 2.1 (PVB) P = 0.899	

EP: epidural analgesia; PVB: paravertebral block; VATS: video-assisted thoracoscopic surgery.

evidence to answer the clinical question. These are summarized in Table 1.

RESULTS

Kosiński *et al.* [2] undertook a non-inferiority randomized trial comparing the analgesic efficacy of continuous thoracic epidural block and percutaneous continuous PVB in 51 patients undergoing VATS lobectomy. The main outcome measures were postoperative static (at rest) and dynamic (coughing) visual analogue pain scores (VAS), patient-controlled morphine usage and side-effect profiles. Control of pain (visual analogue pain scores) was superior in the PVB group at 24 h, both at rest (1.7 vs 3.3, $P = 0.01$) and on coughing (5.8 vs 6.6, $P = 0.023$), and control of pain at rest was also superior in the PVB group at 36 h (3.0 vs 3.7, $P = 0.025$) and at 48 h (1.2 vs 2.0, $P = 0.026$). Comparative analysis did not reveal any significant differences in postoperative morphine requirements. The median dose of intravenous (IV) morphine required in both PVB and EP groups was 0.4 mg/h (day 0), 0.37 mg/h (day 1), 0.21 mg/h (day 2) and 0.14 mg/h (day 3). The incidence of postoperative urinary retention (defined as no spontaneous micturition for 8 h or ultrasound-assessed volume of the urinary bladder >500 ml) was greater in the EP group (64.0% vs 34.6%, $P = 0.0036$), as was the incidence of hypotension (32.0% vs 7.7%, $P = 0.0031$), which is defined as systolic arterial pressure below 90 mmHg and/or systolic arterial pressure (SAP) decrease by >20% compared with the presurgery value. There was no significant difference in the incidence of atelectasis (4.0% vs 7.7%, $P = 0.0542$). Conversely, the incidence of pneumonia was significantly more frequent in the PVB cohort (3.8% vs 0%, $P = 0.0331$). Kosiński *et al.* concluded that PVB is as effective as thoracic epidural block in providing analgesia and offers a superior safety profile with lower postoperative complications.

Okajima *et al.* [3] undertook a randomized trial comparing the requirements for postoperative supplemental analgesia in 90 patients receiving either a PVB or thoracic epidural infusion for VATS lobectomy, segmentectomy or wedge resection. The main outcome measures were pain scores at rest (verbal rating scale: 0 = none and 10 = maximum pain) blood pressure, side effects and overall satisfaction scores relating to control of pain (1 = dissatisfied and 5 = satisfied). The frequency of supplemental analgesia for moderate pain (50 mg diclofenac sodium suppository or 15 mg pentazocine intramuscularly) was similar in both groups, with 56% of those in the PVB group requiring ≥2 doses, compared to 48% in the EP group ($P = 0.26$). The incidence of hypotension (defined as systolic blood pressure <90 mmHg) occurred with a greater frequency in the EP group (21.2% vs 2.8%, $P = 0.02$). There was no difference in the incidence of other side effects between EP and PBV: pruritus (3.0% vs 0%, $P = 0.29$) and postoperative nausea and vomiting (30.3% vs 25.0%, $P = 0.62$). There was no statistically significant difference in patient-reported satisfaction in pain control between EB and PVB, reported anonymously using the verbal rating scale (5.0 vs 4.5, $P = 0.36$). Additionally, there was no difference in postoperative verbal rating scales for pain post-VATS between EP and PVB (no *P*-value available). In summary, PVB offers similar levels of pain relief to thoracic epidural block in addition to a lower incidence of haemodynamic instability postoperatively.

A small prospective randomized trial conducted by Kashiwagi *et al.* [4] included 12 patients undergoing VATS for lung cancer and investigated the differences in postoperative pain relief and intraoperative haemodynamic status. The main outcome measures were postoperative pain levels [scored against the Numeric Rating Scale (0 = no pain and 10 = worst possible pain)], volume of intraoperative fluid transfused and the lowest systolic blood pressure. Both the PVB and EP groups received postoperative analgesia with continuous infusion of 0.2% ropivacaine 6 ml/h. Patient-reported pain levels against the Numeric Rating Scale (0–10) were higher in the PVB group at both 12 h (4.5 vs 2.7, $P < 0.01$) and 24 h after surgery (4.5 vs 2.7, $P < 0.01$). The volume of intraoperative transfusion required was smaller in the PVB group compared to the EP group (1, 331 ml vs 1, 693 ml, $P < 0.01$). Furthermore, systolic blood pressure was higher in the PVB group compared to the EP group (87 mmHg vs 73 mmHg, $P < 0.01$). Kashiwagi *et al.* concluded that although PVB confers a haemodynamic benefit, EP is superior in controlling pain levels post-VATS.

Khoshbin *et al.* [5] performed analysis on 81 patients undergoing VATS for pleural aspiration ± pleurodesis, lung biopsies or bullectomy. The main outcome was postoperative pain levels, documented every 6 h and scored against the Visual Analogue Scale (0 = no pain, 10 = worst possible pain). In both the PVB and EP groups, bupivacaine 0.125% was the local anaesthetic of choice, with clonidine added to the epidural infusion at 300 μg in 500 ml. There was no significant difference in mean pain scores between PVB or EP (2.1 vs 2.9, $P = 0.899$). Khoshbin *et al.* concluded that PVB is as efficacious as EP in controlling pain post-VATS.

CLINICAL BOTTOM LINE

Despite there being a limited amount of evidence available in the literature, the consensus is that PVB offers an equal level of analgesic effect when compared to EP. PVB also offers a more favourable side-effect profile compared to epidural analgesia.

Conflict of interest: none declared.

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