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(Abstracts and Case Report/Series)

Contents

Erector Spinae Block (ESP) as an Analgesic Technique for Video-Assisted Thoracoscopy Surgery (VATS): A Randomized-Controlled Bicentric Study

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Introduction:

There is no gold standard for postoperative analgesia after VATS at the moment. While VATS has significantly decreased tissue trauma and recovery time compared to thoracotomy, postoperative pain is often severe due to the presence of chest tubes and multiple injuries to the ribs, intercostal nerves and pleura.

Multiple techniques have been proposed to fill the research gap on postoperative pain management after VATS. The paravertebral block is often mentioned, but may present a questionable benefit-risk ratio given its proximity to the neuraxis. There is a sizeable niche for a minimally invasive analgesic technique that could facilitate the advent of ambulatory thoracic surgery[1].

Our objective was to determine the analgesic potential of a single-shot Erector Spinae Block (ESP) for VATS[2]. The primary objective was the total consumption of hydromorphone with patient-controlled analgesia (PCA) at 24 hours after surgery.

Methods:

A prospective, randomized, double-blind study was conducted in patients scheduled for VATS wedge resection, segmentectomy or lobectomy. Our study was approved by the local Scientific and Ethics Committee and was registered under Clinicaltrial.gov. Non-inclusion criteria included: chronic pain history, regular marijuana use, any contraindication to a regional block or documented allergy to medications described in the research protocol. A total of 52 patients were randomized into 2 groups: single-shot ESP block using bupivacaine (Bupivacaine group = B) or ESP block with normal saline (Placebo group = P). The sample size calculation was based on a local preliminary study.

ESP blocks were performed in the lateral decubitus position after standardized induction of general anesthesia by ESP experts (≥ 20 ESP blocks completed) with 30 mL of bupivacaine 0.5 % with epinephrine 5 $mcg.mL^{-1}$ or 30 mL of normal saline.

Quality of recovery (QoR-15) questionnaire was administered preoperatively and 24h postoperatively. Postoperative pain was assessed using a visual analog scale (VAS) at 1h, 6h, 12h, 18h and 24h at rest and when coughing for the thorax area as well as for shoulder pain. Total standardized intra-operative fentanyl, total postoperative hydromorphone consumption (PCA; primary endpoint), and incidence of adverse effects were evaluated.

Results:

Demographic data and surgical characteristics were similar between the groups. There was no difference regarding the primary objective, hydromorphone consumption over 24 hours (7.6 (4.4) mg for group B versus 8.1 (4.2) mg for group P at H24; absolute difference: -0.3 (-2.8 to 2.1 95% CI). Secondary objectives such as intra-operative fentanyl administration, postoperative pain scores at rest and when coughing, shoulder pain and QoR-15 scores were not different between the two groups at any time point during the first 24 hours following surgery (see figure). There was also no significant difference between the two groups in all evaluated postoperative adverse events (PONV, pruritus, sedation scores).

Discussion:

Our randomized-controlled bicentric study found no advantage of a single-shot ESP block for VATS lung resection regarding intra- and postoperative opioid consumption, pain scores, and QoR-15 scores. Larger VATS incisions by some surgeons and surgical variability might explain the unexpected negative results reported in our study[3].

Further studies are warranted and ongoing in our center to establish the benefits of using denser blocks such as paravertebral blocks in association with an ESP block (single shot + continuous infusion through a catheter), to provide a larger spread of local anesthetics and likely a better quality of analgesia.

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Table 1:

	Bupivacaine B group *N* = 26	Placebo P group *N* = 26	Absolute difference (95% CI)	*P* value
QoR-15	96 (25)	106 (20)	-11 (-23 to 2)	0.10
Intraoperative fentanyl (mcg)	231 (143)	255 (142)	-24 (-103 to 55)	0.55
Hydromorphone (mg) H24	7.6 (4.4)	8.1 (4.2)	-0.3 (-2.8 to 2.1)	0.77
Thorax VAS at rest				
Max	6.0 (2.1)	5.4 (2.0)	0.6 (-0.6 to 1.7)	0.34
Mean	3.3 (1.5)	2.7 (1.3)	0.6 (-0.2 to 1.4)	0.12
Thorax VAS when coughing				
Max	7.1 (2.2)	6.6 (1.8)	0.5 (-0.6 to 1.6)	0.39
Mean	4.9 (2.1)	4.6 (2.0)	0.4 (-0.8 to 1.5)	0.54

Hospital-, Anesthesiologist-, Surgeon- and Patient-Level Variation in Neuraxial Anesthesia use for Lower Limb Revascularization Surgery: A Population-Based Cross-Sectional Study

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Introduction:

As the incidence of peripheral arterial disease (PAD) increases in our aging population, so do its sequelae: claudication and chronic limb-threatening ischemia. Lifestyle modification and pharmacotherapy are important treatments in all stages of PAD, however as the disease progresses, endovascular or surgical revascularization is often required for symptom control and limb preservation.[1] Patients requiring lower limb revascularization surgery are often older and live with frailty and multimorbidity, resulting in higher rates of complications and mortality.[2] A population-based comparative effectiveness study[3] and subsequent systematic review and meta-analysis[4] have shown that use of neuraxial instead of general anesthesia is associated with reduced morbidity, mortality, and length of hospital stay. However, neuraxial anesthesia use for lower limb revascularization is decreasing over time. Our objective was to estimate the degree of variation in neuraxial anesthesia use for lower limb revascularization at the hospital-, anesthesiologist-, surgeon- and patient-level.

Methods:

Following protocol registration, we conducted a historical cross-sectional analysis of population-based linked health administrative data in Ontario, Canada. All Ontario residents aged 18 or older on the day of lower limb revascularization surgery were identified from April 1st, 2009 to March 31st, 2018 using procedural Canadian Classification of Intervention (CCI) codes. Patients receiving endovascular procedures, dialysis access surgery, and surgery at hospitals performing <50 lower limb revascularization surgeries per year were excluded. Patients were coded as having received neuraxial anesthesia if they received an epidural or spinal anesthetic without any general anesthetic. Data on demographics, Elixhauser co-morbidities, preoperative residence, prescription drug use, Hospital-patient One-year Mortality Risk (HOMR), frailty index, surgical urgency, and previous lower limb revascularization surgeries were collected. Multilevel generalized linear mixed models

were used to estimate the variation in neuraxial anesthesia use at the hospital-, anesthesiologist-, surgeon- and patient-level using variance partition coefficients and median odds ratios. Patient- and hospital-level predictors of neuraxial anesthesia use were identified. The model's predictive performance was estimated using discrimination (c-statistic), calibration (using visual plots), and explained variance (using the Nagelkerke-R^2). External generalizability was estimated through temporal validation in the last 4 years of data.[5]

Results:

Of 11,849 patients included in the study, 3,489 (29.4%) received neuraxial anesthesia. Patients receiving neuraxial anesthesia were older, less likely to have cardiac valvular disease or coagulopathies, and more likely to have elective bypasses at non-teaching hospitals. The largest proportion of variation was attributable to the hospital-(47%) and then patient-level (46%); anesthesiologists and surgeons had minimal attributable variation (6% and 1%, respectively). The median odds ratio suggested patients would experience a 5.7-fold difference in their odds of receiving neuraxial anesthesia if randomly allocated to two different hospitals. Factors predicting receipt of neuraxial with moderate effect size included younger age, surgery type (femoral artery endarterectomy and/or patch angioplasty) and urgency (non-elective), cerebrovascular disease, cardiac valve disease, or coagulopathy (all negatively associated), and chronic pulmonary disease (positively associated). Results were consistent in sensitivity analyses, including adjustment for prescription anticoagulants and antiplatelets. In temporal validation, discrimination and explained variance were strong, but attenuated.

Discussion:

In contrast to other high-variation perioperative practices, neuraxial anesthesia use primarily varies at the hospital-level. While neuraxial anesthesia was provided to 15% of patients in the median hospital, the 95% probability interval varied from 4% to 87%. This unwarranted variation is likely due to preference-sensitive factors and may be associated with adverse patient outcomes. As previous studies suggest improved outcomes with neuraxial anesthesia, efforts to promote use of neuraxial anesthesia for lower limb revascularization should likely focus on the hospital context. Multicenter trials assessing neuraxial anesthesia effectiveness, and patient decision-aids for anesthesia selection could help reduce this unwarranted variation.

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The Impact of Peripheral Nerve Blocks on the Quality of Care Following Ankle Fracture Surgery

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Introduction:

Ankle fractures are common orthopedic injuries, often requiring operative intervention to restore joint stability, improve alignment, and reduce the risk of post-traumatic ankle arthritis.[1] However, ankle fracture surgeries (AFSs) are associated with significant postoperative pain, typically requiring postoperative opioid analgesics. In addition to putting patients at risk of opioid dependence, the adverse effects of opioids include nausea, vomiting, and altered mental status which may delay recovery.[2,3] Peripheral nerve blocks (PNBs) offer notable benefits to the postoperative pain profile when compared to general or spinal anesthesia alone and may help improve recovery.[4,5] The primary objective of this quality improvement (QI) study was to increase PNB administration for AFS at our institution to above 50% by January 2021.

Methods:

A root cause analysis was performed by a multidisciplinary team to identify barriers for PNB administration. Four interventions were chosen & implemented: recruitment and training of expert anesthesiologists in regional anesthesia techniques, procurement of additional ultrasound machines, implementation of a dedicated block room with training to create an enhanced learning environment, and the development of an educational pamphlet for patients outlining strategies to manage rebound pain, instructions around the use of oral multimodal analgesia, and the potential for transient motor block of the leg.

The primary outcome was the percentage of patients who received PNB for AFS. Secondary outcome measures included total hospitalization length of stay (LOS), post-anesthesia care unit (PACU) and 24-hour postoperative opioid consumption (mean oral morphine equivalent [OME]), proportion of patients requiring opioid analgesic in PACU, and proportion of patients experiencing post-operative nausea and/or vomiting (PONV) requiring antiemetic in the PACU. Thirty-day post-operative emergency department (ED) visits were collected as a balance measure.

Results:

The groups receiving PNB and not receiving PNB included 78 and 157 patients, respectively, with no significant differences in age, gender, or ASA class between groups. PNB administration increased from 10% to 53% following implementation of the improvement bundle. Mean total hospital LOS did not vary significantly across the PNB and no PNB groups (1.04 days vs. 1.42 days, P=0.410). Mean PACU and mean 24-hour postoperative opioid consumption was significantly lower in the PNB group than the no PNB group (OME in PACU 38.96mg vs. 55.42mg [P=0.001]; 24-hour OME 44.74mg vs. 37.71mg [P=0.008]). A greater proportion of patients in the PNB group than the no PNB group did not require any PACU opioid analgesics (62.8% vs. 27.4%, P<0.001). The proportion of patients experiencing PONV requiring antiemetic in the PACU did not vary significantly across groups. Thirty-day postoperative ED visits did not vary significantly across groups.

Discussion:

By performing a root cause analysis and implementing a multidisciplinary, patient-centered QI bundle, we achieved significant increases in PNB administration for AFS. As a result, there were significant improvements in the recovery of patients following AFS, specifically reduced use of postoperative opioid analgesia. This multi-faceted approach provides a framework for an individualized QI approach to increase PNB administration and achieve improved patient outcomes following AFS.

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