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(Abstracts and Case Report/Series)

Contents

A Cohort Study on The Impact of the Covid-19 Pandemic on Surgical Practice for Breast Cancer Surgery: One More Step Towards Regional Anesthesia

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Background: The Covid-19 pandemic has dramatically increased the oncologic surgery delays. It is now recommended to avoid general anesthesia and promote regional anesthesia whenever possible. This retrospective observational cohort study evaluates whether performing oncologic breast surgery under paravertebral blocks as sole anesthetic technique would improve the time to discharge from the Ambulatory Surgery Unit as well as reduce the incidence of postoperative nausea and vomiting (PONV) and the need for postoperative analgesia.

Methods: Institutional ethics review board approval was obtained to retrospectively review the files of 106 consecutive patients who underwent an oncologic breast surgery between March and June 2020 (intra-pandemic group) and of 104 consecutive patients moving backwards from February 2020 to December 2019 (pre-pandemic group). The primary outcome was the time from the end of surgery to discharge from hospital. The secondary outcomes included the incidence of PONV, the need for postoperative analgesia and the duration in post-anesthesia care unit (PACU).

Results: The time to discharge was significantly lower in the patients who had their surgery done under paravertebral blocks in the intra-pandemic group (139 (58) vs 202 (60) minutes; $p < 0.001$). The incidence of PONV was significantly lower in the intra-pandemic group (11% vs 3% $p=0.03$). The need for postoperative analgesia was similar in the 2 groups. The PACU durations were significantly lower in the intra-pandemic group (46 (37,63) vs 29 (21,39) minutes, $p < 0.001$).

Conclusions: Patients who had their breast oncologic surgery done under paravertebral blocks left the hospital 63 minutes earlier. They also spent less time in the PACU and has less PONV. With growing surgical waiting lists, concerns to reduce aerosol generating procedures and official recommendations to avoid GA when feasible, paravertebral blocks as sole anesthetic for oncologic breast surgery offer greater benefits for patients and medical teams.

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Table 1. Postoperative data

	Pre-pandemicGroup (n=106)	**Intra-pandemicGroup (n=104)**	***p* value**
PACU stay (yes)	106 (100%)	97 (93%)	**0.007**
Time spent in PACU (min)	46 (37, 63)	29 (21, 39)	**<0.001**
Opioid dose in PACU (morphine equivalent PO mg)	2.0 (5.0)	1.2 (2.9)	0.14
PONV in PACU	6 (6%)	2 (2%)	0.188
Opioid Dose in Ambulatory Surgery (morphine equivalent PO mg)	0.5 (1.7)	0.5 (2.0)	0.14
PONV in Ambulatory Surgery	**11 (11%)**	**3 (3%)**	**0.029**
Total time spent in hospital (min) – between end of surgery and hospital discharge (including ALL patients)	202 (60)	157 (73)	**<0.001**
Total time spent in hospital (min) – between end of surgery and hospital discharge (excluding patients under GA in intra-pandemic group)	202 (60)	139 (58)	**<0.001**
Hospitalisation	4 (4%)	4 (4%)	0.967

PACU, postanesthesia care unit; PO, per os; PONV, postoperative nausea and vomiting; GA, general anesthesia

A Survey Assessing the Need for Spinal Chloroprocaine to Provide Subarachnoid Neuraxial Anesthesia for Short Duration Surgeries in Canada

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Introduction: The ability to access chloroprocaine (CP) in Canada for subarachnoid blockade (SAB) and epidural use ceased in 2012.1 Its fast onset, intense nerve blockade, reliable anesthetic time, and quick offset make it ideal for short-duration surgery.2,3 Current recommendations during the COVID-19 pandemic favor regional anesthesia to avoid aerosol-generating medical procedures.4,5 This survey of Canadian anesthesiologists sought to assess the need for CP to provide spinal anesthesia for short duration surgeries.

Methods: Ethics approval was obtained from the local REB. An electronic survey link was sent to 2218 members of the Canadian Anesthesia Society (CAS), and 1720 members of the Ontario Anesthesia Section (OAS). The survey questions were developed using focused discussion (Appendix) and tested with-in the authorship team. The survey was conducted from December 1st, 2020 to January 4th, 2021 using the REDCap (Research Electronic Data Capture) platform. Descriptive statistics were performed on all the collected variables. Categorical variables were reported using counts and percentages.

Results: The CAS and OAS survey response rates were 379/2218 (17%) and 81/1720 (4.7%) respectively, giving a total of 460 who consented to be part of the survey.
Two hundred and twenty-seven participants had experience using CP. The participants worked in a variety of work settings. Prior to the COVID-19 pandemic, 73% of respondents estimated the number of short surgical procedures amenable to SAB to be at least 3 or more per week. Fifty-seven percent provide SAB for short surgical procedures sometimes often or always. If CP was available, 92% would provide SAB sometimes, often or always. The choice of local anesthetic for SAB for short surgical procedures was bupivacaine 64.5%, lidocaine 18%, mepivacaine 15.5% and other 2%. The main barriers to SAB provision were prolonged time for spinal anesthesia regression, 86%, and lack of reliable short-acting local anesthetic without risk of transient neurological symptoms, 72%. Sixty-nine percent of Canadian anesthesiologists responded that access to spinal CP for SAB in short duration surgeries would be of 'considerable help' or 'extremely helpful'. Eighty-eight percent were more likely to provide SAB for short surgical procedures during the COVID-19 pandemic compared to their pre-pandemic practice.

Discussion: The responders of the survey of two major Canadian anesthesiologists' societies have identified the lack of a reliable short-acting local anesthetic without risk of transient neurological symptoms as a main barrier to use of spinal anesthetic for short procedures. The Canadian health organization should work collaboratively to ensure the availability of CP in Canada not only to provide requisite patient care options, patient satisfaction and safety, but also to mitigate risk and protect peri-operative staff from aerosolized particles during a general anesthetic.

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Table 1. Barriers to Performance of SAB in Order of Frequency

	Freq	%
Prolonged time for spinal anesthesia regression causing delayed discharge readiness	372	86
Lack of reliable short-acting local anesthetic without risk of TNS.	311	72
Patients' fears of spinal anesthesia and being "awake"	140	32
Surgeons' or post-anesthesia nurses' preference for general anesthesia	105	24
Lack of space such as block room to provide parallel processing	68	16
Insufficient time to provide SAB due to rapid operating room turn-over	62	14
Lack of personnel to assist in the performance of SAB	19	4

Assessing the Effectiveness of Thoracic Epidurals for Post-Operative Pain Control. A Quality Improvement Project

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Introduction: Thoracic epidural analgesia (TEA) is routinely used for post-operative pain control in patients undergoing various surgical procedures and has been shown to improve patient outcomes (1). Their failure can lead to patient dissatisfaction, clinician frustration, increased resource usage, and loss of operating room time used for performing the procedure. At our institution, improving the success rate of TEA has been identified as a key target for quality improvement (QI). The goal of our project is to establish the baseline failure rate of TEA at our institution and elucidate the causes of failed thoracic epidurals.

Methods: Ethics approval was obtained from the local REB. We performed a retrospective chart review for all patients over 18 years old who received TEA as a part of their post-operative analgesia regimen between January and February 2019. A “successful TEA” is defined as an epidural continued in the post-operative period until no further need. We further stratified “failed TEA” into primary failure (ineffective epidural removed in PACU), and secondary failure (effective epidural that is subsequently and prematurely discontinued). We also collected information on the reasons for failed epidurals, epidural technical information, epidural safety information, patient demographics, surgical information, and PACU quality indicators.

Results: Data was collected from 41 patients who met our inclusion criteria and received a thoracic epidural. There were 12 mid-thoracic (T5-T9) epidurals and 29 lower thoracic (T9-T12) epidurals. 24.4% (10/41) of patients had a failed thoracic epidural. Out of these, 20% (2/10) were primary failures and 80% (8/10) were secondary failures. Reasons for failure include hypotension (4), ineffective analgesia (4), neurological deficit (1), and unknown/not documented (1). The average PACU admission pain score for these patients was 2.4 ± 3.4 out of 10. On average, it took 44.3 ± 15.7 minutes for induction of anesthesia which includes time needed to insert the epidural. Patients stayed in the PACU for 146.2 ± 65.4 minutes and they stayed in the hospital for a median of 6 days.

Discussion: Thoracic epidurals are crucial in improving patient outcomes postoperatively. However, multidisciplinary support is required to maximize their effectiveness. Our data shows there is an opportunity to improve the success rates of thoracic epidurals performed at our institution. A vast majority of our TEA failures were secondary failures where an epidural was deemed effective in the PACU then subsequently removed on the ward. This suggests improvements can be made in the management of TEA after a patient leaves the PACU. Possible QI interventions include multidisciplinary education, auditing and enlisting the help of a dedicated pain service nurse. Our findings establish the baseline failure rates of TEA at our institution and provide specific targets for future QI in TEA to improve patient outcomes.

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Assessment of Hemi-diaphragm Dysfunction after Upper Extremity Nerve Blocks Using an Oscillometry Device to Measure Lung Mechanics

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Background: Respiratory mechanics can be measured using an effort independent technique known as oscillometry (Osc). An Osc device is held in the patient's mouth and small pressure waveforms are superimposed on normal tidal volume breaths to measure respiratory system resistance (R) and reactance (X, a measure of compliance and inertia properties) over a frequency range of 5-37 Hz. Osc has been useful for assessing changes in lung mechanics in many conditions including asthma (1,2), COPD (1) and after mechanical ventilation (3,4). The objective of this prospective observational study was to determine if Osc was sensitive to lung function changes secondary to phrenic nerve and hemi-diaphragm dysfunction (HDD) caused by an Interscalene (ISB) or Supraclavicular brachial plexus nerve block (SCB).

Methods: Ethics approval was obtained from the local REB. Consenting patients undergoing routine ISB or SCB were recruited. Patient age, sex, smoking history, bronchodilator use and BMI were recorded. Osc was performed using a handheld oscillometry device (Tremoflo, Thorasys, Montreal) before the nerve block and after the block, once HDD was confirmed by chest ultrasonography (< 20% inspiratory diaphragm thickening). Three serial 30 second tests of Osc measurements were recorded at both time points for each patient. Osc testing was done in a standardized head-up bed position used for nerve blocks. Self-reported dyspnea was recorded every 5 minutes after ISB/SCB nerve block. R at 5 Hz (R5) quantified total respiratory system resistance, and the difference from R at 19 Hz, (R5-19) assessed any heterogeneity from narrowing in the small airways. X values at 5 Hz (X5) and area under the reactance curve AX indicated respiratory system stiffness. R and X values (cmH2O.s/L) were statistically compared using paired t-tests or Wilcoxon signed rank tests.

Results: A total of 16 patients with ultrasound confirmed HDD were included in the study (5 ISB/11 SCB, 9 male/7 female, mean age 58 years, mean BMI 28 kg/m^2, 10/16 lifetime non-smokers). After HDD, significant changes were seen in the resistance, R5 (mean increase 12.7%, p=0.0057) and reactance, X5 (median decrease 79.5%, p=0.039). There also was a significant increase in the R5-19 parameter (median increase 45.7%, p<0.001) and AX (median increase 69.16%, p=0.016).

Discussion: The overall pattern of changes in mechanics measured after HDD were indicative of increased heterogeneity in the small airways, causing impaired flow to the periphery of the lung. The change in X indicated increased stiffness likely due to small airway obstruction, and potentially from altered thoracic volume and shape changes with hemidiaphragm elevation. Previous Osc studies have reported similar patterns of post-operative changes after mechanical ventilation (3,4). Based on our data, Oscillomety can detect changes in lung mechanics after HDD and has potential for clinical use in future studies of HDD.

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Association of Anesthesia Technique with Graft Patency Rates After Open Lower Limb Revascularization: A Retrospective Population Cohort Study

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Background: Lower limb revascularization is performed for patients with blood flow occlusion, with the goals of improving pain and function (1). Graft patency is associated with higher quality of life scores (2). Our primary objective was to determine, for patients undergoing elective open lower limb revascularization, whether the use of regional anesthesia (RA) only (spinal, epidural, and peripheral nerve block), compared to general anesthesia (GA) only, is associated with higher rates of patent graft within 30 days postoperatively.

Methods: After REB approval, we analyzed the multicenter National Surgical Quality Improvement Program (ACS NSQIP®) dataset from 2014-2019. All elective cases within the NSQIP Lower Extremity Open procedure-targeted dataset (LEO) were included and linked with the main NSQIP dataset. Patients with age<18, urgent and emergent surgery, local anesthesia only or unknown anesthesia type, and international normalized ratio (INR)>=1.5 on day of surgery were excluded. Patients who had both GA and RA were excluded from primary analysis.

The primary outcome was graft patency, derived from the LEO variable "Most Severe Procedural Outcome" and "Untreated Loss of Patency". The group of patients with non-patent grafts included patients who died. Secondary outcomes included major reintervention, amputation, venous thromboembolism (VTE), myocardial infarction (MI) or stroke, pneumonia, discharge to new facility, postoperative length of stay, readmission rate, and death, all within 30 days postoperatively. Complete case analysis was performed with no imputation. Multivariate logistic regression was performed adjusting for potential confounders: age, bleeding diathesis (including medication causes), severe chronic obstructive pulmonary disease, total operating time, renal failure, functional status, diabetes, and year of surgery.

Results: The cohort included 8893 patients, with 7.7% (688) patients receiving RA only, 90.4% (8039) GA only, and 1.9% (166) both GA and RA. The mean age in the RA only group was 71(10) years, compared to 67(11) years in the GA only group. Compared to patients in the GA only group, patients in the RA only group had higher frequencies of bleeding diathesis, high risk physiologic factors as defined by NSQIP, and severe COPD. The RA group also had lower frequencies of high-risk anatomic features and current smoking status, and shorter surgery time. The frequency of missing data for patency was 13.0% (1155/8893). The patency rate was 93.2% (573/615) for RA only, and 91.5% (6390/6983) for GA only (P = 0.15). Multivariate logistic regression showed that the use of RA only, compared to GA only, was not associated with a higher rate of patency (adjusted odds ratio 1.16, 95% confidence interval 0.83 to 1.63, P = 0.378).

Interpretation: The rate of patency 30 days after elective lower limb revascularization is high; compared to GA only, the use of RA only was not associated with a significant increase in patency rate. Further studies could explore the impact of RA with a longer-term follow up.

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Erector Spinae Plane Block When Neuraxial Analgesia is Contraindicated by Clotting Abnormalities in Trauma and Surgical Patients

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Introduction/Background: Erector spinae plane (ESP) block is technically simple, has a low risk profile, and provides an excellent analgesic alternative in the presence of coagulopathy – an absolute contraindication to epidural/paravertebral blocks. Four patients with ongoing coagulopathies received an ESP block to manage severe thoracic pain with respiratory impairment. Tracheal intubation was avoided in two cases, and extubation facilitated in the other two.

Case Presentation: Case 1: 54-year-old morbidly obese man with recurrent lung abscesses/empyema had a right thoracotomy for middle lobe wedge resection, decortication, and pleurectomy. Suspected sepsis precluded preoperative epidural insertion. Two chest drains were placed and he was sent to intensive care where severe pain hindered weaning from the ventilator. Because INR was 1.6 (secondary to massive intraoperative blood loss and underlying liver cirrhosis), a single-shot ESP block was performed allowing subsequent tracheal extubation.

Case 2: A 39-year-old male post motorcycle accident sustained polytraumatic injuries. Thoracic pathology included left-sided rib fractures 6-12 with flail chest, hemo/pneumothorax and suspected esophageal tear precluding oral co-analgesics. Severe pain, ongoing oxycodone/marijuana abuse and behavioural challenges impeded weaning from mechanical ventilation. Due to rapid downtrending consumptive thrombocytopenia, a single-shot ESP was performed allowing tracheal extubation.

Case 3: A 93-yr-old man was admitted with 5 right-sided rib fractures and bilateral lower lobe atelectasis/consolidation after a fall 10 hours prior. He had significant cardiorespiratory comorbidities (on therapeutic doses of apixaban for atrial fibrillation) presenting in acute respiratory distress requiring high flow oxygen. Upon institution of thoracic ESP infusion of local anesthetic, he was weaned from supplementary oxygen and discharged home 2 days later.

Case 4: 69-year-old moderately obese man post motorcycle accident with 1-7 right-sided rib fractures, small hemothorax, pulmonary contusion and suspected sleep apnea. He was on ticagrelor for coronary stents and prophylactic dalteparin. Despite conventional multimodal analgesia, he was unable to cough or breathe deeply. Following a single-shot ESP block, he was weaned from oxygen and discharged home 2 days later.

Ethics approval and written consent were obtained.

Conclusion: Satisfactory analgesia without central nervous depression can positively affect trauma and perioperative outcomes. In the elderly, mortality is ~5% for every rib fractured and in the young approximately ~2.5%.[1] Coagulopathies often preclude neuraxial/paravertebral analgesia. The risk of spinal hematoma after ESP block is considered low.[2] To date, it has been used in the setting of von Willebrand features,[3] thrombocytopenia,[4] and coagulopathy,[5] and no clinically significant spinal hematoma has been reported. This safety profile is attributed to the absence of major blood vessels in the ESP, the greater distance between the ESP and the

spine, the superficial nature of the block (allowing for external pressure to control bleeding should it occur), and the larger spaces where blood can be accommodated without compressing vital structures.

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Postoperative Neurologic Symptoms in the Operative Arm After Shoulder Surgery With Interscalene Block: A Systematic Review

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Background. Nerve injury, anesthesia (1,2). Interscalene block (ISB) provides reliable anesthesia and analgesia for shoulder surgery (3) but has been associated with PONS in observational case series (1,4). However, unmeasured confounders may have biased these older, nonrandomized studies that also predated the development of newer alternative regional techniques and the widespread use of adjuvant agents to extend block duration. This systematic review of randomized trials aimed to compare the risk of PONS between ISB and other techniques and the relative safety of different agents used in ISB.

Methods. The review followed the methods of Cochrane review, and institutional ethics approval was not required. A search strategy was developed with a methodological expert and applied to MEDLINE, EMBASE, and CENTRAL from database inception to June 2020. All screening and data extraction was done independently and in duplicate with disputes resolved by a third author. We included randomized, or quasi-randomized trials of patients (>5 years old) undergoing any shoulder surgery with any ISB technique as an intervention, and a comparison group that received any other non-regional or regional technique, or ISB of alternate composition or technique. PONS, however defined and measured a minimum of 1 week after surgery, was the outcome of interest.

Results. 568 full text articles were assessed from 1,611 records. 422 of 568 (74%) were excluded due to lack of PONS outcome and 91 (16%) for other reasons. The remaining 55 studies (10%), totaling 6236 participants (median sample size 69; range 30-910) were included for full text review. PONS was assessed by telephone report (n=26, 47%), physical exam (n=21, 38%) or unclear methods (n=8, 15%) and frequently assessed at more than one time point. 44 (80%), 7 (13%), 9 (16%) and 10 (18%) studies assessed PONS between 1 week and <1 month, 1 and <3 months, 3 months and <6 months, and at 6 months to 1 year, respectively. Meta-analysis was not attempted due to low PONS counts and heterogeneity in comparator groups, time period of PONS assessment and PONS diagnostic criteria (Table 1). The most commonly applied diagnostic criteria for PONS were the presence of one or more of paresthesia, sensory deficit or motor deficit, used in 16 studies (29%).

Conclusion. The relative risk of PONS between different ISB agents and compared to other regional anesthesia techniques could not be quantified from meta-analysis of relevant randomized trials. This was due to PONS being infrequently measured as an outcome and definitions varying markedly between studies. Standardization of a PONS outcome definition and regularly reporting its occurrence would improve patient safety by increasing our understanding of PONS epidemiology.

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Table 1. Frequency of specific diagnostic criteria used in the definition of postoperative neurologic symptoms among the 55 included studies.

Diagnostic criteria	Frequency among included studies
Paresthesia/Tingling/Abnormal sensations	30 (55%)
Numbness/sensory deficits	22 (40%)
Dysesthesia	4 (7%)
Motor deficit/motor dysfunction/weakness	27 (49%)
Pain[1]	10 (18%)
Non-specific definition[2]	14 (25%)
Other	5 (9%)

1. Pain includes neuropathic pain, new onset pain, radiating pain in brachial plexus distribution, pain in forearm or hand.
2. Non-specific definitions include neurologic symptoms, dysfunction, deficits or complications, neuropathy, nerve injury or palsy; abnormal neurologic evaluation; or persistent motor or sensory dysfunction

Video Conferencing as a Tool for Improving Access to Regional Anesthesia in a Remote Community Hospital

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Introduction: The COVID-19 pandemic has led to an increase in the amount of video conferencing and telemedicine practiced worldwide. User-friendly applications for video conferencing have facilitated the implementation of telemedicine in anesthesia in areas such as remote obstetric anesthesia and trauma care at remote centres[1,2]. With this easily accessible technology, we present a novel strategy for providing real-time mentoring for the performance of regional anesthesia in a community hospital 569km away from the nearest centre with an advanced regional anesthesia program.

Case Presentation: Patient consent was obtained for publication of this case. As this case report is devoid of patient identifiable information, it is exempt from REB review requirements.

Family practice anesthetists (FPAs) approached our regional anesthesia group for support in performing adductor canal blocks for knee surgery. The FPA group already had some experience with the technique, but felt that real-time expert feedback would be helpful to refine their approach. A webinar was organized and given by the regional anesthesia fellow and a staff specialist in regional anesthesia prior to block performance. The session included a review of relevant anatomy and sonoanatomy, details regarding how to safely perform the block, videos demonstrating appropriate technique, and provided opportunity for questions and discussion.

Subsequently, a video conferencing session was arranged to provide guidance from the regional anesthesia specialists during performance of an adductor canal block. The remote site provided real-time audio and visual feed of the room where the nerve block was performed, and could share the ultrasound images through the video conferencing platform. The FPA performing the block had assisted in adductor canal blocks previously, but this was the first she performed independently. The patient and the FPA performing the block were easily visualized with simultaneous, live video feed from the ultrasound machine in two different windows. As a result, advice could be provided in real-time regarding probe placement, needling technique, and identification of appropriate local anesthetic spread in the adductor canal and subsequent identification of the saphenous nerve.

Discussion: Through video conferencing and the ability to view ultrasound images, real-time mentoring facilitated the use of regional anesthesia in a remote community. This strategy has not yet been reported in the literature, although video conferencing in the context of simulation in regional anesthesia has been documented[3]. In a recent survey of anesthesiologists working at academic and community sites in southwestern Ontario, 72% of anesthesiologists reported they would like to receive additional training in the use of ultrasound and all respondents felt they would benefit from E-learning modules[4]. The use of video conferencing provides the opportunity not only for E-learning but also for feedback, which improves skill acquisition[5]. Through this technology, knowledge-sharing and mentorship could potentially facilitate learning and maintenance of competency in regional anesthesia, and improve perioperative care for

patients in rural and remote locations.

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