
# CAS 2024
# Regional and Acute Pain Abstracts

# Contents

# Critical limb ischemia presenting as motor block in a patient with a continuous thoracic epidural: a case report

**Submission ID**

49

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## INTRODUCTION

Epidural analgesia (EA) is a common modality that provides superior postoperative analgesia compared with parenteral opioids for select procedures, while reducing many perioperative complications.[1] While EA ideally provides sensory, but not motor, blockade, inadvertent motor blockade occurs in 5–36% of patients. Though more common with lumbar epidurals, 2% of motor blocks occur with thoracic epidurals.[1] Motor block may be a sign of a serious complication such as an epidural hematoma, abscess, or spinal cord injury.[1] We discuss the case of a patient who underwent an incisional hernia repair under general anesthesia and EA, and developed unilateral motor weakness secondary to acute iliac artery thrombosis. This (usually extremely painful) presentation may have been partially masked by EA. This report highlights the need to maintain a broad differential diagnosis when assessing motor weakness in patients with EA, including neuraxial and nonneuraxial etiologies. Research ethics board approval and consent were obtained for publication.

## CASE PRESENTATION

A 67-yr-old, American Society of Anesthesiologists Physical Status IV, male presented for an elective open incisional hernia repair. Preoperatively, an epidural was placed at T9–T10 without complication. Continuous EA infusion (bupivacaine 0.1% + hydromorphone 10 $\mu g \cdot mL^{-1}$) was initiated at 5 $mL \cdot hr^{-1}$ and maintained throughout the unremarkable general anesthesia course.

One hour postoperatively, he presented with decreased level of consciousness (LOC) and respiratory acidosis (pH = 7.16; $PCO_2$ = 76 mm Hg), which was managed with BiPAP ventilation. Shortly after, his LOC improved and he complained of pain in the right lower abdomen. To assess epidural function, a 7 mL 2% lidocaine bolus was titrated, resulting in bilateral T6–L1 sensory block. The patient was pain-free, however developed motor block of the right lower extremity (modified Bromage 3).[2] The EA infusion was paused and the patient transferred to ICU for continued BiPAP ventilation.

Four hours postoperatively, the patient's weakness had gradually improved (modified Bromage 5)[2] and the epidural infusion was restarted.

Overnight, the patient remained difficult to assess because of fluctuating LOC, attributed to hypercapnia versus delirium. He occasionally complained of right lower quadrant pain and had fluctuating (modified Bromage 2–4)[2] right lower extremity weakness.

Because of concerns over potential intraabdominal hemorrhage (hemoglobin drop 128 to 91 $g \cdot dL^{-1}$), an urgent CT scan was ordered. Concurrently, the epidural was removed because of the uncertain clinical picture (i.e., fluctuating unilateral leg weakness despite diluted LA solution in a 'difficult-to-assess' patient with fluctuating LOC), and images of the vertebral canal were ordered on CT. CT revealed extensive right common iliac artery thrombosis and the patient underwent amputation.

## CONCLUSION

We present the case of a patient with a thoracic epidural who developed postoperative unilateral lower limb weakness secondary to acute iliac artery thrombosis. This diagnosis may have, in part, been masked by a functioning epidural catheter.

Motor block may be a sign of devastating EA complications, including hematoma and abscesses. Importantly, motor weakness can also be caused by nonneuraxial events, including stroke, acute limb ischemia, myositis, and Guillain–Barre syndrome.[3]

This case highlights the need to carefully assess patients with epidural catheters presenting with motor block and to maintain a broad differential of neuraxial and nonneuraxial etiologies of motor weakness.

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# Efficacy of surgically-inserted rectus sheath catheters, epidural, and patient-controlled analgesia for major urologic surgeries

**Submission ID**

78

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**INTRODUCTION**

Protocols for Enhanced Recovery After Surgery recommend epidural analgesia in open surgical procedures. Epidurals however, have associated risks, and variable success rates depending on the anesthesiologists' skill set, diligent follow-up care, and adequate nursing training. Contrastingly, rectus sheath (RS) catheters are gaining popularity as a perioperative pain adjunct with comparable efficacy and considerably less risks than epidurals.[1] The use of RS catheters is effective and safe in patients undergoing major open urologic procedures,[2] but the utility of surgically-initiated RS (SI-RS) catheters is currently unknown.[3] At our institution SI-RS catheter placement using visualization and tactile sensation prior to incision closure has been offered for patients undergoing open urologic surgeries since 2013, and is a stable component of multimodal analgesia (MMA) regimen for these surgeries.

In this retrospective cohort study, we examined the analgesic benefits of SI-RS catheters compared with a patient-controlled-analgesic (PCA)-based or epidural-based MMA following open cystectomies and cystoprostatectomies.

**METHODS**

Study approval was obtained by our institutional review board and patient consent was waived. Patients undergoing cystectomy/cystoprostatectomy at our institution from January 2010 to December 2016 were eligible (three years of data before and after SI-RS catheter insertion became routine). Inclusion criteria were > 17 yr old, elective open cystectomy/cystoprostatectomy, and ASA Physical Status I–III. Eligible patients were grouped into PCA-only, SI-RS with PCA, and thoracic epidural analgesia (TEA) only.

Our primary outcome was pain score at 24 hr with movement. Secondary outcomes included intraoperative and postanesthesia care unit opioid consumption, pain scores on movement at 12, 24, 48, and 72 postoperative hr, length of PACU and hospital stay, ICU

admission, and incidence of nausea/vomiting. Given the variability in the use of opioid analgesia (oral/IV-PCA/epidural opioids), we included the use of IV-PCA as a covariate instead of analyzing total opioid usage with each modality.

Pain scores were analyzed after dichotomizing them to acceptable (VAS ≤ 5/10) *vs* not acceptable (VAS > 5/10). Nonpain outcomes were similarly dichotomized. Multivariable logistic regression was performed. Analgesic modality was the grouping variable while age, sex, body mass index, ASA classification, smoking status, chronic pain, opioid dependence, psychiatric illness, history of COPD, DM, and recreational drug use were covariates.

**RESULTS**

Total number of 133 eligible charts were included. Fifty-nine patients were in the no block group, 50 patients in the SI-RS group, and 24 patients in the TEA group.

The probability of having a VAS (0–10) score of < 5/10 at 24 hr postop was significantly higher with the use of either SI-RS or TEA compared no block, and there was no significant difference between SI-RS and TEA groups. A similar result was noted for pain scores on movement at other time points. The groups showed no difference in ICU admissions, time to mobilization, time to oral diet, or length of hospital stay. TEA resulted in a significantly longer length of PACU stay. There was no difference in the incidence of nausea/vomiting between the groups, but it was weakly associated with the use of IV-PCA. No leakage was noted in any of the 50 RS catheters with only one dislodgement.

**DISCUSSION**

Pain scores on movement were lower with the use of SI-RS or TEA and were comparable. TEA resulted in a longer PACU stay and was not associated with significant analgesic benefits. There was no leakage in the catheter-over-needle assemblies used where the needle is housed within the catheter allowing a 'snug-fit' to the skin preventing leakage and dislodgement.

Study limitations are intrinsic to its small sample size and retrospective design with inconsistencies of data and recordkeeping.

Prospective RCTs are necessary to determine whether SI-RS catheters are an effective analgesic compared with other modalities for this patient population.

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# Local anesthetic systemic toxicity in ultrasound-guided single-shot nerve blocks: a systematic review

**Submission ID**

115

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**INTRODUCTION**

Ultrasound guidance has markedly increased patient safety and minimized complications, contributing significantly to the prominence of regional anesthesia. The assessment of this tool, with its direct visualization and precise nerve targeting, seeks to diminish local anesthetic (LA) dosage, presumably leading to enhanced outcomes. Despite these benefits, the widespread use of LAs in regional anesthesia faces a challenge because of their systemic toxicity (LAST). The majority of the available data regarding this potentially fatal complication is composed of case reports and series. Our systematic review aims to expand upon previous studies and analyze the available literature regarding the occurrence of LAST during ultrasound-guided single-shot blocks.

**METHODS**

To conduct a comprehensive systematic review, we aimed to assess the occurrence of LAST in single-shot ultrasound-guided peripheral nerve and fascial plane blocks, without age restrictions. Our eligibility criteria focused on case reports or series, excluding studies using LA infusions through catheters. The primary objectives were to gather data on patients' demographics, the administered dose of local anesthetic, the severity of LAST cases, onset time and severity of symptoms, and the use of lipid emulsion as a treatment modality.

**RESULTS**

A comprehensive literature search in MEDLINE, Cochrane, and EMBASE yielded 1,561 studies related to LAST. Among these, we included 28 adult patients and one neonate, drawn from 26 case reports meeting our eligibility criteria. The clinical spectrum of LAST ranged from mild symptoms like perioral numbness and sensory disturbances to severe manifestations, including

seizures and cardiac arrest. Most reports described the occurrence of LAST despite the use of recommended dosages of LA. Among the reported cases, only four involved overdoses of LA, two of which resulted in cardiac arrest. Brachial plexus blocks accounted for 13 cases, while fascial plane blocks were associated with ten cases and inferior limb blocks with five. Ropivacaine was implicated in 51.7% of toxicity cases, while Bupivacaine was mentioned in 41%. Approximately 20% of the cases did not use lipid emulsion, with one of them resulting in cardiac arrest. All reported patients experienced a full recovery.

## DISCUSSION

Despite adhering to the recommended clinical dosage of LA remains an essential safety measure during the execution of ultrasound-guided single-shot blocks, our study shows that the majority of the LASTs occurred within a dose range considered safe. Nevertheless, the cases in which the recommended maximum dose was reached or surpassed exhibited more severe LAST symptoms. Therefore, acknowledging the limitations inherent in studies relying on descriptive sources such as case reports, our findings highlight the necessity for further investigation, particularly in a better understanding of the relationship between the administered dose of LA and its potential associated toxicity.

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# Rebound pain in opioid-tolerant patients following peripheral nerve blockade for ambulatory surgery: a retrospective cohort study

**Submission ID**

111

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## INTRODUCTION

Rebound pain, defined as significant pain following recession of peripheral nerve blockade, presents a potential limitation to single shot regional anesthesia for ambulatory surgery.[1] In particular, the risk of rebound pain for opioid tolerant patients remains to be fully characterized and this may represent a high risk population for home analgesia management. Therefore, it is essential to characterize the risk of rebound pain in opioid-tolerant patients receiving peripheral nerve blocks for ambulatory surgery in deciding on the most appropriate anesthetic technique and timing of hospital discharge. The primary objective of this study was to compare the incidence of rebound pain for opioid-tolerant and nontolerant patients who received single shot peripheral nerve blocks for ambulatory surgery. Secondary objectives were to report patient satisfaction and rates of return to hospital following discharge.

## METHODS

Following the institutional research ethics board and waiver of consent approvals, a single-centre retrospective cohort study was conducted at Queen Elizabeth II Health Sciences Center in Halifax, NS, Canada. Ambulatory surgery patients who received a peripheral nerve block between March 2017 and December 2022 were included in the study. Opioid tolerance was defined as the use of more than 60 $mg \cdot kg^{-1}$ oral morphine per day,[2] or the use of methadone, buprenorphine or fentanyl patches.

We examined the incidence of rebound pain, defined as the transition from well-controlled pain (numerical rating scale [NRS] < 3) to severe pain (NRS > 7) as well as rebound pain scores, defined as the difference between maximum PACU pain and home pain scores. Patient satisfaction scores and incidence of returning to hospital after discharge were recorded. Data was obtained from hospital medical record databases (Innovian, Dragerwerk AG & Co., Lubeck, Germany) and questionnaire-based sources. Statistical analysis was performed in Graphpad Prism (Version 10) and IBM SPSS Statistics (Version 28). Categorical and numerical data were analyzed with Fisher's exact tests and Mann–Whitney tests, respectively.

## RESULTS

Three thousand, six hundred patients met the inclusion criteria. Of these, 47 patients were identified as opioid-tolerant and 3,553 patients as nontolerant. Opioid tolerant patients were more commonly given perioperative dexamethasone, a known modifier of rebound pain[1] (46.9% *vs* 32.9%; *P* = 0.02). The highest mean (SD) PACU NRS pain scores were higher in the opioid-tolerant (5.5 [3.5]), compared with nonopioid tolerant patients (3.2 [3.3]) (*P* = 0.0003). In contrast, the highest mean (SD) pain scores at home were not significantly different between opioid tolerant (5.5 [3.8]) and nontolerant patients (5.3 [3.3]) (*P* = 0.57). Thus, the mean RPS was reduced in opioid tolerant patients (1.7 [4.2] *vs* 3.9 [4.1]). We did not find a significant difference in the satisfaction scores between the groups, with a mean (SD) Likert score of 3.9 (0.9) for opioid-tolerant and 4.0 (0.8) for nontolerant (*P* = 0.80). Nevertheless, the opioid-tolerant patients were more likely to return to the hospital after discharge (12% opioid tolerant *vs* 3% nontolerant; *P* = 0.02).

## DISCUSSION

In this retrospective study, we did not find an increased risk of rebound pain in opioid-tolerant patients who received single shot peripheral nerve blocks for ambulatory surgery. Rebound pain scores were in fact reduced in the opioid tolerant population, owing to a similar maximum home pain score following an elevated PACU pain score. Opioid-tolerant patients reported similar satisfaction rates with peripheral nerve blockade as nontolerant patients. Nevertheless, there was a higher rate of return to hospital in the opioid-tolerant population. Confounders include an increased use of dexamethasone in the opioid tolerant population which may have contributed to less rebound pain.

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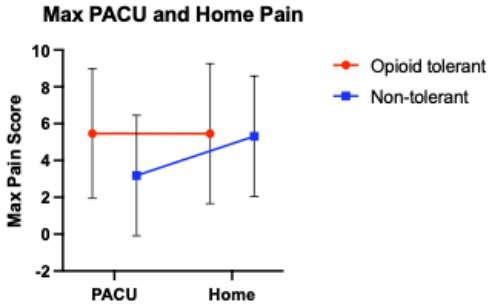
## Figure



# Safety of a catheter-over-needle system for epidural placement in a porcine *in vivo* model

**Submission ID**

70

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**INTRODUCTION**

Continuous epidural analgesia remains an effective modality in the perioperative period and the gold standard for labour analgesia.[1] Epidural catheters are traditionally placed using a catheter-through-needle (CTN) technique. Recent studies have shown that catheter-over-needle (CON) systems have decreased complication rates (accidental catheter dislodgement and medication leakage at the catheter insertion site) and improved analgesia outcomes in peripheral nerve blocks compared with CTN techniques.[2,3] Further study has shown the feasibility of placing epidural catheters using a novel CON system in fresh human cadavers.[4] This proof of concept investigation aims to study the efficacy of epidural catheter placement and potential damage of the spinal cord and surrounding structures caused by using a novel CON system in a live animal model.

**METHODS**

After local Animal Ethics Board approval, a CON epidural system (E-Cath Acc. Tsui; Tuohy 83mm, Pajunk, Geisingen, Germany) was used to evaluate the efficacy and safety of placing epidural catheters in live anesthetized pigs. Pigs were chosen as they share vertebral and spinal cord anatomy similar to humans and other nonhuman primates.[5] The animals were anesthetized, endotracheally intubated, and positioned laterally. Three CON epidural catheter placements were attempted per animal using loss-of-resistance technique alone (Animal 1) before adding fluoroscopic guidance (Animals 2-6), given the procedural and safety concerns experienced in Animal 1. The animals were then euthanized via a pharmacologic overdose and necropsy was performed to assess final catheter location (epidural placement success) in addition to both gross anatomical and histopathological evidence of damage to the spinal cord and surrounding structures.

## RESULTS

Six pigs (10–12 weeks old, about 30 kg) were used. A Gross necropsy examination showed 17 of 18 catheters were successfully placed in the epidural space. In Animal 1 (epidural placed without fluoroscopic guidance) significant difficulty was experienced identifying the loss-of-resistance in addition to involuntary muscle contraction during placement. Number of attempts per epidural catheter placement in Animal 1 was 3, 10, and 1 respectively, with 2 of 3 catheters ultimately placed in the epidural space. Additionally, significant gross and histopathological injury was found including epidural and subdural hemorrhage, as well as hemorrhagic cavitation in the spinal cord with associated neuronal degeneration and necrosis. In all subsequent animals (procedure completed with fluoroscopic assistance) epidural placement was clinically unremarkable. There was a maximum of 2 attempts, all were sucessfully placed within the epidural space, and there was no evidence of gross or histopathologic spinal cord damage (Figure).

## DISCUSSION

This study showed this novel CON system for placing epidural catheters can be successful in a live animal model. The experience with Animal 1 (procedural failure, multiple attempts, and spinal cord damage) is likely related to a dermal plug in the nonstylet epidural needle in the CON kit. Although we did not use a stylet for subsequent procedures, the use of fluoroscopy minimized attempts and distance of tissue the needle passed through, reducing the risk of plugging and subsequent damage. Our results showed a CON based epidural placement technique is possible; but further investigation is required, including using a stylet epidural needle.

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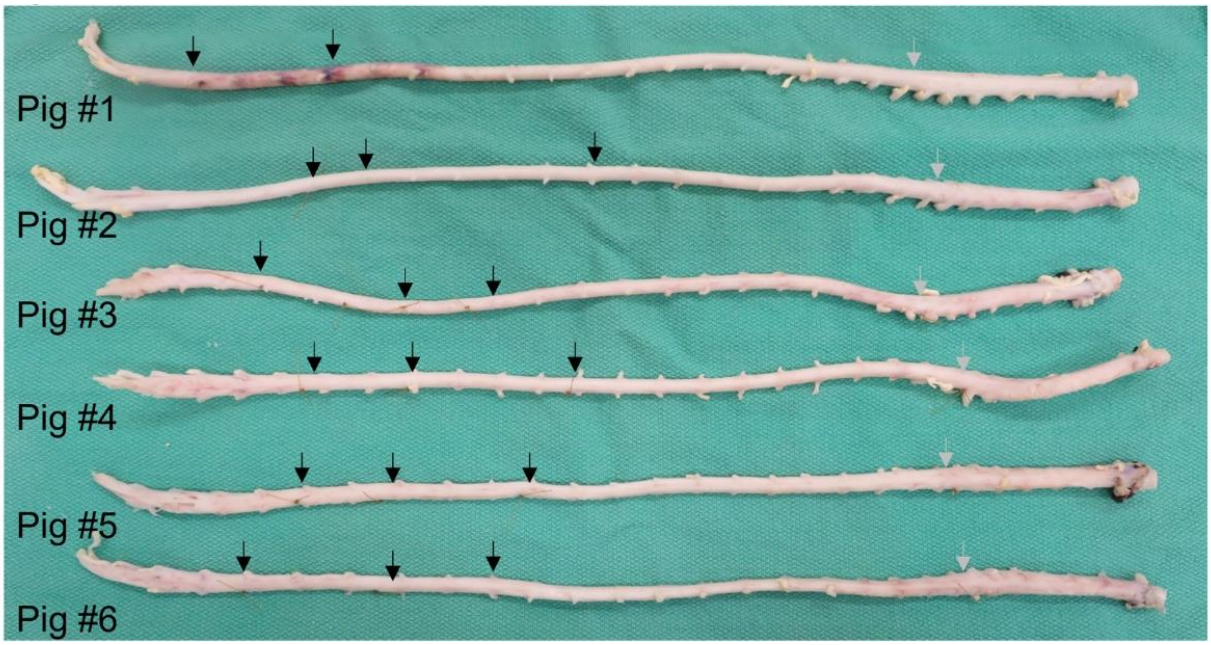
**Figure** Formalin-fixed spinal cords of all studies animals




*Black arrows indicated catheter entry point; grey arrows indicated the first thoracic spinal roots. Note the gross hemorrhage near the catheter entry points in Pig # 1.

# Systemic heparinization after neuraxial anesthesia in vascular surgery: a retrospective analysis

**Submission ID**

16

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## INTRODUCTION

Neuraxial anesthesia (NA) constitutes an excellent anesthetic option with well-established perioperative benefits during vascular surgery.[1] To mitigate the risk of spinal hematoma (SH)—a potentially devastating complication—the American Society of Regional Anesthesia and Pain Medicine (ASRA) guidelines recommend intravenous heparin be held for at least one hour following an atraumatic NA technique (grade 1A recommendation).[2] If traumatic and/or difficult NA, a collaborative risk benefit decision involving the surgical team is recommended.

This recommendation is largely based on a 1981 study (*N* = 684) where 342 patients in emergency departments were given intravenous heparin for 10–14 days following diagnostic lumbar puncture (LP) in the context of acute cerebral ischemia,[3] and isolated case reports and closed claims.

During vascular surgeries where heparin is typically required soon after induction, some anesthesiologists may avoid NA altogether, whereas others may elect to proceed after weighing the risks against a general anesthetic.

## METHODS

To test the hypothesis that anesthesiologists often overlook the ASRA guideline, we conducted a retrospective chart review at two separate institutions. We measured median time interval from NA placement to intravenous heparin administration (primary outcome) in adult patients (> 18 yr old) undergoing vascular surgeries (endovascular aneurysm repair [EVAR], femoral-femoral bypass, and femoral-popliteal or femoral-tibial bypass) between April 2012 and December 2022. The incidence of SH (secondary outcome) was also recorded.

Patients who received both NA and intravenous heparin were included in the final analysis. At each institution, the following data were extracted by two independent reviewers at each centre: anesthetic type (general anesthesia [GA] *vs* epidural *vs* spinal anesthesia); surgical procedure and duration; details of NA technique (time, number of attempts, any immediate complications); time and dose of intravenous heparin; and patient's demographics

(age, sex, body mass index, and American Society of Anesthesiologists Physical Classification). We recorded the time interval between NA and first heparin administration. If NA time was not specified, we measured the time interval between the first recorded blood pressure and heparin administration.

**RESULTS**

At Institution A, 125 charts (from a total of 322 reviewed) involved NA technique with subsequent heparin administration and were therefore included in the final analysis. The vast majority (83.8%) of patients received intravenous heparin within one hour. An average of 41.85 ± 23.11 min elapsed between NA and heparin administration, with 10 (8.13%) being ≤ 19 min. Patients undergoing EVAR received the highest heparin dose (8400 ± 1,813 units) in the shortest interval (30.18 ± 12.36 minutes) post-NA.

At Institution B, 608 charts (from 996 reviewed) fit inclusion criteria and were analyzed. Only 42.3% received intravenous heparin within one hour. An average of 66.8 ± 28.3 min elapsed between NA and heparin administration, with only 5 (0.8%) being ≤ 19 min. Time elapsed was similar between surgical subgroups.

No patients analyzed at either institution developed a spinal hematoma.

**DISCUSSION**

Our results show that anesthesiologists commonly overlook ASRA recommendations to wait one-hour post-NA prior to administering intravenous heparin, especially during EVARs. Nevertheless, rates of adherence to ASRA guidelines differ by institution. Institution B has a vascular surgery residency program, which may contribute to delayed heparin administration. NA has been associated with fewer postoperative complications and shorter surgical time and hospital stay compared with GA in EVAR patients,[4] and the risk-benefit ratio for these comorbid patients may favor NA; however, the risk of SH is not negligible. Anesthesiologists may modify their practice by delaying heparin, or pre-emptively opting for GA.

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# The effect of dexamethasone on the incidence and severity of rebound pain after regional anesthesia for ambulatory surgery: a retrospective cohort study

**Submission ID**

109

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## INTRODUCTION

Rebound pain after peripheral nerve block (PNB) is a rapid increase in the severity of pain shortly after the block wears off and has been recognized as a significant and common issue after single-shot PNBs in ambulatory patients.[1–3] Previous studies have identified dexamethasone administration as one of the modifiable factors to reduce the risk of rebound pain, with a recent meta-analysis of randomized control trials reinforcing its role in rebound pain prevention.[4] The primary objective of this retrospective cohort study was to determine the optimal dose and timing of dexamethasone associated with a reduced incidence and severity of rebound pain in ambulatory surgery patients. We also investigated the practice pattern of dexamethasone use in regional anesthesia at our centre over time.

## METHODS

Following the institutional research ethics board and waiver of consent approvals, we performed a retrospective cohort study of adult patients who received a single-shot peripheral nerve block for ambulatory surgery at Queen Elizabeth II Health Sciences Center in Halifax, NS, Canada, between March 2017–December 2022. We excluded patients planned for overnight hospital admission, highly opioid-tolerant patients, and patients who received a continuous peripheral nerve catheter. The primary outcome was rebound pain, as defined by Barry *et al*. as the transition from well-controlled pain (numerical rating scale [NRS] < 3) to severe pain (NRS > 7) within 24 hr of block performance.[1] The secondary outcome was rebound pain score (RPS), which is the difference in maximum PACU pain score and maximum pain score at home within the 24-hr follow-up period. Data was obtained from hospital medical record databases (Innovian, Dragerwerk AG & Co., Lubeck, Germany) and questionnaire-based sources. Statistical analysis was performed in RStudio (PBC, build 554) and IBM SPSS Statistics (Version 28).

**RESULTS**

A total of 4,352 patients were identified for inclusion in the study, with 3,756 patients having available primary outcome data (596 [13.7%] patients lost to follow-up). Dexamethasone was given to 1,425 patients: 1,389 intravenous, 27 perineural, and nine cases where the route was not indicated. Dexamethasone administration was associated with a reduction in rebound pain incidence in multivariable logistic regression (OR, 0.39; 95% confidence interval [CI], 0.33 to 0.47; $P < 0.001$) when including previously described risk factors age, sex, and bone surgery.[1] A higher dexamethasone dose was associated with reduced RPS but not incidence of rebound pain when including the covariates. There was an increase in rebound pain incidence (OR, 1.30; 95% CI, 1.05 to 1.61; $P = 0.015$) and RPS (slope 0.51 [NRS score per hour]; 95% CI, 0.19 to 0.84; $P = 0.002$) the later it was given after PNB.

**DISCUSSION**

Dexamethasone is currently one of the known modifiable factors that appears to reduce the rate and severity of rebound pain after PNB. This retrospective cohort study showed a dose-dependent association between dexamethasone and reduced rebound pain incidence and severity. Rebound pain was also increased the later dexamethasone was given after the time of PNB performance. The results of this study suggest that dexamethasone given in doses higher than 4 mg and close to the time of PNB may be best to prevent rebound pain.

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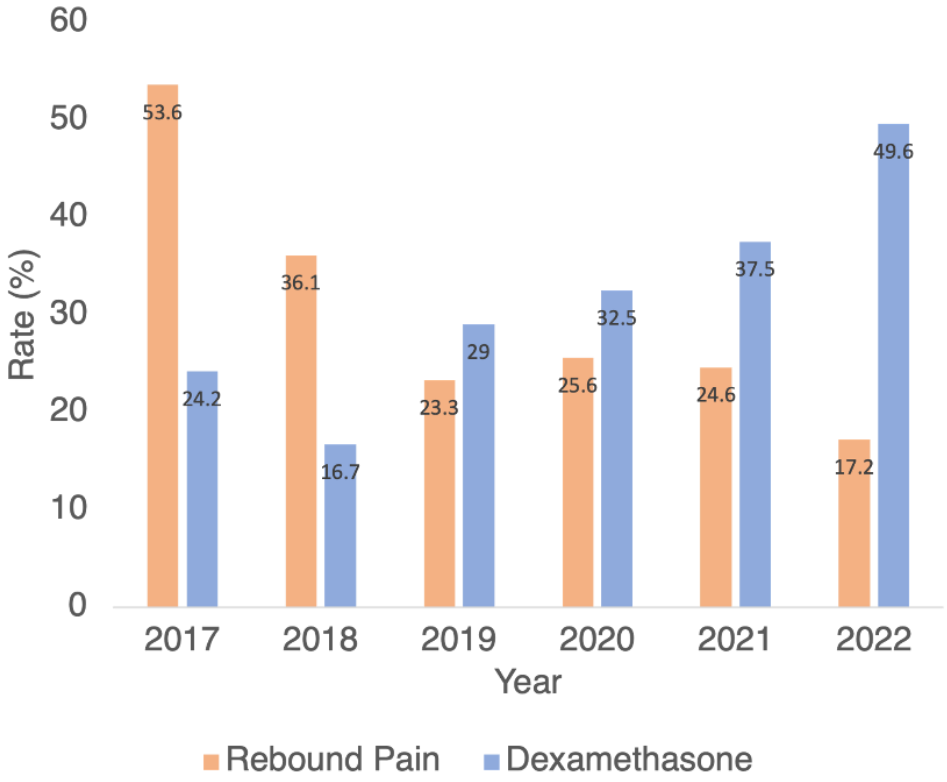
**Figure**


60
50
40
30
20
10
0
Rate (%)
53.6
24.2
36.1
16.7
23.3
29
25.6
32.5
24.6
37.5
17.2
49.6
2017
2018
2019
2020
2021
2022
Year
Rebound Pain
Dexamethasone

# The role of short-term long-acting hydromorphone in acute pain management following open abdominal urologic surgeries

**Submission ID**

27

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## INTRODUCTION

Opioids are commonly used for pain control postsurgery, including short-acting and long-acting formulations. Although the use of long-acting opioids has been reduced because of the risk of adverse events and overdose when used for chronic pain, evidence is lacking to support the short-term use of a low dose long-acting opioid for acute pain control in a monitored setting.[1,2] Long-acting opioids are still commonly used, especially in orthopedic surgery, with more rapid functional recovery following total knee arthroplasty.[3] In a recent, large, retrospective cohort study, persistent postoperative opioid use appeared to be lower for long-acting tapentadol compared with long-acting oxycodone for opioid-naïve patients and opioid-experienced patients.[4] The objective of this study is to evaluate whether low dose, long-acting hydromorphone short term (two days) combined with short-acting hydromorphone as required offers better pain control postoperatively to allow earlier ambulation after major urologic surgeries compared with short-acting opioid alone.

## METHODS

Following ethics approval and obtaining written informed patient consent, a randomized, double-blind, controlled trial was conducted assessing all adult patients undergoing elective open abdominal urologic surgeries with an American Society of Anesthesiologist Physical Status score of I–III who met the inclusion criteria. Patients were excluded from analysis in the following circumstances: refusal, history of chronic pain, allergy to hydromorphone, local anesthetic or acetaminophen, severe postoperative nausea and vomiting, inability to swallow tablets, and severe renal failure. Patients were randomized into two groups: long-acting hydromorphone on a regular basis for two days with short-acting hydromorphone available on an ‘as required’ basis (long-acting group) or short-acting hydromorphone on an ‘as required’ basis only (short-acting group). All patients were given general anesthetic and intravenous opioid at the discretion of the anesthesiologist in the operating room. The primary outcome measure was the time (days postoperatively) to achieve adequate pain relief to get up and walk

three steps. Secondary outcomes included pain scores recorded in the post anesthesia care unit (PACU) and 24/48/72 hr postoperatively, opioid consumption intraoperatively, in the PACU and 24/48/72 hr postoperatively, nausea, vomiting, loss of sleep, patient satisfaction, and other adverse events.

**RESULTS**

Eighty patients were recruited, and the final analysis included 32 patients in the long-acting opioid group and 35 patients in the short-acting opioid group. Thirteen patients were excluded from analysis after recruitment because of postoperative surgical complications, opioid sensitivity, severe vomiting, patient withdrawal, or other clinical reasons unrelated to the study. There was no statistically significant difference in the time to first mobilization, opioid consumption, or pain scores at any time point between the two groups. There were trends toward more nausea on postoperative days one, two and three, as well as more severe loss of sleep the first night after surgery in the short-acting group, although the differences did not reach statistical significance. Both groups reported similar levels of satisfaction with their pain control. No other adverse effects were noted.

**DISCUSSION**

Our study suggests that patients who received low dose, long-acting hydromorphone did not mobilize earlier than those who received short-acting hydromorphone in the immediate postoperative period following open abdominal urologic surgery. Opioid consumption and pain scores were comparable between groups. This refutes the concept of more stable analgesia and less frequent dosing with long-acting opioids, as well as a previous study showing benefits of long-acting opioids in early rehabilitation after arthroplasty surgery.[3,5] Although not statistically significant, there appeared to be more nausea and disturbed sleep in the short-acting hydromorphone group immediately postoperatively. A larger sample size is warranted.

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# The use of simulation in ultrasound guided regional anesthesia training: a Canadian national survey

**Submission ID**

22

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## INTRODUCTION

Traditionally, training in ultrasound-guided regional anesthesia (UGRA) has followed the "see one, do one, teach one" approach. Nevertheless, this method presents potential risks for patients, particularly when residents in the early stages of their training begin performing these procedures.[1,2] The literature shows considerable variability in the comfort levels of graduating trainees when performing UGRA.[3] Simulation-based medical education (SBME) is a valuable tool that can supplement real clinical exposure and provide opportunities for deliberate practice in a controlled environment with no risk to the patients.[2,4] Simulation use in UGRA can also lead to improved knowledge acquisition and patient outcomes.[4] Despite its potential benefits, there is currently a lack of clarity regarding the scope and approach of simulation-based UGRA training in Canada. This study aims to investigate the current state of UGRA simulations within Canadian anesthesiology residency programs, examining both facilitators and barriers to its implementation.

## METHODS

Approval was obtained from the University of Ottawa Research Ethics Board. An initial structured survey was developed based on prior surveys related to medical education and simulation in UGRA training. The survey was modified based on gaps identified within the Canadian context by the study authors, whose collective experience included expertise in simulations, medical education, UGRA, and survey methodologies. The survey was pilot-tested with a faculty member who has expertise in SBME. The resulting feedback was incorporated into a final version, which was approved by all the study authors prior to the recruitment. The survey focused on various aspects of simulation use in UGRA training, including program demographics, types of modalities employed, hours of exposure, and its use for resident assessment. It also explored the facilitators and barriers to using UGRA simulation, as well as opinions on using simulation for training and assessment. This survey was distributed via email to simulation and/or UGRA education leads in all 17 Canadian anesthesiology residency

programs. The responses were anonymously collected over four months, and only one response per institution was allowed. The quantitative results were summarized using frequencies, percentages, and median (range) where appropriate.

## RESULTS

Out of 17 Canadian anesthesiology programs, 15 responded to the survey. Among them, 53% employ simulations for UGRA technical training, and 60% for nontechnical skills. Most programs (93%) do not use simulations for resident assessment. Live-model scanning was the most widely used simulation modality, followed by gel phantom models, screen-based teaching, and part-task trainers. The primary barriers to using simulations were lack of funding, faculty availability and simulator availability. Key facilitators were improved patient safety and interest from residents. When asked about increasing simulation exposure in UGRA, 47% of respondents agreed, 7% disagreed, and 46% remained neutral. On necessity of using simulations to show UGRA proficiency before clinical practice, opinions were split with 33% agreement, 33% disagreement, and 34% neutrality. The effectiveness of simulations in enhancing UGRA skills saw 66% agreement, 20% disagreement, and 14% neutrality. Lastly, 60% supported standardizing UGRA simulations, with 33% neutral, and 7% opposing the idea.

## DISCUSSION

Simulation-based UGRA training varies widely in implementation and perception across Canada. The USA is ahead of Canada, with 80% of residency programs using SBME in UGRA.[5] Nevertheless, both countries face similar barriers, such as a lack of funding and simulator. Many respondents were not optimistic about further using UGRA simulation for assessment. Despite greater SBME use in U.S., the percentage of programs using simulation for assessment was similar to Canada.[5] SBME is an ideal tool to supplement clinical experience.[2,4] Nevertheless, its resource-heavy nature warrants investigations to identify the most effective way to implement UGRA simulation into the current curriculum.

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# Transversus abdominis plane block catheters following renal transplantation: a retrospective cohort study

**Submission ID**

18

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## INTRODUCTION

The mainstay of postoperative analgesia for renal transplantation patients is opioid delivered via patient-controlled analgesia (PCA) pumps, despite well-documented opioid-related adverse effects and health care cost. Renal transplant patients are at an increased risk of adverse opioid-related outcomes secondary to altered drug metabolism.[1] Opioid use may impair gastrointestinal recovery and impede early postoperative physical rehabilitation and subsequent postoperative activities of daily living.[2] Opioid use following renal transplantation is also associated with an increased risk of death and graft failure in the first year after transplant.[1] Local anesthetic infusion through transversus abdominis plane (TAP) catheters has been shown to enhance pain control and reduce opioid requirements following various surgical procedures,[3] yet the role of surgically-initiated TAP catheters for renal transplantation has not been comprehensively investigated.[4] The aim of our study is to examine the efficacy of TAP catheters in reducing cumulative opioid consumption following renal transplantation.

## METHODS

Following research ethics board approval, a retrospective cohort study was conducted by reviewing the electronic medical records of patients ≥ 18 yr old who underwent renal transplantation at our institution between January 2020 and June 2023. Patients who underwent renal transplantation between August 2021 to June 2023 received a TAP catheter, and were compared with a historical control group of patients who underwent renal transplantation between January 2020 to July 2021 without the use of TAP catheters. This study excluded pediatric recipients, patients with end-stage liver disease, patients with a non-Gibson transplant incision, patients experiencing pretransplant chronic pain, and those undergoing multi-organ transplant. The primary outcome of this study was cumulative opioid consumption at 48 hr, expressed as oral morphine equivalents. Several secondary outcomes were analyzed, including the cumulative opioid consumption by postoperative day 7, the primary opioid

administration mechanism (PCA *vs* oral-based), adverse postoperative events, and analgesic adjunct usage.

## RESULTS

Patient data (*n* = 344) was analyzed using descriptive and comparative statistics as appropriate (174 patients with TAP catheters *vs* 170 patients without TAP catheters). The demographic details are shown in Table 1. Cumulative opioid consumption at 48 hr was not significantly different between groups (170 mg *vs* 167 mg; TAP *vs* No TAP; *P* = 0.86). Notably, the opioid consumption at 48 hr was significantly higher with the use of a PCA when compared with oral opioid administration on an 'as required' basis (183 mg *vs* 118 mg; PCA *vs* no-PCA; *P* = 0.007), irrespective of TAP catheter status. Secondary outcomes indicated no significant difference between the groups in rates of renal graft failure, postoperative reintubation, depressed respiratory rate (< 10 breaths/min), or increased oxygen demand beyond postoperative day two. Severe surgical complications, defined as single or multisystem organ failure, admission to ICU with a life-threatening complication, or patient mortality were also not significantly different between groups.

## DISCUSSION

Our study did not find any significant difference in opioid consumption at 48 hr between the TAP group and the no-TAP group. Our results showed a significantly higher opioid consumption associated with PCA use compared with alternative oral routes on an 'as required' basis, which is supported by existing literature.[5] Our study was limited by the retrospective design and the use of a historical control group. Prospective randomized control trials are required to further elucidate the role of TAP catheters in optimizing postoperative pain management in renal transplantation.

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**Figure**

| Demographic | TAP Block *(n=174)* | No TAP Block *(n=170)* |
|---|---|---|
| Sex - *Male/Female* | 106 (60.9%) / 68 (30.1%) | 114 (65.5%) / 56 (32.9%) |
| Age (years) | | |
| *18-40* | 38 (21.8%) | 32 (18.8%) |
| *41-60* | 74 (42.5%) | 83 (48.8%) |
| *60-80* | 60 (34.5%) | 55 (32.4%) |
| *>80* | 2 (1.2%) | 0 (0%) |
| Weight (kg) - *Range (Mean)* | 41.8 - 148.4 (78.8) | 38.4 - 125.9 (82.1) |
| Height (m) - *Range (Mean)* | 1.39 - 1.96 (1.7) | 1.46 - 1.96 (1.71) |
| Opioid Use 7 Days Prior to Transplant - *Yes/No* | 11 (6.3%) / 163 (93.7%) | 15 (8.8%) / 155 (91.2%) |