

Received: 2019.11.02

Accepted: 2019.12.18

Available online: 2020.01.28

Published: 2020.03.11

Safe and Effective Use of Bilateral Erector Spinae Block in Patient Suffering from Post-Operative Coagulopathy Following Hepatectomy

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Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
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Conflict of interest: None declared

Patient: Male, 75-year-old
Final Diagnosis: Cholangiocarcinoma
Symptoms: Postoperative pain
Medication: —
Clinical Procedure: Continuous erector spinae nerve block
Specialty: Oncology

Objective: Unusual clinical course

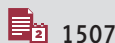
Background: Regional nerve blocks ideally provide safe and effective post-operative pain control, decrease opiate requirements, and enhance recovery from intense pain following major thoracic, abdominal, and musculoskeletal surgeries. The erector spinae plane block, a recently described novel treatment for chronic neuropathic pain and acute pain after thoracic surgery, can be performed with in plane infiltration and placement of a continuous infusion catheter deep to the erector spinae muscle at the tip of the transverse process, resulting in diffusion of local anesthetic between vertebrae and the paravertebral space with sensory blockade of spinal nerves as well as sympathetic branches.

Case Report: We describe the novel use of the erector spinae block for primary pain control and uncomplicated catheter removal in the setting of anticoagulation following a major hepatectomy for intrahepatic cholangiocarcinoma. The use of the erector spinae block in this context provided effective post-operative analgesia.

Conclusions: Additional evidence from clinical trials will be helpful to evaluate the role of this relatively new block for peri-operative analgesia.

MeSH Keywords: Acute Pain • Cholangiocarcinoma • Nerve Block

Full-text PDF: <https://www.amjcaserep.com/abstract/index/idArt/921123>



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Background

Cholangiocarcinoma represents the second most common liver malignancy [1]. Elevated serum biomarkers, serial liver ultrasound, computed tomography or magnetic resonance imaging, and needle biopsy are useful in the diagnosis and staging of intrahepatic malignancy [2]. Surgery is offered to non-cirrhotic patients with good performance status who present at an early stage with curable disease [3]. Hepatectomy is desirable in the setting of a localized nodule with adequate remnant liver volume, while liver transplantation within Milan criteria is reserved for multifocal disease and/or in the presence of cirrhosis not amenable to anatomic resection [2].

Anesthetic considerations for liver resection include pre-operative patient selection with risk stratification, intra-operative management of acute bleeding, and post-operative monitoring [4]. Cirrhotic patients with intrahepatic carcinoma require assessment of pre-operative hepatic function and prognostication for peri-operative complications using the model for end-stage-liver-disease or the Child-Turcotte-Pugh score (A, B, or C) [5]. Intraoperatively, maintaining a central venous pressure <5 mmHg through fluid minimization, volatile anesthetic agents, vasodilators such as nitroglycerin, or acute normovolemic hemodilution is recommended to decrease venous bleeding during transection of liver parenchyma [4,5].

Epidural analgesia confers benefits related to decreased pain scores and side effects compared to systemic intravenous analgesics following open abdominal surgery [6,7]. However epidural analgesia has been found non-superior to regional techniques, such the paravertebral block, in achieving patient satisfaction [6]. Complications of epidural analgesia include a varying incidence of post-dural puncture headache, local anesthetic systemic toxicity, spinal hematoma and abscess, hypotension, nausea and vomiting, and urinary retention [6,7]. Epidural catheter removal can be delayed following liver resection due to post-operative coagulopathy [7,8].

The erector spinae regional block is emerging as an intriguing alternative to conventional neuraxial analgesia for a variety of thoracic, intraabdominal, and joint surgeries due in part to a decreased risk for spinal hematoma, infection, and adverse hemodynamic effects [9,10]. To date, descriptions of the beneficial effects of the erector spinae block on patients include reduced opioid consumption and decreased pain and temperature sensation, with no reports of adverse bleeding, hypotension, or urinary retention [9]. Experience suggests that the erector spinae block is less technically challenging to perform than other thoracic nerve blocks, such as the paravertebral block, and not absolutely contraindicated in patients who are on therapeutic anticoagulation [9,11].

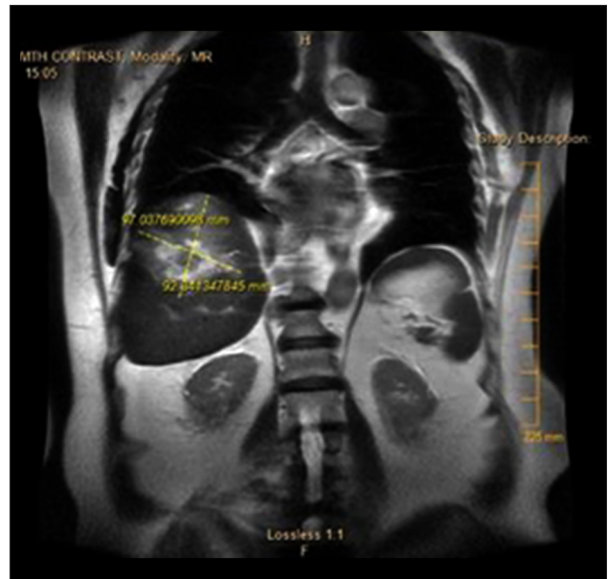


Figure 1. Magnetic resonance imaging of the liver revealing a 10×9.7×9.2 cm mass in the right lobe of the liver involving segment 7 and 8.

Case Report

Written informed consent for this report was obtained from a 75-year-old male patient (weight 103.5 kg; height 182.9 cm; BMI 30.9 kg/m²) with coronary artery disease, obstructive sleep apnea, abdominal aortic aneurysm, atrial fibrillation, mitral regurgitation, psoriatic arthritis, gastroesophageal reflux disease, chronic kidney disease, type II diabetes, hypertension, and hyperlipidemia who presented for an open right extended hepatectomy and cholecystectomy for resection of cholangiocarcinoma (Figure 1).

On the day of the surgery, the patient's vitals were temperature 36.6°C, blood pressure 130/72 mmHg, respiratory rate 18 breathes per minute, pulse oximetry 98% on room air, and pain 0/10. Airway examination revealed limited neck extension, small oral opening (Mallampati Class IV), and 3 finger breadth thyromental distance. He was able to sustain activity greater than 4 metabolic equivalents and deemed American Society of Anesthesiologists (ASA) physical status IV by the anesthesiologist [12,13]. An electrocardiogram revealed rate controlled atrial fibrillation, premature ventricular complexes, and evidence of a prior septal infarct.

After informed consent was obtained, the patient was marked by the operating provider, a timeout was conducted, and the patient was positioned for bilateral erector spine block in a sitting position with standard monitors and oxygen administered through a nasal cannula. The skin was prepped in a sterile fashion using chlorhexidine cleansing solution. After relevant anatomy was identified by palpation, the T7 spinous process

Table 1. Pain scores and PRN medications.

	Pain score medication	
	VAS	PRN
Pre OP	0	None
Post OP day 1	0	50 mcg fentanyl
Post OP day 2	0	None
Post OP day 3	0	None
Post OP day 4	0	None

PRN – “pro re nata” or “as needed”; VAS – visual analog scale, Pre OP – pre-operative; Post OP – post-operative.

was marked. Using the curvilinear ultrasound (Sonosite Edge) probe in a transverse orientation on the left side, the transverse process was identified. A 17-gauge 9 cm Tuohy needle (Arrow) was inserted in plane in a cranial-to-caudal direction underneath the erector spinae muscle at the transverse process of the vertebrae. The plane was hydrodissected with 5 mL saline until the transverse process was met.

After negative aspiration of heme, 1 mL of local anesthetic was injected without signs of local anesthetic toxicity. A total of 20 mL of ropivacaine 0.5% was injected with intermittent negative heme aspiration in 5 mL aliquots. Once a pocket of local anesthetic was created, a flexible 19-gauge 60 cm catheter (Arrow) was threaded through the Tuohy needle below the level of the erector spinae muscle. This catheter was left at 12 cm. Visual confirmation of the catheter in the muscle plane was confirmed with further administration of normal saline. Then the ultrasound was directed to the right side. After relevant anatomy and landmarks were identified utilizing ultrasound guidance on the right side, the procedure was repeated. The catheter on the right side was left at 15 cm. Vital signs were stable, and the patient tolerated the procedure well.

On post-operative day 1, the patient was successfully weaned off pressors and extubated in the surgical intensive care unit. He reported 0/10 pain with a continuous infusion of 10 cc/hour of 0.2% ropivacaine without programmed boluses through each erector spinae catheter (Table 1). On post-operative day 2, the patient was out of bed and continued to report 0/10 pain without any requirement for additional intravenous or oral analgesics (Table 1). The patient was resumed on therapeutic anticoagulation with unfractionated intravenous heparin. On post-operative day 4, after holding the local anesthetic infusions for several hours to confirm adequate pain control, both catheters were removed without complication despite an elevated prothrombin time/international normalized ratio (PT/INR) of 2.4.

During the 4-day catheter-based infusion, the patient received a single dose of intravenous fentanyl for a total morphine mg equivalent dose of 4.99 mg for breakthrough pain. On each subsequent day, the patient was able to achieve improving incentive spirometry scores of 9.7 cc/kg, 14.5 cc/kg, and 16.9 cc/kg. He was transferred out of the intensive care unit on post-operative day 7 for monitoring of coagulopathy and discharged home on post-operative day 18 after liver function began to normalize.

Discussion

In 2016, the erector spinae block was first described as a new regional block for the treatment of neuropathic thoracic pain [11,14,15]. Subsequently, the block has been adapted for acute and chronic pain control with ease and low complications for a variety of surgeries and conditions including spine surgery, breast surgery, limb amputation, video assisted thoracoscopic surgery, rib fractures, post-herpetic neuralgia, complex regional pain syndrome, cardiac surgery, laparoscopic and open abdominal surgery, and hip surgery [11,15]. The site of action includes a large area involving the intercostal nerve, the dorsal ramus of the spinal nerve, paravertebral region, and the epidural space, providing analgesia for somatic and visceral nociceptive sensation with an average numerical rating scale for pain less than or equal to 3/10 in most reports [11].

The erector spinae block is performed using ultrasound guidance to visualize the relevant anatomy in awake, sedated, or fully anesthetized adult or pediatric patients who are positioned in sitting, lateral, or prone position [11,15]. A linear high frequency probe in the thoracic region or curvilinear low frequency probe in the lumbar region is placed in a transverse fashion to initially locate the appropriate spinous process [11]. The transverse process is then identified by moving the ultrasound probe laterally and changing the probe orientation by 90°. At T5, the needle is inserted in the plane through the skin, subcutaneous tissue, trapezius, rhomboid major, and erector spinae, followed by hydrodissection with saline, and a single shot injection of bupivacaine or ropivacaine and catheter placement if needed for continuous infusion [11,16].

The erector spinae block is potentially a safer alternative in the presence of contraindications to an epidural or paravertebral technique, including systemic anticoagulation, coagulation disorders, use of antiplatelet medications, and following heparinization [10,11]. Advantages include simplicity and low risk of complications given that the block is not immediately adjacent to the spinal cord, lung pleura, or vascular structures [8,10,11]. Optimal volume, concentration, and type of local anesthetic to reach the target dermatomes and enter the paravertebral space, while avoiding systemic toxicity are under active investigation [15].

Patients undergoing extensive liver surgery experience dramatic somatic and visceral pain due to extended subcostal incision, rib retraction, as well as diaphragmatic and peritoneal irritation [16]. Despite the absence of a pre-operative contraindication for epidural placement, patients undergoing hepatic surgery are prone to the development of post-operative coagulopathy which could potentially pose a bleeding risk and delay removal of an epidural catheter [8,17]. Risk factors for the development of post-operative elevations in international normalized ratios following hepatic resection include small remnant liver volumes, decreased body mass index, and long duration of procedure [16]. In such clinical scenarios, the erector spinae block may serve as a safe new and effective method to achieve control of pain related to hepatic surgery [8].

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Conclusions

We report on the successful outcome of a regional nerve block as a replacement for gold standard epidural analgesia in achieving effective pain control following hepatic surgery. Additional randomized clinical trials are needed to further elucidate the role for non-traditional pain management in patients with contraindications to neuraxial anesthesia.

Conflicts of interest

None.