11-5-2021

Erector Spinae Plane Continuous Catheters for Refractory Abdominal Pain Related to Necrotizing Pancreatitis: A Case Report

Matthew T. Allos

Daniel M. Zukowski

Christina W. Fidkowski

Erector Spinae Plane Continuous Catheters for Refractory Abdominal Pain Related to Necrotizing Pancreatitis: A Case Report

Matthew T. Allos, BS, Daniel M. Zukowski, DO, and Christina W. Fidkowski, MD

Erector spinae plane (ESP) continuous catheters are used for the management of postsurgical pain. The use of these catheters for acute nonsurgical abdominal pain is not well defined. This case describes a patient with refractory abdominal pain secondary to necrotizing pancreatitis despite escalating doses of opioids, ketamine, and dexmedetomidine. Our patient declined epidural analgesia. Bilateral ESP continuous catheters successfully controlled her pain, and she was weaned off of all analgesics during the week following catheter placement. This case demonstrates that ESP continuous catheters can be considered for patients with acute nonsurgical abdominal pain especially when thoracic epidural analgesia is contraindicated. (A&A Practice. 2021;15:e01543.)

GLOSSARY

BMI = body mass index; **CT** = computed tomography; **EQUATOR** = Enhancing the QUAlity and Transparency Of health Research; **ESP** = erector spinae plane; **HD** = hospital day; **OME** = oral morphine equivalents; **PCA** = patient-controlled analgesia; **TPN** = total parenteral nutrition; **TAP** = transversus abdominus plane; **VAS** = visual analog scale

Acute pancreatitis is a severe disease in which 20% of patients require prolonged hospitalization.[1] Treatment is primarily supportive with a focus on hydration, nutrition, and adequate pain control. While the majority of patients have adequate pain control with systemic analgesics, epidural analgesia may be required.[2,3] The erector spinae plane (ESP) block is a newer fascial plane block that may be an alternative to epidural analgesia. Two case reports demonstrate the effectiveness of ESP blocks for acute pancreatitis.[4,5] We describe the successful use of ESP continuous catheters for extended pain management in a patient with necrotizing pancreatitis. The patient provided written Health Insurance Portability and Accountability Act authorization to publish this case report. This article adheres to the applicable Enhancing the QUAlity and Transparency Of health Research (EQUATOR) guidelines.

CASE DESCRIPTION

A 27-year-old, 76.3-kg (body mass index [BMI] 26.4) otherwise healthy woman presented with acute epigastric pain and vomiting. She was diagnosed with acute cholecystitis with choledocholithiasis. She underwent a laparoscopic cholecystectomy with intraoperative cholangiogram. An obstructing common bile duct stone was identified but could not be removed. Postoperatively, she underwent endoscopic retrograde cholangiopancreatography, and 2 stones were removed. She tolerated a regular diet, had mild abdominal pain, and was discharged home that evening.

Two days postoperatively, she presented with intractable vomiting and significant abdominal pain that radiated to her back. She was tachycardic with a leukocytosis. Laboratory analysis revealed an elevated lipase of 423 IU/L. A computed tomography (CT) scan showed acute necrotizing pancreatitis. She was admitted to the surgical intensive care unit for supportive care. She tolerated a clear liquid diet. Total parenteral nutrition (TPN) was started on hospital day (HD) 7 due to poor caloric intake.

On admission, multimodal analgesia was initiated with acetaminophen, gabapentin, and hydromorphone patient-controlled analgesia (PCA). Her pain was poorly controlled despite escalating doses of systemic analgesics. On HD 12, the chronic pain service recommended epidural analgesia, but the patient declined. Ketorolac and methocarbamol were started. The trauma psychology team was instrumental in managing her depressed and anxious mood due to separation from her exclusively breastfed 3-month-old infant and the lack of family support overnight due to visitor restrictions due to the pandemic.

Despite multimodal analgesia and mitigation strategies for her anxiety and depression, her pain worsened. On HD 16, a dexmedetomidine infusion was started. At that time, she became febrile, developed a leukocytosis of 27.3 K/μL, and had persistent tachycardia. A repeat CT scan revealed worsening peripancreatic fluid collections. Purulent fluid (4.2 L) was removed during a paracentesis on HD 18. Vancomycin and piperacillin/tazobactam were started. On HD 19, she was taken to the operating room for drainage of the intra-abdominal fluid collections. Through a 10-cm upper midline incision, dense adhesions and friable tissue were seen, and the procedure was aborted due to the risk of iatrogenic injury with further dissection.

On postoperative day 1 (HD 20), her pain remained poorly controlled. The regional anesthesia team recommended

From the Department of Anesthesiology, Pain Management, and Perioperative Medicine, Henry Ford Hospital, Detroit, Michigan.

Accepted for publication September 23, 2021.

Funding: None.

The authors declare no conflicts of interest.

Address correspondence to Christina W. Fidkowski, MD, Department of Anesthesiology, Pain Management, and Perioperative Medicine, Henry Ford Hospital, 2799 W Grand Blvd, Detroit, MI 48202. Address e-mail to cfidkow1@hfhs.org.

DOI: 10.1213/XAA.0000000000001543

epidural placement, but again she declined. A transversus abdominus plane (TAP) block was performed to alleviate incisional pain. She acknowledged that the TAP block relieved her incisional pain but did not relieve her deeper abdominal pain. A ketamine infusion was started at that time due to escalating analgesic requirements. She subsequently underwent a CT-guided catheter placement to drain an abdominal fluid collection.

Despite worsening abdominal pain, she declined epidural placement but agreed to bilateral ESP continuous catheters on HD 23. With the patient seated, a linear high frequency probe was placed in the parasagittal plane 2 to 3 cm from the midline. The T7 transverse processes and erector spinae muscles were identified. An 83-mm catheter over needle was advanced in plane in a caudad to cranial direction on each side. A total of 30 mL of 0.25% bupivacaine was injected through the needle on each side. Local anesthetic spread in the ESP was visualized with ultrasound imaging. The needle was removed, and an inner catheter, which extends 15 mm from the tip of the outer catheter, was placed through the outer catheter. An additional 2 mL of 0.25% bupivacaine was injected through the inner catheter on each side to verify local anesthetic spread in the ESP with ultrasound imaging. A continuous infusion was started with 0.2% ropivacaine at 8 mL/h on each side using separate elastomeric pumps.

In the 24 hours preceding ESP catheter placement, the patient consumed 198 mg oral morphine equivalents (OME) and was maintained on a ketamine infusion (0.2 mg/kg/h) and a dexmedetomidine infusion (1 μg/kg/h). Her visual analog scale (VAS) pain score was 10 immediately before ESP catheter placement. Her VAS was 0 at 1 hour and 5 at 6 hours after ESP catheter placement. In the 24 hours following ESP catheter placement, she consumed 42 mg OME. The ketamine infusion was stopped 20 hours after ESP catheter placement, and the dexmedetomidine infusion was weaned over 72 hours. The Figure shows her analgesic consumption before and after ESP catheter placement. Gabapentin and methocarbamol were stopped on HD 27.

On HD 25, a CT showed improvement of the abdominal fluid collection that had previously been drained but worsening of 2 other fluid collections. Two additional CT-guided abdominal drains were placed on HD 26. The ESP continuous catheters were removed after 7 days (HD 30) at which point, she did not require opioids for the remainder of her hospital stay. Despite resolution of her pancreatitis pain, she had persistent abdominal fluid collections. Two additional CT-guided drains were placed on HD 35. She was transitioned to ampicillin-sulbactam on HD 38 to complete a 6-week course. She tolerated a full diet, but her caloric intake remained inadequate. A gastrojejunostomy tube was placed for supplemental tube feeds. She was discharged home on HD 42. She continued supplemental tube feeds for 1 month post discharge at which point, she was gaining weight and doing well.

DISCUSSION

Although epidural analgesia can provide effective pain relief for acute pancreatitis, it is rarely used. In 2 retrospective studies, 4.6% and 0.7% of patients with acute pancreatitis received epidural analgesia.[2,3] In addition to the analgesic benefits from epidurals, the resultant sympathetic blockade improves intestinal and pancreatic microcirculation and decreases pancreatic necrosis.[6] Jabaudon et al[2] found that epidural analgesia reduced 30-day mortality in patients with acute pancreatitis (2% vs 17%; $P = .01$). Concerns due to induced hypotension, epidural hematoma, and epidural abscess may deter providers from choosing epidurals in critically ill patients. Neither Jabaudon et al[2] nor Sasabuchi et al[3] reported complications from epidurals in their study populations. Our patient did not have a contraindication to an epidural but declined one several times.

ESP block is a suitable alternative to epidural analgesia due to a lower risk of complications. The ESP block was first described by Forero et al in 2016.[7,8] The proposed mechanism involves blockade of both the dorsal and ventral rami resulting in somatic and visceral analgesia.[9,10] Local anesthetic spreads cranially and caudally in the fascial plane to block multiple spinal levels.[10] In a cadaveric study comparing injection volumes during ESP block, a 30 mL injection volume was associated with paravertebral spread, whereas a 10 mL injection volume was not.[11] We used an initial loading dose of 30 mL 0.25% bupivacaine on each side. Her VAS pain score of 0 at 1-hour post-ESP block suggests that we achieved paravertebral spread, and hence visceral analgesia, with our initial injection.

TAP blocks provide only somatic analgesia to the abdominal wall and parietal peritoneum. Our patient had marginal relief after the TAP block, which suggests that the majority of her pain was visceral and related to her necrotizing pancreatitis. The ESP block provided more complete analgesia than the TAP block.

The ESP block appears to provide both visceral and somatic analgesia. In 3 randomized controlled trials, ESP blocks, as compared to TAP blocks, decreased postoperative analgesic consumption in patients undergoing laparoscopic cholecystectomies and open abdominal hysterectomies.[12–14] In a pilot study, ESP blocks at a T8 level provided visceral analgesia in patients with renal colic as demonstrated by a decreased need for opioids and increased satisfaction scores.[15] Two case reports demonstrate the visceral analgesia effect of ESP blocks at a T6 and a T7 level for noncomplicated acute pancreatitis.[4,5] Our patient had necrotizing pancreatitis with purulent intra-abdominal fluid collections and benefitted from bilateral ESP catheter placement for extended pain control.

As the ESP block is a relatively new block, the optimal dosing and maintenance for ESP continuous catheters has yet to be determined. Since the ESP block relies on a high volume for adequate local anesthetic spread throughout the fascial plane, an intermittent bolus technique may be preferred. Future studies comparing continuous infusion versus programmed intermittent bolus may determine the ideal maintenance techniques for ESP catheters.

In summary, our case demonstrates the successful use of ESP continuous catheters to control our patient's refractory abdominal pain due to necrotizing pancreatitis. ESP continuous catheters should be considered as an alternative to

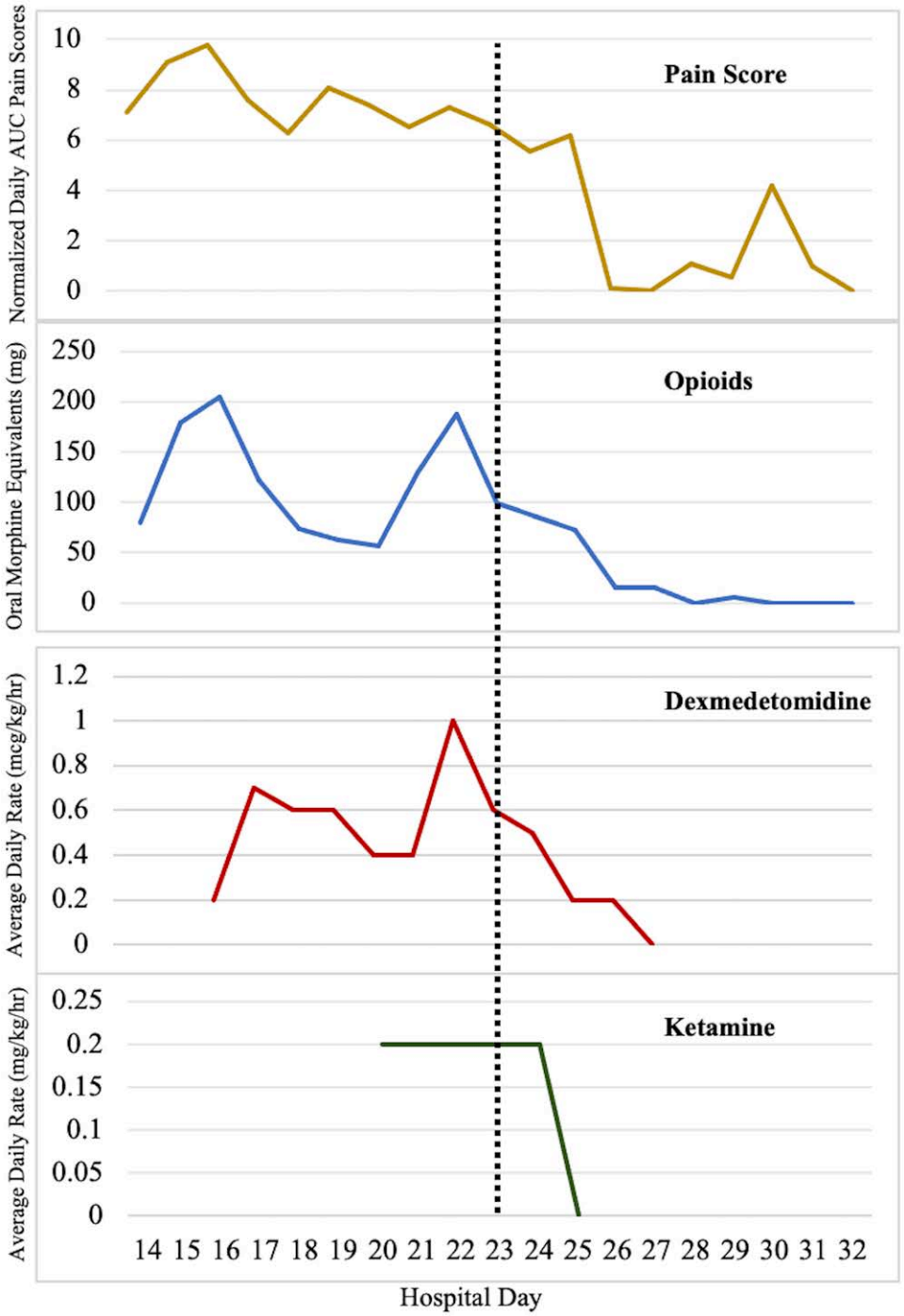

Figure. Analgesic consumption and VAS pain scores before and after erector spinae plane catheter placement. The AUC for her pain scores was calculated for each calendar day. The AUC was normalized by dividing by the total hours over which the pain scores were recorded each day. The normalized daily AUC for visual analog pain scores, the daily oral morphine equivalents consumption, the average daily rate of dexmedetomidine, and the average daily rate of ketamine are shown before and after ESP catheter placement. The dashed vertical line on hospital day 23 indicates ESP catheter placement. AUC indicates area under the curve; ESP, erector spinae plane; VAS, visual analog scale.

epidural analgesia when neuraxial analgesia is contraindicated or when providers wish to avoid potential risks from epidurals.

DISCLOSURES

Name: Matthew T. Allos, BS.
Contribution: This author wrote the original draft and critically reviewed and revised the manuscript.
Name: Daniel M. Zukowski, DO.
Contribution: This author critically reviewed and revised the manuscript.
Name: Christina W. Fidkowski, MD.
Contribution: This author critically reviewed and revised the manuscript.
This manuscript was handled by: BobbieJean Sweitzer, MD, FACP.

REFERENCES

1. Machicado JD, Papachristou GI. Pharmacologic management and prevention of acute pancreatitis. *Curr Opin Gastroenterol.* 2019;35:460–467.
2. Jabaudon M, Belhadj-Tahar N, Rimmelé T, et al; Azurea Network. Thoracic epidural analgesia and mortality in acute pancreatitis: a multicenter propensity analysis. *Crit Care Med.* 2018;46:e198–e205.

3. Sasabuchi Y, Yasunaga H, Matsui H, Lefor AK, Fushimi K, Sanui M. Epidural analgesia is infrequently used in patients with acute pancreatitis: a retrospective cohort study. *Acta Gastroenterol Belg*. 2017;80:381–384.
4. Elkoundi A, Eloukkal Z, Bensghir M, Belyamani L, Lalaoui SJ. Erector spinae plane block for hyperalgesic acute pancreatitis. *Pain Med*. 2019;20:1055–1056.
5. Mantuani D, Josh Luftig PA, Herring A, Mian M, Nagdev A. Successful emergency pain control for acute pancreatitis with ultrasound guided erector spinae plane blocks. *Am J Emerg Med*. 2020;38:1298.e5–1298.e7.
6. Windisch O, Heidegger CP, Giraud R, Morel P, Bühler L. Thoracic epidural analgesia: a new approach for the treatment of acute pancreatitis? *Crit Care*. 2016;20:116.
7. Forero M, Adhikary SD, Lopez H, Tsui C, Chin KJ. The erector spinae plane block: a novel analgesic technique in thoracic neuropathic pain. *Reg Anesth Pain Med*. 2016;41:621–627.
8. Chin KJ, Adhikary S, Sarwani N, Forero M. The analgesic efficacy of pre-operative bilateral erector spinae plane (ESP) blocks in patients having ventral hernia repair. *Anaesthesia*. 2017;72:452–460.
9. Chin KJ, El-Boghdadly K. Mechanisms of action of the erector spinae plane (ESP) block: a narrative review. *Can J Anaesth*. 2021;68:387–408.
10. De Cassai A, Bonvicini D, Correale C, Sandei L, Tulgar S, Tonetti T. Erector spinae plane block: a systematic qualitative review. *Minerva Anestesiol*. 2019;85:308–319.
11. Choi YJ, Kwon HJ, O J, et al. Influence of injectate volume on paravertebral spread in erector spinae plane block: an endoscopic and anatomical evaluation. *PLoS One*. 2019;14:e0224487.
12. Altıparmak B, Toker MK, Uysal AI, Kuşçu Y, Demirbilek SG. Ultrasound-guided erector spinae plane block versus oblique subcostal transversus abdominis plane block for postoperative analgesia of adult patients undergoing laparoscopic cholecystectomy: randomized, controlled trial. *J Clin Anesth*. 2019;57:31–36.
13. Tulgar S, Kapakli MS, Senturk O, Selvi O, Serifsoy TE, Ozer Z. Evaluation of ultrasound-guided erector spinae plane block for postoperative analgesia in laparoscopic cholecystectomy: a prospective, randomized, controlled clinical trial. *J Clin Anesth*. 2018;49:101–106.
14. Kamel AAF, Amin OAI, Ibrahem MAM. Bilateral ultrasound-guided erector spinae plane block versus transversus abdominis plane block on postoperative analgesia after total abdominal hysterectomy. *Pain Physician*. 2020;23:375–382.
15. Aydin ME, Tekin E, Ahiskalioglu EO, et al. Erector spinae plane block vs non-steroidal anti-inflammatory drugs for severe renal colic pain: a pilot clinical feasibility study. *Int J Clin Pract*. 2021;75:e13789.