Erector Spinae Plane Blocks in Major Hepatopancreaticobiliary Surgery: A Case Series

Shrijit Nair, FCAI, Siobhan McGuinness, FANZCA, Fouad Masood, FCAI, John F. Boylan, FRCP, and Niamh P. Conlon, FCARCSI

Hepatopancreaticobiliary (HPB) surgery is major upper abdominal surgery with considerable risk of pulmonary complications related to postoperative pain. While epidural analgesia remains an effective analgesic technique for upper abdominal surgery, HPB surgery poses challenges to its use due to coagulopathy. Erector spinae plane (ESP) blocks are a promising alternative to epidurals. Injection of local anesthetic deep to the erector spinae muscle plane and placement of a catheter for prolonged effect provide both somatic and visceral analgesia for both thoracic and abdominal surgery. We describe a series of 3 cases that illustrate the efficacy of ESP blocks after major HPB surgery. (A&A Practice. 2019;13:332–4.)

GLOSSARY

APTT = activated partial thromboplastin time; **ESP** = erector spinae plane; **HPB** = hepatopancreaticobiliary; **INR** = international normalized ratio; **IV** = intravenous; **NSAID** = nonsteroidal anti-inflammatory drug; **PCA** = patient-controlled analgesia; **PONV** = postoperative nausea and vomiting; **PT** = prothrombin time; **TAP** = transverse abdominal plane

Hepatopancreaticobiliary (HPB) surgery is major abdominal surgery with considerable risk of postoperative pulmonary complications, and effective postoperative analgesia is essential to minimize this morbidity.^{1–6}

Thoracic epidurals are long considered the most effective form of analgesia in major abdominal surgery.^{1,7} However, HPB surgery poses significant challenges to the use of epidural analgesia due to the risk of coagulation abnormalities, either via biliary tract obstruction, major intraoperative blood loss, reduced synthetic liver function after large-volume liver resection, or a combination of these factors.⁸

The standard analgesic regime at our institution for major HPB surgery includes preinduction intrathecal morphine injection (dose 8–10 µg/kg, ideal body weight), rectus sheath, and subcostal transversus abdominal plane (TAP) blocks with surgically sited TAP catheters at the end of surgery, analgesic adjuncts including paracetamol and nonsteroidal anti-inflammatory drugs (NSAIDs) when appropriate, and morphine-based patient-controlled analgesia (PCA) starting postoperative day 1.

ESP blocks, described by Forero et al,⁹ utilize the injection of local anesthetic deep to the erector spinae muscle plane under ultrasound guidance. Both visceral and somatic analgesia are achieved via blockade of dorsal and ventral nerve

roots of spinal nerves and penetration of local anesthetic to the paravertebral and indeed epidural space.

There is minimal literature regarding the use of ESP blocks in HPB surgery. Six months ago, we commenced using ESP blocks and catheters postoperatively in patients having major HPB surgery, with good clinical results. We describe 3 individual cases (written consent has been obtained from the patients for publication of this case report) where the technique was particularly useful.

CASE 1

A 69-year-old woman was scheduled for elective Whipple procedure. She had several lumbar spine operations and reported multiple drug allergies including to morphine (coma) and pethidine (angioedema). She also had a strong history of postoperative nausea and vomiting (PONV).

After induction with propofol, fentanyl, and rocuronium and maintenance with sevoflurane in oxygen and air, the patient was turned into the left lateral position. Under ultrasound guidance at the level of T7 on the right side, an 18-gauge Tuohy needle was inserted into the erector spinae plane and 20 mL of 0.25% bupivacaine was injected. A catheter was inserted 4 cm into the space in the caudal to cranial direction. Intraoperatively the patient received fentanyl 300 µg intravenous (IV), paracetamol 1 g IV, and diclofenac 75 mg IV. A left-sided rectus sheath catheter was placed at the end of the surgical procedure under ultrasound guidance because the incision had been extended 4 cm across the midline and a 10-mL bolus of 0.25% bupivacaine was given. The patient reported a maximum pain score of 4/10 in the postanesthesia care unit and received 40 µg IV of fentanyl. An infusion of 0.25% bupivacaine at 5 mL/h via the ESP catheter and 3 mL/h via the rectus sheath catheter was started, both for 5 days. She also received paracetamol 1 g every 6 hours either IV or orally. The first night postoperatively the patient received 60 µg fentanyl IV. She had no PONV and was discharged on postoperative day 6.

From the Department of Anesthesia and Intensive Care Medicine, St Vincent's University Hospital, Elm Park, Dublin, Ireland.

Accepted for publication June 20, 2019.

Funding: None.

The authors declare no conflicts of interest.

Address correspondence to Shrijit Nair, FCAI, Department of Anesthesia and Intensive Care Medicine, St Vincent's University Hospital, Elm Park, Dublin 4, Ireland. Address e-mail to drshrijitnair@yahoo.com.

CASE 2

A 19-year-old man with metastatic liver disease from testicular carcinoma was scheduled for major liver resection. Preinduction, he received 600 µg of intrathecal morphine. He was induced with propofol, fentanyl, and rocuronium, and maintenance was with sevoflurane in oxygen and air. Intraoperatively he received 500 µg fentanyl, 1 g paracetamol, and 75 mg diclofenac. Surgically placed bilateral TAP catheters were bolused with 20 mL of 0.25% bupivacaine on each side at the end of the procedure and an infusion of 10 mL/h of 0.15% bupivacaine via a Y connector. On postoperative day 2, the patient was in severe pain. He had used 88 mg of morphine in the first 12 hours postoperatively. He was also receiving paracetamol 1 g IV every 6 hours, diclofenac 100 mg rectally every 16 hours, and ketamine 100 mg over 24 hours via subcutaneous infusion, with little effect. He was not tolerating fluids orally due to nausea and vomiting. He remained on supplementary oxygen, had poor effort with physiotherapy and basilar atelectasis bilaterally. A decision was made to place bilateral ESP catheters to improve analgesia. The patient was turned into the left lateral position after 1 mg of midazolam and 50 µg of fentanyl IV. The TAP catheters were removed. Bilateral ESP catheters were placed under ultrasound guidance at the level of T7. A 20-mL bolus of 0.25% bupivacaine was given bilaterally. Infusions of 0.15% bupivacaine were commenced at 5 mL/h bilaterally for 5 days. The patient reported immediate improvement, and morphine consumption via PCA was reduced to 24 mg over 24 hours by the next day. Paracetamol and NSAIDs were continued, but ketamine was stopped. By postoperative day 3, the PCA was discontinued. Oral opiate requirements for postoperative days 4 and 5 were 10 mg of oxycodone per 24 hours. He was discharged home on postoperative day 7.

CASE 3

A 58-year-old woman with autoimmune hepatitis was scheduled for orthotopic liver transplantation. Her preoperative coagulation results showed a prothrombin time (PT) 13.1, activated partial thromboplastin time (APTT) 26.9, international normalized ratio (INR) 1.13, and platelets 193. The surgical procedure was uneventful with intraoperative blood loss of 1 L. Her postoperative thromboelastograph was normal, and the coagulation screen was PT 17.1, APTT 33.8 seconds, INR 1.48, and platelets 131. We placed bilateral ESP catheters for analgesia as part of a fast track technique. Intraoperatively the patient had received a fentanyl infusion of 100–250 µg/h for 6 hours. After skin closure, the patient was turned into a left lateral position, and under ultrasound guidance, bilateral ESP catheters were placed 4 cm into the space at the level of T7. Each catheter was bolused with 10 mL of 0.25% bupivacaine, and an infusion was started at 10 mL/h of 0.15% bupivacaine via a Y connector for 5 days. From postoperative day 1 to day 3, the patient had a total of 26 mg of supplemental morphine IV as boluses. The ESP catheters were bolused with 10 mL of 0.25% bupivacaine on postoperative days 2 and 3. From postoperative day 4, the patient was switched to oral oxycodone, and for the next 2 days, the total analgesia requirement was 20 mg. The patient was discharged home on day 14.

DISCUSSION

HPB surgery poses unique challenges in terms of postoperative pain management, which has both visceral and somatic components, with the nerve supply to most HPB structures coming from the coeliac plexus, while the somatic component is mainly via the intercostal nerves.

Epidural analgesia has been considered the optimal analgesic technique for HPB surgery, but with limitations. With novel techniques in regional anesthesia, there is the potential to use lower-risk techniques that can provide good-quality analgesia and may alter patient outcomes.¹⁰ Enhanced recovery protocols are increasingly emphasizing opioid-sparing or opiate-free anesthesia.¹¹

One such technique that has been described is the ESP block. Described by Forero et al⁹ for management of chronic thoracic pain, this block has since been used in various acute pain settings such as fractured ribs¹² and bariatric surgery.¹³ It has been suggested that block at the lower thoracic level (T7–T9) provides both visceral and somatic analgesia.^{13,14} In the cadaveric model, the injection of dye at T7 showed spread extending from C7–T2 cranially and to L2–L3 caudally.^{14,15}

Ivanusic et al¹⁶ in a cadaveric study suggested that injection of local anesthetic deep to the erector spinae muscle leads to craniocaudal spread of the local anesthetic along the length of the thoracolumbar spine and penetration through the costotransverse foramina to act on the dorsal and ventral rami via paravertebral and epidural spread.

The significant advantages of ESP block compared to epidural or paravertebral block relate to the relative ease, simplicity, and safety of the block. Ultrasound is used to determine the vertebral level of insertion and identify the erector spinae muscle over the transverse process. Once the erector spinae plane has been opened with an initial bolus of local anesthetic, a catheter can be threaded for continuous infusion of local anesthetic postoperatively. The rare but catastrophic risk of damage, either directly or indirectly, to neuraxial structures as with epidural and up to 1% risk of pneumothorax with paravertebral block are much less of an issue with ESP block. ESP block being a new block, it is difficult to define its exact risk profile. As the placement of the needle down onto the transverse process is performed in plane under ultrasound guidance and the target plane is relatively remote from major neural or vascular structures and the pleura, theoretically safety should be improved.¹⁷

Our experience of ESP block in HPB surgery is uniformly positive in terms of reduced opiate analgesia requirement, reduced incidence of nausea and vomiting, earlier return of gut function, and earlier discharge from physiotherapy. This block shows great potential as part of an enhanced recovery protocol for major abdominal surgery.¹²

It is difficult to advocate for a change of practice based on a case series. The current role of ESP block is in the management of patients where existing techniques are contraindicated or have been tried and failed. Further comparative studies to assess the efficacy and safety of ESP blocks are required. ■■

DISCLOSURES

Name: Shrijit Nair, FCAI.

Contribution: This author helped search the literature, draft the manuscript, and final approval of the manuscript.

Name: Siobhan McGuinness, FANZCA.

Contribution: This author helped search the literature and draft the manuscript.

Name: Fouad Masood, FCAI.

Contribution: This author helped critically revise the article.

Name: John F. Boylan, FRCPC.

Contribution: This author helped revisit the manuscript and critically revise the article.

Name: Niamh P. Conlon, FCARCSI.

Contribution: This author helped with the conception of the presented idea, did critical revision of the article, and was involved with the final approval of the version to be published.

This manuscript was handled by: BobbieJean Sweitzer, MD, FACP.

REFERENCES

1. Pöpping DM, Elia N, Marret E, Remy C, Tramèr MR. Protective effects of epidural analgesia on pulmonary complications after abdominal and thoracic surgery: a meta-analysis. *Arch Surg*. 2008;143:990–999.
2. Wijesundera DN, Beattie WS, Austin PC, Hux JE, Laupacis A. Epidural anaesthesia and survival after intermediate-to-high risk non-cardiac surgery: a population-based cohort study. *Lancet*. 2008;372:562–569.
3. Rigg JR, Jamrozik K, Myles PS, et al; MASTER Anaesthesia Trial Study Group. Epidural anaesthesia and analgesia and outcome of major surgery: a randomised trial. *Lancet*. 2002;359:1276–1282.
4. Park WY, Thompson JS, Lee KK. Effect of epidural anesthesia and analgesia on perioperative outcome: a randomized, controlled Veterans Affairs cooperative study. *Ann Surg*. 2001;234:560–569.
5. Rodgers A, Walker N, Schug S, et al. Reduction of postoperative mortality and morbidity with epidural or spinal anaesthesia: results from overview of randomised trials. *BMJ*. 2000;16:1–12.
6. Hermanides J, Hollmann MW, Stevens MF, Lirk P. Failed epidural: causes and management. *Br J Anaesth*. 2012;109:144–154.
7. Guay J, Nishimori M, Kopp SL. Epidural local anesthetics versus opioid-based analgesic regimens for postoperative gastrointestinal paralysis, vomiting, and pain after abdominal surgery: a Cochrane review. *Anesth Analg*. 2016;123:1591–1602.
8. Jacquenod P, Wallon G, Gazon M, et al. Incidence and risk factors of coagulation profile derangement after liver surgery: implications for the use of epidural analgesia—a retrospective cohort study. *Anesth Analg*. 2018;126:1142–1147.
9. 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.
10. Reddi D. Preventing chronic postoperative pain. *Anaesthesia*. 2016;71(suppl 1):64–71.
11. Kamdar NV, Hoftman N, Rahman S, Cannesson M. Opioid-free analgesia in the era of enhanced recovery after surgery and the surgical home: implications for postoperative outcomes and population health. *Anesth Analg*. 2017;125:1089–1091.
12. Hamilton DL, Manickam B. Erector spinae plane block for pain relief in rib fractures. *Br J Anaesth*. 2017;118:474–475.
13. Chin KJ, Malhas L, Perlas A. The erector spinae plane block provides visceral abdominal analgesia in bariatric surgery: a report of 3 cases. *Reg Anesth Pain Med*. 2017;42:372–376.
14. 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.
15. Forero M, Rajarathinam M, Adhikary S, Chin KJ. Continuous erector spinae plane block for rescue analgesia in thoracotomy after epidural failure: a case report. *AA Case Rep*. 2017;8:254–256.
16. Ivanusic J, Konishi Y, Barrington MJ. A cadaveric study investigating the mechanism of action of erector spinae blockade. *Reg Anesth Pain Med*. 2018;43:567–571.
17. Luis-Navarro JC, Seda-Guzmán M, Luis-Moreno C, López-Romero JL. The erector spinae plane block in 4 cases of video-assisted thoracic surgery [in English, Spanish]. *Rev Esp Anestesiol Reanim*. 2018;65:204–208.