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Dual Thoracic and Caudal Epidural Catheters for Abdominoperineal Resection: A Case Report on a Novel Approach for Postoperative Analgesia

Jaclyn Edelson, BA[1], Michael O'Rourke, MD[2], and Scott Byram, MD[2]

Background: Given the wide-reaching effects of the opioid crisis in the United States and around the world, it is incumbent on anesthesiologists to create effective ways to limit the necessity of opioids for patients after their hospital stays and surrounding their experiences in the operating room. Ultrasound-guided dual thoracic and caudal epidural catheter placement has been used in a limited amount of surgery types but is one way in which anesthesiologists can improve the hospital experience and limit postoperative pain requiring opioids.

Case Report: We describe a novel use of ultrasound-guided dual thoracic and caudal epidural catheter placement for postoperative pain management in abdominoperineal resection (APR) as a successful opioid-sparing strategy in this case report of 2 patients. It is significant that we chose this option for pain management in an APR procedure because this type of surgery spans multiple noncontiguous dermatomes.

Conclusion: The described technique, while difficult to deliver, is an excellent option for noncontiguous multidermatomal surgeries. Notably, our patients required far fewer opioids for pain management postoperatively than expected given the extensive nature of this surgery.

Key words: Abdominoperineal resection, caudal analgesia, dual catheter epidural, epidural analgesia, postoperative analgesia

BACKGROUND

An abdominoperineal resection (APR) refers to the surgical excision of the sigmoid colon, rectum, and anus, and the construction of a permanent end colostomy (1). It is often performed for patients with a very distal rectal cancer. Colorectal cancer is expected to be diagnosed in 147,950 Americans in 2020 (2).

In the past, APR has been performed with no regional anesthesia at all (3); however, in more recent years, epidural analgesia has been recommended for open colorectal surgery. The use of intraoperative thoracic epidural anesthesia has been associated with better gastrointestinal recovery (4). Thoracic epidural anesthesia can also be an opioid-sparing pain control method that reduces the adverse effects of opioids such as nausea, vomiting, and respiratory depression. Given the extent of the worldwide opioid crisis, it is important that pain management doctors do everything in their power to limit the necessity of opioid use in their patients. This includes employing creative strategies, such as novel regional anesthesia, to improve their postoperative pain. APR presents a unique challenge to the regional anesthesiologist wanting to

From: [1]University of Queensland-Ochsner Clinical School, Ochsner Healthcare System, New Orleans, LA; [2]Department of Anesthesiology, Loyola University Medical Center, Maywood, IL

Corresponding Author: Scott Byram, MD, E-mail: sbyram@lumc.edu
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use epidural analgesia. This is because the surgical sites are in noncontiguous dermatomes with both sacral and thoracic dermatomes requiring analgesia.

In this case report, we discuss the benefits of planned dual epidural catheter therapy for analgesic management in 2 patients undergoing APR. In our case, one epidural was inserted in the thoracic region and another inserted in the caudal region. Previously a double catheter method has been shown to be effective for pain control in spine deformity surgery (5), labor analgesia (6), and more recently large abdominal exploratory laparotomies (7). To these authors' knowledge, this is the first time this therapy has been reported for APR.

Health Insurance Portability and Accountability Act authorization has been obtained from each patient.

CASE

Patient Description: Patient A is a 55-year-old man weighing 61 kg scheduled for an abdominoperineal resection and a transverse rectus abdominus (TRAM) flap repair. Patient B is a 34-year-old woman weighing 73 kg scheduled for a proctectomy completion via an abdominal and perineal approach.

CASE HISTORY

Both patients had presurgical diagnoses of rectal cancer. The surgical plan was to open the fascia to the right of midline from the xiphoid process to the pubic bone (in preparation for the TRAM flap), then prepare the left lower quadrant colostomy site.

Physical Exam Results: The surgical analgesia needed for these procedures must cover the sacral and thoracic dermatomes. Thus, we decided to use a dual thoracic and caudal epidural catheter approach for pain management.

Results of pathological tests and other investigations: Not applicable

Treatment Plan: The regional anesthesia procedures for both of these patients were performed preoperatively. The block approach for both patients was similar. Patients were placed in the left lateral decubitus position. The T10 epidural was placed via a right paramedian approach using loss of resistance to air and saline with a 17-gauge Touhy needle and a 19-gauge epidural catheter. The caudal catheter was placed using ultrasound guidance with a 40-mm footprint high-frequency linear probe. The sacral hiatus was imaged in a transverse plane identifying the sacral cornu (Fig. 1). Although we prefer in-plane needling, an out-of-plane approach (Fig. 2) was used for these patients since an in-plane approach (Fig. 3) would place the exit point of the catheter closer to the perineal surgical site. Furthermore, the caudal catheter was subcutaneously tunneled away from the surgical site. Again, a 17-gauge Touhy needle and a 19-gauge epidural catheter was used for the caudal catheter. After ultrasonic visualization of satisfactory spread of injectate, the catheter was advanced into the caudal space. The Touhy needle was slightly withdrawn over the catheter but left in the subcutaneous space to protect the catheter during tunneling (Fig. 4). After further local anesthetic infiltration of the planned subcutaneous trajectory, a second 17-gauge Touhy needle was inserted near the right posterior superior iliac spine and directed subcutaneously toward the needle used to place the caudal catheter. Since the first Touhy was protecting the catheter, it was possible to exit the skin adjacent to the first Touhy and any skin bridge was incised. Next, the first needle that was used to place the caudal catheter was completely withdrawn, the catheter was passed retrograde through the second tunneled Touhy, and the second needle was withdrawn so that the catheter rested in the subcutaneous tissue without a skin bridge. The skin nick was closed with 2-octyl cyanoacrylate (Dermabond).

For both patients, upon admission to the postanesthesia care unit (PACU), an infusion was programmed to 2 mg/mL of ropivacaine set at a basal rate of 4 mL/hour caudally and 6 mL/hour thoracically with a patient-controlled analgesia (PCA) dose of 2 mL, and a lockout time of 30 minutes. Both patients were started on our institution's Enhanced Recovery After Surgery Protocol, which is a multimodal regimen. This protocol incudes preoperative and postoperative gabapentin, preoperative celecoxib, and an intraoperative and postoperative low-dose ketamine infusion. Additionally, patients have access to postoperative ketorolac, oral opioids, and intravenous opioids if needed.

Expected Outcome: We believed the patients would require fewer postoperative opioids for sufficient pain control.

Actual Outcome: During patient A's 6-day postoperative hospital stay, he only required a total of 1,000 mg of oral tramadol for satisfactory pain management, with half of that total administered after his catheters were removed on postoperative day 5. Patient B also had a 6-day postoperative hospital stay and required a total of 105 mg of oral oxycodone for satisfactory pain management with an increase in need after her catheters were removed on postoperative day 4.

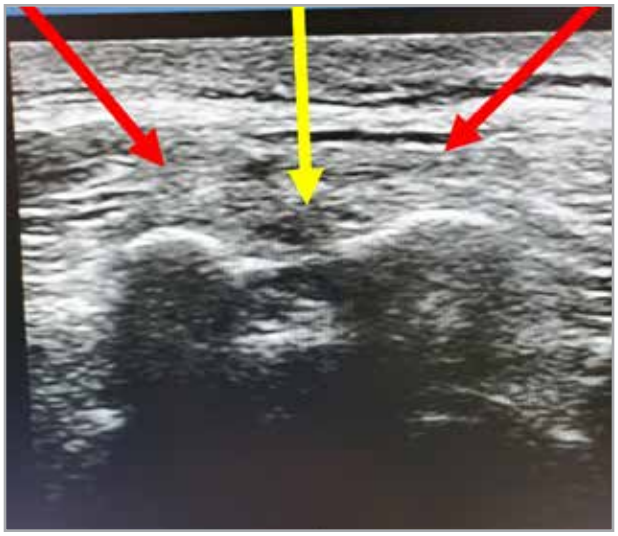

Fig. 1. Transverse ultrasound image of the caudal space for out-of-plane needling. Red arrows mark sacral cornu. Yellow arrow marks sacrococcygeal ligament.

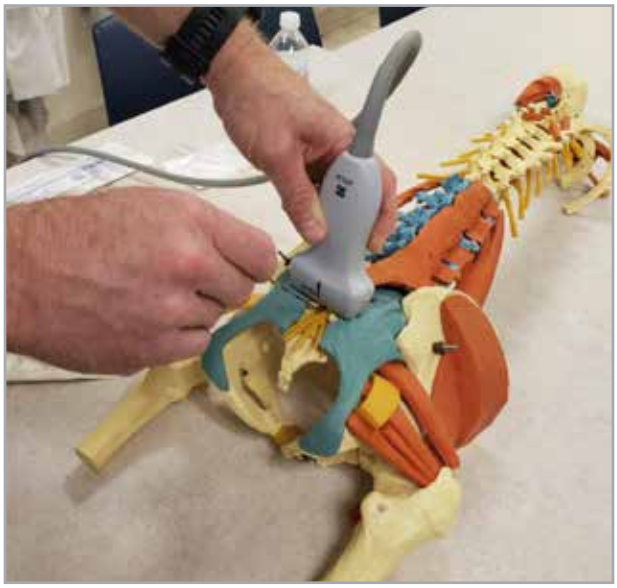

Fig. 2. Out-of-plane approach for caudal epidural

Fig. 3. In-plane approach for caudal epidural

Fig. 4. Tunneling technique demonstrating right-sided tunneling

Significantly, neither patient requested any treatments for breakthrough pain on postoperative day 1. Moreover, throughout their entire hospital stays neither patient required additional pain control measures beyond oral analgesics and neither required any morphine, as would be typical for patients postoperatively after this procedure. Upon discharge, both patients reported that they were very satisfied with their pain management.

DISCUSSION

Dual thoracic and caudal epidural catheter placement is an advanced regional anesthetic technique. It requires experience for placement and extra time for placement preoperatively that may not be suitable for all patients. Both of our patients had expressed a goal

of opioid minimization or avoidance due to poor previous experiences with opioid side effects. Hence, for our patients this regional anesthesia technique was clinically significant. We chose this specific regional anesthesia technique due to the noncontiguous dermatomes of the surgical sites.

To asses our decision, one must remember that the colon and rectum are innervated by multiple sets of nerve populations. The visceral pain component is controlled by lumbar splanchnic fibers innervating the proximal colon, which terminate within the thoracolumbar spinal cord (T10-L1), and the sacral pelvic afferents innervate the distal colon and rectum and terminate within the lumbosacral spinal cord (9). The somatic pain component of the area is determined by spinal nerve roots (T7-L1) for laparotomy, and pudendal nerve roots (S2-S4) for perineal distribution (10). Therefore, both sacral and thoracolumbar segments must be blocked for incisional (somatic) and visceral pain components. This division of cell bodies and central axon termination points, between the thoracic spinal cord and the sacral spinal cord, is what causes APR surgery to take place in 2 nonconsecutive dermatomes and is the reason we chose to prepare our patients for perioperative pain management for this procedure with 2 epidural catheters.

It is also important to note that we considered other methods of regional anesthesia in these 2 cases. One technique considered was a thoracic epidural combined with intravenous patient-controlled analgesia. This technique was not preferred because it would lead to increased opioid side effects, due to likely increased opioid usage as compared to other methods (8), which was in direct opposition to our patients' stated goals. Another consideration was a thoracic epidural administration of hydrophobic opioid. Again, this was avoided due to increased opioid side effects from systemic absorption (11). We also considered epidural anesthesia administration with additional local anesthesia at the perineal site. It was thought that our technique would provide better analgesia than infiltration of local anesthetic given the relatively long postoperative recovery time for an APR surgery.

CONCLUSIONS

Our case report explains the technique and reasoning behind a novel regional block for APR surgery. While dual catheter use is gaining popularity, it has not yet been tried in this context before. Based on the postoperative opioid-use of the 2 patients we reported on, this dual catheter technique has the potential to be very successful for opioid minimization in multiple noncontiguous dermatomal surgery.

Institutional Review Board for the Protection of Human Subjects, L University Health Sciences Division:

This project has been designated with an LU number of 213571. This IRB body has waived the consent requirements for the patients referenced in this case report as there is no protected health information in the manuscript.

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