

Introduction

- The field of anesthesia has a ubiquitous goal of reducing acute postsurgical pain, with intravenous opioid analgesia traditionally serving as the mainstay of treatment for post-op pain.
- Continuous thoracic epidural analgesia (TEA) provides not only postoperative analgesia, but when placed pre-operatively, it reduces intraoperative surgical stimulation and decreases neuroendocrine stress response (ie. less insulin resistance) (1).
- In patients where TEA may not be feasible, an alternative regional pain plan can be used to ameliorate post-operative pain. We discuss a case where bilateral rectus sheath catheters were successfully utilized for post-operative pain control.
- TEA is the gold standard for large midline incisions. However, it has limitations, including risk of hypotension and difficulty with placement in the elderly, leg weakness in lower epidurals, and inability to use TEA on patients who are systemically anticoagulated.
- Overall, rectus sheath catheters are easier to place, have a better safety profile and provide noninferior analgesia compared to TEA.

Case Description

- A 58-year-old man with a history of anxiety, abdominal aortic aneurysm complicated by endoleak presented for an open aorto-bi-iliac artery repair.
- The anesthesia team attempted a thoracic epidural in the pre-operative area. There was successful loss of resistance to air at multiple levels but inability to pass the catheter.
- The patient then developed new left lower extremity pain, paresthesia and a headache, and the epidural procedure was aborted. There were no acute findings on neurological exam, and the surgical team proceeded with the planned surgery.
- The patient had a large midline incision and had received preoperative intrathecal morphine with reports of adequate pain control.
- On post-op day 1, the patient developed significant abdominal pain that was not adequately controlled by patient-controlled analgesia.
- The acute pain service team successfully placed bilateral rectus sheath catheters, with significant improvement in pain scores and decreased IV opioid usage.
- The rectus sheath catheters were removed on post-op day 7, and the patient was successfully transitioned to oral pain medications prior to discharge.

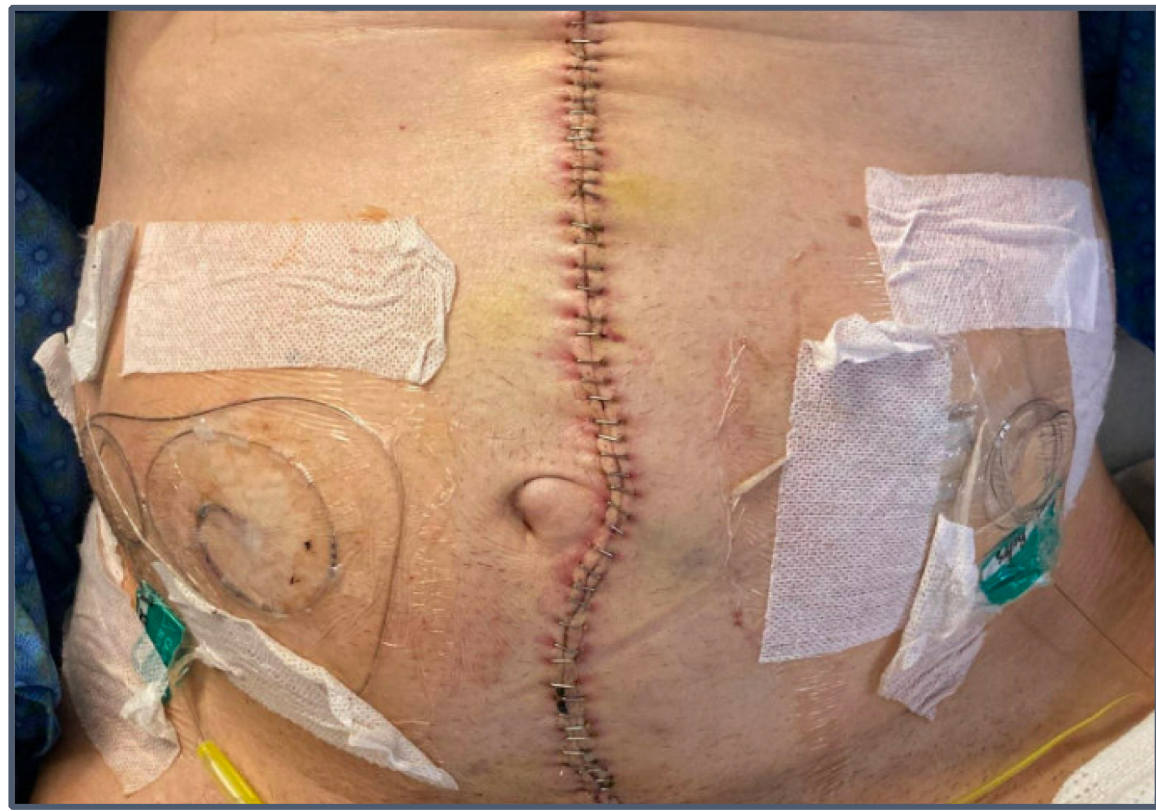


Figure 1. Midline abdominal incision with bilateral rectus sheath catheters.

Procedure

- Patient was placed in supine position, the abdomen was prepped with antiseptic (i.e. Chloroprep) and draped to provide a sterile field
- An ultrasound transducer was covered with a sterile sleeve and sterile US gel. The transducer was placed midline with transverse orientation at the level of the umbilicus. It was then moved laterally to identify the rectus muscle and associated sheaths.
- Once an optimal view was obtained, a syringe containing saline was connected to an echogenic tuohy needle which was advanced in-plane until the tip lies just beneath the rectus muscle, at which point the muscle was hydrodissected from the posterior sheath.
- An initial bolus of local anesthetic was administered to expand this space, and subsequently a catheter was advanced through the tuohy to place 6-8 cm of catheter within the rectus sheath.
- The catheter was secured with Dermabond, steri-strips and tegaderm. The procedure was repeated on the contralateral side.

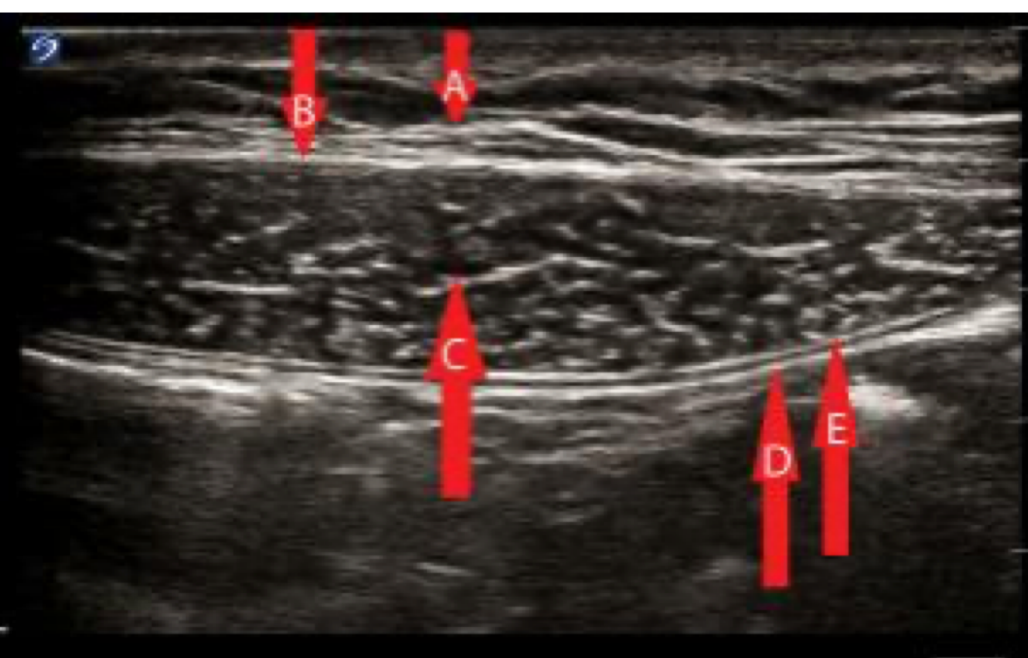


Figure 2: US image of the mid-rectus abdominis muscle. Arrow A: subcutaneous tissue; Arrow B: anterior rectus sheath; Arrow C: rectus abdominis muscle; Arrow D: transversalis fascia; Arrow E: posterior rectus sheath.

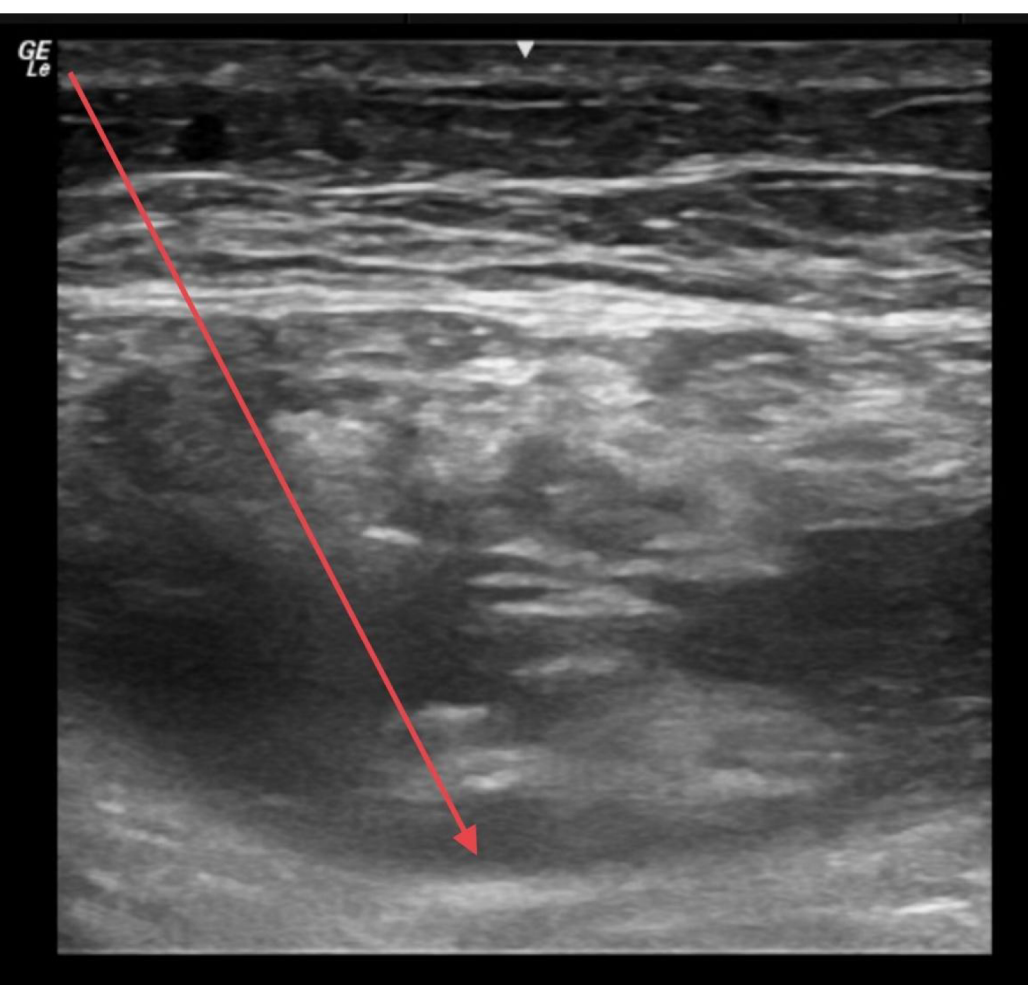


Figure 3: US image of local anesthetic deposition within the rectus sheath. Red arrow depicts needle path.

Pain scores pre- and post- rectus sheath catheters

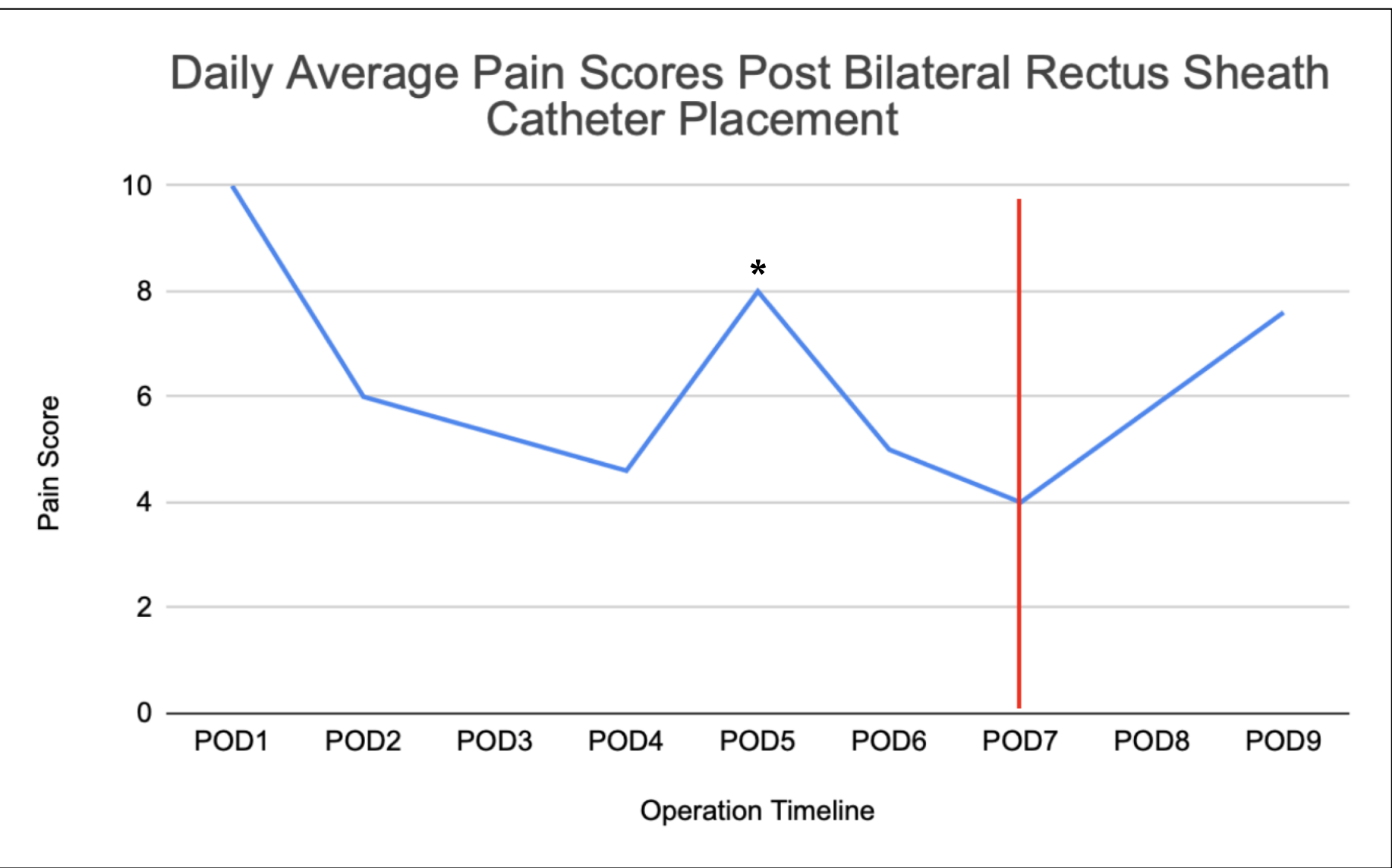


Figure 4. Average daily pain scores after bilateral rectus sheath catheter placement on postoperative day 1 (POD1). Patient received 10cc bolus of 0.25% Bupivacaine daily, along with a 8cc/hr infusion POD1-POD4. The continuous infusion was increased to 10cc/hr from POD5-7. Red line depicts when RSCs were removed. *POD5 patient reported severe headache accounting for high pain that day. .

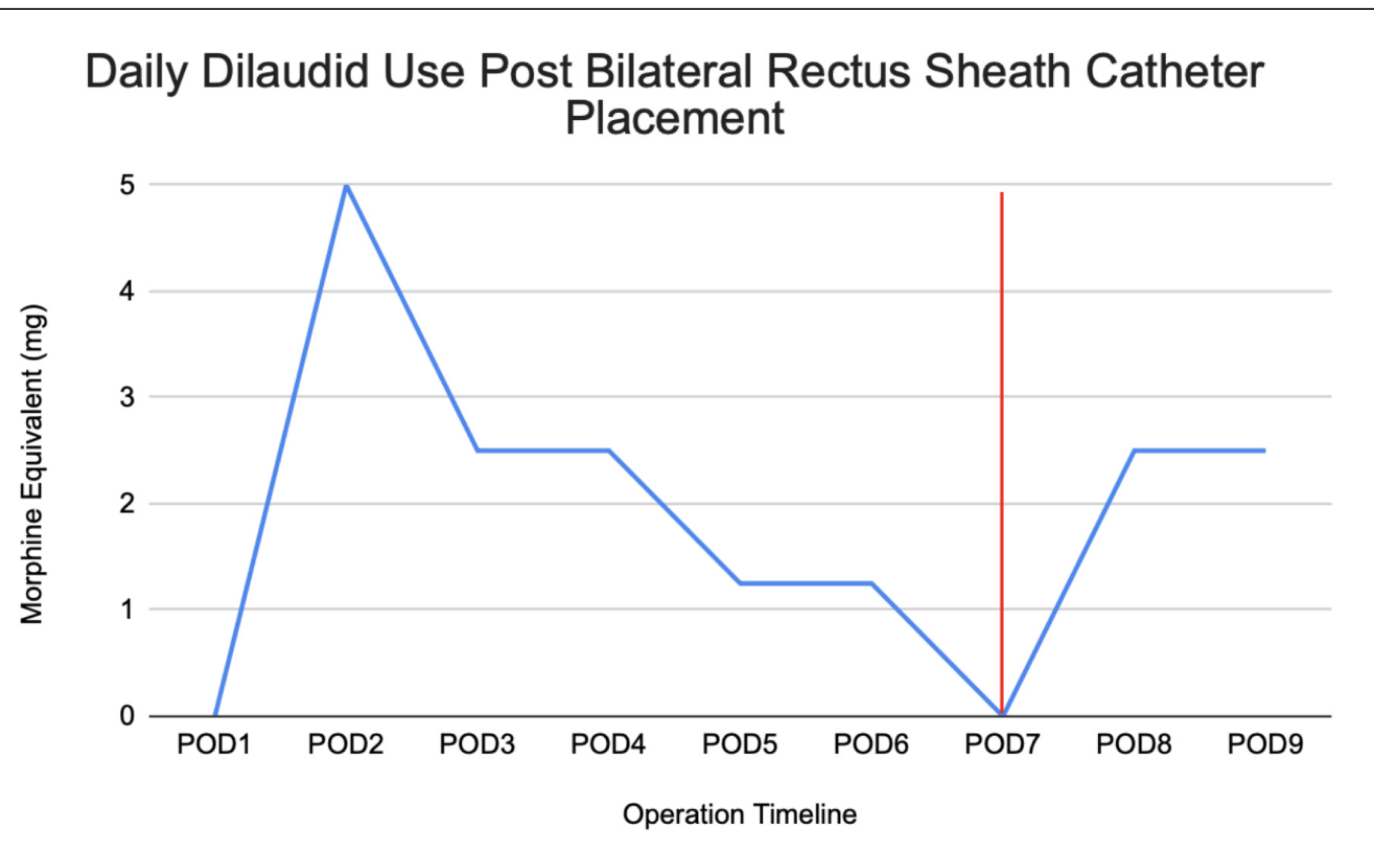


Figure 5. Daily Dilaudid use in milligrams after bilateral rectus sheath catheter placement on postoperative day 1 (POD1). Patient received Dilaudid bolus above in addition to patient controlled analgesia consisting of 0.2mg Dilaudid every 10 minutes without a basal infusion rate. Red line depicts when RSCs were removed.

Discussion and Conclusion

- In patients where a thoracic epidural is contraindicated or technically challenging, rectus sheath catheter analgesia (RSCA) is a viable alternative with its own benefits. In comparing the two modalities:
 - TEA provides sufficient analgesia for the first 24 hours post procedure, but by 72 hours, it was found that RSCA provided superior analgesia when compared to TEA (2).
 - RSCs were associated with a lower incidence of opiate consumption, hypotension, and vasopressor dependency compared to TEA (2).
 - RSCs are potentially more cost-effective compared to TEA (2) due to better pain control, leading to decreased length of hospital stay, earlier mobility/ functional recovery, fewer additional opioid medications, and less side effects from those opioids, thus incurring less financial costs
 - RSCs can be used in patients on anticoagulation where neuraxial procedures such as TEA may be contraindicated.
 - A meta-analysis comparing TEA versus RSCA found that RSCA has a lower rate of postoperative hypotension, allows for earlier ambulation and has a favorable side effect profile (3).
- There is significant decrease in the mean daily pain score before versus after bilateral RSC placement. The mean pain score was 10/10 even with patient-controlled analgesia prior to placement, which decreased to an average of 4/10 after RSC placement.
- Patient was able to ambulate and work with physical and occupational therapy with the RSCA. The combination of RSCA and PCA gave patient the autonomy to control his pain versus waiting for nursing staff to provide him with the prescribed pain medications.
- RSCs served as a crucial part of multimodal pain management, leading to improved patient outcomes and were a great adjunct for pain management in this patient.

References

1. Lee JH, Kim DH, Koh WU. Real-time ultrasound guided thoracic epidural catheterization: a technical review. *Anesth Pain Med* (Seoul). 2021 Oct;16(4):322-328. doi: 10.17085/apm.21060. Epub 2021 Oct 29. PMID: 34289297; PMCID: PMC8828624. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC8828624/>
2. Krige, A., Brearley, S. G., Mateus, C., Carlson, G. L., & Lane, S. (2022). A comparison between thoracic epidural analgesia and rectus sheath catheter analgesia after open midline major abdominal surgery: randomized clinical trial. *BJS open*, 6(3), zrac055. <https://academic.oup.com/bjsopen/article/6/3/zrac055/6583540>
3. Claxton, H. L., Nevins, E. J., & McCallum, I. (2023). Comparison of the effectiveness of Thoracic epidural and rectus sheath catheter as analgesic modalities following Laparotomy: A systematic review and meta-analysis. *Journal of Perioperative Practice*, 33(11), 332-341. <https://journals.sagepub.com/doi/abs/10.1177/17504589221086130>