

Fig 1a/b/c/d. 1a/b. Ultrasound imaging without/with false color overlay showing anatomy prior to ESP block. 1c/d. Ultrasound imaging without/with false color overlay showing the anatomy during the block, with needle and needle tip visible.
Abbreviations: TM = Trapezius Muscle; RMM = Rhomboid Muscle; ESM = Erector Spinae Muscle; TP = Transverse Process; PVS = Paravertebral Space; Fl. Spread = Fluid Spread

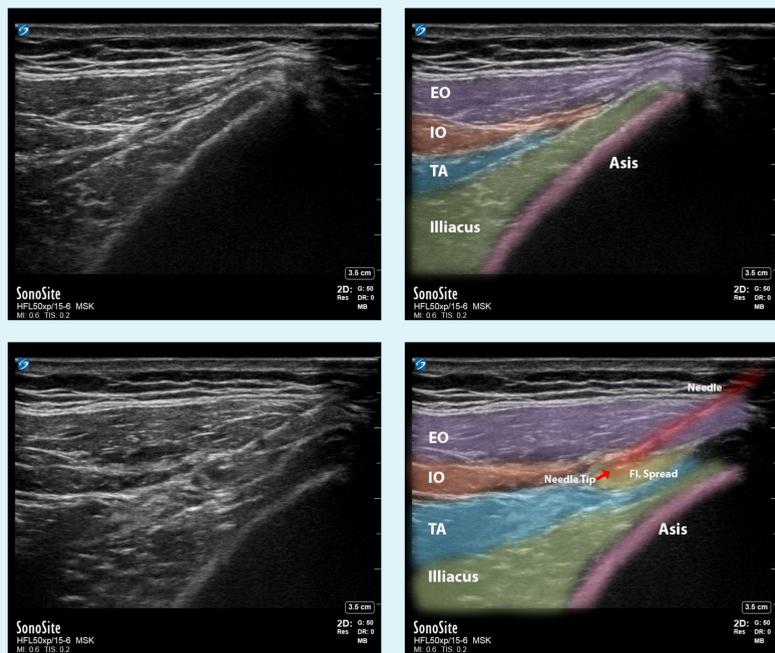


Fig 2a/b/c/d. 2a/b. Ultrasound imaging without/with false color overlay showing anatomy prior to II/IH block. 2c/d. Ultrasound imaging without/with false color overlay showing the anatomy during the block, with needle and needle tip visible.
Abbreviations: EO = External Oblique; IO = Internal Oblique; TA = Transverse Abdominis

Analgesic efficacy of ultrasound-guided bilateral ESPB and II/IH blocks for ablation of atrial fibrillation via the Convergent Procedure: A case series

Robert J Suriani MD¹, Wolf Vogel MD¹, Nomita Bhawal MD¹, Vlad Frenk MD¹, Michael Rubin MD¹, David Maduram MD PhD¹

¹Department of Anesthesiology, St. Vincent's Medical Center, Bridgeport CT, USA; St. Vincent's Medical Center, Bridgeport CT, USA

Introduction

Convergent surgery is an emerging surgery option for treatment of atrial fibrillation, which consists of (1) surgical ablation of the posterior left atrium with monopolar radiofrequency through a minimally invasive subxiphoid approach, followed by (2) endocardial catheter ablation to perform pulmonary vein dilation and completion of any additional ablation lines via a femoral approach. Although this procedure is designed to be minimally invasive, opening of the chest wall, entering the pericardium, and ablating the left atrium can cause significant pain. Treatment of this pain with opioids can cause significant adverse effects including nausea and respiratory compromise. We present a retrospective case series of patients undergoing a convergent procedure with a multimodal anesthetic regimen including an erector spinae plane (ESP) and ilioinguinal/iliohypogastric (II/IH) blocks to provide a robust opioid-sparing perioperative analgesia. Our main outcome was the patient's opioid requirements and postoperative pain scores at 24, 48 and 72 hours after the end of surgery. As secondary endpoints, we looked at length of hospital stay.

Methods & Results

We reviewed medical records of three patients who underwent convergent surgery between March 11, 2021 to June 3, 2021 at St. Vincent's Medical Center, Bridgeport, Connecticut. The demographic data of all patients in this sample were recorded. In the postoperative period, pain scores on movement were measured via visual analogue scale(VAS) at 24, 48, and 72 hours postoperatively. Postoperative morphine equivalent requirements were noted and recorded. All patients in this series received general anesthesia with intraoperative ESPB and II/IH blocks. As part of a multimodal regimen, all patients received acetaminophen and a gabapentinoid preoperatively. Anesthesia was induced with propofol, midazolam, rocuronium, 4% LTA spray, and ketamine 0.5 mg/kg and maintained intraoperatively with dexmedetomidine 0.6 mcg/kg/hr, ketamine 0.25 mg/kg/hr and sevoflurane. Post-operative pain was treated with scheduled oral acetaminophen and opioids as needed for breakthrough pain. All blocks were performed after chlorhexidine 4% prep with Ultrasound-guidance using a linear array ultrasonography 8-13 Hz probe (HFL38x, M-Turbo; SonoSite, Bothwell, WA) and 50-mm 22-gauge Stimulplex needle (B-Braun, Melsungen, Germany).

Methods & Results (continued)

ESP blocks were performed bilaterally at the T10 level. The ultrasound probe was positioned in a parasagittal orientation to identify the ribs as hyperechoic structures with acoustic shadowing below (Figure 1a, b). The block needle was inserted in a cranial-to-caudal direction using the in-plane technique. When the needle tip was positioned just below the erector spinae muscles, the correct tip position was confirmed by the visualization of linear fluid spreading in the myofascial plane between the transverse process and erector spinae muscles (Figure 1c, d). Fifteen milliliters of 0.25% bupivacaine with 10 ml of liposomal bupivacaine was injected in 5 ml aliquots. This procedure was repeated on the opposite side for a total of 50 ml of local anesthetic.

II/IH blocks were performed with the ultrasound transducer probe positioned in a longitudinal orientation on a line joining the anterior superior iliac spine and the umbilicus to identify the anatomy (Figure 2a, b). The correct tip position was confirmed by the visualization of linear fluid spreading in the myofascial plane between the internal oblique and the transverse abdominus muscles (Figure 2c, d). After confirming needle tip position, a total of 15 milliliters of 0.25% bupivacaine with 5mg dexamethasone was injected in 5cc aliquots. This procedure was repeated on the opposite side for a total of 30 ml of local anesthetic.

All patients received 1000 mg intravenous acetaminophen and 15 mg ketoralac prior to extubation. After completion of the surgery, all patients were taken to the postanesthesia care unit (PACU). Three patients underwent convergent surgery with multimodal analgesic regimen inclusive of bilateral ESPB and II/IH blocks. Patient demographic and pain information is illustrated in the table below:

Subject	Age (y)	Sex	ASA	Opioid Consumption in MME at 24h, 48h, 72h	Pain Scores at 24h, 48h, 72h
1	60	M	4	8.5, 11, 16	0, 2, 0
2	61	M	4	6, 6, 11	0, 5, 2
3	68	M	3	10, 25, 25	2, 5, n/a

The median 24h pain score was 0. The median 24h postoperative opioid consumption in oral MME (milliequivalent units) was 8.5 mg. Patient and surgeon satisfaction was high with the analgesia provided.

Discussion

The main findings of the current case series demonstrate that combined ESP and ilioinguinal / iliohypogastric blocks in patients slated for convergent procedures are associated with low postoperative opioid requirements, decreased pain scores, and high patient satisfaction. Although formal assessment of time to first rescue analgesia, length of ICU stay, and hemodynamic stability were not performed, our initial results, coupled with the absence of any notable complications, make ESP/II/IH blocks a promising perioperative addition to any cardiac ERAS / opioid-sparing regimen.

It is important to note that other important elements of the anesthetic regimen included preemptive analgesic administration of dexmedetomidine, as well as liposomal bupivacaine and dose ketamine. Our findings on efficacy and safety of ESP/II/IH blocks for convergent procedures are consistent with other studies of fascial plane blocks for cardiac surgery. Although other fascial plane blocks have been shown to be effective for cardiac surgery, ESP/II/IH blocks may provide an unique advantage in terms of ease of performance and reduced risk of complications such as pneumothorax, chest wall hematoma, and local anesthetic toxicity. Further research is warranted.

Acknowledgements & References

- Special thanks to Bill Lahiff for assistance with poster authorship and technical support.
- Cox, J. L., Churyla, A., Malaisrie, S. C., Pham, D. T., Kruse, J., Kisilitsina, O. N., & McCarthy, P. M. (2019). A hybrid maze procedure for long-standing persistent atrial fibrillation. *The Annals of thoracic surgery*, 107(2), 610-618.
 - Varzaly, J. A., Lau, D. H., Chapman, D., Edwards, J., Worthington, M., & Sanders, P. (2021). Hybrid Ablation for Atrial Fibrillation: A Systematic Review and Meta-analysis. *JTCVS Open*.
 - Trzcinka, A., Lee, L. S., Madias, C., Homoud, M. K., Rastegar, H., Couper, G. S., & Cobey, F. C. (2021). The convergent procedure: A unique multidisciplinary hybrid treatment of atrial fibrillation. *Journal of Cardiothoracic and Vascular Anesthesia*, 35(2), 631-643.
 - Li, X., Li, M., Shao, Y., Gu, W., Ni, B., Gu, J., & Chen, M. (2021). Thoracoscopic ablation delays progression from paroxysmal to persistent atrial fibrillation. *The Journal of Thoracic and Cardiovascular Surgery*.
 - Abdelbaser, I. I., & Mageed, N. A. (2020). Analgesic efficacy of ultrasound guided bilateral transversus thoracis muscle plane block in pediatric cardiac surgery: A randomized, double-blind, controlled study. *Journal of Clinical Anesthesia*, 67, 110002.