A Joint Effort: Surgeon and Anesthesia Administered Transversus Thoracic Muscle Plane Block for Intra and Postoperative Pain for CABG: A Case Series

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Figures

Fig 1. Staged photograph showing transducer during transversus thoracic muscle plane block.

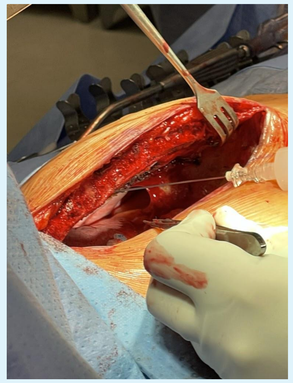
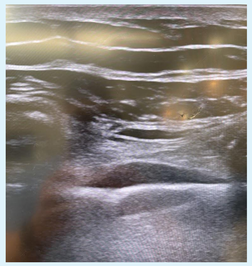


Fig 2. Field block, performed by surgeon following take down of the LIMA.



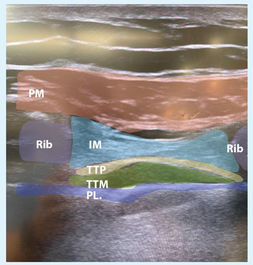
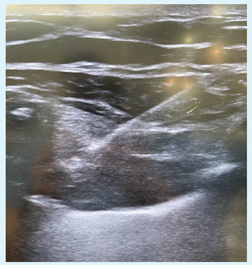


Fig 3a. Ultrasound imaging showing anatomy prior to TTP block. Fig 3b. Ultrasound imaging with false color overlay showing the anatomy during the block.



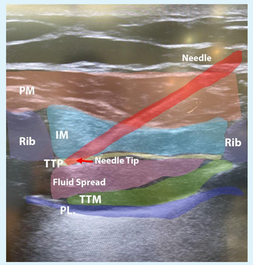


Fig 4a. Ultrasound imaging showing anatomy and needle position during TTP block. Fig 4b. Ultrasound imaging with false color overlay showing anatomy and needle position during TTP block.
Abbreviations: PM - Pectoralis Major, IM = Intercostal Muscle, TTP = Transversus Thoracic Plane, TTM = Transversus Thoracic Muscle, Pl. = Pleura

Introduction

The concept of ERAS (Enhanced Recovery After Surgery) is now a well-established concept on a global scale that utilizes evidence-based perioperative approaches, ranging from preoperative optimization, multimodal analgesia, the utilization of nerve blocks, and strategies in the postoperative period aimed at reducing extubation times, ICU length of stay, and ICU delirium (1). A major goal of ERAS in cardiac surgery is to improve patient outcomes by reducing opioid consumption, avoiding adverse side effects which leads to a decrease in the time to extubation, and overall lower cost from a shorter hospital and ICU stay. The transversus thoracic plane block (TTPB) has proven to be an excellent modality for achieving this goal during coronary artery bypass graft (CABG) surgery. These blocks are performed in a parasternal fashion and have been shown to be a safe and effective procedure to reduce intra and postoperative pain during cardiac surgery (2). However, there is a theoretical risk of injury to the left internal mammary artery (LIMA) from the nerve block needle, as the LIMA runs in the same plane as the injection that is performed and can oftentimes be difficult to visualize with the ultrasound machine (3).

We present three cases to minimize opioid requirements and avoid unwanted damage to the LIMA in which a right sided TTPB was performed by the Cardiac Anesthesia team, and a left sided LIMA-sparing field block was performed by the cardiac surgeon following take-down of the LIMA.

Methods & Results

After a thorough discussion, all three patients consented to bilateral transversus thoracic plane blocks (TTPB) as part of an enhanced recovery after cardiac surgery (ERAS-C) multimodal pain management plan. Written consent for publication of non-identifying medical information and Health Insurance Portability and Accountability Act authorization was obtained.

General anesthesia was induced with propofol, midazolam, and rocuronium and maintained with sevoflurane and rocuronium. Rectus sheath blocks were performed bilaterally using bupivicaine 0.25% 10 cc. Right sided TTP blocks were then performed at the T4 level. After chlorhexidine 4% prep, the ultrasound probe was positioned in a parasagittal orientation to obtain a parasternal view (Figure 1). The ribs were identified as hyperechoic structures with acoustic shadowing below (Figure 3).

Methods & Results (continued)

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 intercostal muscle, the correct tip position was confirmed by the visualization of linear fluid spreading in the myofascial plane between the transversus thoracic and internal intercostal muscles (Figure 4). Ten milliliters of 0.25% bupivacaine admixed with 10 ml of liposomal bupivacaine 1.3% was injected in 5 ml aliquots. Following dissection and mobilization of the LIMA, the cardiac surgeon performed the left sided field block from inside the thoracic cavity (Figure 5) with the same volume and concentration of local anesthetic.

All blocks were performed 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). After completion of surgery, the patients were taken to the intensive care unit. Demographic, opioid use, morphine equivalents, ICU and overall LOS information on each case is illustrated in the table below:

All three patients required minimal narcotic intraoperatively and postoperatively. The average extubation time following arrival to the ICU was 5.8 hours, patients were in the ICU for 1 day, and the average length of stay was 12 days (Table 1).

Subject	Age (y)	Sex	Opioid Consumption in MME at 24h, 48h, 72h	Total Intraoperative Fentanyl (mcg)
1	66	M	9, 9, 19	0
2	75	F	6, 6, 6	0
3	69	M	0, 0, 0	100

Subject	Age (y)	Sex	Intubation Time (h)	ICU LOS	Overall LOS
1	66	M	5.2	1	4
2	75	F	6.6	1	4
3	69	M	16.9	1	4

Discussion

In this case series, a right sided TTMB and a surgeon-administered field block were performed during CABG in efforts to reduce the potential of inadvertent LIMA damage while performing a left-sided injection. Liposomal bupivacaine was added to both injections to extend the analgesia at the site of sternotomy. Our patients required on average 0.4 mcg/kg of fentanyl intraoperatively, and the average 24, 48, and 72 hr morphine equivalents were only 5, 8.3 and 8.3 respectively. One of the three patients did not require any narcotics postoperatively and the only opioids used their entire hospital admission was 100 mcg fentanyl for intubation. Limitations of this case series include a small sample size, non-homogeneous distribution of patients, and inability to evaluate sensory-cutaneous blockage following the block as the blocks were performed under general anesthesia.

Chest wall blocks such as the TTMP have previously been shown to be a safe, and effective modality for providing analgesia following sternotomy for CABG (1, 4). By having the surgeon perform a field block following dissection of the LIMA, we avoided potentially damaging the vessel prior to its use for the surgery. A surgeon and anesthesia combo injection boasts a higher safety profile while at the same time proves to be an effective modality for reducing opioid consumption, shorter extubation times, and shorter stay in the ICU. Future studies are needed to compare the effectiveness of surgeon-administered field block to anesthesia-administered TTMB.

Acknowledgements & References

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