

Regional Analgesia in Cardiothoracic Surgery: A Changing Paradigm Toward Opioid-Free Anesthesia?

Nearly a decade or two ago, mention of “regional anesthesia in cardiac surgery” implied use of thoracic epidural anesthesia. Despite proven and potential benefits, fear of permanent neurologic deficits prevented anesthesiologists from using epidural blocks routinely. This apprehension was applicable to depositing spinal opioids also.^[1] Given that many surgical patients continue to be administered dual antiplatelet medications until surgery, even those anesthesiologists who wish to carry out these regional techniques are unable to. Shorter acting antiplatelet medications are neither recommended nor are there any on the horizon of manufacture. Till such time, it is unlikely that central neuraxial blocks would make a comeback in patients receiving dual antiplatelet medications.^[2] In addition, use of local anesthetic agents to provide postoperative analgesia instead of opioids in tandem provides a vista of opportunity to reduce or avoid opioid use and move toward opioid-free anesthesia (OFA).

With an intent to improve healthcare quality, the need to fast track cardiac surgery through minimal invasive surgery decrease the length of stay in the intensive care unit and hospital became necessary.^[3] This encouraged the anesthesiologists to have a relook at multimodal postoperative analgesia using minimal opioids, intravenous acetaminophen, and regional anesthesia (both nerve and fascial blocks). Instead of neuraxial blocks, the emphasis now seems to be on blocking peripheral nerves in neural planes using ultrasound guidance. Such a practice not only reduced the possibility of permanent neurological deficits (that were associated with central neuraxial blocks) but also rendered the procedure safe by “unblinding” the operator. Performing nerve blocks with ultrasound guidance not only reduces the rate of complications (vascular or nerve injury and intravascular injection) but also upsurges the success rate of the nerve block, that too with smaller quantity of local anesthetic solutions.^[4] Nerve blocks for limbs are simpler, but the chest innervation and block is complicated. There are multiple plexuses, and nerves that are embedded in muscular fascial planes innervating the chest wall, which make blocking them difficult. An operator with an intention to produce pain relief of sternotomy or thoracotomy incision may have to block either para-axial (to avoid the central neuraxis) or muscular fascial planes or selective nerve with local anesthetic agents.

The most commonly administered block of the paraxial nervous system used to be paravertebral block (PVB).

Although the anatomy of paravertebral space was known for many years, reproducible successful PVB became achievable routinely only recently due to the ability of the operator to locate the paravertebral space and avoid damaging the pleura.^[5] Similarly, providing muscular plane blocks (such as serratus anterior plane [SAP] block and erector spinae block [ESB]) and selective nerve blocks (pectoralis nerve) would have been difficult without visualizing the muscular plane/nerve by ultrasound. PVB became a viable option to thoracic epidural anesthesia because it was paraxial but benefits such as epidural were observed. In addition, the disadvantages of thoracic epidural such as hemodynamic instability were not noted with continuous PVB.^[6]

SAP block has been offered by many cardiac anesthesiologists recently for providing pain relief thoracotomy. The block is simple to administer and effective. The needle tip could be visualized well using ultrasound. At the author’s institute, it is routine to administer SAP block to provide postoperative analgesia in cardiac surgery through thoracotomy. In a recent study, SAP block produced satisfactory pain relief after thoracotomy.^[7]

Pectoralis nerve block

Like the other blocks on the muscular fascial planes, pectoralis block popularly called “pecs block” has smaller and blunt learning curve. Even when administered by a novice, the complications are fewer. There are no major neurovascular bundles surrounding the area of interest. It has been shown that administering such bilateral blocks significantly reduced the duration of ventilation ($P < 0.0001$), pain at rest, and on coughing ($P < 0.05$) in patients who underwent cardiac surgery via mid-sternotomy.^[8] This block appears to possess a great deal of promise because of low complication rates and given that the block could be administered without changing patient position from supine.

Erector spinae block

This block has been used to provide analgesia for thoracotomy pain relief.^[9] ESB is easily reproducible at times even without ultrasound guidance. Like “pecs block,” absence of major neurovascular bundles in and around the area of interest renders this block safe as well. At this author’s institute, ESBs are routinely carried out without complications. ESB unlike the other two blocks mentioned above could be carried out at nearly all

levels of spine, akin to epidural block.^[10] This block has been administered to provide pain relief after pediatric thoracic surgery too.^[11] In a work published in this issue of *Annals of Cardiac Anaesthesia*, Nagaraja *et al.* have used bilateral ESB to provide postoperative analgesia after cardiac surgery through midsternotomy. They observed significantly improved pain scores at rest and during coughing in patients who received ESB for up to 48 h.^[12]

The other nerve blocks that are useful in cardiothoracic work include intrapleural local anesthesia, intercostal nerve block^[13] infiltration of local anesthetic in the surgical incision,^[14] intercostal and subcostal drainage tube insertion sites. At the author's institute, it is a routine practice to infiltrate the subcutaneous tissue around the drainage tube sites with 10 ml 0.06% bupivacaine thrice daily. Postoperative pain caused by drainage tubes pressing on the intercostal nerves may be abolished by this simple technique. By combining these regional blocks with other agents such as nonsteroid anti-inflammatory agents and nonopioid agents, one could achieve opioid OFA.

Philosophy of opioid-free anesthesia

Opioids produce predictable satisfactory analgesia and sedation in postoperative patients. However, they are without side effects such as respiratory depression, drowsiness, and myocardial depression. Yet another potential disastrous side effect is habituation to opioids. It is said that several countries are currently battling "opioid epidemics" due to the misuse of opioids by postsurgical patients, who were exposed to opioid by prescription.^[15] The magnitude of the problem of opioid abuse is such that several enhanced recovery after surgery protocols are now advocating opioid-free techniques, and even a "Society for OFA" has been formed to address the problem. Recently, there is a shift toward OFA, wherein good quality analgesia is provided without prescribing opioids, but multimodal analgesic method is used. Regional blocks discussed above have become important components while providing multimodal analgesia in the ambit of OFA. These regional techniques may be encouraged to produce pain- and risk-free postoperative period.^[3] It is said "perioperative pain relief in cardiothoracic surgery is mandatory not only to provide postoperative relief from pain to patients but also to prevent the occurrence of chronic pain syndromes".^[16] It may be relevant to add the requisite of OFA and analgesia to these requirements using multimodal analgesic methods by combining nonopioids with regional blocks.

It is likely that in the future, multimodal anesthesia in cardiac surgery will include regional blocks in addition to systemic nonopioids. It is perhaps time that a useful mode which we were blind to hitherto should take center stage in pain relief.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

Murali Chakravarthy

Department of Anesthesia, Critical Care and Pain Relief, Fortis Hospitals, Bengaluru, Karnataka, India

Address for correspondence: Dr. Murali Chakravarthy, Department of Anesthesia, Critical Care and Pain Relief, Fortis Hospitals, Bannerughatta Road, Bengaluru - 560 076, Karnataka, India.

E-mail: mailchakravarthy@gmail.com


References

1. Chaney MA. Intrathecal and epidural anesthesia and analgesia for cardiac surgery. *Anesth Analg* 2006;102:45-64.
2. Chakravarthy M. Future of awake cardiac surgery. *J Cardiothorac Vasc Anesth* 2014;28:771-7.
3. Roediger L, Larbuisson R, Lamy M. New approaches and old controversies to postoperative pain control following cardiac surgery. *Eur J Anaesthesiol* 2006;23:539-50.
4. Wadhwa A, Kandadai SK, Tongpresert S, Obal D, Gebhard RE. Ultrasound guidance for deep peripheral nerve blocks: A brief review. *Anesthesiol Res Pract* 2011;2011:262070.
5. D'Ercole F, Arora H, Kumar PA. Paravertebral block for thoracic surgery. *J Cardiothorac Vasc Anesth* 2017. pii: S1053-0770(17) 30787-5.
6. Pintaric TS, Potocnik I, Hadzic A, Stupnik T, Pintaric M, Novak Jankovic V, *et al.* Comparison of continuous thoracic epidural with paravertebral block on perioperative analgesia and hemodynamic stability in patients having open lung surgery. *Reg Anesth Pain Med* 2011;36:256-60.
7. Khalil AE, Abdallah NM, Bashandy GM, Kaddah TA. Ultrasound-guided serratus anterior plane block versus thoracic epidural analgesia for thoracotomy pain. *J Cardiothorac Vasc Anesth* 2017;31:152-8.
8. Kumar KN, Kalyane RN, Singh NG, Nagaraja PS, Krishna M, Babu B, *et al.* Efficacy of bilateral pectoralis nerve block for ultrafast tracking and postoperative pain management in cardiac surgery. *Ann Card Anaesth* 2018;21:338-43.
9. Adhikary SD, Pruett A, Forero M, Thiruvankatarajan V. Erector spinae plane block as an alternative to epidural analgesia for post-operative analgesia following video-assisted thoracoscopic surgery: A case study and a literature review on the spread of local anaesthetic in the erector spinae plane. *Indian J Anaesth* 2018;62:75-8.
10. Yamak Altinpulluk E, Garcia Simón D, Fajardo-Pérez M. Erector spinae plane block for analgesia after lower segment caesarean section: Case report. *Rev Esp Anestesiología Reanimación* 2018. pii: S0034-9356(17) 30264-5.
11. Hernandez MA, Palazzi L, Lapalma J, Forero M, Chin KJ. Erector spinae plane block for surgery of the posterior thoracic wall in a pediatric patient. *Reg Anesth Pain Med* 2018;43:217-9.
12. Nagaraja PS, Ragavendran S, Singh NG, Asai O, Bhavya G, Manjunath N, *et al.* Comparison of continuous thoracic epidural analgesia with bilateral erector spinae plane block for perioperative pain management in cardiac surgery. *Ann Card Anaesth* 2018;21:328-32.
13. Demmy TL, Nwogu C, Solan P, Yendamuri S, Wilding G, DeLeon O, *et al.* Chest tube-delivered bupivacaine improves pain and decreases opioid use after thoracoscopy. *Ann Thorac Surg* 2009;87:1040-6.
14. Kocabas S, Yedicocuklu D, Yuksel E, Uysallar E, Askar F. Infiltration

of the sternotomy wound and the mediastinal tube sites with 0.25% levobupivacaine as adjunctive treatment for postoperative pain after cardiac surgery. *Eur J Anaesthesiol* 2008;25:842-9.

15. Brandal D, Keller MS, Lee C, Grogan T, Fujimoto Y, Gricourt Y, *et al.* Impact of enhanced recovery after surgery and opioid-free anesthesia on opioid prescriptions at discharge from the hospital: A Historical-prospective study. *Anesth Analg* 2017;125:1784-92.
16. Maxwell C, Nicoara A. New developments in the treatment of acute pain after thoracic surgery. *Curr Opin Anaesthesiol* 2014;27:6-11.

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

Access this article online	
Quick Response Code: 	Website: www.annals.in
	DOI: 10.4103/aca.ACA_56_18

How to cite this article: Chakravarthy M. Regional analgesia in cardiothoracic surgery: A changing paradigm toward opioid-free anesthesia?. *Ann Card Anaesth* 2018;21:225-7.