

The analgesic efficacy of continuous presternal bupivacaine infusion through a single catheter after cardiac surgery: A commentary

Pain relief after cardiothoracic surgery is important, several choices of providing it are available. Either opioid agents (intravenous bolus or infusion or intrathecal), or oral supplements, or neuraxial blocks (paravertebral block, thoracic epidural anesthesia) or intra-pleural local anesthetic are commonly used to achieve this.^[1] Sometimes combinations of more than one technique could also be used to augment the action of each other. Side-effects mitigate the free use of one or combinations of techniques. The side-effects may be related to the technique: Epidural hematoma as a result of thoracic epidural anesthesia,^[2] accidental intrathecal deposition during paravertebral block^[3] or the agents used in providing the pain relief.^[4] The use of opioids are associated with side-effects; some serious such as respiratory depression and others less serious, such as nausea, vomiting, itching, and constipation. Despite the potential side-effects, opioids seem to enjoy popularity, due to the ease of their administration; good pain relief and sedation are to be expected from its use. With a view to avoid the side effects and to enhance patient safety, one must look at opioid sparing techniques as well. The opioid sparing techniques are regional anesthetic blocks, intra-pleural local anesthetic deposition and presternal bupivacaine infusion through a catheter in surgical incision. It makes logical sense to use the last of the above mentioned techniques, because the others might cause neuraxial complications. Continuous presternal local anesthetic infusion

appears to be an ideal technique at the outset, because it is devoid of complications that occur with the other alternatives-opioids and neuraxial blocks. It is surprising that a technique that looks so perfect has not been studied widely and applied in routine clinical practice. There only a few studies in cardiac surgical population-pediatric cardiac surgery,^[5] minimally invasive cardiac surgery^[6] and median sternotomy.^[7] Surprisingly, the study by Chiu *et al.*^[6] appears to be one of the few studies other than the current study.^[8]

The authors of the current manuscript rightly point out that a few aspects of infiltration of local anesthetic in the surgical wound are still debatable. Although many authors showed benefits,^[9,10] Agarwal *et al.* stopped their study on subcutaneous infiltration of ropivacaine because of unfavorable results.^[11] The authors of this work have indicated that subcutaneous infiltration of bupivacaine (for that matter any other local anesthetic) alone might not produce the desired analgesic effect.^[6] Infiltration of the anterior cutaneous branch of the intercostal nerves may play an important role in a producing a perfect block. Clinicians desirous of practicing this technique must look at the additional block requirement, before wanting to assess the efficacy of the block. Other adjuvants such as intravenous paracetamol, small doses of opioids and oral anti-inflammatory and analgesic agents should also be considered to produce good postoperative pain relief.

Infiltration of a large quantity of bupivacaine might produce clinically unacceptable levels of bupivacaine in the serum. The authors and similarly Chiu *et al.*^[6] have demonstrated a lack of abnormal serum value of bupivacaine despite continuous infusion of bupivacaine in the presternal areas. Chiu *et al.* showed serum bupivacaine levels varying from 0.5 ± 0.2 to 0.5 ± 0.5 $\mu\text{g/ml}$ in their study while the authors of this work^[8] showed 1.2 ± 0.3 – 1.7 ± 0.3 $\mu\text{g/ml}$. Both these studies showed that bupivacaine level were well below the neurologic toxic dose of 4 $\mu\text{g/ml}$. Adverse cardiac effect due to subcutaneous infiltration does not appear to be common.

Subcutaneous infiltration of local anesthetic in and around the surgical wound has attracted adverse attention, for the possibility of wound infection caused by it. Very little is known about the effects of local anesthetic agents on cutaneous wound healing. If an inhibitory effect

is demonstrated, then the balance between the benefits of postoperative local anesthesia and the negatives of impaired cutaneous wound healing may affect the decision to use local anesthesia or not. Nonhealing of corneal ulcers treated with local anesthetics initially kicked off the controversies.^[12] A detergent-like effect on plasma membranes accounts for its epithelial toxicity when used frequently. Animal studies^[13] have shown that in clinically relevant dose, both lignocaine and bupivacaine do not alter wound healing. However, in contrast, Al-Attar *et al.* have severely criticized the use of local anesthetic in the median sternotomy wound.^[14] This criticism has been countered by Nuttall and Johnson *et al.*^[15] The to and fro arguments only indicate a lack of clarity even among clinicians.

Although the choice of administering local anesthetic in the subcutaneous plane with the supplementation of block of anterior cutaneous nerve branch of intercostal nerve appear to produce adequate analgesia. The authors of this work have shown significant 48 h morphine sparing effect (18.83 ± 3.4 mg in the control group in contrast to 8.6 ± 0.94 mg in the test group) after administering anterior cutaneous branch intercostal nerve block and subcutaneous continuous infiltration of bupivacaine. However, wound infection and lack of reproducible pain relief are two issues that have to be settled before embracing this technique.

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