Guest Editorial

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Continuous wound infiltration of local anaesthetics for acute postoperative pain – A revisit

Adequate control of acute postoperative pain remains a challenge despite the improved understanding of pain mechanisms and implementation of a wide array of analgesic techniques. According to a national survey in the United States involving 300 participants who underwent surgery in the past 5 years, 86% experienced pain after surgery; of which, 75% had moderate to severe pain during the immediate postoperative period.[1] No analgesic technique provides a complete package of good analgesia combined with minimal adverse effects, ease of administration, low cost and patient satisfaction. The concept of multimodal analgesia is therefore becoming increasingly popular as it consists of a combination of analgesics/analgesic techniques aimed at decreasing opioid-associated adverse effects such as nausea, vomiting, pruritis, sedation and respiratory depression. This is especially relevant for caesarean sections as optimal postoperative analgesia helps the mother mobilise early, initiate breast feeding and reduce complications such as deep venous thrombosis and delayed discharge.[2]

In our quest towards finding a safe and effective technique for alleviation of acute postoperative pain, continuous wound infiltration of local anaesthetics (LAs) has emerged as one of the important analgesic techniques both as a standalone technique and an adjunct to multimodal analgesia. The causes of postoperative pain are multifactorial, of which surgical wound is one of the main sources. The concept of incisional pain was elaborated using rat models where pain most likely originates from nociceptors and primary afferent fibers' activation producing primary hyperalgesia.[3] Administration of drugs such as LAs and nonsteroidal anti-inflammatory drugs (NSAIDs) at the surgical wound site blocks the afferent nociceptors thereby reducing the pain. LAs primarily act by inhibiting the nociceptive transmission from the surgical wound by blocking the voltage-gated sodium channels expressed on small-diameter neurons.[4] It is possible that LAs may also have anti-inflammatory properties which may contribute to the analgesic effect.[5] In a recent study, the authors compared the analgesic efficacy of continuous preperitoneal wound infiltration with epidural analgesia and its effect on inflammatory cytokines in patients undergoing open radical cystectomy. It was found that there was a reduction in proinflammatory markers such as IL1β, IL6, and TNFα and increase in the anti-inflammatory markers such as IL10 in the preperitoneal group when compared with epidural group and a significant reduction within the same group when comparing the postinfusion to the preinfusion levels.[6] LAs may also produce analgesia by absorption into the systemic circulation. It has been shown that even low doses of intravenous LA reduce the development of central hyperalgesia.[7]

Surgical site infiltration with LAs may be practiced as a single-shot infiltration either at the beginning[8] or the end of surgery.[9] Placement of a catheter at the surgical site enables the administration of intermittent boluses[10] or continuous infusion[11] for a prolonged effect. The technique of continuous infusion of LAs at the surgical site has gained popularity due to the easy availability of multiorifice catheters and portable elastomeric pumps. Although LA infiltration into the surgical site has been found to be safe as it neither increases the rate of wound infection nor leads to systemic toxicity,[12] there are a few concerns regarding local toxicity. LAs may cause impaired wound healing,[13] chondrotoxicity[14] and even myotoxicity.[15] LA myotoxicity is seen universally in animal models but is now reported in humans as well.[16] Future research in this field may involve the use of long-acting LAs thus doing away with the need of a wound catheter. The duration of action of LAs can be

prolonged using delivery systems which encapsulate the LA and provide sustained release over a prolonged period such as liposomes, polymers, microcapsules, cyclodextrins and fibrin.[17]

Thomas *et al.* in their study have compared the use of continuous wound infiltration of 0.25% bupivacaine at two different anatomical planes, subcutaneous and preperitoneal for provision of postoperative analgesia.[18] This is a prospective double-blinded, randomised clinical trial, carried out on 52 parturients who underwent elective lower segment caesarean section under spinal anaesthesia. The primary objective was to compare the postoperative morphine consumption in the first 48 h. The secondary objectives were to compare the pain scores at rest and at movement, opioid-related adverse effects, return of bowel movements and procedure-related complications such as local site bleeding, wound discharge and infection. The 48-h postoperative morphine consumption was lesser in the 'preperitoneal' group (15.96 ± 7.69 mg) when compared with the subcutaneous group (21.26 ± 11.03 mg) but was statistically not significant *(P* = 0.058). There was no difference in the pain scores between the groups both at rest and movement, opioid-related adverse effects, time to return of bowel movements and procedure-related complications.

This study concluded that there is no difference in the analgesic efficacy of continuous wound infiltration of LA based on the anatomical placement of the wound catheter (preperitoneal or subcutaneous) after caesarean section. The study therefore does not help in resolving the divided opinion on the ideal anatomical placement of the catheter in the wound. For provision of post cesarean analgesia, Kainu *et al*.[11] found no advantage of continuous infusion of LAs in the subfascial plane, whereas according to O'Neil *et al*.[19] it achieves better analgesia with lesser side effects than epidural morphine. It is postulated that the subfascial placement of the catheter is more efficacious as it may block the visceral nociceptive input.[4] In a systematic review and meta-analysis on the use of LA wound infiltration for post cesarean section analgesia, the authors found that the pain scores at rest and movement and 24-h opioid requirement were only reduced with catheter placement below the fascia and not with subcutaneous placement.[20]

The strength of the study is the randomised, double-blind design where both the patient and the investigators were unaware of the group allocation thus minimising the risk of bias. However, a major limitation of the study is that it did not have a control group to discriminate the effect of the intervention. In fact, a recent study showed that continuous in-wound infusion with levobupivacaine plus ketorolac provides greater opioid-sparing effects than continuous in-wound infusion with levobupivacaine alone when compared with placebo thus questioning the efficacy of continuous wound infiltration with LAs alone.[21] Another limitation of the study is that the authors did not evaluate the recovery criteria and breastfeeding outcomes which would have added value to the efficacy of the analgesic technique in terms of functional recovery. The major advantage of multimodal analgesic techniques is to enhance recovery in terms of early oral intake and mobilisation. In addition, parturients undergoing caesarean section would benefit with early initiation of breast feeding and contribute to mother–child bonding and well-being.

The authors also did not administer paracetamol and NSAIDs as a part of the multimodal analgesia. These help reduce both pain scores and opioid consumption and unless contraindicated are the drugs of choice after cesarean delivery.[22]

Continuous wound infiltration of LAs is a simple and safe technique of providing analgesia at the incision site. Its analgesic efficacy and opioid-sparing effect improve postoperative outcomes making it a suitable component of multimodal analgesia technique.

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