



Wound catheter techniques for postoperative analgesia

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Abstract

Wound catheter technique is a technique of postoperative analgesia in which the surgeon places a catheter to infuse local anesthetic into wounds at the end of the procedure. It can be used in abdominal colorectal surgery or afterolecystectomies, was studied after caesarean delivery. It was effective after some orthopaedic procedures such as shoulder and knee surgery, at the donor site in the iliac crest. It can be used in plastic surgery after breast surgery. It is technically efficient, substantially reduces the need for opioids and the related side effects and can be used for several days. With the introduction of portable pumps, it can be used on an ambulatory basis. No signs of impaired or delayed healing were shown in any of the studies, no clinical signs of local anesthetic toxicity were observed. There have been some conflicting reports of the overall efficacy, therefore more studies are needed to help us understand the procedure specific optimal flow rates, local anesthetic concentrations, site of catheter placement. In spite of many unanswered questions, both the efficacy and technical simplicity of this technique encourage its widespread clinical use.

INTRODUCTION

Effective postoperative analgesia is important from the patient's perspective and can also improve clinical outcome (1, 2). Regional analgesic techniques are an efficient, non-opioid pharmacological approach to postoperative analgesia. Advanced analgesic techniques, such as epidural or perineural catheters, can provide successful analgesia. However, many of these analgesic modalities are labor – intensive and carry specific risks related to central or peripheral nerve blocks.

A promising modality that might help improve postoperative analgesia is the relatively simple technique in which the surgeon directly places a catheter to infuse local anesthetic into wounds at the end of the procedure. Wound catheter technique can be widely used, is technically efficient, offers the potential to provide complete analgesia or to substantially reduce the needs for opioids and their related side effects, can be used for several days and can now, with the introduction of new portable pumps, be used on an ambulatory basis. Although there are multiple reports and small randomized controlled trials, there have been conflicting reports of the overall efficacy (1).

Abdominal surgery

Midline incision is one of the most commonly used for abdominal surgery. In the clinical trial of Padmanabhan catheter was placed within the rectus sheath space (3). The effect of bupivacaine infusion in the

midline wound on postoperative pain and postoperative opioid requirements was studied. It showed no benefit when assessed by measurement of opiate requirement and did not affect pain scores or peak expiratory flow rate. Baig, however, showed less daily opioid requirements in patients with intrawound bupivacaine infusion and earlier ambulation, but no difference in overall pain scores and length of hospitalization after abdominal surgery with midline incision (4).

In the study of Zohar, the bupivacaine wound instillation with adjuvant intravenous diclofenac was associated with similar postoperative analgesia after caesarean delivery to that induced with intravenous diclofenac alone (5).

Gupta compared analgesia with levobupivacaine via a catheter placed intraperitoneally to placebo after abdominal hysterectomy (6). Incisional pain, deep pain and pain on coughing were studied and were all significantly less in the local anesthetic group compared to saline. Levobupivacaine infusion intraperitoneally also had a significant opioid sparing effect after hysterectomy. Also bupivacaine continuous intrawound infusion diminished rescue analgesic requirements after total abdominal hysterectomy with lower pain scores at coughing and with less nausea and vomiting (7).

Gupta studied analgesic effects of ropivacaine via a catheter placed intraperitoneally after laparoscopic cholecystectomy (8). Early postoperative pain could be relieved by ropivacaine administered into the bed of the gall bladder with lower pain scores for deep pain and coughing, but opioid consumption and times to walk, drink and eat at home were similar in the ropivacaine and in the placebo group.

In the randomized, double-blind placebo-controlled study of Beaussier continuous preperitoneal infusion of ropivacaine improved pain relief, reduced morphine consumption and accelerated recovery after colorectal surgery (9).

After appendectomy, a reduction in postoperative pain and in rescue analgesic consumption was observed in the ropivacaine wound infusion group, but no statistically significant differences in the frequency of adverse effects could be found between the ropivacaine and placebo group (10).

Wound catheter local anesthetic technique was most widely studied after inguinal hernia repair. Ropivacaine and bupivacaine wound infusion provided safe and adequate analgesia (11–13). It provided effective analgesia especially when patients were mobilizing. This has implications for earlier discharge from hospital and associated cost-savings.

Shoulder surgery

In the study of Boss the continuous subacromial application of bupivacaine after open acromioplasty and cuff repair surgery failed to reduce the pain score and cumulative morphine consumption in the first 48 hours

postoperatively (14). Many other studies, however, concluded that postoperative wound infiltration with ropivacaine or bupivacaine provided smaller pain scores and opioid requirement in comparison with saline after arthroscopic and open shoulder surgery (15–17). Catheters were placed subacromially. After subacromial arthroscopy, also intrabursal infusion of bupivacaine and morphine provided affective analgesia (18).

Lower limb surgery

After cruciate ligament reconstruction, intraarticular catheter technique was studied. When only bupivacaine was used for continuous infusion, analgesia was not effective (19, 20). With a multimodal approach the intra-articular infusion of ropivacaine, morphine and ketorolac combination provided effective pain relief and lower daily opioid consumption, but the difference in the incidence of opioid-related side effects was not statistically significant (21). Hoenecke studied the effectiveness of continuous wound infusion of bupivacaine in the patellar tendon donor site and showed less pain and less narcotic requirement in the study group compared to placebo (22).

After primary total knee replacement Rasmussen showed lower pain scores, lower opioid consumption, increased knee flexion and reduced hospital stay with continuous intraarticular infusion of morphine and ropivacaine (23).

Bianconi showed that postoperative infiltration and continuous wound infusion with ropivacaine reduced pain and opioid requirements after total hip replacement compared to systemic analgesia (24).

Spine fusion surgery

There is only one study published about wound catheter technique after spine fusion surgery (25). Wound infiltration and continuous wound infusion of ropivacaine via two parallel catheters reduced pain scores at rest and during movement, significantly reduced rescue analgesic consumption, but there were no statistically significant differences in the incidence of adverse effects between the study and placebo group.

Iliac crest

Different orthopaedic procedures require autogenous bone graft from the ilium, resulting in two painful sites for the patient. The pain at the donor site usually resolves within the first postoperative weeks, but it may persist and represent a significant source of postoperative morbidity. Compared with placebo, continuous infusion of ropivacaine through an iliac crest catheter provided significantly better control of postoperative pain both at rest and during motion at the donor site, significant reduction of morphine consumption, and significantly higher patient satisfaction. The beneficial effect on pain was still present during motion 3 months after surgery (26).

Breast surgery

Postoperative pain is a common problem following ambulatory breast augmentation surgery. In the study of Rawal patients received a subcutaneously placed multiple-hole catheter through the incision along the periphery of each breast (27). The results of this study provide evidence that patients receiving patient-controlled wound infusion with ropivacaine experienced better pain relief, required less rescue analgesics, had less sleep disturbance and nausea, and woke up less often at night due to pain than their counterparts receiving analgesia with paracetamol and ibuprofen tablets. The analgesic effects of ropivacaine 0.25% were similar to those of ropivacaine 0.5% (27).

Efficacy of a continuous bupivacaine infusion at postoperative surgical sites in patients with autologous breast reconstruction with a latissimus dorsi pedicled flap immediately after mastectomy was also studied (28). A two-site infusion kit with split flow to two catheters was inserted at the donor and recipient sites before skin closure. Significantly lower pain scores and lower opioid consumption was observed in the study group compared with placebo.

Wound healing

There is growing evidence that local anesthetics can inhibit local inflammatory response to injury. They reduce release of inflammatory mediators from neutrophils, reduce neutrophil adhesion to endothelium and decrease edema formation (29).

In most of the studies wound healing was specifically observed and was found normal. Continuous wound infusion of local anesthetic did not impair or delay healing compared to continuous saline infusion.

Local anesthetic toxicity

No clinical signs of local anesthetic toxicity were observed in any of the studies. Local anesthetic blood levels were measured in several studies (6, 8, 9, 17, 24–26, 30). Plasma concentrations remained well below toxic levels in all the reports.

CONCLUSION

Liu et al performed a quantitative and qualitative systematic review of wound catheter analgesia and found improved analgesia, reduced opioid use, increased patient satisfaction, and perhaps reduced hospital stay (1). The most notable feature was the consistent evidence of these benefits across wide range of surgical procedures, location of wound catheters, and dosing regimens accompanied with low incidences of catheter-related complications. Additional double blind placebo-controlled studies are needed to help us understand the procedure specific optimal flow rates, local anesthetic concentrations, site of catheter placement. More studies are needed to understand if potential benefits of this technique optimize outcomes, such as conversion of inpatient proce-

dures to ambulatory procedures. In spite of many unanswered questions, both the efficacy and technical simplicity of this technique encourage its widespread clinical use.

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