Case Report

Continuous local anaesthetic wound catheter infiltration after clamshell thoracotomy

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Summary

We report on the novel and successful use of local anaesthetic wound infusions via elastomeric pumps in a 17-year-old male who underwent emergent clamshell thoracotomy after sustaining a stab wound to the flank. This formed one component of a multi-modal analgesic regimen aimed at reducing opioid requirements and their associated side-effects. The patient was mobilising and was discharged from the intensive care unit 24 h postoperatively. There was an unplanned break in the local anaesthetic infusion during which the patient's reported pain scores increased significantly. The catheters were removed on the fifth postoperative day and he was discharged from hospital on day 7.

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Introduction

Emergency clamshell thoracotomy for a variety of indications in major trauma is an increasingly commonly performed procedure. Survivors present an analgesic challenge as the gold standard of thoracic epidural is rarely suitable in this patient group. Pain-related morbidity is high, potentially delaying discharge from both intensive care unit (ICU) and hospital. Local anaesthetic wound infusions via elastomeric pumps have been shown to be a useful adjunct to a multi-modal analgesic strategy for many types of surgery, avoiding many of the problems associated with central neuraxial blockade and systemic opioids.

Case report

A 17-year-old male was admitted following stabbing to the left flank causing diaphragmatic injury, pericardial injury and rib fracture. A left anterolateral and then right anterolateral clamshell thoracotomy was performed in the operating theatre after a positive pericardial window performed during laparotomy. The patient underwent repair of a large diaphragmatic wound through the thoracotomy incision. The clamshell incision permitted greater access to the diaphragmatic injury and facilitated repair. Pericardial blood was found to have emanated from an incised wound to the pericardium only, with no deeper myocardial wound. At the end of the operation, intercostal drains were placed in both hemithoraces and a myocardial drain placed behind the heart. The ribs were approximated and sutured with ethibond. Before closing the fascia and skin, bilateral wound infiltration catheters were placed overlying the approximated ribs at the level of the thoracotomy and each attached to an elastomeric pump containing levobupivacaine 0.1% set at 10 ml.hr⁻¹ (Fig. 1). Running concurrently was an intravenous morphine patient-controlled analgesia (PCA) pump with background infusion rate of 1 mg.hr⁻¹.

The patient was admitted to the ICU postoperatively and his trachea was extubated five hours later. The patient was mobilising, his urinary catheter removed and he was discharged from the ICU within the first 24 h postoperatively. Both critical care nursing staff and critical care physicians were subjectively impressed with his pain control and speed of extubation.

Figure 1 Intra-operative placement of a wound catheter.

At 50 h postoperatively the elastomeric pumps were depleted and there was an unplanned break in his local anaesthetic infusion. Some hours after this break in wound infiltration his pain scores increased, particularly on coughing. Therefore, a bolus was given and new pumps attached to provide a further 50 h infusion time. Pain scores were noted by ward staff and the acute pain team to be reduced after resumption of the infusion. The catheters were removed on day five with no related complications, having used total of 175 mg morphine via PCA during the postoperative period. The patient was discharged home on postoperative day seven.

Discussion

The need for effective and safe analgesia following cardiothoracic surgery is well recognised. Inadequate postoperative pain relief can have a number of adverse consequences, including respiratory compromise and consequent infections, decreased mobilisation, prolonged length of stay and decreased patient satisfaction. Many can go on to develop chronic pain [1].

Systemic opioids are effective but have well-recognised undesirable side-effects. These include prolonged time to extubation, prolonged ICU stay, nausea and vomiting, disrupted bladder and bowel function, hypotension and sedation leading to delayed mobilisation. Administration of high doses of opioids is labour intensive for ward staff, with increased patient monitoring requirements, management of pumps and the increased regulatory burden of managing controlled substances.

Thoracic epidural analgesia has been shown to be effective in such circumstances. However, significant drawbacks are associated with this technique. In particular, thoracic epidural analgesia requires skills for catheter placement, titration and monitoring, and is associated with complications such as dural puncture, infection, haematoma and subsequent neurological sequelae. Additionally, side-effects can include hypotension and urinary retention. The patient group undergoing emergency thoracotomy are rarely suitable for neuraxial techniques given their increased risks of trauma-induced coagulopathy and the diagnostic challenges that provoking hypotension in the immediate peri-operative period might cause. Various nerve blocks have been trialled, including intercostal, paravertebral and intrapleural blocks, and although effective as an adjunct to other techniques, are not as effective as a thoracic epidural analgesic strategy [2, 3].

Local anaesthetic infusion via elastomeric pump and catheter can offer a significant opioid sparing effect. Local anaesthetic infusions also have a more favourable haemodynamic side-effect profile when compared with thoracic epidural and require low maintenance once placed during the surgical procedure. This is because infusion catheters with elastomeric pumps follow the patient around as a single unit, are portable and do not require further maintenance as they are single-use and disposed of when empty. Additionally, complication rates are low: a systematic review of 44 randomised control trials looking at wound catheters

for all types of surgery showed an overall incidence of pump or catheter failure of 1.1%, with no incidences of local anaesthetic systemic toxicity [4]. We are not aware of any published cases of this technique being used following clamshell thoracotomy (Fig. 1).

A retrospective analysis of 110 patients undergoing unilateral thoracotomy showed a near threefold reduction in postoperative opioid utilisation and improved pain scores in patients treated with bupivacaine continuous wound infusion vs. continuous thoracic epidural infusion [5]. In a prospective study of 50 patients undergoing non-emergency thoracotomy, comparison of ropivacaine continuous wound infusion with thoracic epidural yielded either no difference or slightly higher postoperative pain scores. However, overall length of stay was reduced in the group receiving continuous wound infusions and on discharge there was no difference in pain scores between the two groups [6].

The choice of ropivacaine vs. bupivacaine in these studies appears to have been influenced by propensity of the former to cause local anaesthetic systemic toxicity. None of the studies reported incidents of local anaesthetic toxicity, nor did they note a difference in wound healing or infection rates, although this was not the focus of these studies. These complications must still be considered in all patients where a continuous wound infusion technique is being used. The only contraindication to its use would be allergy to local anaesthetic. One may postulate a cost benefit conferred by earlier discharge, although this has not been measured directly in any of the above studies. We believe that this technique could significantly improve pain-related outcomes and experience in patients undergoing clamshell thoracotomy following trauma.

Continuous local anaesthetic infusion via wound catheter has been shown to significantly reduce postoperative patient pain scores and decrease length of hospital stay, while sparing opioid use. It is technically simpler and avoids many potentially serious side-effects associated with other regional analgesic techniques. We believe this is the first reported case of its application following clamshell thoracotomy for trauma.

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