

## Post Operative Continuous Wound Analgesia (POCWA) per Countries (1983-2015)

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### Clinical consequences of inadequate pain relief: barriers to optimal pain management.

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#### Abstract

##### SUMMARY:

Uncontrolled postoperative pain may result in significant clinical, psychological, and socioeconomic consequences. Not only does inadequate pain management following surgery result in increased morbidity and mortality but it also may delay recovery, result in unanticipated readmissions, decrease patient satisfaction, and lead to chronic persistent postsurgical pain. Pain is multifactorial in nature, and understanding both the complexity of pain and its side effects is imperative to achieving a successful surgical outcome. In this section, we review the consequences of pain as they pertain to plastic surgery with a focus on the impact of pain on the surgical stress response and risk of wound infections and the effect of improved pain control on flap surgery. Uncontrolled acute postoperative pain may lead to chronic persistent postsurgical pain, which has a high incidence in patients undergoing breast cancer surgery. To achieve optimal postoperative analgesia, one must recognize the barriers to effective pain management, including both physician/nursing-related barriers and patient-related barriers, as well as the increasingly common appearance of opioid-tolerant patients.

[J Pediatr Urol.](#) 2015 Apr;11(2):72.e1-5. doi: 10.1016/j.jpuro.2014.10.011. Epub 2015 Mar 7.

### Continuous local anesthetic infusion for children with spina bifida undergoing major reconstruction of the lower urinary tract.

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#### Abstract

##### OBJECTIVE:

While many options for postoperative analgesia are available to the general patient population, choices are limited for individuals with spinal dysraphism. We hypothesized that the use of continuous local anesthetic infusion following major reconstruction of the lower urinary tract in children with spina bifida would significantly decrease need for opiate use, while maintaining adequate pain control.

#### **MATERIALS AND METHODS:**

Children with spina bifida who underwent major reconstruction of the lower urinary tract at Children's Hospital Colorado were identified from January, 2003 through January, 2013 were identified. In addition to enterocystoplasty, procedures included Mitrofanoff or Monti creation, bladder neck reconstruction, and Malone antegrade continence enema. Patients who had local anesthetic infusion catheters placed in the incision were compared to patients without catheters. Opioid consumption was calculated by conversion of any opiates into IV morphine (mg/kg) on postoperative days (POD) 0-3. Pain was assessed by mean and maximum FLACC scores on POD 0-2. Use of antiemetic medications and wound related complications were recorded as secondary metrics. Patients with other etiologies for neurogenic bladder and bowel were excluded. Patients whose pain was assessed by other assessment scales were excluded. Chi-squared analysis was used for nominal variables, students t-test was used for analysis of continuous variables. P values <0.05 were considered significant.

#### **RESULTS:**

36 myelomeningocele patients who underwent primary enterocystoplasty met the inclusion criteria. All surgeries were open procedures. 24 patients in the infusion catheter group were compared to 12 patients who received primary analgesia by PCA or IV narcotics. There were no significant differences in age, sex, weight or spinal defect level between the two groups. Opioid use, as defined by IV morphine equivalents, was significantly less in the wound soaker group on all PODs. The total opioid use after POD #0-3 was 0.55 mg/kg in the wound soaker group vs 1.66 mg/kg in the IV/PCA group ( $p = 0.03$ ). FLACC scores were uniformly lower in the wound soaker group, but were not significantly different. There was a significant decrease in need for postoperative antiemetic use in the wound soaker group (36.5% vs 83.3%,  $p = 0.014$ ). Complications and hospital stay were similar between both groups.

#### **DISCUSSION:**

The advantage of local anesthesia is the reduction of systemic opioids and their subsequent adverse side effects. Our results suggest that in children with spina bifida undergoing major reconstruction of the lower urinary tract narcotic consumption is approximately 1/3 when continuous local anesthetic catheters are placed into the incision. The need for antiemetic medication is also significantly less. While this technique has been validated in a variety of other settings, it may be most beneficial in patients with myelomeningocele or other spinal dysraphism where epidural placement is generally contraindicated and narcotic use may have a particularly deleterious effect on preexisting neurogenic bowel function. The primary limitation of our study is that it is a retrospective review of a limited number of patients. Patients were not randomized and subject to other management differences that could have influenced our results in unknown ways.

#### **CONCLUSIONS:**

Continuous local anesthetic catheters are a simple, effective alternative strategy to provide postoperative analgesia while reducing systemic opiate use and associated adverse effects.

[Colorectal Dis.](#) 2015 Apr;17(4):342-50. doi: 10.1111/codi.12893.

## **Postoperative analgesia with continuous wound infusion of local anaesthesia vs saline: a double-blind randomized, controlled trial in colorectal surgery.**

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#### **Abstract**

##### **AIM:**

The aim of this prospective double-blind randomized clinical trial was to determine whether preperitoneal continuous wound infusion (CWI) of the local anaesthetic ropivacaine after either laparotomy or video-assisted laparoscopy for colorectal surgery would reduce patient consumption of morphine.

##### **METHOD:**

Patients scheduled for colorectal surgery randomly received a 48-h preperitoneal CWI of either 0.38% ropivacaine or 0.9% saline at rates of 5 ml/h after laparotomy or 2 ml/h after laparoscopy. The primary end-point was total morphine consumption in surgery and afterwards through a patient-controlled analgesia device. Results in the laparotomy and laparoscopy subgroups were also compared.

##### **RESULTS:**

Sixty-seven patients were included, 33 in the ropivacaine CWI group and 34 in the saline group. Median [interquartile range (IQR)] morphine consumption was lower in the ropivacaine group [23.5 mg (11.25-42.75)] than in the saline group [52 mg (24.5-64)] ( $P = 0.010$ ). Morphine consumption was also lower in the laparotomy subgroup receiving ropivacaine [21.5 (15.6-34.7)] than in the saline group [52.5 (22.5-65) ml] ( $P = 0.041$ ). Consumption was statistically similar in laparoscopy patients on ropivacaine or saline. No side effects were observed. Sixteen patients had a surgical wound infection (23.9%); 11 (16.4%) presented wound infection and five (7.5%) organ space infection. Forty-six catheter cultures were obtained; 10 (21.7%) were positive, assessed to be due to contamination.

##### **CONCLUSION:**

Preperitoneal CWI of ropivacaine is a good, safe addition to a multimodal analgesia regimen for colorectal surgery. CWI can reduce morphine consumption without increasing adverse effects.

[Eur J Cardiothorac Surg.](#) 2015 Mar 11. pii: ezv097. [Epub ahead of print]

## Efficacy of wound analgesia for controlling post-thoracotomy pain: a randomized double-blind study†.

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### Abstract

#### OBJECTIVES:

Continuous wound infusion of local anaesthetics has been successfully applied for postoperative pain control in several procedures but, surprisingly, it is underused in thoracic surgery. We aimed to investigate the effects of wound analgesia associated with systemic patient-controlled analgesia in patients undergoing lung cancer resection with muscle-sparing thoracotomy.

#### METHODS:

Sixty consecutive patients undergoing lung cancer resection via standard muscle-sparing thoracotomy were randomized into two groups (wound analgesia and placebo groups). Bupivacaine in the wound group and free-saline solution in the placebo group were injected using a multiholed catheter connected to an elastomeric pump inserted at the end of operation between the pericostal sutures and the serratus muscle and removed 48 h after. The inter-group differences were assessed by the following criteria: (i) level of cytokines [IL-6, IL-10 and tumour necrosis factor-alpha (TNF-alpha)]; (ii) pain on a visual analogue scale at rest and after coughing; (iii) recovery of respiratory functions (flow expiratory volume in 1 s % and forced vital capacity %) and (iv) narcotic medication consumption at different time points of the postoperative course.

#### RESULTS:

Five out of a total of 60 patients were excluded from the final analysis. Thus, the wound and placebo groups comprised 27 and 28 patients, respectively. The wound group compared with the placebo group had a significant decrease of IL-6 ( $P < 0.001$ ), IL-10 ( $P < 0.001$ ) and TNF-alpha ( $P < 0.001$ ) blood concentration levels, pain scores at rest ( $P < 0.001$ ) and after coughing ( $P = 0.01$ ), and a reduction of additional morphine intake ( $P = 0.03$ ) and Ketorolac ( $P = 0.01$ ) during the entire postoperative course. The recovery of the flow expiratory volume in one second % ( $P = 0.01$ ) and the forced vital capacity % ( $P = 0.02$ ) was also better in the wound than in the placebo group.

#### CONCLUSIONS:

Our data prove that wound analgesia is an effective, easy and safe procedure. It significantly reduces systemic inflammatory markers, pain scores and opioid intake; and accelerates the recovery of respiratory function. Catheter placement does not require particular manoeuvres by the surgeon nor does the elastomeric pump need any adjustment or care by physicians or nurses.

[BMC Anesthesiol.](#) 2014 Dec 15;14:121. doi: 10.1186/1471-2253-14-121. eCollection 2014.

## Transversus abdominis-plane block versus local anesthetic wound infiltration in lower abdominal surgery: a systematic review and meta-analysis of randomized controlled trials.

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## Abstract

### BACKGROUND:

Postoperative pain management is of great importance in perioperative anesthetic care. Transversus abdominis plane (TAP) block has been described as an effective technique to reduce postoperative pain and morphine consumption after open lower abdominal operations. Meanwhile, local anesthetic infiltration (LAI) is also commonly used as a traditional method. However, the effectiveness of these two methods has not been compared before.

### METHODS:

A meta-analysis of all relevant randomized controlled trials (RCTs) was conducted to compare the efficacy of single shot TAP block with that of single shot LAI for postoperative analgesia in adults. Major medical databases and trial registries were searched for published and unpublished RCTs. The endpoints include postoperative visual analog scale (VAS) pain score, morphine requirement, and rate of postoperative nausea and vomiting (PONV). For continuous data, weighted mean differences (WMDs) were formulated; for dichotomous data, risk ratios (RR) were calculated. Results were derived using a random-/fixed-effects model with 95% confidence interval (CI).

### RESULTS:

Four RCTs, encompassing 96 TAP-block and 100 LAI patients, were included in the final analysis. Patients in the TAP-block group had lower VAS pain scores 24 hours postoperatively compared with the LAI group, both at rest (WMD [95% CI] = -0.67 [p < 0.01] and with movement (WMD = -0.89, p < 0.01). There were no significant between-group differences in 24-hour postoperative morphine requirements, the rates of PONV or VAS pain scores at 2 and 4 h postoperatively.

### CONCLUSION:

TAP block and LAI provide comparable short-term postoperative analgesia, but TAP block has better long-lasting effect.

[Ann Card Anaesth.](#) 2015 Jan-Mar;18(1):15-20. doi: 10.4103/0971-9784.148314.

## The analgesic efficacy of continuous presternal bupivacaine infusion through a single catheter after cardiac surgery.

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## Abstract

### BACKGROUND:

Median sternotomy, sternal spreading, and sternal wiring are the main causes of pain during the early recovery phase following cardiac surgery.

### AIM:

This study was designed to evaluate the analgesic efficacy of continuous presternal bupivacaine infusion through a single catheter after parasternal block following cardiac surgery.

### MATERIALS AND METHODS:

The total of 40 patients (American Society of Anesthesiologist status II, III), 45-60 years old, undergoing coronary-artery bypass grafting were enrolled in this prospective, randomized, double-blind study. A presternal catheter was inserted with continuous infusion of 5 mL/h bupivacaine 0.25% (Group B) or normal saline (Group C) during the first 48 postoperative hrs. Primary outcomes were postoperative morphine requirements and pain scores, secondary outcomes were extubation time, postoperative respiratory parameters, incidence of wound infection, Intensive Care Unit (ICU) and hospital stay duration, and bupivacaine level in blood.

### STATISTICAL METHODS:

Student's t-test was used to analyze the parametric data and Chi-square test for categorical variables.

### RESULTS:

During the postoperative 48 h, there was marked reduction in morphine requirements in Group B compared to Group C, (8.6 ± 0.94 mg vs. 18.83 ± 3.4 mg respectively, P = 0.2), lower postoperative pain scores, shorter extubation time (117 ± 10 min vs. 195 ± 19 min, respectively, P = 0.03), better respiratory parameters (PaO<sub>2</sub> /FiO<sub>2</sub>, PaCO<sub>2</sub> and pH), with no incidence of wound infection, no differences in ICU or hospital stay duration. The plasma concentration of bupivacaine remained below the toxic threshold (at T24, 1.2 ug/ml ± 0.3 and T48 h 1.7 ± 0.3 ug/ml).

### CONCLUSION:

Continuous presternal bupivacaine infusion has resulted in better postoperative analgesia, reduction in morphine requirements, shorter time to extubation, and better postoperative respiratory parameters than the control group.

[Plast Reconstr Surg](#). 2014 Dec;134(6):862e-70e. doi: 10.1097/PRS.0000000000000762.

## Postoperative analgesia by infusion of local anesthetic into the surgical wound after modified radical mastectomy: a randomized clinical trial.

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### Abstract

#### BACKGROUND:

There is no consensus on the efficacy of postoperative infusion of local anesthetics after radical mastectomy.

#### METHODS:

A randomized, double-blind, placebo-controlled, parallel-groups clinical trial was conducted in a tertiary hospital. Eighty consecutive women with operable breast cancer with indications for modified radical mastectomy without breast reconstruction were assigned randomly to receive infusion of levobupivacaine (0.5%) or saline at 2 ml/hour for 48 hours through a wound catheter. Seventy-three women finished the study (intervention group, n = 34; control group, n = 39). During surgery, all patients received 0.25% levobupivacaine (30 ml).

#### RESULTS:

The levobupivacaine group reported less pain ( $p < 0.001$ ) than controls in the postanesthesia care unit ( $1.6 \pm 1.3$  versus  $6.7 \pm 1.8$ ) and on the ward at 24 ( $0.8 \pm 0.9$  versus  $4.2 \pm 1.9$ ) and 48 ( $0.4 \pm 0.7$  versus  $3.3 \pm 2.3$ ) hours. In the postanesthesia care unit, the levobupivacaine group consumed less metamizole ( $0.4 \pm 0.5$  versus  $0.8 \pm 0.4$ ;  $p < 0.001$ ) and dextetoprofen ( $0.1 \pm 0.3$  versus  $0.7 \pm 0.4$ ;  $p < 0.001$ ), with differences in paracetamol use being insignificant ( $0.8 \pm 0.4$  versus  $0.9 \pm 0.3$ ;  $p = 0.140$ ). On the ward, the levobupivacaine group used significantly less paracetamol ( $0.5 \pm 0.7$  versus  $2.0 \pm 2.0$ ;  $p < 0.001$ ) and metamizole ( $0.2 \pm 0.4$  versus  $1.2 \pm 1.4$ ;  $p < 0.001$ ), but differences in dextetoprofen were not significant ( $0.03 \pm 0.2$  versus  $0.2 \pm 0.6$ ;  $p = 0.074$ ). In the postanesthesia care unit, the levobupivacaine and control groups consumed  $0 \pm 0$  and  $0.7 \pm 1.2$  doses of opioids ( $p = 0.001$ ), respectively. The authors observed no differences in nausea and vomiting at any stage in the postanesthesia care unit ( $0.2 \pm 0.4$  versus  $0.4 \pm 0.5$ ;  $p = 0.081$ ) or on the ward ( $0.3 \pm 0.5$  versus  $0.4 \pm 0.5$ ;  $p = 0.563$ ). All participants reported high levels of satisfaction.

#### CONCLUSION:

Continuous infusion of local anesthetic reduces pain and analgesic consumption, with high satisfaction, but does not affect rates of nausea and vomiting.

[J Vet Med Sci](#). 2014 Dec;76(12):1595-601. doi: 10.1292/jvms.14-0112. Epub 2014 Sep 20.

## Effects of surgical wound infiltration with bupivacaine on postoperative analgesia in cats undergoing bilateral mastectomy.

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### Abstract

The analgesic effect of wound infiltration with bupivacaine was evaluated in cats undergoing bilateral mastectomy. Twenty-one female cats with mammary gland tumors were anesthetized with propofol and oxygen-isoflurane anesthesia following premedication with atropine. In the trial group (Group I; n=11), 30 ml of saline containing 2 mg/kg of bupivacaine was infiltrated topically into the surgical wound right after removal of the mammary glands, whereas only saline solution was infiltrated in the control group (Group II; n=10). At the same time, carprofen (4 mg/kg) was also administered subcutaneously in both groups. Behavioral signs of pain were monitored during the recovery period after general anesthesia. In order to examine the behavioral changes associated with acute pain, a questionnaire was prepared and given to the owners to be completed 4 hr and then 10 hr after the operation. According to the owners' answers to the questionnaire, a pain score was specified using a "numerical rating scale" for each cat. Although some cats showed mild to moderate pain, the pain score recorded at 4 hr after the operation was significantly lower in Group I ( $P < 0.001$ ). No significant difference was found at 10 hr after the operation between the groups. The incidence of vocalization, aggression and convulsion within 2 hr after the operation was also lower in Group I. In conclusion, wound infiltration with bupivacaine before incisional closure provided reliable analgesia at least 4 hr after bilateral radical mastectomy in cats.

[Ann Plast Surg.](#) 2014 Nov;73(5):598-601. doi: 10.1097/SAP.0b013e318276d8e7.

## Antimicrobial effect of continuous lidocaine infusion in a Staphylococcus aureus-induced wound infection in a mouse model.

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### Abstract

Continuous infusion of local anesthetics in surgical wounds has been shown to be an effective technique for postoperative analgesia. To investigate the potential antimicrobial effect of continuous local anesthetic infusion, we adapted a mouse model of surgical wound infection to examine effects on antibacterial response. Forty male BALB/c mice were randomized into 2 groups. An incision wound was made over the dorsal flank and instilled with Staphylococcus aureus. An osmotic pump was then implanted to deliver either 0.9% NaCl or 2% lidocaine continuously. Each wound was cultured postoperatively at 2 days, and the colony count of S. aureus was determined. Results showed that the number of colony-forming units of S. aureus measured in wounds treated with lidocaine displayed a nearly 10-fold reduction compared to the wounds in the saline group (P=0.009). The demonstrated antibacterial activity indicates that local anesthetic infusion may play a role in prophylaxis for surgical wound infections.

[Chirurg.](#) 2011 Oct;82(10):906-12. doi: 10.1007/s00104-011-2160-2.

## [Continuous local wound infusion with local anesthetics : For thoracotomy and major abdominal interventions].

[Article in German]

[Mann V<sup>1</sup>](#), [Mann S](#), [Hecker A](#), [Röhrig R](#), [Müller M](#), [Schwandner T](#), [Hirschburger M](#), [Sprengel A](#), [Weigand MA](#), [Padberg W](#).

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### Abstract

Wound infusion with local anesthetics is a nearly 100 years old proven and secure analgesic method. Recently special wound infusion catheters have become available which can be placed intraoperatively into the wound under direct supervision of the surgeon to infuse local anesthetics and optimize postoperative analgesia. For thoracotomy this method was modified to improve its efficacy and the catheters are used to establish a continuous paravertebral intercostal nerve block (PVB). Many studies have confirmed the analgesic power of PVB which results in a pain reduction comparable to thoracic epidural analgesia (TEA) but without TEA-specific side-effects, in particular hypotension. The efficacy of continuous localwound infusion (CLWI) is less obvious for laparotomy. If fundamental preconditions for this loco-regional method are considered (indications, choice of catheter, local anesthetic dose) the laparotomy wound could also be suitable for the use of CLWI. According to the literature currently available CLWI is not associated with an increased risk of wound infections.

[Pain Med.](#) 2014 Sep;15(9):1603-8. doi: 10.1111/pme.12523. Epub 2014 Aug 4.

## Intermittent epidural vs continuous wound infusion of ropivacaine for acute and chronic pain control after hysterectomy or myomectomy: a randomized controlled trial.

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## Abstract

### OBJECTIVE:

Adequate postoperative analgesia may enhance recovery. The efficacy of continuous wound infusion vs intermittent epidural ropivacaine for postoperative analgesia was investigated.

### DESIGN:

Prospective randomized, observer blind trial.

### SETTING:

Aretaieio University Hospital.

### SUBJECTS:

Patients scheduled for open abdominal hysterectomy or myomectomy.

### METHODS:

Patients received 10 mL of 0.75% ropivacaine along the skin incision before skin closure, followed by wound infusion 2 mL/hour of 0.375% ropivacaine or epidurally 10 mL of 0.75% ropivacaine in the beginning of surgery followed by 10 mL of 0.2% ropivacaine 6 hourly. The epidural injections or the wound infusion of ropivacaine lasted 48 hours. Rescue analgesia consisted of patient-controlled analgesia morphine up to 48 hours and acetaminophen/codeine tablets the next 24 hours. Analgesic consumption and visual analog scale pain at rest and during cough were assessed 2, 4, 8, 24, 48, and 72 hours postoperatively. One and three months later, patients were interviewed by phone for analgesic consumption at home and presence of pain.

### RESULTS:

The subcutaneous group consumed more morphine during the first 2, 4, and 8 hours postoperatively ( $P < 0.001$ ,  $P < 0.001$ , and  $P < 0.001$ , respectively). Subsequent morphine and acetaminophen/codeine requirements did not differ between the two groups. Pain intensity during cough was higher only 2 hours after surgery in the subcutaneous group ( $P = 0.002$ ). Three months postoperatively, the two groups did not differ in the analgesic requirements and presence of persisting and/or burning pain.

### CONCLUSION:

Based on our results, there is no clinical significant difference between the epidural ropivacaine and the subcutaneous ropivacaine group or a clear superiority to one management strategy.

[Hippokratia](#). 2014 Jan;18(1):28-31.

## Comparison of analgesic efficiency between wound site infiltration and ultra-sound-guided transversus abdominis plane block after cesarean delivery under spinal anaesthesia.

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## Abstract

### BACKGROUND:

[corrected] Local anesthetic infiltration applied on the wound site or abdominal wall may be used for relieving postoperative pain after delivery by caesarean section. The aim of this study was to compare the analgesic efficiency of ultrasound (USG)-guided transversus abdominis plane (TAP) block with local anesthetic infiltration on a wound site.

### METHODS:

This study was designed as a prospective randomized trial, and consisted of 70 pregnant women of American Society of Anesthesiologists (ASA) class I-II. Patients were randomized into Group I (wound site infiltration, n=35) and Group T (TAP block, n=35). Spinal anaesthesia was administered to all patients. In Group I, wound site infiltration was applied by the surgical team. In Group T, a USG-guided bilateral TAP block was applied. Patients' numeric pain scale (NPS) levels at 2, 6, 12 and 24(th) hours, after the operation (NPS0) and during mobilization were assessed. Postoperative complications, time to first analgesic request and patient satisfaction were recorded.

### RESULTS:

The NPS0 values of Group T were found to higher and time to first analgesic request longer than those of Group I. The NPS values of Group I at 2, 6, 12, and 24(th) hours were found to be statistically significantly higher than those of Group T.

### CONCLUSIONS:

According to our results, USG-guided TAP block might be superior to infiltration anaesthesia for postoperative pain management of patients who have had caesarean section and it provided longer-lasting and more efficient analgesia.

[Eur Surg Res](#). 2014;53(1-4):43-60. doi: 10.1159/000363233. Epub 2014 Jul 23.

# Ropivacaine for continuous wound infusion for postoperative pain management: a systematic review and meta-analysis of randomized controlled trials.

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## Abstract

### BACKGROUND:

The use of continuous wound infusion (CWI) of local anaesthetics has been suggested as a safe and effective alternative technique to epidural anaesthesia/analgesia that allows surgeons to provide postoperative pain relief while reducing opioid consumption and associated adverse events. A previous meta-analysis by Liu et al. [Am Coll Surg 2006;203:914-932] reported results mainly from studies of bupivacaine. Subsequently, several new randomized controlled trials (RCTs) of ropivacaine have been published. This systematic review and quantitative meta-analysis evaluates the efficacy of ropivacaine for CWI.

### METHODS:

Systematic literature searches (EMBASE, MEDLINE) were performed to retrieve studies which met the following criteria: double-blind RCT of ropivacaine versus either placebo or an active comparator; use of ropivacaine solution without added active agents, and prohibition of other routine analgesics during the study period except rescue patient-controlled analgesia. For each included study, standardized effect sizes for ropivacaine versus placebo were calculated for opioid rescue use, pain score at rest, and pain score at mobilization. Meta-analyses were conducted for each endpoint.

### RESULTS:

Fourteen RCTs comparing ropivacaine (n = 376) versus placebo (n = 380) were identified. Effect size estimates revealed significantly less opioid rescue use for ropivacaine patients (-1.3; 95% CI -1.5 to -1.1) and significantly less pain for ropivacaine patients both at rest (-1.1; 95% CI -1.3 to -0.9) and on mobilization (-1.5; 95% CI -1.7 to -1.3). The weighted mean reduction in opioid rescue use was 22.4 mg.

### CONCLUSION:

This systematic review and meta-analysis presents substantial evidence that ropivacaine provides clinically meaningful reductions in opioid use and pain outcomes. Ropivacaine CWI is effective for postoperative pain management in a wide range of surgical procedures.

[Minerva Anesthesiol.](#) 2015 May;81(5):541-56. Epub 2014 Jun 11.

# Effect of analgesic modality on outcome following open liver surgery: a systematic review of postoperative analgesia.

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## Abstract

Postoperative analgesia following liver resection remains controversial. The traditional standard of care of thoracic epidural is increasingly questioned due to perceived associated complications and delays to recovery. Evidence supporting alternative analgesic techniques is emerging however best practice is not yet established. This review aimed to evaluate the literature to assess the optimum analgesic technique following liver resection. A systematic review was conducted of trials evaluating analgesic methods in open liver surgery. Primary outcome was the postoperative complication rate. Secondary outcomes were length of stay and pain scores. Fourteen trials matching the inclusion criteria were analysed. No difference was observed in systemic complication rates between analgesic modalities. Epidural was associated with prolonged length of stay when compared with continuous wound infiltration and intrathecal morphine. Epidural offered equivalent or superior pain scores when compared to alternative techniques. In summary current evidence suggests alternative analgesic modalities may provide favorable recovery outcomes following liver surgery but consistent evidence is limited. Epidurals provide superior pain relief to alternatives but this does not translate into reduced length of stay or complication rate following liver surgery.

[Zhonghua Liu Xing Bing Xue Za Zhi.](#) 2013 Nov;34(11):1125-7.



# [Study on the effectiveness of continuous local infiltration analgesia and related short-term prognosis after laparotomy].

[Article in Chinese]

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## Abstract

### OBJECTIVE:

To evaluate the effectiveness of incisional infusion through local anesthetics under a continuous-infusion elastomeric pump for the management of postoperative pain after laparotomy, on reducing the amount of opioids being used after surgery.

### METHODS:

We performed a retrospective comparative analysis on 285 patients who had undergone laparotomies between January 2012 and September 2012. Among those patients, 144 took a continuous-infusion elastomeric pump to receive local anesthetic (LA) at the incisional area for postoperative pain management while another 141 patients took 'patient-controlled' intravenous analgesia (PCA). Data were reviewed on items as: visual analog pain scores (VAS) during both resting and active situation, mean opioid use, bowel function, condition of incision and complications etc.

### RESULTS:

Both groups showed similar VAS scores for the first 48 hours post-operation. However, in the LA group, VAS scores appeared significantly higher within the first 72 hours ( $P < 0.001$ ), with less opioid use ( $P < 0.01$ ), less symptoms as postoperative nausea or vomiting ( $P < 0.001$ ), with earlier recovery of bowel function ( $P < 0.01$ ) etc. when compared to the PCA group. No significant difference found on the incidence rates of wound infection other than, a higher rate of incisional drainage ( $P < 0.001$ ) was seen in the LA group.

### CONCLUSION:

Continuous infusion of local anesthetic under an elastomeric infusion pump post the laparotomy, a similar analgesic effect could be seen on those patient-controlled intravenous analgesia within the first 48 hours, it could also reduce opioid consumption and postoperative symptoms as nausea or vomiting, which all appeared to be associated with the earlier recovery of bowel function.

[Masui](#). 2013 Dec;62(12):1461-5.

# [Case of Leriche's syndrome treated with safe and effective analgesia after laparotomy by transversus abdominis plane block, rectus sheath block, and continuous wound infusion with ropivacaine].

[Article in Japanese]

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## Abstract

Ultrasound-guided peripheral nerve blocks in the abdominal wall, such as transversus abdominis plane block (TAP block) and rectus sheath block, are now widely used. We report a case of Leriche's syndrome treated with safe and effective analgesia after laparotomy by abdominal wall block and continuous infusion. A 61-year-old man diagnosed with Leriche's syndrome underwent Y-graft replacement for an abdominal aortic aneurysm. Preoperative enhanced and 3-dimensional CTs showed many collateral arterial systems, especially in the right abdominal wall. It was suggested that the right internal iliac artery had been completely occluded, and the left one showed severe stenosis. After the induction of general anesthesia, we recognized collateral arteries through an ultrasound view as on preoperative CTs. We lowered the pulse repetition frequency more than usual in order not to injure them. We injected 0.1875% ropivacaine 60 ml as TAP block, and 20 ml as rectus sheath block. When the wound was closed, a catheter was passed through an 18-gauge Tuohy needle placed above the fascia along the supraumbilical site. After the operation, 0.2% ropivacaine was continuously delivered at a rate of 6 ml hr<sup>-1</sup> through the catheter. We could provide the patient with effective analgesia after surgery.

[Int J Gynaecol Obstet.](#) 2014 Mar;124(3):212-5. doi: 10.1016/j.ijgo.2013.08.019. Epub 2013 Nov 23.

## Efficacy of continuous wound infiltration of local anesthetic for pain relief after gynecologic laparoscopy.

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### Abstract

#### OBJECTIVE:

To assess the efficacy of analgesia provided by continuous ropivacaine wound infiltration after gynecologic laparoscopy.

#### METHODS:

Sixty patients who underwent gynecologic laparoscopy at Ajou University School of Medicine, Suwon, Republic of Korea, between March and May 2012 were randomized to receive either intravenous fentanyl and ketorolac infusion on demand by patient-controlled analgesia (IV PCA group, n=31) or continuous wound infiltration of local ropivacaine (CWI group, n=29). Postoperative pain and postoperative nausea and vomiting (PONV) were assessed via a visual analog scale. The number of patients who requested rescue analgesia was recorded.

#### RESULTS:

There was no significant difference in postoperative pain between the 2 groups, but more patients requested rescue analgesia in the CWI group than in the IV PCA group in 24 hours (18 versus 9 patients, respectively; P=0.010). The PONV scores at 12 and 24 hours were, respectively, 0.28 and 0.27 in the CWI group, and 0.71 and 0.73 in the IV PCA group (P=0.004). Nine patients requested cessation of IV PCA because of severe nausea or vomiting.

#### CONCLUSION:

Continuous ropivacaine wound infiltration was found to be as effective as patient-controlled analgesia for postoperative pain relief after gynecologic laparoscopy. This technique provides good analgesia with less opioid analgesic requirement and few adverse effects.

[Ann Vasc Surg.](#) 2014 May;28(4):837-44. doi: 10.1016/j.avsg.2013.11.019. Epub 2014 Jan 20.

## Paraincisional subcutaneous infusion of ropivacaine after open abdominal vascular surgery shows significant advantages.

[Chaykovska L](#)<sup>1</sup>, [Blohmé L](#)<sup>2</sup>, [Mayer D](#)<sup>3</sup>, [Gloekler S](#)<sup>4</sup>, [Rancic Z](#)<sup>3</sup>, [Schmidt CA](#)<sup>3</sup>, [Tunesi R](#)<sup>3</sup>, [Veith F](#)<sup>5</sup>, [Lachat M](#)<sup>3</sup>, [Bettex D](#)<sup>6</sup>.

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### Abstract

#### BACKGROUND:

Opiates are widely used for postoperative pain relief. Unfortunately, their side effects such as inhibited gastrointestinal motility and respiratory depression may compromise or delay postoperative recovery after laparotomy. We used paraincisional subcutaneous catheters (PSCs) and applied 0.25% ropivacaine infusion to improve pain relief and decrease postoperative morphine consumption in patients after open surgery for aortic aneurysm.

#### METHODS:

A retrospective single-center study including 58 patients treated by open surgery for aortic aneurysm between October 2006 and June 2012. Overall, 28 patients (control group) received standard postoperative pain management including opiates, and 30 patients (PSC group) were treated with paraincisional continuous local analgesia with 0.25% ropivacaine administered via bilateral subcutaneous catheters along with additional ad libitum opiates administration, at first intravenously and then orally.

#### RESULTS:

Patients characteristics as well as perioperative and postoperative outcomes were comparable between the groups during the first 5 days after surgery. Patients of the PSC group received significantly less morphine, although the patients in both groups reported a similar pain intensity. Neither wound-healing disorder nor catheter-associated subcutaneous infection was reported. High serum concentration of ropivacaine was detected in 2 patients (6%) with end-stage renal disease, who developed temporary neurologic symptoms. Length of intensive care unit (ICU) stay was significantly shorter in the PSC group (2 [0-23] vs. 4.5 [0-32] ICU days).

#### CONCLUSIONS:

This is the first report about PSCs for analgesia after laparotomy. This case/control study shows that continuous paraincisional subcutaneous infusion of 0.25% ropivacaine after open surgery for aortic aneurysm repair is a feasible method of postoperative analgesia. This technique allows sustained pain relief with significant reduction of opiate requirement and faster recovery after surgery. Prospective randomized controlled trial is necessary for the assessment of safety and efficacy of this method.

[Obstet Gynecol Sci.](#) 2013 Mar;56(2):93-101. doi: 10.5468/OGS.2013.56.2.93. Epub 2013 Mar 12.

## The ON-Q pain management system in elective gynecology oncologic surgery: Management of postoperativesurgical site pain compared to intravenous patient-controlled analgesia.

[Chung D<sup>1</sup>](#), [Lee YJ](#), [Jo MH](#), [Park HJ](#), [Lim GW](#), [Cho H](#), [Nam EJ](#), [Kim SW](#), [Kim JH](#), [Kim YT](#), [Kim S.](#)  
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#### Abstract

##### OBJECTIVE:

The goal of this study was to compare postoperative surgical site pain in gynecologic cancer patients who underwent elective extended lower midline laparotomy and managed their pain with either the ON-Q pain management system (surgical incision site pain relief system, ON-Q pump) or an intravenous patient-controlled analgesia pump (IV PCA).

##### METHODS:

Twenty gynecologic cancer patients who underwent elective extended lower midline laparotomy were divided into two groups. One group received a 72-hour continuous wound perfusion of the local anesthetic ropivacaine (0.5%, study group) into the suprapéritoneal layer of the abdominal incision through the ON-Q pump. The other group received intravenous infusion pump of patient-controlled analgesia (fentanyl citrate 20 mg/mL · kg+ondansetron hydrochloride 16 mg/8 mL+normal saline). Postoperative pain was assessed immediately and at 6, 24, 48, 72, and 96 hours after surgery using the visual analogue scale.

##### RESULTS:

Postoperative surgical site pain scores at 24, 48, and 72 hours after surgery were lower in the ON-Q group than the IV PCA group. Pain scores at 24 hours and 48 hours after surgery were significantly different between the two groups ( $P=0.023$ ,  $P<0.001$ ). Overall painkiller administration was higher in the ON-Q group but this difference was not statistically significant (5.1 vs. 4.3,  $P=0.481$ ).

##### CONCLUSION:

This study revealed that the ON-Q pain management system is a more effective approach than IV PCA for acute postoperativesurgical site pain relief after extended lower midline laparotomy in gynecologic cancer patients.

[Minerva Anestesiol.](#) 2014 Jul;80(7):769-78. Epub 2013 Nov 21.

## The effects of subfascial wound versus epidural levobupivacaine infusion on postoperative pain following hysterectomy.

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#### Abstract

##### BACKGROUND:

Local analgesia through wound catheters is used as a part of multimodal analgesia. The efficacy of continuous subfascial woundinfusion compared to epidural analgesia is unknown for abdominal hysterectomy and bilateral salpingo-oophorectomy (TAH-BSO) via Pfannenstiel

incision. The aim of this study was to compare the aforementioned two methods in this type of surgery for postoperative morphine consumption, acute and persistent postsurgical pain.

**METHODS:**

Fifty patients enrolled in the study were randomly allocated to receive continuous 10 mL/h levobupivacaine either via subfascial (Group S) or epidural (Group E) catheter for 48 h postoperatively. In Group S 0.25% levobupivacaine was used for the first six hours and 0.125% thereafter, whereas Group E received 0.125% levobupivacaine throughout the study period. Cumulative morphine consumption, static and dynamic pain, gastrointestinal recovery, ambulation, patient satisfaction, hospital stay, as well as pain at 2nd and 6th months were evaluated.

**RESULTS:**

Group S was superior to Group E regarding cumulative morphine consumption (16.8±7.2 mg and 28.7±10.3 mg respectively, P<0.001; mean difference -11.9 with 95% CI of the difference -17.1 to -6.7) and pain relief. Patient satisfaction was higher in Group S compared to Group E (P=0.006). Less postoperative vomiting was observed in Group S. No difference was detected in length of hospital stay and persistent postsurgical pain incidence.

**CONCLUSION:**

Wound analgesia via subfascial catheter with continuous levobupivacaine infusion decreases postoperative morphine consumption and increases patient satisfaction compared to epidural analgesia with no difference in persistent postsurgical pain following TAH-BSO via Pfannenstiel incision.

[Anesth Essays Res.](#) 2013 Sep-Dec;7(3):336-40. doi: 10.4103/0259-1162.123227.

## Effect of wound infiltration with bupivacaine or lower dose bupivacaine/magnesium versus placebo for postoperative analgesia after cesarean section.

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**Abstract**

**AIM:**

The authors examined the analgesic effect of wound infiltration with bupivacaine or lower dose bupivacaine and magnesium versus normal saline for postoperative analgesia after cesarean section.

**MATERIALS AND METHODS:**

A total of 120 patients, American Society of Anesthesiologists (ASA) I-II were prepared for elective cesarean section. At the end of the surgery, the wound was continuously infiltrated at a rate of 5 ml/h for 24 h post-operatively by one of the following solutions: 0.25% bupivacaine, a mixture of 0.125% bupivacaine and 5% magnesium sulphate or normal saline (0.9%). Total opioid consumption, Visual Analogue Scale (VAS) at rest and movement, incidence of opioid side-effects and signs of wound inflammation were assessed during the period of the study (24 h post-operatively). Three months later, residual pain, surgical wound infection, need for extra-antibiotic therapy and woundhealing impairment were assessed.

**RESULTS:**

Post-operative pain scores at rest were statistically significant higher in the control group than those in the both wound infiltration groups from 4(th) h and onwards (P < 0.0001). Meanwhile, post-operative pain was higher in bupivacaine group versus magnesium group (P < 0.0001, P < 0.0001, 0.0012, respectively). There was statistically significant increase in VAS during movement in the control group versus others at 2, 4, 12, 24 h post-operatively (P < 0.0001). However, patients received magnesium plus bupivacaine wound infiltration showed a significant decrease in post-operative pain scores than whom received bupivacaine from 4(th) h and onward (P < 0.0001, 0.0054, 0.0001, respectively). Morphine consumption was significantly reduced in the magnesium group, (P < 0.0001). Incidence of residual pain was comparable in the three groups. The incidence of sedation and urine retention were noted to be significantly higher in the control group in comparison to other groups, (P < 0.0001). The incidence of post-operative nausea and vomiting was reduced in patients received magnesium plus bupivacaine block versus others (P < 0.0001).

**CONCLUSION:**

Continuous wound infiltration with a mixture of bupivacaine and magnesium sulphate after cesarean section showed an effective analgesia and reduced post-operative Patient Controlled Analgesia (PCA) requirements as compared to continuous wound infiltration with local anesthetic only or placebo with fewer incidences of opioid adverse effects.

[Pain Pract.](#) 2014 Jun;14(5):477-87. doi: 10.1111/papr.12108. Epub 2013 Aug 15.

## Recent management advances in acute postoperative pain.

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### Abstract

#### INTRODUCTION:

Acute postoperative pain remains a major problem, with both undertreatment and overtreatment leading to serious consequences, including increased risk of persistent postoperative pain, impaired rehabilitation, increased length of stay and/or hospital readmission, and adverse events related to excessive analgesic use, such as oversedation. New analgesic medications and techniques have been introduced that target the preoperative, intraoperative, and postoperative periods to better manage acute postoperative pain, with improvements in analgesic efficacy and safety over more traditional pain management approaches. This review provides an overview of these new analgesic medications and techniques. Specific topics that are discussed include the use of preoperative nonsteroidal anti-inflammatory drugs, anxiolytics, and anticonvulsants; intraoperative approaches such as neuraxial analgesia, continuous local anesthetic wound infusion, transversus abdominis plane block, extended-release epidural morphine, intravenous acetaminophen, and intravenous ketamine; and postoperative use of intravenous ibuprofen, new opioids (eg, tapentadol) or opioid formulations (morphine-oxycodone), and patient-controlled analgesia.

#### CONCLUSION:

New, targeted, analgesic medications and techniques may provide a safer and more effective approach to the management of acute postoperative pain than traditional approaches such as postoperative oral analgesics.

[Paediatr Anaesth.](#) 2013 Oct;23(10):959-61. doi: 10.1111/pan.12240. Epub 2013 Aug 9.

## Continuous postoperative analgesia via quadratus lumborum block - an alternative to transversus abdominis plane block.

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### Abstract

Different transversus abdominis plane blocks techniques cause variations in postoperative analgesia characteristics. We report the use of unilateral quadratus lumborum catheter for analgesia following colostomy closure. The catheter was placed under direct ultrasound visualization and had good outcomes: low pain scores and minimal use of rescue analgesic medication. No complications were reported in this pediatric patient. More studies are needed to evaluate the effectiveness and safety of this regional anesthesia technique.

[Radiol Oncol.](#) 2013 May 21;47(2):145-53. doi: 10.2478/raon-2013-0018. Print 2013 Jun.

## Comparison of continuous local anaesthetic and systemic pain treatment after axillary lymphadenectomy in breast carcinoma patients - a prospective randomized study.

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### Abstract

#### BACKGROUND:

Acute pain after axillary lymphadenectomy is often related mainly to axillary surgery. The aim of the prospective randomized study was to find out if continuous wound infusion of local anaesthetic reduces postoperative pain, consumption of opioids and the incidence of chronic pain compared to the standard intravenous piritramide analgesia after axillary lymphadenectomy in breast carcinoma patients.

**METHODS:**

Altogether 60 patients were enrolled in the prospective randomized study; half in wound infusion of local anaesthetic and half in the standard (piritramide) group.

**RESULTS:**

In the recovery room and on the first day after surgical procedure, the wound infusion of local anaesthetic group reported less acute and chronic pain, a lower consumption of piritramide and metoclopramide, but their alertness after the surgical procedure was higher compared to the standard group.

**CONCLUSIONS:**

After axillary lymphadenectomy in breast carcinoma patients, wound infusion of local anaesthetic reduces acute pain and enables reduced opioid consumption, resulting in less postoperative sedation and a reduced need for antiemetic drugs. After wound infusion of local anaesthetic there is a statistical trend for reduction of chronic pain.

[Int J Obstet Anesth.](#) 2014 Nov;23(4):302-8. doi: 10.1016/j.ijoa.2014.07.004. Epub 2014 Jul 18.

## Bupivacaine-soaked absorbable gelatin sponges in caesarean section wounds: effect on postoperative pain, analgesic requirement and haemodynamic profile.

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**Abstract****BACKGROUND:**

Pain is a common distressing adverse effect in the early postoperative period following caesarean section. The aim of this study was to investigate the effect on postoperative pain, analgesic requirement and haemodynamic profile of placing a suprafacial bupivacaine-soaked absorbable gelatin sponge in the caesarean section wound.

**METHODS:**

A total of 164 healthy patients scheduled to undergo general anaesthesia for elective caesarean section were randomised to a study group (n=81) or a control group (n=83). In the study group, a bupivacaine-soaked absorbable gelatin sponge was placed subcutaneously in the caesarean section wound. Intramuscular diclofenac 75 mg was given to all patients at 8-h intervals during the first 24h. Postoperatively, visual analogue scale pain scores, requirement for pethidine and diclofenac and changes in blood pressure and heart rate were compared between groups.

**RESULTS:**

Pain scores were lower in the study group compared to the control group at all assessments (P<0.001). During the first eight hours after surgery, fewer patients in the study group required rescue pethidine compared with the control group (4 vs. 33, P<0.001). In the study group, total opioid and diclofenac consumption was lower (P<0.001), and blood pressure and heart rate were lower (P<0.001) compared to the control group.

**CONCLUSION:**

Suprafascial wound placement of a bupivacaine-soaked absorbable gelatin sponge improved postoperative analgesia and decreased opioid consumption following caesarean section.

[Eur Surg Res.](#) 2014;53(1-4):43-60. doi: 10.1159/000363233. Epub 2014 Jul 23.

## Ropivacaine for continuous wound infusion for postoperative pain management: a systematic review and meta-analysis of randomized controlled trials.

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**Abstract**

**BACKGROUND:**

The use of continuous wound infusion (CWI) of local anaesthetics has been suggested as a safe and effective alternative technique to epidural anaesthesia/analgesia that allows surgeons to provide postoperative pain relief while reducing opioid consumption and associated adverse events. A previous meta-analysis by Liu et al. [Am Coll Surg 2006;203:914-932] reported results mainly from studies of bupivacaine. Subsequently, several new randomized controlled trials (RCTs) of ropivacaine have been published. This systematic review and quantitative meta-analysis evaluates the efficacy of ropivacaine for CWI.

**METHODS:**

Systematic literature searches (EMBASE, MEDLINE) were performed to retrieve studies which met the following criteria: double-blind RCT of ropivacaine versus either placebo or an active comparator; use of ropivacaine solution without added active agents, and prohibition of other routine analgesics during the study period except rescue patient-controlled analgesia. For each included study, standardized effect sizes for ropivacaine versus placebo were calculated for opioid rescue use, pain score at rest, and pain score at mobilization. Meta-analyses were conducted for each endpoint.

**RESULTS:**

Fourteen RCTs comparing ropivacaine (n = 376) versus placebo (n = 380) were identified. Effect size estimates revealed significantly less opioid rescue use for ropivacaine patients (-1.3; 95% CI -1.5 to -1.1) and significantly less pain for ropivacaine patients both at rest (-1.1; 95% CI -1.3 to -0.9) and on mobilization (-1.5; 95% CI -1.7 to -1.3). The weighted mean reduction in opioid rescue use was 22.4 mg.

**CONCLUSION:**

This systematic review and meta-analysis presents substantial evidence that ropivacaine provides clinically meaningful reductions in opioid use and pain outcomes. Ropivacaine CWI is effective for postoperative pain management in a wide range of surgical procedures.

[BMC Musculoskelet Disord.](#) 2014 Jul 5;15:220. doi: 10.1186/1471-2474-15-220.

## Local anaesthetic infiltration for peri-operative pain control in total hip and knee replacement: systematic review and meta-analyses of short- and long-term effectiveness.

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**Abstract****BACKGROUND:**

Surgical pain is managed with multi-modal anaesthesia in total hip replacement (THR) and total knee replacement (TKR). It is unclear whether including local anaesthetic infiltration before wound closure provides additional pain control.

**METHODS:**

We performed a systematic review of randomised controlled trials of local anaesthetic infiltration in patients receiving THR or TKR. We searched MEDLINE, Embase and Cochrane CENTRAL to December 2012. Two reviewers screened abstracts, extracted data, and contacted authors for unpublished outcomes and data. Outcomes collected were post-operative pain at rest and during activity after 24 and 48 hours, opioid requirement, mobilisation, hospital stay and complications. When feasible, we estimated pooled treatment effects using random effects meta-analyses.

**RESULTS:**

In 13 studies including 909 patients undergoing THR, patients receiving local anaesthetic infiltration experienced a greater reduction in pain at 24 hours at rest by standardised mean difference (SMD) -0.61 (95% CI -1.05, -0.16; p = 0.008) and by SMD -0.43 (95% CI -0.78 -0.09; p = 0.014) at 48 hours during activity. In TKR, diverse multi-modal regimens were reported. In 23 studies including 1439 patients undergoing TKR, local anaesthetic infiltration reduced pain on average by SMD -0.40 (95% CI -0.58, -0.22; p < 0.001) at 24 hours at rest and by SMD -0.27 (95% CI -0.50, -0.05; p = 0.018) at 48 hours during activity, compared with patients receiving no infiltration or placebo. There was evidence of a larger reduction in studies delivering additional local anaesthetic after wound closure. There was no evidence of pain control additional to that provided by femoral nerve block. Patients receiving local anaesthetic infiltration spent on average an estimated 0.83 (95% CI 1.54, 0.12; p = 0.022) and 0.87 (95% CI 1.62, 0.11; p = 0.025) fewer days in hospital after THR and TKR respectively, had reduced opioid consumption, earlier mobilisation, and lower incidence of vomiting. Few studies reported long-term outcomes.

**CONCLUSIONS:**

Local anaesthetic infiltration is effective in reducing short-term pain and hospital stay in patients receiving THR and TKR. Studies should assess whether local anaesthetic infiltration can prevent long-term pain. Enhanced pain control with additional analgesia through a catheter should be weighed against a possible infection risk.

[Schmerz.](#) 2014 Jun;28(3):265-81. doi: 10.1007/s00482-014-1420-8.

# [Perioperative pain management for abdominal and thoracic surgery].

[Article in German]

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## **Abstract**

Abdominal and thoracic surgical procedures can result in significant acute postoperative pain. Present evidence shows that postoperative pain management remains inadequate especially after "minor" surgical procedures. Various therapeutic options including regional anesthesia techniques and systemic pharmacotherapy are available for effective treatment of postoperative pain. This work summarizes the pathophysiological background of postoperative pain after abdominal and thoracic surgery and discusses the indication, effectiveness, risks, and benefits of the different therapeutic options. Special focus is given to the controversial debate about the indication for epidural analgesia, as well as various alternative therapeutic options, including transversus abdominis plane (TAP) block, paravertebral block (PVB), wound infiltration with local anesthetics, and intravenous lidocaine. In addition, indications and contraindications of nonopioid analgesics after abdominal and thoracic surgery are discussed and recommendations based on scientific evidence and individual risk and benefit analysis are made. All therapeutic options discussed are eligible for clinical use and may contribute to improve postoperative pain outcome after abdominal and thoracic surgical procedures.

[Best Pract Res Clin Anaesthesiol](#). 2014 Mar;28(1):41-57. doi: 10.1016/j.bpa.2014.02.002.

Epub 2014 Mar 18.

# Peripheral nerve catheters and local anesthetic infiltration in perioperative analgesia.

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## **Abstract**

Peripheral nerve catheters (PNCs) and local infiltration analgesia (LIA) represent valuable options for controlling perioperative pain. PNCs have been increasingly utilized to provide both surgical anesthesia and prolonged postoperative analgesia for a wide variety of procedures. PNCs can be more technically challenging to place than typical single-injection nerve blocks (SINB), and familiarity with the indications, contraindications, relevant anatomy, and appropriate technical skills is a prerequisite for the placement of any PNC. PNCs include risks of peripheral nerve injury, damage to adjacent anatomic structures, local anesthetic toxicity, intravascular injection, risks associated with motor block, risks of unnoticed injury to the insensate limb, and risks of sedation associated with PNC placement. In addition to these common risks, there are specific risks unique to each PNC insertion site. LIA strategies have emerged that seek to provide the benefit of targeted local anesthesia while minimizing collateral motor block and increasing the applicability of durable local anesthesia beyond the extremities. LIA involves the injection and/or infusion of a local anesthetic near the site of surgical incision to provide targeted analgesia. A wide variety of techniques have been described, including single-injection intraoperative wound infiltration, indwelling wound infusion catheters, and the recent high-volume LIA technique associated with joint replacement surgery. The efficacy of these techniques varies depending on specific procedures and anatomic locations. The recent incorporation of ultra-long-acting liposomal bupivacaine preparations has the potential to dramatically increase the utility of single-injection LIA. LIA represents a promising yet under-investigated method of postoperative pain control.



## Paraincisional subcutaneous infusion of ropivacaine after open abdominal vascular surgery shows significant advantages.

[Chaykovska L](#)<sup>1</sup>, [Blohmé L](#)<sup>2</sup>, [Mayer D](#)<sup>3</sup>, [Gloekler S](#)<sup>4</sup>, [Rancic Z](#)<sup>3</sup>, [Schmidt CA](#)<sup>3</sup>, [Tunesi R](#)<sup>3</sup>, [Veith F](#)<sup>5</sup>, [Lachat M](#)<sup>3</sup>, [Bettex D](#)<sup>6</sup>.

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- <sup>6</sup>Division of Cardiovascular Anesthesia, University Hospital Zurich, Zurich, Switzerland.

### **Abstract**

#### **BACKGROUND:**

Opiates are widely used for postoperative pain relief. Unfortunately, their side effects such as inhibited gastrointestinal motility and respiratory depression may compromise or delay postoperative recovery after laparotomy. We used paraincisional subcutaneous catheters (PSCs) and applied 0.25% ropivacaine infusion to improve pain relief and decrease postoperative morphine consumption in patients after open surgery for aortic aneurysm.

#### **METHODS:**

A retrospective single-center study including 58 patients treated by open surgery for aortic aneurysm between October 2006 and June 2012. Overall, 28 patients (control group) received standard postoperative pain management including opiates, and 30 patients (PSC group) were treated with paraincisional continuous local analgesia with 0.25% ropivacaine administered via bilateral subcutaneous catheters along with additional ad libitum opiates administration, at first intravenously and then orally.

#### **RESULTS:**

Patients characteristics as well as perioperative and postoperative outcomes were comparable between the groups during the first 5 days after surgery. Patients of the PSC group received significantly less morphine, although the patients in both groups reported a similar pain intensity. Neither wound-healing disorder nor catheter-associated subcutaneous infection was reported. High serum concentration of ropivacaine was detected in 2 patients (6%) with end-stage renal disease, who developed temporary neurologic symptoms. Length of intensive care unit (ICU) stay was significantly shorter in the PSC group (2 [0-23] vs. 4.5 [0-32] ICU days).

#### **CONCLUSIONS:**

This is the first report about PSCs for analgesia after laparotomy. This case/control study shows that continuous paraincisional subcutaneous infusion of 0.25% ropivacaine after open surgery for aortic aneurysm repair is a feasible method of postoperative analgesia. This technique allows sustained pain relief with significant reduction of opiate requirement and faster recovery after surgery. Prospective randomized controlled trial is necessary for the assessment of safety and efficacy of this method.

## Epidural versus ON-Q local anesthetic-infiltrating catheter for post-thoracotomy pain control.

[Gebhardt R](#)<sup>1</sup>, [Mehran RJ](#), [Soliz J](#), [Cata JP](#), [Smallwood AK](#), [Feeley TW](#).

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### **Abstract**

#### **OBJECTIVE:**

The authors compared thoracic epidural with ON-Q infiltrating catheters in patients having open thoracotomy to determine whether one method better relieves postoperative pain and would allow earlier discharge from the hospital and, hence, cost savings.

#### **DESIGN:**

Retrospective chart review.

#### **SETTING:**

University hospital.

#### **PARTICIPANTS:**

Fifty adult patients (24 to 81 years old) undergoing open thoracotomy by one surgeon.

#### **INTERVENTIONS:**

One group had thoracic epidural catheters placed by an anesthesiologist and then managed by the acute pain service. The other group had intraoperative ON-Q (ON-Q; I-Flow; Lake Forest, California) infiltrating catheters placed by the surgeon, wound infiltration with a local anesthetic, plus patient-controlled analgesia with an intravenous opioid.

#### MEASUREMENTS AND MAIN RESULTS:

The authors measured and compared average daily pain rating, maximum pain rating, time to discharge from the hospital, and total bill for hospital stay. Patients who received epidural analgesia had lower average pain scores on day 2 than did patients in the ON-Q group. Patients in the ON-Q group reported higher maximum pain scores on days 1 and 2 and at the time of discharge. Patients in the ON-Q group were discharged an average of 1 day earlier; hence, their average total bill was lower.

#### CONCLUSIONS:

Even though the maximum pain score was higher in the ON-Q group, patients were comfortable enough to be discharged earlier, resulting in cost savings. ON-Q infiltrating catheters present a good option for providing postoperative analgesia to patients having an open thoracotomy.

[Liver Transpl.](#) 2013 Sep;19(9):1036-45. doi: 10.1002/lt.23691. Epub 2013 Aug 18.

## Prospective, randomized study of ropivacaine wound infusion versus intrathecal morphine with intravenous fentanyl for analgesia in living donors for liver transplantation.

[Lee SH<sup>1</sup>](#), [Gwak MS](#), [Choi SJ](#), [Park HG](#), [Kim GS](#), [Kim MH](#), [Ahn HJ](#), [Kim J](#), [Kwon CH](#), [Kim TS](#).

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#### Abstract

Postoperative analgesia and care for living liver donors have become particular interests for clinicians as the use of living donor liver transplantation has increased. Local anesthetic-based analgesia has been known to provide effective pain control. In this prospective, randomized study, we compared the postoperative analgesic efficacy of local anesthetic-based analgesia (PainBuster) with the efficacy of opioid-based analgesia [intrathecal morphine (ITM) with intravenous (IV) fentanyl] in liver donors. Forty adult donors were randomly allocated to 1 of 2 groups: an ITM/IV fentanyl group (n = 21) and a PainBuster group (n = 19). Donors in the PainBuster group received 0.5% ropivacaine via a multi-orifice catheter (ON-Q PainBuster) placed at the wound. Donors in the ITM/IV fentanyl group received ITM sulfate (400 µg) preoperatively and a continuous IV fentanyl infusion postoperatively. A visual analogue scale (VAS) at rest and with coughing and rescue IV fentanyl and meperidine consumption were assessed for 72 hours after the operation. Side effects, including sedation, dizziness, nausea, vomiting, pruritus, respiratory depression, wound seroma or hematoma, and the first time to flatus, were recorded. The VAS score at rest during the first 12 postoperative hours was significantly lower for the ITM/IV fentanyl group. At other times, the VAS scores were comparable between the groups. In the PainBuster group, rescue IV fentanyl and meperidine use was significantly reduced 24 to 48 hours and 48 to 72 hours after surgery in comparison with the first 24 postoperative hours. The time to first flatus was significantly reduced in the PainBuster group. There were no differences in side effects. In conclusion, analgesia was more satisfactory with ITM/IV fentanyl versus PainBuster during the first 12 hours after surgery, but they became comparable thereafter, with a shortened bowel recovery time in the PainBuster group. The concurrent use of ITM with PainBuster may be considered in a future investigation.

[Ann Card Anaesth.](#) 2015 Jan-Mar;18(1):15-20. doi: 10.4103/0971-9784.148314.

## The analgesic efficacy of continuous presternal bupivacaine infusion through a single catheter after cardiac surgery.

[Nasr DA<sup>1</sup>](#), [Abdelhamid HM](#), [Mohsen M](#), [Aly AH](#).

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#### Abstract

##### BACKGROUND:

Median sternotomy, sternal spreading, and sternal wiring are the main causes of pain during the early recovery phase following cardiac surgery.

##### AIM:

This study was designed to evaluate the analgesic efficacy of continuous presternal bupivacaine infusion through a single catheter after parasternal block following cardiac surgery.

##### MATERIALS AND METHODS:

The total of 40 patients (American Society of Anesthesiologist status II, III), 45-60 years old, undergoing coronary-artery bypass grafting were enrolled in this prospective, randomized, double-blind study. A presternal catheter was inserted with continuous infusion of 5 mL/h bupivacaine 0.25% (Group B) or normal saline (Group C) during the first 48 postoperative hrs. Primary outcomes were postoperative morphine requirements

and pain scores, secondary outcomes were extubation time, postoperative respiratory parameters, incidence of wound infection, Intensive Care Unit (ICU) and hospital stay duration, and bupivacaine level in blood.

#### STATISTICAL METHODS:

Student's t-test was used to analyze the parametric data and Chi-square test for categorical variables.

#### RESULTS:

During the postoperative 48 h, there was marked reduction in morphine requirements in Group B compared to Group C, ( $8.6 \pm 0.94$  mg vs.  $18.83 \pm 3.4$  mg respectively,  $P = 0.2$ ), lower postoperative pain scores, shorter extubation time ( $117 \pm 10$  min vs.  $195 \pm 19$  min, respectively,  $P = 0.03$ ), better respiratory parameters ( $\text{PaO}_2/\text{FiO}_2$ ,  $\text{PaCO}_2$  and pH), with no incidence of wound infection, no differences in ICU or hospital stay duration. The plasma concentration of bupivacaine remained below the toxic threshold (at T24,  $1.2 \text{ ug/ml} \pm 0.3$  and T48 h  $1.7 \pm 0.3 \text{ ug/ml}$ ).

#### CONCLUSION:

Continuous presternal bupivacaine infusion has resulted in better postoperative analgesia, reduction in morphine requirements, shorter time to extubation, and better postoperative respiratory parameters than the control group.

[Dan Med J](#). 2015 Apr;62(4):A5053.

## Factors affecting post-operative sleep in patients undergoing colorectal surgery – a systematic review.

[Klemann N](#)<sup>1</sup>, [Hansen MV](#), [Gögenur I](#).

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#### Abstract

##### INTRODUCTION:

Understanding factors affecting post-operative recovery is of great importance to efforts at reducing morbidity and mortality after general surgery. Post-operatively, most patients suffer from objectively and subjectively measurable reduced sleep quality. We aimed to review the available literature on post-operative sleep in patients undergoing colorectal surgery.

##### METHODS:

This systematic review was conducted according to the PRISMA guidelines, searching the electronic data-bases PubMed, Embase and the Cochrane Library. All articles were evaluated according to pre-defined inclusion criteria.

##### RESULTS:

Five studies were included in the review. Sleep quality was affected by type of surgery (open or laparoscopic), the administration/mode of application of analgesics (epidural analgesia or continuous woundinfusion) and the level of pain. Patients who listened to new age music and a "relaxing text" had better quality of post-operative sleep than controls. Overall, pain interfered with subjective, post-operative sleep quality and adequate treatment of pain improved subjective sleep quality.

##### CONCLUSION:

Sleep quality is sensitive to various factors in the perioperative period, and impairment of sleep quality can be prevented by simple improvements in perioperative care.

[Tech Coloproctol](#). 2015 Apr;19(4):231-9. doi: 10.1007/s10151-015-1270-0. Epub 2015 Feb 26.

## Impact of analgesic modality on stress response following laparoscopic colorectal surgery: a post-hoc analysis of a randomised controlled trial.

[Barr J](#)<sup>1</sup>, [Boulind C](#), [Foster JD](#), [Ewings P](#), [Reid J](#), [Jenkins JT](#), [Williams-Yesson B](#), [Francis NK](#).

#### Author information

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#### Abstract

##### BACKGROUND:

Epidural analgesia is perceived to modulate the stress response after open surgery. This study aimed to explore the feasibility and impact of measuring the stress response attenuation by post-operative analgesic modalities following laparoscopic colorectal surgery within an enhanced recovery after surgery (ERAS) protocol.

#### **METHODS:**

Data were collected as part of a double-blinded randomised controlled pilot trial at two UK sites. Patients undergoing elective laparoscopic colorectal resection were randomised to receive either thoracic epidural analgesia (TEA) or continuous local anaesthetic infusion to the extraction site via wound infusion catheter (WIC) post-operatively. The aim of this study was to measure the stress response to the analgesic modality by measuring peripheral venous blood samples analysed for serum concentrations of insulin, cortisol, epinephrine and interleukin-6 at induction of anaesthesia, at 3, 6, 12 and 24 h after the start of operation. Secondary endpoints included mean pain score in the first 48 h, length of hospital stay, post-operative complications and 30-day re-admission rates.

#### **RESULTS:**

There was a difference between the TEA and WIC groups that varies across time. In the TEA group, there was significant but transient reduced level of serum epinephrine and a higher level of insulin at 3 and 6 h. In the WIC, there was a significant reduction of interleukin-6 values, especially at 12 h. There was no significant difference observed in the other endpoints.

#### **CONCLUSIONS:**

There is a significant transient attenuating effect of TEA on stress response following laparoscopic colorectal surgery and within ERAS as expressed by serum epinephrine and insulin levels. Continuous wound infusion with local anaesthetic, however, attenuates cytokine response as expressed by interleukin-6.

[HSS J.](#) 2015 Feb;11(1):56-64. doi: 10.1007/s11420-014-9414-8. Epub 2014 Nov 12.

## **Intra-articular Analgesia and Discharge to Home Enhance Recovery Following Total Knee Replacement.**

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#### **Abstract**

##### **BACKGROUND:**

The increasing demand for total knee arthroplasty (TKR) and the initiatives to reduce health care spending have put the responsibility for efficient care on hospitals and providers. Multidisciplinary care pathways have been shown to shorten length of stay and result in improved short-term outcomes. However, common problems such as post-op nausea, orthostasis, and quad weakness remain, while reliance on discharge to rehabilitation facilities may also prolong hospital stay.

##### **QUESTIONS/PURPOSES:**

Our aim was to document that combined modifications of our traditional clinical pathway for unilateral TKR could lead to improved short-term outcomes. We pose the following research questions. Can pathway modifications which include intra-articular infusion and saphenous nerve block (SNB) provide adequate pain relief and eliminate common side effects promoting earlier mobilization? Can planning for discharge to home avoid in-patient rehab stays? Can these combined modifications decrease length of stay even in patients with complex comorbidities indicated by higher ASA class? Will discharge to home incur an increase in complications or a failure to achieve knee range of motion?

##### **PATIENTS AND METHODS:**

A retrospective review was performed and identified two cohorts. Group A included 116 patients that underwent unilateral TKR for osteoarthritis between August 2009 and August 2010. Group B included 171 patients that underwent unilateral TKR for osteoarthritis between February 2012 to February 2013. Group A patients were treated with spinal anesthesia with patient-controlled epidural analgesia (PCEA)/femoral nerve block (FNB) for the first 48 h after surgery. Discharge planning was initiated after admission. Group B had spinal anesthesia with SNB and received a continuous intra-articular infusion of 0.2% ropivacaine for 48 h post-op. Discharge planning was initiated with a case manager prior to hospitalization and discharge to home was declared the preferred approach. An intensive home PT program was made available through a program with our local home care agency. Outcomes assessed and compared between groups included length of stay, incidence of post-op nausea, dizziness, in-hospital falls, occurrence of complications including wound infection and the recovery of range of motion at 6 weeks, 3 months, and 1 year post-op.

##### **RESULTS:**

Pain control was similar between the groups but Group B had fewer side effects. With the new pathway, length of stay (LOS) was reduced from 4.32 to 3.64 days with a similar LOS reduction across all ASA classes. There was no increase in Group B wound or other complications. Return of ROM was similar between groups.

##### **CONCLUSIONS:**

Our findings suggest that replacing PCEA and FNB with intra-articular analgesia with a SNB allows for improved early recovery following TKR. That, combined with pre-op discharge planning and initiation of an intensive home PT program, reduced average length of stay.

[Vet J.](#) 2014 Dec;202(3):522-6. doi: 10.1016/j.tvjl.2014.08.030. Epub 2014 Sep 3.

# Effectiveness of pre-peritoneal continuous wound infusion with lidocaine for pain control following ovariohysterectomy in dogs.

[Morgaz J<sup>1</sup>](#), [Muñoz-Rascón P<sup>2</sup>](#), [Serrano-Rodríguez JM<sup>3</sup>](#), [Navarrete R<sup>2</sup>](#), [Domínguez JM<sup>2</sup>](#), [Fernández-Sarmiento JA<sup>2</sup>](#), [Gómez-Villamandos RJ<sup>2</sup>](#), [Serrano JM<sup>3</sup>](#), [Granados Mdel M<sup>2</sup>](#).

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## **Abstract**

This study compared the post-operative analgesic efficacy of continuous lidocaine administration with that of intramuscular (IM) methadone in dogs undergoing ovariohysterectomy. Thirty-eight dogs were divided randomly into two groups. Following surgery, the lidocaine group (L) received a continuous lidocaine infusion (2 mg/kg/h) through a wound catheter inserted in the pre-peritoneal space; the control group (C) received methadone (0.2 mg/kg IM). A dynamic and interactive visual analogue scale (DIVAS), the Scale-Form Glasgow Composite Measure Scale (CMPS-SF), mechanical wound thresholds, heart rate, respiratory rate and blood pressure were assessed pre-operatively and 2, 4, 6, 18, and 24 h after surgery. The presence of the wound catheter prevented the evaluator from remaining blinded to group allocations. Plasma lidocaine and cortisol levels were measured 2, 6, 18, and 24 h after surgery. There were no intergroup differences in any pain assessment scale scores at any time point. Stable intravenous lidocaine levels were observed. Four animals in the control group but none in the lidocaine group required rescue analgesia. There were no differences in complication rates between groups. Continuous locoregional lidocaine delivered via a wound catheter between the parietal peritoneum and abdominal muscle offers effective analgesia in dogs during ovariohysterectomy and appears to be a promising analgesic option in veterinary surgery.

[Arch Orthop Trauma Surg.](#) 2013 Nov;133(11):1607-12. doi: 10.1007/s00402-013-1849-8.

Epub 2013 Sep 14.

# Periarticular infiltration for pain relief after total hip arthroplasty: a comparison with epidural and PCA analgesia.

[Pandazi A<sup>1</sup>](#), [Kanellopoulos I](#), [Kalimeris K](#), [Batistaki C](#), [Nikolakopoulos N](#), [Matsota P](#), [Babis GC](#), [Kostopanagiotou G](#).

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## **Abstract**

### **PURPOSE:**

Epidural and intravenous patient-controlled analgesia (PCA) are established methods for pain relief after total hip arthroplasty (THA). Periarticular infiltration is an alternative method that is gaining ground due to its simplicity and safety. Our study aims to assess the efficacy of periarticular infiltration in pain relief after THA.

### **METHODS:**

Sixty-three patients undergoing THA under spinal anaesthesia were randomly assigned to receive postoperative analgesia with continuous epidural infusion with ropivacaine (epidural group), intraoperative periarticular infiltration with ropivacaine, clonidine, morphine, epinephrine and corticosteroids (infiltration group) or PCA with morphine (PCA group). PCA morphine provided rescue analgesia in all groups. We recorded morphine consumption, visual analog scale (VAS) scores at rest and movement, blood loss from wound drainage, mean arterial pressure (MAP) and adverse effects at 1, 6, 12, 24 h postoperatively.

### **RESULTS:**

Morphine consumption at all time points, VAS scores at rest, 6, 12 and 24 h and at movement, 6 and 12 h postoperatively were lower in infiltration group compared to PCA group ( $p < 0.05$ ), but did not differ between infiltration and epidural group. There was no difference in adverse events in all groups. At 24 h, MAP was higher in the PCA group ( $p < 0.05$ ) and blood loss was lower in the infiltration group ( $p < 0.05$ ).

### **CONCLUSIONS:**

In our study periarticular infiltration was clearly superior to PCA with morphine after THA, providing better pain relief and lower opioid consumption postoperatively. Infiltration seems to be equally effective to epidural analgesia without having the potential side effects of the latter.

[Can J Anaesth](#). 2013 Sep;60(9):888-95.

## The ultrasound-guided retrolaminar block.

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### **Abstract**

#### **PURPOSE:**

Paravertebral blocks have gained in popularity and offer the possible benefit of reduced adverse effects when compared with epidural analgesia. Nevertheless, pulmonary complications in the form of inadvertent pleural puncture are still a recognized risk. Also, the traditional paravertebral blocks are often technically difficult even with ultrasound guidance and constitute deep non-compressible area injections. We present our experience with the first three patients receiving ultrasound-guided retrolaminar blocks for managing the pain associated with multiple rib fractures.

#### **CLINICAL FEATURES:**

The vertebral laminae are identified by ultrasound imaging in a paramedian sagittal plane by sequentially visualizing the pleura and ribs, transverse processes, and the corresponding laminae (from lateral to medial). The block needle is guided to contact the lamina, and the local anesthetic injectate is visualized under real-time imaging. A catheter is inserted and used for continuous analgesia. In three consecutive patients, verbal rating scale (VRS) pain scores were reduced from 10/10 to less than 5/10, and no technical difficulties, complications, or adverse effects were encountered.

#### **CONCLUSIONS:**

Successful analgesia was achieved in all three cases utilizing continuous infusion and intermittent boluses with ultrasound-guided retrolaminar blocks. These results show the feasibility of this approach for patients with multiple rib fractures.

[Anaesthesist](#). 2013 Jun;62(6):460-3. doi: 10.1007/s00101-013-2188-4. Epub 2013 Jun 5.

## [Ultrasound-guided thoracic paravertebral block for acute thoracic trauma:continuous analgesia after high speed injury].

[Article in German]

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### **Abstract**

Paravertebral blocks have experienced a renaissance because ultrasound-guidance is becoming common practice. The method is often presented as an alternative to thoracic epidural anaesthesia, mainly in the field of elective thoracic surgery. It is also propagated as an opioid-sparing analgesic procedure in breast tumor surgery. In this case report it was successfully used as a continuous intervention for acute pain therapy of a severe injury of the left thorax. A transverse probe position in the fifth intercostal space was combined with an in-plane needle technique from lateral to medial. An ultrasound-enhanced needle positioning was used due to the steep angle of puncture. The absolute limit for medial needle advancement is the acoustic shadow of the transverse process. A catheter was placed 2 cm beyond the needle tip and its correct position was verified by hydrolocation. The excellent and continuous analgesia enabled non-invasive patient ventilation to be achieved directly after extubation and was continued for 6 days.

[J Cardiothorac Vasc Anesth](#). 2013 Jun;27(3):451-8. doi: 10.1053/j.jvca.2012.09.026. Epub

2012 Dec 28.

## Local versus epidural anesthesia in fast-track abdominal aortic surgery.

[Renghi A<sup>1</sup>](#), [Gramaglia L](#), [Casella F](#), [Moniaci D](#), [Gaboli K](#), [Brustia P](#).

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#### Abstract

##### OBJECTIVE:

The aim of this study was to investigate a possible alternative to epidural anesthesia/analgesia. The authors compared thoracic epidural anesthesia/analgesia with continuous wound infiltration anesthesia/analgesia in patients scheduled for mini-invasive abdominal aortic surgery in a fast-track setting.

##### DESIGN:

A prospective randomized study.

##### SETTING:

A university hospital.

##### PARTICIPANTS:

Sixty patients undergoing fast-track abdominal aortic surgery.

##### INTERVENTIONS:

The authors compared thoracic epidural infusion (the PERI group) with continuous localwound infiltration (the LOC group) for anesthesia/analgesia. Pain scores, the resumption of oral feeding, the resumption of ambulation, the day of discharge, and postoperative complications in the immediate (ie, 30 days) and long-term periods (ie, 2 years) were evaluated.

##### MEASUREMENTS AND MAIN RESULTS:

Pain scores were low in both groups. The intraoperative LOC group needed higher doses of anesthetic/analgesic drugs. The postoperative LOC group needed significantly higher doses of bupivacaine ( $3.9 \pm 0.7$  mL/h [PERI group] and  $5.7 \pm 1.3$  mL/h [LOC group] on day 0 [ $p < 0.01$ ];  $3.8 \pm 0.8$  mL/h [PERI group] and  $5.3 \pm 1$  mL/h [LOC group] on day 1 [ $p < 0.01$ ]). The parameters of postoperative recovery were comparable between the 2 groups in terms of the resumption of ambulation after surgery (within 3 hours), feeding (within 6 hours), the passage of stools (mean 2 days), and the median hospital stay (3 days). In the 2-year follow-up period, a difference between the 2 groups in the incidence of wound complications was not observed.

##### CONCLUSIONS:

The results obtained showed good and similar pain control in the 2 groups, but the LOC group required higher doses of anesthetic/analgesic drugs. Parameters of the postoperative recovery were similar in both groups.

[Urologe A](#). 2013 Apr;52(4):585-95; quiz 596-7. doi: 10.1007/s00120-013-3164-y.

## [Pain management in urology].

[Article in German]

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#### Abstract

This article reviews aspects of postoperative and chronic pain management in urology patients. Continuous epidural techniques are recommended for extensive retroperitoneal and transperitoneal surgery due to its excellent analgesia and facilitation of enhanced recovery. In patients without regional analgesia techniques, intravenous or oral non-opioid analgesics should be combined with titration of fast acting opioids on an as-needed basis. Oral slow-release opioids are increasingly being used as part of systemic pain management although little evidence exists. Local wound infiltration and transcutaneous electrical nerve stimulation (TENS) treatment are simple and effective supplements for postoperative pain management. In 70-90% of urological cancer patients pain can be adequately relieved by consistent adherence to the WHO cancer pain recommendations. Additional pain relief approaches, such as radiation as well as psychosocial and spiritual needs of these patients have to be considered. In long-term treatment of non-cancer pain, effective use of opioids is not evidence-based. These patients often benefit from multimodal, interdisciplinary pain management comprising psychological and educational approaches as well as activating physiotherapy.

[Br J Surg](#). 2013 Feb;100(3):395-402. doi: 10.1002/bjs.8999. Epub 2012 Dec 19.

## Feasibility study of analgesia via epidural versus continuous wound infusion after laparoscopic colorectal resection.

[Boulind CE](#)<sup>1</sup>, [Ewings P](#), [Bulley SH](#), [Reid JM](#), [Jenkins JT](#), [Blazeby JM](#), [Francis NK](#).

#### Author information

- <sup>1</sup>Department of Surgery, Yeovil District Hospital NHS Foundation Trust, Yeovil, [UK](#).

#### Abstract

##### BACKGROUND:

With the adoption of enhanced recovery and emerging new modalities of analgesia after laparoscopic colorectal resection (LCR), the role of epidural analgesia has been questioned. This pilot trial assessed the feasibility of a randomized controlled trial (RCT) comparing epidural analgesia and use of a local anaesthetic wound infusion catheter (WIC) following LCR.

**METHODS:**

Between April 2010 and May 2011, patients undergoing elective LCR in two centres were randomized to analgesia via epidural or WIC. Sham procedures were used to blind surgeons, patients and outcome assessors. The primary outcome was the feasibility of a large RCT, and all outcomes for a definitive trial were tested. The success of blinding was assessed using a mixed-methods approach.

**RESULTS:**

Forty-five patients were eligible, of whom 34 were randomized (mean(s.d.) age 70(11.8) years). Patients were followed up per-protocol; there were no deaths, and five patients had a total of six complications. Challenges with capturing pain data were identified and resolved. Mean(s.d.) pain scores on the day of discharge were 1.9(3.1) in the epidural group and 0.7(0.7) in the WIC group. Median length of stay was 4 (range 2-35, interquartile range 3-5) days. Mean use of additional analgesia (intravenous morphine equivalents) was 12 mg in the WIC arm and 9 mg in the epidural arm. Patient blinding was successful in both arms. Qualitative interviews suggested that patients found participation in the trial acceptable and that they would consider participating in a future trial.

**CONCLUSION:**

A blinded RCT investigating the role of epidural and WIC administration for postoperative analgesia following LCR is feasible. Rigorous standard operating procedures for data collection are required.

[Masui](#). 2012 Nov;61(11):1281-4.

## [Continuous wound infiltration for upper abdominal surgery: 3 case reports].

[Article in Japanese]

[Sata N<sup>1</sup>](#), [Hotta K](#), [Taira K](#), [Takeuchi M](#), [Seo N](#).

[Author information](#)

- <sup>1</sup>Department of Anesthesiology and Critical Care Medicine, Jichi Medical University School of Medicine, [Shimotsuke](#) 329-0498.

**Abstract**

We report three cases of continuous wound infiltration (CWI) for postoperative analgesia in upper abdominal surgery using the multi-holed epidural catheter. Ropivacaine 0.2% at a rate of 8 ml x hr<sup>-1</sup> was administered through the catheters after surgery. Intravenous-patient controlled analgesia was used as a rescue. The postoperative pain was well controlled, and all patients could walk the next day after surgery. The consumption of rescue morphine was little and no side effect of morphine was observed. CWI is an easy procedure and is indicated in the patients with hemostatic abnormality and a difficulty in the epidural anesthesia. CWI was an effective technique for postoperative pain control in the upper abdominal surgery patients.

[Anesth Analg](#). 2013 Jan;116(1):255-7. doi: 10.1213/ANE.0b013e31826f5e25. Epub 2012 Dec 7.

## Case report: ultrasound-guided continuous thoracic paravertebral block for outpatient acute pain management of multilevel unilateral rib fractures.

[Murata H<sup>1</sup>](#), [Salviz EA](#), [Chen S](#), [Vandepitte C](#), [Hadzic A](#).

[Author information](#)

- <sup>1</sup>Department of Anesthesiology, Columbia University, St Luke's Roosevelt Hospital, New York, NY 10025, [USA](#).

**Abstract**

A 61-year-old man with multiple unilateral rib fractures (T3-T8) gained the ability to breathe deeply and to ambulate after ultrasound-guided continuous thoracic paravertebral block and was discharged home after being observed for 15 hours after the block. The ultrasound guidance was helpful in determining the site of rib fractures and the optimal level for catheter placement. This report also discusses the management of analgesia using continuous paravertebral block in an outpatient with trauma.

[Anesth Analg](#). 2012 Dec;115(6):1442-50. doi: 10.1213/ANE.0b013e31826b4694. Epub 2012 Nov 9.



# The postoperative analgesic efficacy of preperitoneal continuous wound infusion compared to epidural continuous infusion with local anesthetics after colorectal cancer surgery: a randomized controlled multicenter study.

[Bertoglio S](#)<sup>1</sup>, [Fabiani F](#), [Negri PD](#), [Corcione A](#), [Merlo DF](#), [Cafiero F](#), [Esposito C](#), [Belluco C](#), [Pertile D](#), [Amodio R](#), [Mannucci M](#), [Fontana V](#), [Cicco MD](#), [Zappi L](#).

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## **Abstract**

### **BACKGROUND:**

Open colorectal cancer (CRC) surgery induces severe and prolonged postoperative pain. The optimal method of postoperative analgesia in CRC surgery has not been established. We evaluated the efficacy of preperitoneal continuous wound infusion (CWI) of ropivacaine for postoperative analgesia after open CRC surgery in a multicenter randomized controlled trial.

### **METHODS:**

Candidates for open CRC surgery randomly received preperitoneal CWI analgesia or continuous epidural infusion (CEI) analgesia with ropivacaine 0.2% 10 mL/h for 48 hours after surgery. Fifty-three patients were allocated to each group. All patients received patient-controlled IV morphine analgesia.

### **RESULTS:**

Over the 72-hour period after the end of surgery, CWI analgesia was not inferior to CEI analgesia. The difference of the mean visual analog scale score between CEI and CWI patients was 1.89 (97.5% confidence interval = -0.42, 4.19) at rest and 2.76 (97.5% confidence interval = -2.28, 7.80) after coughing. Secondary end points, morphine consumption and rescue analgesia, did not differ between groups. Time to first flatus was  $3.06 \pm 0.77$  days in the CWI group and  $3.61 \pm 1.41$  days in the CEI group ( $P = 0.002$ ). Time to first stool was shorter in the CWI than the CEI group ( $4.49 \pm 0.99$  vs  $5.29 \pm 1.62$  days;  $P = 0.001$ ). Mean time to hospital discharge was shorter in the CWI group than in the CEI group ( $7.4 \pm 0.41$  and  $8.0 \pm 0.38$  days, respectively). More patients in the CWI group reported excellent quality of postoperative pain control (45.3% vs 7.6%). Quality of night sleep was better with CWI analgesia, particularly at the postoperative 72-hour evaluation ( $P = 0.009$ ). Postoperative nausea and vomiting was significantly less frequent with CWI analgesia at 24 hours ( $P = 0.02$ ), 48 hours ( $P = 0.01$ ), and 72 hours ( $P = 0.007$ ) after surgery evaluations.

### **CONCLUSIONS:**

Preperitoneal CWI analgesia with ropivacaine 0.2% continuous infusion at 10 mL/h during 48 hours after open CRC surgery provided effective postoperative pain relief not inferior to CEI analgesia.

[Anesth Analg](#). 2012 Jan;114(1):179-85. doi: 10.1213/ANE.0b013e3182368e87. Epub 2011 Oct 24.

# Ropivacaine continuous wound infusion versus epidural morphine for postoperative analgesia after cesarean delivery: a randomized controlled trial.

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## **Abstract**

### **BACKGROUND:**

The infusion of local anesthetic in the surgical wound is helpful in the multimodal management of postoperative pain. We hypothesized that local anesthetic wound infusion after cesarean delivery would provide better pain control than epidural morphine analgesia.

### **METHODS:**

Healthy, term women scheduled for elective cesarean delivery were included in this assessor-blinded, randomized study. Patients were randomly assigned to receive analgesia through a multiorifice wound catheter placed below the fascia and connected to a 5 mL/h ropivacaine 2 mg/mL infusion or an epidural bolus of morphine 2 mg every 12 hours. Both analgesic regimens were continued for 48 hours. The primary outcome was pain at rest at 24 hours postoperatively using the verbal rating score for pain (0-10 scale). Pain intensity, rescue analgesia consumption, and side effects were assessed at 2, 6, 24, and 48 hours after cesarean delivery by an observer blinded to group allocation. Three months after discharge, patient satisfaction, residual pain, and surgical wound complications were assessed.

### **RESULTS:**

Fifty-eight women participated in the study. At 24 hours, the median rest verbal rating score for pain was 0 (interquartile range: 0-0) in the continuous infusion group and 3 in the epidural morphine group (interquartile range: 2-3; 95% confidence interval of difference: 1-3 units;  $P < 0.001$ ). The median scores of the 2-, 6-, and 48-hour pain assessments at rest were also lower in the continuous wound infusion group than in

the epidural morphine group, and at 2, 6, and 24 hours with movement ( $P < 0.001$ ). The incidence of nausea, vomiting, pruritus, and urinary retention was significantly lower in the wound infusion group and time to recovery of bowel function was shorter. During the 48-hour follow-up evaluation, the median number of nurse visits attributed exclusively to the analgesic regimen was 1 (interquartile range: 1-2) in the continuous wound infusion group and 8 (interquartile range: 7-10) in the epidural morphine group (95% confidence interval of difference: 6-8 visits;  $P < 0.001$ ).

#### CONCLUSIONS:

Continuous wound infusion with ropivacaine for 48 hours after cesarean delivery was associated with better analgesia, a lower incidence of side effects, less need for nursing care, and shorter duration of stay compared with epidural morphine analgesia.

[HPB \(Oxford\)](#). 2012 Sep;14(9):611-8. doi: 10.1111/j.1477-2574.2012.00490.x. Epub 2012 Jun 10.

## Randomized clinical trial of local infiltration plus patient-controlled opiate analgesia following liver resection surgery.

[Revie EJ](#)<sup>1</sup>, [McKeown DW](#), [Wilson JA](#), [Garden OJ](#), [Wigmore SJ](#).

#### [Author information](#)

- <sup>1</sup>Department of Clinical Surgery, University of Edinburgh, Edinburgh, [UK](#).

#### Abstract

##### OBJECTIVES:

Epidural analgesia is recommended for the provision of analgesia following major abdominal surgery. Continuous local anaesthetic wound infiltration may be an effective alternative. A prospective randomized trial was undertaken to compare these two methods following open liver resection. The primary outcome was length of time required to fulfil criteria for discharge from hospital.

##### METHODS:

Patients undergoing open liver resection were randomized to receive either epidural (EP group) or local anaesthetic wound infiltration plus patient-controlled opiate analgesia (WI group) for the first 2 days postoperatively. All other care followed a standardized enhanced recovery protocol. Time to fulfil discharge criteria, pain scores, physical activity measurements and complications were recorded.

##### RESULTS:

Between August 2009 and July 2010, 65 patients were randomized to EP ( $n = 32$ ) or WI ( $n = 33$ ). The mean time required to fulfil discharge criteria was 4.5 days (range: 2.5-63.5 days) in the WI group and 6.0 days (range: 3.0-42.5 days) in the EP group ( $P = 0.044$ ). During the first 48 h following surgery, pain scores were significantly lower in the EP group both at rest and on movement. Resting pain scores within both groups were rated as mild (range: 0-3). There was no significant difference between the groups in time to first mobilization or overall complication rate (48.5% in the WI group vs. 58.1% in the EP group;  $P = 0.443$ ).

##### CONCLUSIONS:

Local anaesthetic wound infiltration combined with patient-controlled opiate analgesia reduces the length of time required to fulfil criteria for discharge from hospital compared with epidural analgesia following open liver resection. Epidural analgesia provides superior analgesia, but does not confer benefits in terms of faster mobilization or recovery.

[Br J Anaesth](#). 2012 Jun;108(6):998-1005. doi: 10.1093/bja/aes091. Epub 2012 Mar 30.

## Cost-effectiveness analysis comparing epidural, patient-controlled intravenous morphine, and continuous wound infiltration for postoperative pain management after open abdominal surgery.

[Tilleul P](#)<sup>1</sup>, [Aissou M](#), [Bocquet F](#), [Thiriart N](#), [le Grelle O](#), [Burke MJ](#), [Hutton J](#), [Beaussier M](#).

#### [Author information](#)

- <sup>1</sup>Department of Pharmacy, Assistance Publique-Hopitaux de Paris, St Antoine Hospital Paris, [France](#).

#### Abstract

##### BACKGROUND:

Continuous wound infiltration (CWI), i.v. patient-controlled analgesia (i.v.-PCA), and epidural analgesia (EDA) are analgesic techniques commonly used for pain relief after open abdominal surgery. The aim of this study was to evaluate the cost-effectiveness of these techniques.

##### METHODS:

A decision analytic model was developed, including values retrieved from clinical trials and from an observational prospective cohort of 85 patients. Efficacy criteria were based on pain at rest (VAS  $\leq$  30/100 mm at 24 h). Resource use and costs were evaluated from medical record measurements and published data. Probabilistic sensitivity analysis (PSA) was performed.

**RESULTS:**

When taking into account all resources consumed, the CWI arm (€ 6460) is economically dominant when compared with i.v.-PCA (€ 7273) and EDA (€ 7500). The proportion of patients successfully controlled for their postoperative pain management are 77.4%, 53.9%, and 72.9% for CWI, i.v.-PCA, and EDA, respectively, demonstrating the CWI procedure to be both economically and clinically dominant. PSA reported that CWI remains cost saving in 70.4% of cases in comparison with EDA and in 59.2% of cases when compared with PCA.

**CONCLUSIONS:**

Device-related costs of using CWI for pain management after abdominal laparotomy are partly counterbalanced by a reduction in resource consumption. The cost-effectiveness analysis suggests that CWI is the dominant treatment strategy for managing postoperative pain (i.e. more effective and less costly) in comparison with i.v.-PCA. When compared with EDA, CWI is less costly with almost equivalent efficacy. This economic evaluation may be useful for clinicians to design algorithms for pain management after major abdominal surgery.

[Rev Esp Anesthesiol Reanim.](#) 2011 Jun-Jul;58(6):337-44.

## [Continuous infusion of local anesthetic at the site of the abdominal surgical wound for postoperative analgesia: a systematic review].

[Article in Spanish]

[Fustran Guerrero N<sup>1</sup>](#), [Dalmau Llitjós A](#), [Sabaté Pes A](#).

**Author information**

- <sup>1</sup>Servicio de Anestesiología y Reanimación, Hospital Universitario de Bellvitge, Idibell, [Barcelona](#).

**Abstract**

**OBJECTIVES:**

We present a systematic review of clinical trials to evaluate the efficacy of infusing local anesthetic through a catheter placed in the abdominal surgical wound.

**METHODS:**

The Jadad (Oxford) scoring system was used to select trials. The variables considered in relation to each trial selected were as follows: type of intervention and incision; type, dose, and concentration of local anesthetic; site where the catheter was placed; rescue analgesia required; opioid use; and incidence of adverse events.

**RESULTS:**

Fifteen clinical trials with a mean Jadad score of 4.6 were selected. The 1139 patients enrolled in the trials were grouped according to catheter placement: subfascial (6 trials), subcutaneous (8 trials), and both (1 trial). Six additional unpublished trials registered at ClinicalTrials.gov were also located.

**CONCLUSIONS:**

Surgical wound analgesia is a safe technique whose effectiveness has been observed in cesarean sections and hysterectomies performed with Pfannenstiel incisions. Outcomes for other types of surgery are inconsistent. There is a lack of studies of the optimal site for catheter placement as well as of adequate anesthetic concentration and volume.

[J Neurotrauma.](#) 2012 May 20;29(8):1650-62. doi: 10.1089/neu.2011.2100. Epub 2012 Apr 2.

## Analgesia or addiction?: implications for morphine use after spinal cord injury.

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**Author information**

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**Abstract**

Opioid analgesics are among the most effective agents for treatment of moderate to severe pain. However, the use of morphine after a spinal cord injury (SCI) can potentiate the development of paradoxical pain symptoms, and continuous administration can lead to dependence, tolerance, and addiction. Although some studies suggest that the addictive potential of morphine decreases when it is used to treat neuropathic pain, this has not been studied in a SCI model. Accordingly, the present studies investigated the addictive potential of morphine in a rodent model of SCI using conditioned place preference (CPP) and intravenous self-administration paradigms. A contusion injury significantly increased the expression of a CPP relative to sham and intact controls in the acute phase of injury. However, contused animals self-administered significantly less morphine than sham and intact controls, but this was dose-dependent; at a high concentration, injured rats exhibited an increase in drug-reinforced responses over time. Exposure to a high concentration of morphine impeded weight gain and locomotor recovery. We suggest that the increased preference observed in injured rats reflects a motivational effect linked in part to the drug's anti-nociceptive effect.

Further, although injured rats exhibited a suppression of opiate self-administration, when given access to a high concentration, addictive-like behavior emerged and was associated with poor recovery.

[Ann Fr Anesth Reanim.](#) 2012 Feb;31(2):120-5. doi: 10.1016/j.annfar.2011.10.017. Epub 2011

Dec 29.

## [Wound infiltration with local anesthetics for postoperative analgesia. Results of a national survey about its practice in France].

[Article in French]

[Beaussier M](#)<sup>1</sup>, [Bouaziz H](#), [Aubrun F](#), [Belbachir A](#), [Binhas M](#), [Bloc S](#), [Fuzier R](#), [Jochum D](#), [Nouette-Gaulain K](#), [Paqueron X](#);membres du comité douleur-ALR de Sfar.

### [Collaborators \(13\)](#)

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### [Abstract](#)

#### **BACKGROUND AND OBJECTIVE:**

Local wound infiltration is a component of multimodal postoperative (p.o.)analgesia. Its implementation in current clinical practice remains unknown. Pain and Regional Anesthesia Committee of the French Anaesthesia and Intensive Care Society (Sfar) aimed to appraise its practice.

#### **METHOD:**

Postal sample survey based on representative sample of national activity were sent to heads of anaesthesiology departments. The questionnaires included 36 items on single-shot and continuous woundinfiltrations (CWI) with considerations about modality of administration, drugs and development limitations. Results in mean [CI95 %].

#### **RESULTS:**

Response rate was 32 % (n=120). Sample was in accordance with national representation of health institutions. Local infiltration was included in 85 % [79-91] of the p.o. analgesia protocols. Regardless of the surgery, single-shot wound infiltration and CWI were used in more than 50 % of the patients by respectively 58 % [49-67] and 18 % [11-25] of the responders. However, a significant part of the surgeons remained reluctant to CWI. Lack of information and fear of septic complications were the most reported barriers. Peritoneal instillation after laparoscopy was rarely performed, in contrast with intra-articular infiltration after knee arthroscopy, performed systematically or very frequently by 60 % [50-70] of the responders.

#### **CONCLUSION:**

The practice of local wound infiltration for p.o. analgesia seems presently well established, especially for single-shot injections. CWI is less commonly performed. Several surgical reluctances remain to be overcome. Better information about effectiveness and safety are likely to still improve their practices.

[Anesth Analg.](#) 2012 Feb;114(2):456-61. doi: 10.1213/ANE.0b013e318239dc64. Epub 2011

Nov 10.

## Continuous epicapsular ropivacaine 0.3% infusion after minimally invasive hip arthroplasty: a prospective, randomized, double-blinded, placebo-controlled study comparing continuous wound infusion with morphine patient-controlled analgesia.

[Aquirre J](#)<sup>1</sup>, [Baulig B](#), [Dora C](#), [Ekatothramis G](#), [Votta-Velis G](#), [Ruland P](#), [Borgeat A](#).

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## Erratum in

- Anesth Analg. 2013 Jun;116(6):1394.

### Abstract

#### BACKGROUND:

In this study, we investigated the impact of a continuous wound infusion with ropivacaine 0.3% on pain and morphine consumption after minimally invasive hip arthroplasty.

#### METHODS:

Seventy-six consecutive patients scheduled for elective minimally invasive hip replacement using spinal anesthesia were prospectively included in this double-blind study. Epicapsular placement of a 15-cm fenestrated catheter was performed by the surgeon. Patients were randomized to receive either 20 mL ropivacaine 0.3% (R-group) or 20 mL NaCl 0.9% (P-group) applied into the wound as a bolus before woundclosure. A continuous infusion of either ropivacaine 0.3% or placebo was then infused at 8 mL/h for 48 hours after surgery with an elastomeric pump. Morphine IV-patient-controlled analgesia was offered to all patients. Morphine consumption, pain at rest and with motion, and total and unbound ropivacaine plasma concentration were recorded during the 48-hour study period. Postoperative follow-up was performed at 3 months.

#### RESULTS:

Demographic and surgical data were similar in both groups. Mean morphine consumption was significantly lower in the R-group than in the P-group during the first 48 postoperative hours:  $45.4 \pm 9.5$  vs  $69.7 \pm 9.6$  ( $P < 0.0001$ ). There was a mean reduction of 14.4 mg for the first 24 postoperative hours (95% confidence interval [CI] 12.6 to 16.1) and 20.8 mg for the next 24 hours (95% CI 19.1 to 22.4). Pain scores at rest and with motion were lower in the R-group ( $P < 0.0001$ ). Mean patient satisfaction increased 22.7% from baseline (CI 95% 15.9 to 29.6) in the R-group. Total and unbound ropivacaine plasma concentrations were below toxic levels in the R-group. The free ropivacaine concentration was 0.14 and 0.11  $\mu\text{g/mol/L}$  at T(24) and T(48), respectively, in the R-group. At 3 months postoperatively, hip pain and analgesic consumption were similar, but a significant reduction in wound discomfort to touch (31.2; 95% CI 27.7 to 34.7) and pressure (24; 95% CI 20.1 to 27.9) was observed in the R-group ( $P < 0.0001$ ).

#### CONCLUSIONS:

Continuous epicapsular wound infusion with ropivacaine 0.3% after minimally invasive hip replacement is an efficient technique for reducing morphine consumption and improving the quality of postoperative analgesia. The beneficial effects of this technique are still present 3 months after surgery.

[Hand Surg.](#) 2011;16(3):239-44.

## Continuous peripheral nerve block in forearm for severe hand trauma.

[Osada R<sup>1</sup>](#), [Zukawa M](#), [Seki E](#), [Kimura T](#).

### Author information

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### Abstract

We studied the use of a continuous peripheral nerve block (CPNB) in the distal forearm and wrist immediately after emergent surgery for severe hand trauma in 22 hands. After emergent surgery, a 2-3 cm longitudinal incision was made at the distal forearm and an 18-gauge catheter was inserted along the peripheral nerves. All patients received postoperative analgesia by continuous infusion of 0.2% ropivacaine at 2 ml/h for seven to 21 days. Pain score remained low during postoperative period and only a small number of analgesic rescues were needed. There were no major complications related to the CPNB and one patient showed mild superficial infection at the insertion site that immediately recovered after catheter removal. This method provides good postoperative analgesia without loss of motor function in intrinsic hand muscles and should be considered as a postoperative pain management for severe hand trauma.

[Br J Surg.](#) 2012 Feb;99(2):168-85. doi: 10.1002/bjs.7660. Epub 2011 Sep 16.

## Evidence-based management of postoperative pain in adults undergoing open inguinal hernia surgery.

[Joshi GP<sup>1</sup>](#), [Rawal N](#), [Kehlet H](#); [PROSPECT collaboration](#), [Bonnet F](#), [Camu F](#), [Fischer HB](#), [Neugebauer EA](#), [Schug SA](#), [Simanski CJ](#).

### Author information

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### Abstract

#### BACKGROUND:

Open inguinal hernia repair is associated with moderate postoperative pain, but optimal analgesia remains controversial. The aim of this systematic review was to evaluate the available literature on the management of pain after open hernia surgery.

**METHODS:**

Randomized studies, in English, published between January 1966 and March 2009, assessing analgesic and anaesthetic interventions in adult open hernia surgery, and reporting pain scores, were retrieved from the Embase and MEDLINE databases. In addition to published evidence, clinical practice was taken into account to ensure that the recommendations had clinical validity.

**RESULTS:**

Of the 334 randomized studies identified, 79 were included. Quantitative analysis suggested that regional anaesthesia was superior to general anaesthesia for reducing postoperative pain. Spinal anaesthesia was associated with a higher incidence of urinary retention and increased time to home-readiness compared with regional anaesthesia.

**CONCLUSION:**

Field block with, or without wound infiltration, either as a sole anaesthetic/analgesic technique or as an adjunct to general anaesthesia, is recommended to reduce postoperative pain. Continuous local anaesthetic infusion of a surgical wound provides a longer duration of analgesia. Conventional non-steroidal anti-inflammatory drugs or cyclo-oxygenase 2-selective inhibitors in combination with paracetamol, administered in time to provide sufficient analgesia in the early recovery phase, are optimal. In addition, weak opioids are recommended for moderate pain, and strong opioids for severe pain, on request.

[Cir Esp.](#) 2011 Nov;89(9):613-7. doi: 10.1016/j.ciresp.2011.06.002. Epub 2011 Aug 30.

## [Safety of a multiperforated catheter implanted in the surgical wound for the continuous infusion of local anaesthetics in post-operative analgesia].

[Article in Spanish]

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**Author information**

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**Abstract****OBJECTIVE:**

To evaluate the incidence of infection at the surgical site in patients who have a multiperforated catheter implant for continuous infusion of a local anaesthetic as a local analgesic.

**PATIENTS AND METHOD:**

An observational, descriptive and prospective study, of one month duration. It included 50 patients subjected to selective laparotomy in whom a multiperforated pre-peritoneal catheter was implanted for analgesia purposes (Painfusor®. Baxter). Patients with a surgical incision of less than 15 cm and/or ASA>III, were excluded from the study.

**RESULTS:**

The catheter was removed from all patients at 48 hours. An infection at the surgical site was present in 6% of the patients who had the catheter implanted, which was similar to the incidence in clean-contaminated surgery (5.5%; 95% CI: 3.4-8.7%). Colonisation of the catheter was observed in two patients, causing only one infection of the surgical site.

**CONCLUSIONS:**

The use of an in-situ pre-peritoneal catheter for post-surgical anaesthesia does not increase the risk of surgical site infection.

[Transplant Proc.](#) 2011 May;43(4):985-7. doi: 10.1016/j.transproceed.2011.01.144.

## Continuous infusion of local anesthesia after living donor nephrectomy: a comparative analysis.

[Panaro F<sup>1</sup>](#), [Gheza F](#), [Piardi T](#), [Woehl Jaeqle ML](#), [Audet M](#), [Cantù M](#), [Cinquabre J](#), [Wolf P](#).

**Author information**

- <sup>1</sup>Centre de Chirurgie Viscérale et de Transplantation-Hôpital de Haute-pierre, Hôpitaux Universitaires de Strasbourg-Université Louis Pasteur, Strasbourg, [France](#).

**Erratum in**

- Transplant Proc. 2011 Oct;43(8):3149.

### Abstract

#### INTRODUCTION:

Today local anesthetic wound infiltration is widely recognized as a useful adjunct in a multimodality approach to postoperative pain management. The effectiveness of continuous wound infusion of ropivacaine for postoperative pain relief after laparoscopic living donor nephrectomy was analyzed in this retrospective, comparative analysis.

#### METHODS:

Twenty patients undergoing living donor nephrectomy were divided into two groups: standard analgesic therapy (n=10) and ropivacaine continuous infusion group (n = 10).

#### RESULTS:

We observed a significant difference in term of visual analogue scale scores, use of morphine, hospital stay, and bowel recovery in favor of the ropivacaine group. The cost analysis demonstrated an overall savings of 985 Euros/patient.

#### DISCUSSION:

Surgical wound infusion with ropivacaine was safe and seemed to improve pain relief and accelerate recovery and discharge, reducing the overall costs of care. Postoperative pain control in the donor is of primary importance for better patient compliance and greater perceived quality of health care service.

[Langenbecks Arch Surg.](#) 2011 Mar;396(3):323-9. doi: 10.1007/s00423-010-0735-x. Epub 2010 Dec 29.

## Continuous local analgesic therapy reduces pain after radical inguinal/iliacal lymph node dissection.

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### Abstract

#### BACKGROUND:

To optimize postoperative pain therapy after a radical inguinal/iliacal lymph node dissection (RILND), we investigated the influence of a continuous application of a local anaesthetic via a subfascial woundcatheter in the abdominal wall in addition to a standardized systemic analgesia.

#### MATERIALS AND METHODS:

Between July 2007 and December 2009, 50 patients with stage III/IV of melanoma disease received, in an observational study, a systemic analgesic therapy. Of these patients, 30 were additionally treated with a subfascial catheter. Main outcome criterion was the pain under mobilisation at the first postoperative morning registered via a visual analogue score. Minor criteria were the analgesic requirement, the specific (surgical) complications and the day of discharge.

#### RESULTS:

Patients treated with the subfascial catheter had significant less pain at the first postoperative morning in rest (p = 0.02) and after mobilisation (p = 0.03) without increased morbidity (p = 0.45). Less patients of the treatment group needed a supplementary analgesic medication (p = 0.01) and were able to leave hospital earlier than patients of the control group (p = 0.01).

#### CONCLUSIONS:

A subfascially placed pain catheter enhances postoperative pain therapy after RILND.

[Anaesthesist.](#) 2010 Dec;59(12):1076-82. doi: 10.1007/s00101-010-1808-5.

## [Continuous wound infusion of local anesthetics: importance in postoperative pain therapy].

[Article in German]

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### Abstract

Continuous wound infusion of local anesthetics, which is mainly used in general surgery and orthopedics, is an interesting technique in postoperative pain therapy. Continuous wound infusion of local anesthetics is able to reduce postoperative opioid requirements and results in decreased pain scores. Recent studies indicate that rehabilitation seems to be enhanced and postoperative hospital stay may be shorter. Continuous wound infusion is an effective analgesic technique, which is simple to perform. Comparisons with other analgesic techniques, such as peripheral nerve blocks, epidural analgesia and other multimodal analgesic concepts are still required.

[ANZ J Surg.](#) 2010 Nov;80(11):794-801. doi: 10.1111/j.1445-2197.2010.05339.x.

## Wound infusion with local anaesthesia after laparotomy: a randomized controlled trial.

[Wang LW<sup>1</sup>](#), [Wong SW](#), [Crowe PJ](#), [Khor KE](#), [Jastrzab G](#), [Parasyn AD](#), [Walsh WR](#).

### [Author information](#)

- <sup>1</sup>Department of Surgery, Prince of Wales Hospital, New South Wales, [Australia](#).

### Abstract

#### BACKGROUND:

The use of a continuous local anaesthesia infusion after laparotomy may reduce opioid requirements and facilitate earlier return of bowel function, independent mobilization and hospital discharge.

#### METHODS:

We performed a double-blinded, randomized controlled trial on 55 patients who underwent laparotomy. Patients were randomly allocated to receive a continuous infusion of either 0.2% ropivacaine or normal saline into their midline abdominal wound at the fascial level. The end points of the study were: total opioid requirements at 24 and 48 h; time to first flatus, bowel movement and independent ambulation; length of hospital stay; complications; and daily mean patient-reported pain scores at rest and movement.

#### RESULTS:

The two treatment groups were well controlled for factors that influence analgesia requirements, including age, weight, length of wound incision and type of operation. Patients allocated to ropivacaine infusion used, on average, 32 mg less morphine at 48 h (95% confidence interval 7, 57;  $P = 0.01$ ). This was highly statistically significant after adjusting for age, gender and type of operation ( $P = 0.0006$ ). Ropivacaine infusion was associated with a significantly decreased time to independent mobilization ( $P = 0.02$ ), time to first flatus ( $P = 0.02$ ) and reduced post-operative ileus (2/28 versus 9/27,  $\chi^2 = 5.89$ ,  $P = 0.02$ ). There was no significant effect of ropivacaine infusion on time to first bowel movement ( $P = 0.94$ ) nor length of hospital stay ( $P = 0.77$ ).

#### CONCLUSIONS:

Local anaesthesia infusion at the fascial plane provides effective analgesia. This improves patient recovery through earlier return to bowel function and mobilization.

[Anaesthesia.](#) 2010 Dec;65(12):1180-6. doi: 10.1111/j.1365-2044.2010.06530.x. Epub 2010 Oct 19.

## The analgesic efficacy of continuous wound instillation with ropivacaine after open hepatic surgery.

[Chan SK<sup>1</sup>](#), [Lai PB](#), [Li PT](#), [Wong J](#), [Karmakar MK](#), [Lee KF](#), [Gin T](#).

### [Author information](#)

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### Abstract

The analgesic efficacy of continuous local anaesthetic wound instillation after open hepatic surgery was evaluated. Forty-eight patients scheduled for elective liver surgery were assigned to receive either ropivacaine 0.25% or saline infusion at 4 ml.h<sup>-1</sup> for 68 h via two multi-orifice indwelling catheters placed within the musculo-fascial layer before skin closure; plasma ropivacaine concentrations were measured during the infusion. Supplemental analgesia was provided by intravenous patient-controlled analgesia morphine. Patients in the ropivacaine group had decreased mean (SD) total morphine consumption (58 (30) mg vs 86 (44) mg,  $p = 0.01$ ) and less pain at rest as well as after spirometry at 4, 12, 24, 48 and 72 h postoperatively ( $p < 0.01$ ). Forced vital capacity was reduced postoperatively in both groups, but the reduction was greater in the saline group at 12 and 24 h ( $p = 0.03$ ). The mean plasma concentration of ropivacaine increased to 2.05 (0.78)  $\mu\text{g.ml}^{-1}$  at the point when the infusion was terminated.

[N Z Med J.](#) 2010 Oct 15;123(1324):25-31.

## Introduction of continuous regional analgesia via wound catheters in a peripheral hospital.

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#### **Abstract**

##### **PURPOSE:**

To review the effectiveness of continuous regional analgesia (CRA) via wound catheters after abdominal surgery in a district general hospital (Wanganui, New Zealand).

##### **METHODS:**

Retrospective review of postoperative analgesia after CRA via wound catheters was introduced (April 2008 to December 2008). Pain scores, HDU stay, opiate use and complications were recorded.

##### **RESULTS:**

Fifty-four patients' notes have been reviewed after elective and emergency laparotomies. Twenty-seven had WC ( $\pm$  patient controlled analgesia [PCA]), 15 had PCA only, 12 had epidural ( $\pm$  PCA). Resting pain scores were nil or zero in 18/27 (66.7%) wound catheter, 9/15 (60%) PCA and 5/12 (41.7%) epidural patients. Moderate/severe pain on movement was scored in patients 5/27 (18.5%) with wound catheter, 6/15 (40%) with PCA, 5/12 (41.7%) with epidural catheters. A single PCA syringe lasted over 24 hours in 18/27 (66.7%) woundcatheter, 6/15 (40%) PCA, and 5/8 (63%) epidural + PCA patients. Eight adverse effects were seen; 4 woundinfections (2 wound catheter, 1 PCA, 1 epidural patient) and 4 blockages of epidural catheters in epidural group. No adverse effect was found directly related to the WC.

##### **CONCLUSIONS:**

Continuous regional analgesia via wound catheters provides effective and safe postoperativeanalgesia for surgical patients in a small district general hospital. Used as part of a multimodal approach it allows easy step-down from HDU to surgical wards. This technique has been readily accepted over the year by theatre, HDU, ward, and anaesthetics colleagues.

[Anesth Analg](#). 2010 Dec;111(6):1452-9. doi: 10.1213/ANE.0b013e3181f579de. Epub 2010 Sep 22.

## **Continuous subcutaneous instillation of bupivacaine compared to saline reduces interleukin 10 and increases substance P in surgical wounds after cesarean delivery.**

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#### **Abstract**

##### **BACKGROUND:**

Recent evidence suggests that locally delivered local anesthetics may exert tissue-damaging effects such as chondrolysis after intraarticular injection. Alteration of the inflammatory response is a potential mechanism for local anesthetic-induced tissue toxicity. In this study, we tested the effects of continuous local anesthetic infiltration on the release of inflammatory and nociceptive mediators in skin wounds after cesarean delivery.

##### **METHODS:**

Thirty-eight healthy women undergoing cesarean delivery with spinal anesthesia were enrolled in this study, and were randomized to receive subcutaneous surgical wound infiltration with bupivacaine 5 mg/mL or saline at 2 mL/h for 24 hours after cesarean delivery. Wound exudate was sampled at 1, 3, 5, 7, and 24 hours after cesarean delivery using a subcutaneous wound drain technique. Cytokines, chemokines, substance P, prostaglandin E(2), and nerve growth factor were assayed using multiplex Bio-Plex® (Bio-Rad, Hercules, CA) and enzyme-linked immunosorbent assays.

##### **RESULTS:**

Bupivacaine wound infusion resulted in a significant decrease of interleukin 10 and increase of substance P in wounds compared with saline infusion (area under the 24-hour concentration-time curve;  $P < 0.001$ ). No statistically significant differences were detected for other cytokines, nerve growth factor, and prostaglandin E(2).

##### **CONCLUSIONS:**

This study demonstrates that the continuous administration of clinically used doses of bupivacaine into wounds affects the local composition of wound mediators. Observed changes in interleukin 10 are compatible with a disruption of antiinflammatory mechanisms. Whether such modulation combined with the release of the proinflammatory mediator substance P results in an overall proinflammatory wound response will require future studies of wound healing.

[Acta Orthop](#). 2010 Oct;81(5):606-10. doi: 10.3109/17453674.2010.519165.

## **A randomized, controlled trial comparing local infiltration analgesia with epidural infusion for total knee arthroplasty.**

[Andersen KV<sup>1</sup>](#), [Bak M](#), [Christensen BV](#), [Harazuk J](#), [Pedersen NA](#), [Søballe K](#).

[Author information](#)

- <sup>1</sup>Department of Orthopedic Surgery, Aarhus University Hospital, Aarhus, [Denmark](#). karenand@rm.dk

**Abstract**

**BACKGROUND:**

There have been few studies describing wound infiltration with additional intraarticular administration of multimodal analgesia for total knee arthroplasty (TKA). In this study, we assessed the efficacy of wound infiltration combined with intraarticular regional analgesia with epidural infusion on analgesic requirements and postoperative pain after TKA.

**METHODS:**

40 consecutive patients undergoing elective, primary TKA were randomized into 2 groups to receive either (1) intraoperative wound infiltration with 150 mL ropivacaine (2 mg/mL), 1 mL ketorolac (30 mg/mL), and 0.5 mL epinephrine (1 mg/mL) (total volume 152 mL) combined with intraarticular infusion (4 mL/h) of 190 mL ropivacaine (2 mg/mL) plus 2 mL ketorolac (30 mg/mL) (group A), or (2) epidural infusion (4 mL/h) of 192 mL ropivacaine (2 mg/mL) combined with 6 intravenous administrations of 0.5 mL ketorolac (30 mg/mL) for 48 h postoperatively (group E). For rescue analgesia, intravenous patient-controlled analgesia (PCA) morphine was used. Morphine consumption, intensity of knee pain (0–100 mm visual analog scale), and side effects were recorded. Length of stay and corrected length of stay were also recorded (the day-patients fulfilled discharge criteria).

**RESULTS:**

The median cumulated morphine consumption, pain scores at rest, and pain scores during mobilization were reduced in group A compared to group E. Corrected length of stay was reduced by 25% in group A compared to group E.

**INTERPRETATION:**

Peri- and intraarticular analgesia with multimodal drugs provided superior pain relief and reduced morphine consumption compared with continuous epidural infusion with ropivacaine combined with intravenous ketorolac after TKA.

[Obstet Gynecol.](#) 2010 Oct;116(4):893-900. doi: 10.1097/AOG.0b013e3181f38ac6.

## Improving continuous wound infusion effectiveness for postoperative analgesia after cesarean delivery: a randomized controlled trial.

[Rackelboom T<sup>1</sup>](#), [Le Strat S](#), [Silvera S](#), [Schmitz T](#), [Bassot A](#), [Goffinet F](#), [Ozier Y](#), [Beaussier M](#), [Mignon A](#).

[Author information](#)

- <sup>1</sup>Department of Anesthesiology and Intensive Care, Maternité Port-Royal, [France](#).

**Abstract**

**OBJECTIVE:**

To evaluate in which anatomical layer (above the fascia or below the fascia) continuous wound infusion of local anesthetic, combined with nonsteroidal antiinflammatory drugs, through a multiorifice catheter has the best effectiveness during the first 48 hours on postoperative pain intensity after elective cesarean delivery.

**METHODS:**

Fifty-six women undergoing elective cesarean delivery under spinal anesthesia were randomly allocated to receive 48-hour continuous wound infusion either above the fascia or below the fascia using ropivacaine and ketoprofene through a multiholed wound catheter. No other systemic analgesics were used, except for rescue patient-controlled intravenous morphine. Evaluation by a blinded investigator included visual analog scale scores at rest and at movement, morphine consumption, patient satisfaction, residual pain at 1 and 6 months, and undesirable side effects.

**RESULTS:**

Continuous wound infusion below the fascia resulted in significantly reduced pain at rest and total postoperative morphine consumption (15.7 mg, 95% confidence interval 9.7-20.7 mg) compared with wound administration above the fascia (26.4 mg, 95% confidence interval 18.1-34.7). No undesirable side effects or residual pain requiring treatment were recorded in both groups, whereas analgesia and satisfaction were excellent.

**CONCLUSION:**

After cesarean delivery, continuous wound infusion over 48 hours with ropivacaine and ketoprofene through a multiholed wound catheter inserted below the fascia results in better analgesia when compared with administration above the fascia.

[Int Wound J.](#) 2010 Jun;7(3):195-8. doi: 10.1111/j.1742-481X.2010.00675.x.

## Chronic, painful lower extremity wounds: postoperative pain management through the use of continuous infusion

## of regional anaesthesia supplied by a portable pump device.

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### **Abstract**

Reducing and preventing postoperative pain are currently a topic of great interest. There are different modalities for providing analgesia that can provide an alternative or adjunct to opioid therapy. One mode of therapy involves the use of portable pain pump devices that can deliver continuous local anaesthesia directly to the site of interest. A considerable amount of attention in literature has been dedicated to using regional anaesthesia postoperatively for various surgical applications. However, to our knowledge, little or no work has been published concerning the use of infusion of regional anaesthesia in the treatment of painful lower extremity wounds. We present a case report of a 55-year-old gentleman with a complex past medical history, 2-year history of opioid dependency and a 2-week history of intractable pain associated with the combination of debilitating painful diabetic neuropathy and painful lower extremity wounds. After surgical debridement of the lower extremity wounds, substantial analgesia was achieved postoperatively through the implantation of a portable direct infusion pump device. The device supplied 2 ml/hour of 0.25% bupivacaine and resulted in a reduction in pain within the first hour of implantation. Although the device achieved maximal analgesia at 6 hours, we found that this could have been likely reduced through the use of a 5-ml bolus dose of 0.25% bupivacaine at the time of implantation. The device provided sufficient analgesia to the patient without any observed adverse effects, and showed significant potential in avoiding an increase in his requirement for other systemic analgesia including opioids.

[Natl J Maxillofac Surg](#). 2010 Jul;1(2):112-6. doi: 10.4103/0975-5950.79211.

## Continuous ropivacaine infusion vs transdermal fentanyl for providing postoperative analgesia following temporomandibular joint interpositional gap arthroplasty.

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### [Author information](#)

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### **Abstract**

#### **AIM:**

The purpose of this study was to evaluate the postoperative pain control and mouth opening in patients undergoing temporomandibular joint interpositional gap arthroplasty by either placing an epidural catheter in the incision wound and infusing ropivacaine 0.25% or by using a transdermal fentanyl patch.

#### **MATERIALS AND METHODS:**

The study was prospective, randomized and double blind. Eighty patients belonging to American Society of Anesthesiologists grade I and II, 18-32 years of age, scheduled for temporomandibular joint interpositional gap arthroplasty were randomized into 2 groups; ropivacaine group (G rop): to receive 0.25% ropivacaine infusion and transdermal fentanyl group (G tf): to receive transdermal fentanyl patch. For postoperative pain (Visual Analog Score [VAS]) and analgesic requirements were assessed 2, 4 and 8 h after surgery and each morning, until and 4 days after surgery.

#### **RESULTS:**

Time to first analgesic requirement was found to be significantly ( $P < 0.0001$ ) higher in G rop ( $49 \pm 6.7$ ) as compared with G tf ( $32 \pm 9.1$ ) VAS were also significantly lower in G rop throughout the postoperative period. Postoperatively, mouth opening was better in G rop as compared with G tf, which was statistically significant.

#### **CONCLUSION:**

It was concluded that by placing an epidural catheter at the incision wound and continuously infusing with ropivacaine 0.25% effectively controls the postoperative pain in patients undergoing temporomandibular joint interpositional gap arthroplasty and provides better postoperative mouth opening.

[World J Surg](#). 2010 Oct;34(10):2359-62. doi: 10.1007/s00268-010-0651-9.

## Out with the old, in with the new: a novel approach to treating pain associated with rib fractures.

[Truitt MS](#)<sup>1</sup>, [Mooty RC](#), [Amos J](#), [Lorenzo M](#), [Mangram A](#), [Dunn E](#).

### [Author information](#)

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#### Abstract

##### BACKGROUND:

Rib fractures continue to be a challenging problem from both a pulmonary and analgesia standpoint. As a result, numerous modalities have been used to treat this condition, but none has proven universally available and efficacious. The objective of this pilot study was to assess the efficacy of a novel technique for placing an elastomeric infusion pump (EIP) catheter (On-Q; Lake Forest, CA, USA) in the extrathoracic paraspinal space to create a continuous intercostal nerve block.

##### METHODS:

This was a prospective, nonrandomized study conducted in the surgical intensive care unit (SICU) of an urban level II trauma center. We developed a novel technique for placing EIP catheters in the extrathoracic paraspinal space to provide continuous intercostal nerve blockade. We subsequently evaluated 30 consecutive blunt trauma patients with three or more unilateral rib fractures. The catheters were infused with local anesthetic, and the dose was titrated to achieve adequate analgesia. For each patient, preplacement numeric pain scale scores (NPSs) and sustained maximum inspiration (SMI) lung volumes were determined. Sixty minutes following placement of the catheters, the NPS and SMI were repeated. The patients were monitored for any procedural or drug-related complications.

##### RESULTS:

The mean age of the patients was 65 years (22-92 years); the mean ISS was 14 (9-16); and the mean number of rib fractures was 4.4 (3-8). Overall, the mean NPS significantly improved (preplacement NPS 9.03, postplacement NPS 3.06;  $p < 0.05$ ) and was associated with a significant increase in the SMI (preplacement SMI 0.40 L, postplacement SMI 1.1 L;  $p < 0.05$ ). The catheters remained in place for an average of 98 h (72-146 h), and there were no procedural- or drug-related complications.

##### CONCLUSIONS:

These pilot data indicate that the placement of EIP catheters in the extrathoracic paraspinal space may be a safe, viable, and efficacious procedure for ameliorating pain secondary to rib fractures

[Heart Surg Forum](#). 2010 Apr;13(2):E96-E100. doi: 10.1532/HSF98.20091164.

## The analgesic efficacy of local anesthetics for the incisional administration following port access heart surgery: bupivacaine versus ropivacaine.

[Sostaric M<sup>1</sup>](#), [Gersak B](#), [Novak-Jankovic V](#).

#### [Author information](#)

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#### Abstract

##### BACKGROUND:

To avoid large dose opioids, the authors investigated an alternative method for postoperative pain relief after Port Access cardiac surgery.

##### METHODS:

Out of 104 patients who underwent Port Access heart surgery, 78 patients who were extubated in the operating room were enrolled in the retrospective study. The standardized fast track cardiac anesthesia was used for all patients, and the catheter was placed in the surgical wound at the end of the operation. Analgesia was started with a bolus of bupivacaine (B group) or ropivacaine (R group) through the catheter and followed by continuous infusion of local anesthetic. The variables recorded were visual analogue scale (VAS) at extubation and during the first 24 hours, additional requirements of local anesthetic (LA), and opioid analgesic. Possible complications that could be connected with the catheter in the wound or with the administration of LA were recorded as well.

##### RESULTS:

There was no statistical difference between the R and B groups in mean pain score at extubation and in the first 24 hours. The groups were also comparable concerning the need for bolus application of the LA and opioid analgesic. The microbiological analysis of 9 randomly chosen catheter tips from both groups was sterile.

##### CONCLUSION:

Both local anesthetics, ropivacaine and bupivacaine, are equally effective for pain relief after Port Access cardiac surgery. The catheter in surgical incision and application of LA through it does not increase the risk for wound infection and does not interfere with wound healing.

[Rev Esp Anesthesiol Reanim](#). 2009 Aug-Sep;56(7):417-24.

## [Efficacy of a continuous infusion of local anesthetic into the surgical wound for pain relief after abdominal hysterectomy].

[Article in Spanish]

[Gómez Ríos MA<sup>1</sup>](#), [Vázquez Barreiro L](#), [Nieto Serradilla L](#), [Diz Gómez JC](#), [López Álvarez S](#).

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#### **Abstract**

##### **OBJECTIVE:**

To assess the quality of postoperative analgesia provided by intravenous administration of paracetamol and ketorolac plus morphine in bolus doses with or without continuous infusion of local anesthetic into the surgical wound after abdominal hysterectomy. Patient satisfaction was included among the outcomes assessed.

##### **MATERIAL AND METHODS:**

Prospective pilot study in ASA 1-2 patients randomized to 2 groups: women in the subcutaneous catheter group received intravenous analgesics plus a continuous infusion (2 mL/h) of 0.25% bupivacaine whereas women in the control group received only the intravenous analgesics. The outcome measures were pain intensity assessed on a verbal numerical scale at rest and with movement, morphine requirements in the first 48 hours after surgery, and complications related to the drugs used or the technique.

##### **RESULTS:**

Twenty-six patients were enrolled; 10 were randomized to the catheter group and 16 to the control group. Statistically significant between-group differences in pain both at rest and with movement were found while the women were in the postoperative recovery unit. Postoperative pain with movement was also significantly different at 24 hours ( $P < .004$ ) and 48 hours ( $P < .02$ ). Similarly, mean (SD) morphine requirements in the recovery unit were significantly greater in the control group, at 8 (2.27) mg, compared with 3.20 (1.79) mg in the catheter group ( $P < .002$ ). Walking began earlier in the catheter group. No differences were found in the incidences of complications.

##### **CONCLUSIONS:**

Postoperative pain is effectively relieved by continuous infusion of local anesthetic into the surgical wound after abdominal hysterectomy. This technique provides good analgesia with less morphine consumption and scarce adverse effects. Patient satisfaction and the sense of receiving quality pain management are high.

[Vet Anaesth Analg.](#) 2009 Nov;36(6):597-602. doi: 10.1111/j.1467-2995.2009.00487.x.

## **Use of wound soaker catheters for the administration of local anesthetic for post-operative analgesia: 56 cases.**

[Abelson AL](#)<sup>1</sup>, [McCobb EC](#), [Shaw S](#), [Armitage-Chan E](#), [Wetmore LA](#), [Karas AZ](#), [Blaze C](#).

#### Author information

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#### **Abstract**

##### **OBJECTIVE:**

To describe the administration of local anesthetic through wound soaker catheters for post-operative veterinary patients and to characterize complications.

##### **STUDY DESIGN:**

Retrospective study of hospital records.

##### **ANIMALS:**

Records of patients in which a wound soaker catheter was placed post-operatively between November 1, 2004 and July 1, 2006 at a veterinary teaching hospital. Records in which a limb amputation was performed between January 1, 2002 and August 1, 2007 and in which a wound soaker catheter was not placed were reviewed for historic control.

##### **RESULTS:**

A total of 56 cases were identified in which a wound soaker catheter was placed post-operatively including 52 dogs, 2 cats, and 2 goats. Twenty canine cases were identified in which limb amputation was performed and no wound soaker catheter was placed. The majority of surgical procedures for which a woundsoaker catheter was placed included thoracic limb amputation (46.4%) and pelvic limb amputation (35.7%). Wound soaker catheters remained in place for an average of 1.6 +/- 0.5 days. Feline and caprine patients received intermittent bupivacaine boluses every 6 hours. Canine patients received continuous lidocaine infusions. Complications included disconnection of the catheter from the infusion (7.7%), one seroma, and one suspected lidocaine neurotoxicity. Incisional infections were noted in 3/56 (5.3%) limb amputations with woundsoaker catheters placed which was not higher than the incisional infection rate found in the historic control cases 3/20 (15%).

##### **CONCLUSION AND CLINICAL RELEVANCE:**

Use of the wound soaker catheter was a viable means of providing local analgesia in post-operative veterinary patients. Studies are needed to evaluate efficacy of pain management, and to further investigate techniques for catheter placement and maintenance which may help to optimize the analgesia achieved using this technique.

[Pain Med.](#) 2009 Nov;10(8):1487-96. doi: 10.1111/j.1526-4637.2009.00731.x. Epub 2009 Oct

# Pain following battlefield injury and evacuation: a survey of 110 casualties from the wars in Iraq and Afghanistan.

[Buckenmaier CC 3rd<sup>1</sup>](#), [Rupprecht C](#), [McKnight G](#), [McMillan B](#), [White RL](#), [Gallagher RM](#), [Polomano R](#).

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## **Abstract**

### **OBJECTIVE:**

Advances in regional anesthesia, specifically continuous peripheral nerve blocks (CPNBs), have greatly improved pain outcomes for wounded soldiers in Iraq and Afghanistan. Pain management practice variations, however, do exist, depending on the availability of pain-trained military professionals deployed to combat support hospitals. An exploratory study was undertaken to examine pain and other outcomes during evacuation and at Landstuhl Regional Medical Center (LRMC), Germany.

### **DESIGN:**

A mixed-methods, semistructured interview survey design was conducted on a convenience sample of wounded U.S. soldiers evacuated from Iraq and Afghanistan to LRMC. Setting and patients: A total of 110 wounded soldiers evacuated from Iraq and Afghanistan from July 2007 to February 2008 completed a pain survey at LRMC. Data were collected on demographics, injury mechanism, last 24-hour average, least, and worst, and pain now by using a 0-10 scale, and percent pain relief (from 0% [No relief] to 100% [Complete relief]). Similar items and measures of anxiety, distress, and worry during flight transport were measured (from 0 [None] to 10 [Extreme]). Responses were analyzed by using descriptive and correlational statistics, multiple linear regression, Mann-Whitney U-tests, and t-tests. The Walter Reed Army Medical Center, Human Use Committee approved this investigation.

### **RESULTS:**

Participants were typically male (99.1%), Caucasian (80%), and injured from improvised explosive devices (60%) and gunshots (21.8%). Average and worst pain scores were inversely correlated with pain relief during transport ( $r = -0.58$  and  $r = -0.46$ , respectively;  $P < 0.001$ ), and low to moderately positively correlated with increased anxiety, distress, and worry during transport ( $P < 0.05$ ). Average percent pain relief achieved was 45.2%  $\pm$  26.6% during transport and 64.5%  $\pm$  23.5% while at LRMC ( $P < 0.001$ ). Participants with CPNB catheters placed at LRMC reported significantly less pain right now ( $P = 0.031$ ) and better pain relief ( $P = 0.029$ ) than soldiers without CPNBs.

### **CONCLUSIONS:**

Our findings underscore the value of early aggressive pain management after major combat injuries. Increased pain was associated with increased anxiety, distress, and worry during transport, suggesting the need for psychological management along with analgesia. Regional anesthesia techniques while at LRMC contributed to better pain outcomes.

[J Maxillofac Oral Surg](#). 2009 Sep;8(3):254-6. doi: 10.1007/s12663-009-0062-3. Epub 2009

Nov 21.

# Use of a modified epidural catheter for analgesia after iliac crest bone procurement.

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## Author information

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## **Abstract**

### **BACKGROUND AND OBJECTIVES:**

Autogenous bone grafting is the gold standard procedure for various maxillofacial defects which needs surgical correction and anterior iliac crest is the most common site of harvest. Immediate postoperative pain at the harvested site is a major morbidity associated with it. The aim of the study was to assess the immediate postoperative pain control at the iliac crest graft harvested site by placing an epidural catheter in the incision wound and continuously infiltrating bupivacaine 0.25% at regular intervals.

### **MATERIALS AND METHODS:**

Twenty patients requiring autogenous bone grafting for large maxillofacial defects were chosen for the study. They were divided randomly into two groups of ten each. Group 1 patients were placed with epidural catheter in the incision wound at iliac crest harvested site and group 2 patients did not receive epidural catheter. Continuous infiltration of long acting amide local anesthetic (Bupivacaine) was given to group 1 patients on the postoperative day. Both group 1 & group 2 patients received parenteral analgesic Diclofenac sodium 75mg intramuscularly. Pain at the iliac crest and maxillofacial area was assessed by VAS scale. Also the time of ambulation of the patient was noted. These variables were compared statistically.

### **RESULTS:**

The observed findings were statistically analyzed. Group 1 patients showed significant pain relief at the graft harvested site as compared to group 2 patients. Also the patients in group 1 were ambulated early as compared to group 2 patients.

### **INTERPRETATION AND CONCLUSION:**

It was concluded that by placing epidural catheter at the incision wound and continuously infiltrating with bupivacaine 0.25% at iliac crest harvested site at regular intervals effectively controls the immediate acute pain postoperatively and the patient can be ambulated and brought back to normal routine early.

[Transplant Proc.](#) 2009 May;41(4):1128-31. doi: 10.1016/j.transproceed.2009.03.013.

## Wound levobupivacaine continuous infusion for postoperative analgesia in living kidney donors: case-control study.

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### **Abstract**

#### **INTRODUCTION:**

The objective of this study was to evaluate the efficacy of an analgesic regimen based on levobupivacaine continuous infusion into the surgical wound of living kidney donors (LKDs).

#### **PATIENTS AND METHODS:**

Fifty adult LKDs (mean age, 53.1 +/- 5.3 years; age range, 52-68 years) were retrospectively assigned to a no wound infusion (NWI) group (n = 25) or a wound infusion (WI) group (n = 25). At the end of surgery, patients in the WI group received 10 mg intramuscular morphine; a peridural catheter was placed 10 cm between the intercostal muscles fibers close to the lower rib extremity, and a solution of levobupivacaine, 150 mg/100 mL, was started at 5 mL/h(-1). Patients in the NWI group received intramuscular morphine, 10 mg, every 8 hours; intravenous tramadol, 100 mg, was planned as a rescue drug for incidental pain. Pain was measured using a visual analog scale (VAS) ranging from 1 (no pain) to 10 (maximum pain) in both the basal condition (VASb) and during coughing (VASc) at 1 hour after leaving the operating room and 6, 12, and 24 hours thereafter.

#### **RESULTS:**

At 1, 6, 12, and 24 hours, VASb values in the NWI vs the WI group were 5.2 vs 3.1, 6.8 vs 4.1, 5.8 vs 4.9 (all p < .01), and 5.4 vs 5.1, respectively, and VASc values were 8.2 vs 6.3, 8.8 vs 5.9, 7.1 vs 5.3, and 6.8 vs 5.1 (all p < .01). Mean VAS score was significantly higher between 1 and 6 hours in the NWI group for all VASb measurements vs VASc values. Tramadol consumption was higher in the NWI group than in the WI group.

#### **CONCLUSIONS:**

Continuous wound infusion with 5 mL/h(-1) levobupivacaine, 1.5 mg/mL(-1), resulted in a safe and effective analgesic protocol in LKDs both in the immediate postoperative period and in the first day after surgery, a result that was more effective than a morphine-tramadol regimen. No adverse effects were recorded, which confirmed the safety of the technique. It is probable that better results could be achieved with dedicated administration devices.

[Proc West Pharmacol Soc.](#) 2009;52:35-8.

## Efficacy of postoperative continuous wound infiltration with local anesthetic after major abdominal surgery.

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### Author information

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### **Abstract**

The aim of this study was to evaluate the analgesic efficacy, safety, opioid sparing effects and improvement of respiratory function when using 0.2% ropivacaine continuous wound infiltration after major intra-abdominal surgery. Forty patients undergoing major intra-abdominal surgery requiring a midline incision of > or = 20 cm were enrolled into this IRB-approved, randomized, prospective controlled study. Group I: 20 patients, parenteral analgesia (control group). Group II: 20 patients, with local anesthetic wound infiltration (pain pump group). At the end of the procedure, in the pain pump group of patients, a multi hole, 20-gauge catheter was inserted percutaneously, above the fascia. An initial dose of 10 ml of 0.2% ropivacaine was injected in the wound through the catheter. A device provided continuous delivery of 0.2% ropivacaine; the infusion was initiated at 6 ml/h for the following two days. The total "rescue" morphine and oxycodone/acetaminophen tablets administered were significantly lower in the pain pump group. At all time intervals, resting pain scores were significantly lower in the pain pump group when compared with the control group. However, at the 4-48 and 12-48 hours pain scores generated after leg raise and coughing, respectively, were significantly lower in group II. The patient vital capacities were insignificantly higher in group II. We conclude that after major abdominal surgery, infiltration and continuous wound instillation with 0.2% ropivacaine decreases postoperative pain, opioid requirements and oral analgesia. Early patient rehabilitation, hastening convalescence, and preventing respiratory complications are expected outcomes of this approach.

[J Plast Reconstr Aesthet Surg.](#) 2009 May;62(5):618-25. doi: 10.1016/j.bjps.2007.09.042.

Epub 2008 Apr 2.

# Postoperative analgesia and flap perfusion after pedicled TRAM flap reconstruction -continuous wound instillation with ropivacaine 0.2%. A pilot study.

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## **Abstract**

Transverse rectus abdominis musculocutaneous (TRAM) flap surgery is a complex procedure characterised by an extensive wound site. We present a pilot study with 17 patients receiving continuous wound instillation with ropivacaine or isotonic saline. Patients undergoing TRAM flap surgery were included in the study and randomised to the ropi group or the control group. Two catheters were placed subcutaneously before wound site closure. At the end of surgery patients received a single shot dose of 20 ml ropivacaine 0.2% or isotonic saline. After surgery the continuous instillation of ropivacaine or isotonic saline was commenced at an infusion rate of 10 ml/h per catheter. The perfusion of the TRAM flap was measured intraoperatively and postoperatively over 48 h. Pain scores, patient satisfaction, and the quality of recovery score were also assessed postoperatively over 48 h. Ropivacaine plasma levels were quantified 24 and 48 h after start of infusion. Pain scores at rest and on coughing were lower for the ropi group and reached significance in the first 8h at rest (P=0.007). Patient satisfaction, quality of recovery score, and adverse events were also comparable between the groups. Patients of the ropi group had bowel movement earlier than the control group (P=0.003). No differences were seen in the flap perfusion. Ropivacaine plasma levels were within therapeutic range. Our data show a trend that continuouswound instillation of ropivacaine 0.2% increases pain relief after TRAM flap surgery with earlier bowel movement than intravenous opioid patient controlled analgesia (IV-PCA) alone. A does of 960 mg of ropivacaine daily did not result in toxic plasma concentrations. Ropivacaine 0.2% did not show a vasoconstrictor effect.

[HPB \(Oxford\)](#). 2004;6(3):186-9. doi: 10.1080/13651820410030844.

# An alternative method of wound pain control following hepatic resection: a preliminary study.

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## [Author information](#)

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## **Abstract**

### **BACKGROUND:**

Epidural analgesia is considered one of the optimal methods for provision of postoperative pain relief in patients recovering from major upper abdominal operations. Concerns regarding the potential risk of neurological complications prompted an evaluation of an alternative strategy using a continuous intermuscular bupivacaine (CIB) infusion combined with patient-controlled analgesia (PCA).

### **METHODS:**

Two fine-bore catheters are inserted in the deep intermuscular intercostal neuronal plane during abdominal wound closure, and a continuous infusion of bupivacaine 0.25% is commenced for 72 h postoperatively. Simultaneously, patient-controlled analgesia provided intravenous morphine on demand. The study comprised 10 consecutive patients undergoing liver resection in whom CIB infusion and PCA were employed. The feasibility, safety and efficacy of the technique were investigated, analysing postoperative pain scores, morphine requirements, spirometry and oxygen saturation.

### **RESULTS:**

There were no postoperative deaths. Postoperative morbidity included one urinary tract infection, one minor chest infection and acute confusional episodes in two patients. Median pain scores and morphine requirements at 12, 24, 48 and 72 h postoperatively were satisfactory. Spirometry and oxygen saturation values also remained within the normal range.

### **DISCUSSION:**

Preliminary experience with CIB infusion/PCA in the aftermath of major liver resection has demonstrated its simplicity and safety as an alternative method of postoperative pain control. Further study is required to investigate the role of CIB infusion/PCA as a practical alternative to epidural analgesia or PCA alone.

[Anesth Analg](#). 2008 Mar;106(3):997-1001, table of contents. doi:

10.1213/ane.0b013e31816152da.

# A prospective comparison of continuous wound infiltration with ropivacaine versus



# single-injection paravertebral block after modified radical mastectomy.

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## **Abstract**

### **BACKGROUND:**

The efficacy of continuous wound infiltration with local anesthetic has not been compared with that of thoracic paravertebral block (PVB) after breast surgery. In this study, we evaluated the analgesic efficacy and morphine consumption of the two techniques after mastectomy.

### **METHODS:**

Forty-eight patients undergoing modified radical mastectomy with axillary dissection were randomly assigned to either a preoperative PVB with 20 mL of ropivacaine 0.5% (group PVB) or a continuous ropivacaine 0.5% infusion (CRI) at a 2 mL/h rate for each of two multilumen catheters placed subcutaneously at the end of the procedure (group CRI). The catheters were left in place for 24 h postoperatively. A standardized general anesthetic was administered to all patients. Postoperative morphine consumption, pain scores and painful restricted movement of the shoulder for 24 h postoperatively as well as incidence of adverse events, including postoperative nausea and vomiting, were recorded.

### **RESULTS:**

Morphine consumption was similar between groups (PVB: 42.6 +/- 11 vs CRI: 38.7 +/- 11 mg in 24 h, P = 0.225). Absolute pain scores were low in both groups. Four hours after surgery, group PVB showed a significant reduction in postoperative pain (PVB: 0 [0-10] vs CRI: 0 [0-30], P = 0.002) and reduced painful restricted movement (P = 0.004), whereas the CRI group had lower pain scores (PVB: 10 [0-30] vs CRI: 0 [0-20], P = 0.034) and painful restricted movement (P = 0.043) 16 and 24 h (PVB: 10 [0-30] vs CRI: 0 [0-30], P = 0.012) after surgery. Postoperative nausea and vomiting was significantly more frequent in the CRI group (P = 0.017).

### **CONCLUSIONS:**

Continuous wound infiltration of local anesthetics is an effective alternative to paravertebral analgesia after mastectomy with axillary dissection.

[Anesthesiology](#). 2007 Sep;107(3):461-8.

# Continuous preperitoneal infusion of ropivacaine provides effective analgesia and accelerates recovery after colorectal surgery: a randomized, double-blind, placebo-controlled study.

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## **Abstract**

### **BACKGROUND:**

Blockade of parietal nociceptive afferents by the use of continuous wound infiltration with local anesthetics may be beneficial in a multimodal approach to postoperative pain management after major surgery. The role of continuous preperitoneal infusion of ropivacaine for pain relief and postoperative recovery after open colorectal resections was evaluated in a randomized, double-blinded, placebo-controlled trial.

### **METHODS:**

After obtaining written informed consents, a multiholed wound catheter was placed by the surgeon in the preperitoneal space at the end of surgery in patients scheduled to undergo elective open colorectal resection by midline incision. They were thereafter randomly assigned to receive through the catheter either 0.2% ropivacaine (10-ml bolus followed by an infusion of 10 ml/h during 48 h) or the same protocol with 0.9% NaCl. In addition, all patients received patient-controlled intravenous morphine analgesia.

### **RESULTS:**

Twenty-one patients were evaluated in each group. Compared with preperitoneal saline, ropivacaine infusion reduced morphine consumption during the first 72 h and improved pain relief at rest during 12 h and while coughing during 48 h. Sleep quality was also better during the first two postoperative nights. Time to recovery of bowel function (74 +/- 19 vs. 105 +/- 54 h; P = 0.02) and duration of hospital stay (115 +/- 25 vs. 147 +/- 53 h; P = 0.02) were significantly reduced in the ropivacaine group. Ropivacaine plasma concentrations remained below the level of toxicity. No side effects were observed.

### **CONCLUSIONS:**

Continuous preperitoneal administration of 0.2% ropivacaine at 10 ml/h during 48 h after open colorectal resection reduced morphine consumption, improved pain relief, and accelerated postoperative recovery.

[Anesthesiology](#). 2007 Jun;106(6):1220-5.

## Postoperative analgesic effects of continuous wound infiltration with diclofenac after elective cesarean delivery.

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### **Abstract**

#### **BACKGROUND:**

Postoperative pain mostly results from sensitization of afferent fibers at injury sites driving central sensitization. Recently, peripheral processes have gained attention as mechanisms of hyperalgesia, and prostaglandins are among highly sensitizing agents. To date, perioperative administration of a single local dose of nonsteroidal antiinflammatory drugs has shown inconclusive efficacy. Rather than a single bolus, the current study evaluates the postoperative analgesic effect of diclofenac continuous intrawound infusion after elective cesarean delivery.

#### **METHODS:**

Ninety-two parturients were randomly allocated to receive a 48-h continuous intrawound infusion with 240 ml containing 300 mg diclofenac, 0.2% ropivacaine, or saline. In the ropivacaine and saline groups, patients also received 75 mg intravenous diclofenac every 12 h for 48 h. Postoperative evaluation included intravenous morphine consumption by patient-controlled analgesia and visual analog pain scores. Punctate mechanical hyperalgesia surrounding the wound and presence of residual pain after 1 and 6 months were also assessed.

#### **RESULTS:**

Continuous diclofenac infusion significantly reduced postoperative morphine consumption (18 mg; 95% confidence interval, 12.7-22.2) in comparison with saline infusion and systemic diclofenac (38 mg; 95% confidence interval, 28.8-43.7) ( $P=0.0009$ ) without unique adverse effects. Postoperative analgesia produced by local diclofenac infusion was as effective as local ropivacaine infusion with systemic diclofenac.

#### **CONCLUSIONS:**

After elective cesarean delivery, continuous intrawound infusion of diclofenac demonstrates a greater opioid-sparing effect and better postoperative analgesia than the same dose administered as an intermittent intravenous bolus.

[Acta Orthop](#). 2007 Apr;78(2):180-6.

## Reduced hospital stay and narcotic consumption, and improved mobilization with local and intraarticular infiltration after hip arthroplasty: a randomized clinical trial of an intraarticular technique versus epidural infusion in 80 patients.

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### **Abstract**

#### **BACKGROUND:**

Epidural analgesia gives excellent pain relief but is associated with substantial side effects. We compared wound infiltration combined with intraarticular injection of local anesthetics for pain relief after total hip arthroplasty (THA) with the well-established practice of epidural infusion.

#### **METHODS:**

80 patients undergoing elective THA under spinal block were randomly assigned to receive either (1) continuous epidural infusion (group E) or (2) infiltration around the hip joint with a mixture of 100 mL ropivacaine 2 mg/mL, 1 mL ketorolac 30 mg/mL, and 1 mL epinephrine 0.5 mg/mL at the conclusion of surgery combined with one postoperative intraarticular injection of the same substances through an intraarticular catheter (group A).

#### **RESULTS:**

Narcotic consumption was significantly reduced in group A compared to group E ( $p = 0.004$ ). Pain levels at rest and during mobilization were similar in both groups but significantly reduced in group A after cessation of treatment. Length of stay was reduced by 2 days (36%) in group A compared to group E ( $p < 0.001$ ).

#### **INTERPRETATION:**

Wound infiltration combined with 1 intraarticular injection can be recommended for patients undergoing THA. Further studies of dosage (high/low) and duration of intraarticular treatment are warranted.

[J Am Coll Surg.](#) 2006 Feb;202(2):297-305.

## Use of the ON-Q pain management system is associated with decreased postoperative analgesic requirement: double blind randomized placebo pilot study.

[Baig MK<sup>1</sup>](#), [Zmora O](#), [Derdemezi J](#), [Weiss EG](#), [Noqueras JJ](#), [Wexner SD](#).

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### **Abstract**

#### **BACKGROUND:**

Narcotics are routinely used to decrease postoperative pain after laparotomy. But they are associated with unwarranted side effects. The aim of this study was to assess the effectiveness of local perfusion of bupivacaine in decreasing narcotic consumption after midline laparotomy.

#### **STUDY DESIGN:**

We performed a prospective, randomized, double blind study involving patients who underwent a midline laparotomy with subsequent wound closure. Patients were randomized to receive a 72-hour continuous wound perfusion through the ON-Q pain management system (I Flow Corporation) of the local anesthetic bupivacaine (0.5%, study group) or 0.9% NaCl (control group). In addition, all patients received standardized intraoperative analgesia and postoperative morphine patient-controlled analgesia. Total postoperative analgesic requirement, pain control, recovery of bowel function, and complications were recorded.

#### **RESULTS:**

Seventy patients were recruited: 35 in the study group (mean age, 55.7 years) and 35 in the control group (mean age, 58.8 years). There was no difference in overall postoperative pain scores. Patients in the study group reported earlier ambulation as compared with the control group. Mean (+/-SD) daily narcotic requirements were significantly less in the study group versus the control group (33.7 +/- 32 mg versus 60.1 +/- 62 mg, respectively; p=0.03). Patients in the study group made 50% fewer attempts to receive patient-controlled analgesia (p=0.011). But there was no significant difference in length of hospitalization or time to first bowel movement.

#### **CONCLUSIONS:**

This preliminary pilot study revealed that the ON-Q pain management system after midline laparotomy, as part of a multimodal approach, is an effective approach to postoperative pain control.

[J Thorac Cardiovasc Surg.](#) 2005 Aug;130(2):464-8.

## Improved pain management outcomes with continuous infusion of a local anesthetic after thoracotomy.

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### [Author information](#)

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### **Abstract**

#### **OBJECTIVE:**

We sought to determine the effectiveness of an incisional infusion of local anesthetics through a continuous-infusion elastomeric pump for the management of postoperative pain after thoracotomy.

#### **METHODS:**

We performed a retrospective comparative analysis of 110 patients undergoing thoracotomies between November 1999 and March 2003. Postoperative pain management with a continuous-infusion elastomeric pump providing local anesthetic into the incisional area was compared with a single-shot epidural in combination with continuous local anesthetic infusion and continuous thoracic epidural infusion. Data sources were reviewed for mean narcotic use, pain score, and complications.

#### **RESULTS:**

After thoracotomy procedures, 38 patients received the ON-Q Pain Relief System (I-Flow Corp, Lake Forest, Calif), 32 received the ON-Q device and single-shot epidural infusion, and 40 received continuous epidural infusion. Demographic attributes, including age, body mass index, and sex were similar between the groups. Preoperative American Society of Anesthesiologists status was significantly higher in the ON-Q group compared with that in the other groups (P = .02). Narcotic use and pain scores were significantly reduced in the ON-Q group compared with that in the epidural group at all time points (P < .001). There were no wound-healing complications or infections associated with the use of the pump.

#### **CONCLUSION:**

A continuous infusion of 0.25% bupivacaine at 4 mL/h through the ON-Q elastomeric infusion pump is a safe and effective adjunct in postoperative pain management after thoracotomy. The use of the ON-Q Pain Relief System results in decreased narcotic use and lower pain scores compared with continuous epidural infusion.

[ANZ J Surg.](#) 2004 Oct;74(10):873-6.

## Randomized trial of a pain control infusion pump following inguinal hernia repair.

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### **Abstract**

#### **BACKGROUND:**

Continuous ambulatory analgesia following various surgical procedures is gaining popularity. The purpose of the present paper is to evaluate this form of analgesia following open anterior inguinal hernia repair by way of a pain control infusion pump (PCIP).

#### **METHODS:**

Forty-eight consecutive patients scheduled for inguinal hernia repair were enrolled in a double-blind, randomized, placebo-controlled trial. Following the repair, a catheter was placed in the wound connected to an external PCIP, delivering either ropivacaine or normal saline at a fixed rate of 4 mL/h. Regular 4-hourly postoperative pain observations according to a Visual Analogue Score (VAS) and any rescue opioid requirements were recorded, at different levels of mobility.

#### **RESULTS:**

Data analysis included 23 (ropivacaine) and 24 (saline) patients in each group, with one exclusion. There were no adverse effects of the PCIP in either group. Patients in the ropivacaine group ('active pump') had lower mean pain scores and less rescue analgesia compared to the saline group ('placebo pump'). This clinical effect was found to be more striking at increased levels of mobility. Importantly, no patients in the ropivacaine group required any rescue analgesia after the first 4-h block postoperatively.

#### **CONCLUSION:**

The PCIP provided safe and adequate analgesia following inguinal hernia repair. It provided effective analgesia especially when patients were mobilizing. This has implications for earlier discharge from hospital and associated cost-savings.

[Anesth Analg.](#) 2004 Jan;98(1):166-72, table of contents.

## The pharmacokinetics and efficacy of ropivacaine continuous wound instillation after spine fusion surgery.

[Bianconi M](#)<sup>1</sup>, [Ferraro L](#), [Ricci R](#), [Zanoli G](#), [Antonelli T](#), [Giulia B](#), [Guberti A](#), [Massari L](#).

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### **Abstract**

Because local anesthetic continuous wound instillation has not been evaluated after spine fusion surgery, we designed this study to determine whether this technique could enhance analgesia and improve patient outcome after posterior lumbar arthrodesis. Thirty-eight patients undergoing spine stabilization were randomly divided into two groups. The M group received a postoperative baseline IV infusion of morphine plus ketorolac for 24 h, and the R group received IV saline. In both groups, a multihole 16-gauge catheter was placed subcutaneously; in the R group, the wound was infiltrated with a solution of ropivacaine 0.5% 200 mg/40 mL, and infusion of ropivacaine 0.2% 5 mL/h was maintained for 55 h. In the M group, saline infusion was given at the same rate. Pain scores were taken at rest and on passive mobilization by nurses blinded to patient analgesic treatment. The total plasma ropivacaine concentration was evaluated. Pain scores and rescue medication requirements (diclofenac and tramadol) were significantly less in the R group than in the M group. Postoperative blood loss was less and the length of hospital stay was shorter in the R group. The ropivacaine peak total plasma concentration occurred at 24 h during infusion and was within safe limits; no toxic local anesthetic side effects were observed. These results suggest that wound infiltration and continuous instillation of ropivacaine 0.2% is effective for pain management after spine stabilization surgery.

#### **IMPLICATIONS:**

Postoperative pain after lumbar arthrodesis is related to soft tissue and muscle dissection and to manipulations and removal at the operation site. By blocking noxious stimuli from the surgical area, infiltration and wound perfusion with ropivacaine were more effective in controlling pain than systemic analgesia

[J Thorac Cardiovasc Surg.](#) 2003 Nov;126(5):1271-8.

## Improved pain control after cardiac surgery: results of a randomized, double-blind, clinical trial.

[Dowling R<sup>1</sup>](#), [Thielmeier K](#), [Ghaly A](#), [Barber D](#), [Boice T](#), [Dine A](#).

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**Abstract**

**OBJECTIVE:**

We sought to determine whether a continuous regional infusion of a local anesthetic delivered to the operative site would result in decreased levels of postoperative pain and narcotic requirements for patients who undergo a standard median sternotomy for cardiac surgery.

**METHODS:**

A double-blind, randomized, controlled trial was conducted at a single center. Patients who were undergoing elective coronary artery bypass graft surgery alone or combined with laser transmyocardial revascularization received bilateral intercostal nerve blocks with either ropivacaine or saline. At wound closure, 2 catheters with multiple side openings were inserted percutaneously and placed directly over the sternum. The same agent (ropivacaine vs saline) was then administered as a continuous regional infusion for 48 hours through an elastomeric pump. Requirements for postoperative systemic narcotic analgesics and pain assessment scores were recorded for 72 hours after the operation. Secondary outcome measures were hospital length of stay and pulmonary function test results. Pain scores and narcotic use on the second postoperative day were also compared to avoid the confounding influence of anesthesia administered at the time of the operation.

**RESULTS:**

The total amount of narcotic analgesia required by the ropivacaine group was significantly less than that of the control group (47.3 vs 78.7 mg, respectively;  $P = .038$ ). The ropivacaine group required less narcotics on postoperative day 2 as well (15.5 vs 29.4 mg,  $P = .025$ ). The mean overall pain scores for the ropivacaine group were significantly less than the mean overall scores for the normal saline group (1.6 vs 2.6, respectively;  $P = .005$ ). Patients receiving ropivacaine had a mean length of stay of 5.2 days compared with 8.2 days for patients in the normal saline group ( $P = .001$ ). Excluding the data from outliers (length of stay = 39 days), the normal saline group mean length of stay was 6.3 days ( $P < .01$ ). There was no difference in assessment of pulmonary function.

**CONCLUSION:**

Continuous delivery of local anesthetics significantly improved postoperative pain control while decreasing the amount of narcotic analgesia required in patients who underwent standard median sternotomy. There was also a significant decrease in hospital length of stay, which is likely to result in significant cost reductions.

[Br J Anaesth](#). 2003 Dec;91(6):830-5.

## Pharmacokinetics and efficacy of ropivacaine continuous wound instillation after joint replacement surgery.

[Bianconi M<sup>1</sup>](#), [Ferraro L](#), [Traina GC](#), [Zanoli G](#), [Antonelli T](#), [Guberti A](#), [Ricci R](#), [Massari L](#).

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**Abstract**

**BACKGROUND:**

As continuous wound instillation with local anaesthetic has not been evaluated after hip/knee arthroplasties, our study was designed to determine whether this technique could enhance analgesia and improve patient outcome after joint replacement surgery.

**METHODS:**

Thirty-seven patients undergoing elective hip/knee arthroplasties under spinal block were randomly assigned to two analgesia groups. Group M received continuous i.v. infusion of morphine plus ketorolac for 24 h. Then, a multi-hole 16 G catheter was placed subcutaneously and infusion of saline was maintained for 55 h. Group R received i.v. saline. Thereafter the wound was infiltrated with a solution of ropivacaine 0.5% 40 ml, then a multi-hole 16 G catheter was placed subcutaneously and an infusion of ropivacaine 0.2% 5 ml h<sup>-1</sup> was maintained for 55 h. Visual analogue scale scores were assessed at rest and on passive mobilization by nurses blinded to analgesic treatment. Total plasma ropivacaine concentration was measured.

**RESULTS:**

Group R showed a significant reduction in postoperative pain at rest and on mobilization, while rescue medication requirements were greater in Group M. Total ropivacaine plasma concentration remained below toxic concentrations and no adverse effects occurred. Length of hospital stay was shorter in Group R.

**CONCLUSION:**

Infiltration and wound instillation with ropivacaine 0.2% is more effective in controlling postoperative pain than systemic analgesia after major joint replacement surgery.

[J Hand Surg Br](#). 2003 Dec;28(6):513-9.

## Continuous local anaesthesia for post-operative mobilization of injured digits.

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### **Abstract**

We have studied the effects of sustained local anaesthesia on postoperative mobilization of the injured hand. Small epidural catheters were placed adjacent to the peripheral nerves providing sensation to the involved part of the hand under direct vision in the distal forearm. Repeated doses of 0.5% bupivacaine were then administered during mobilization therapy to relieve pain. Fourteen out of 24 digits (60%) recorded 30 degrees or more increases in active range of motion after bupivacaine injection. The cases that failed to improve had suffered severe injuries. Complications were few and were easily managed as the catheters were distal, superficial and accessible. This is an effective, specific and safe method of providing sustained postoperative analgesia for mobilization.

[Reg Anesth Pain Med](#). 2003 Sep-Oct;28(5):424-32.

## Portable infusion pumps used for continuous regional analgesia: delivery rate accuracy and consistency.

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### **Abstract**

#### **BACKGROUND AND OBJECTIVES:**

Multiple benefits of postoperative perineural local anesthetic infusion have been shown including potent analgesia, decreased opioid requirements, and improved rehabilitation. Consequently, portable infusion pumps have been used with increasing frequency to provide perineural infusion for medically unsupervised ambulatory patients. We believe that the infusion rate accuracy and reliability of these pumps infusing potentially toxic doses of medication should be investigated independently. Therefore, we studied the flow-rate accuracy and consistency of various portable infusion pumps that have not been examined previously.

#### **METHODS:**

Using a computer/mass balance combination to record infusion rates, 6 pumps (3 electronic and 3 non electronic) were tested. Several factors that may influence pump performance were varied: temperature (ambient/skin), battery (replacement/addition), and catheter exchange (wound/perineural).

#### **RESULTS:**

Infusion rate accuracy differed significantly among the pumps, exhibiting flow rates within +/-15% of their expected rate for 55% to 99% of their infusion duration. Furthermore, the profiles (infusion rate over time) of the various pumps differed significantly depending on the pump power source. Although elastomeric pump infusion rate increased with an increase in temperature, battery life was a limiting factor for one of the electronic pumps. Substituting wound catheters with commonly used perineural catheters did not significantly alter infusion profile.

#### **CONCLUSIONS:**

Factors such as infusion rate accuracy and consistency, infusion profile, temperature sensitivity, and battery life affect the dose of medication administered by various portable pumps used for continuous regional analgesia. Health care providers should take these factors into consideration when choosing and using a portable infusion pump for local anesthetic administration.

[Anesth Analg](#). 2003 Oct;97(4):1086-91, table of contents.

## Continuous wound infiltration with ropivacaine reduces pain and analgesic requirement after shoulder surgery.

[Gottschalk A<sup>1</sup>](#), [Burmeister MA](#), [Radtke P](#), [Krieg M](#), [Farokhzad F](#), [Kreissl S](#), [Strauss M](#), [Standl T](#).

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### Abstract

After achieving a reduction of pain scores for 10 h with a single dose wound infiltration after shoulder surgery, we examined in a prospective, placebo-controlled and double-blinded study the analgesic effects of continuous wound infiltration with different concentrations of ropivacaine. Forty-five patients undergoing shoulder surgery were randomly assigned into three groups to receive single dose wound infiltration with 30 mL saline (group S) or ropivacaine 7.5 mg/mL (groups R2 and R3.75) after skin closure. Postoperatively, patients received a continuous wound infiltration with saline (group S), ropivacaine 2 mg/mL (group R2) or ropivacaine 3.75 mg/mL (group R3.75) for 48 h. Supplemental pain relief was provided by IV patient-controlled analgesia with the opioid piritramide. At 1, 2, 3, 4, 24, and 48 h postoperatively visual analogue scale (VAS) values (0-100 mm), piritramide requirements and side effects were registered. Plasma levels of ropivacaine were measured preoperatively and at 24 h and 48 h after surgery. Until 48 h VAS values were smaller in group R3.75 compared with group S (group R3.75, 8 +/- 9 mm; group S, 31 +/- 14 mm;  $P < 0.005$ ), whereas 4 h and 48 h postoperatively VAS values were even smaller in group R3.75 compared with group R2 ( $P < 0.05$ ). Cumulative piritramide consumption was always smaller in groups R2 and R3.75 compared with group S (1-24 h,  $P < 0.005$ ; 48 h,  $P < 0.05$ ). Plasma ropivacaine levels remained less than the toxic threshold. We conclude that continuous postoperative wound infiltration with ropivacaine, especially using 3.75 mg/mL, provides smaller VAS values and opioid requirement in comparison with saline after shoulder surgery.

### IMPLICATIONS:

The continuous postoperative wound infiltration after shoulder surgery with different concentrations of ropivacaine, 2 mg/mL and 3.75 mg/mL, results in lower pain scores and opioid requirement compared with infiltration with placebo. Plasma levels of ropivacaine remained less than the toxic threshold.

[Br J Plast Surg](#). 2003 Jul;56(5):478-83.

## Concept for postoperative analgesia after pedicled TRAM flaps: continuous wound instillation with 0.2% ropivacaine via multilumen catheters. A report of two cases.

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### Abstract

Pedicled TRAM flap surgery is a complex procedure characterised by an extensive wound site. We present two patients with efficient postoperative pain relief by continuous wound instillation of ropivacaine 0.2% via two multilumen catheters. The catheters were placed subcutaneously before the wound closure through the umbilicus into the abdominal wound, and under the autologous flap into the breast. Each multilumen catheter provides even distribution for local anaesthetics over 12.5 cm. At the end of surgery, patients received a single shot dose of local anaesthetic via the pain catheters. After surgery the continuous infusion of ropivacaine 0.2% was commenced at a rate of 10 ml/h per catheter. Pain scores at rest and on coughing were low on the first postoperative day, and later zero. No medication for breakthrough pain was required throughout the recovery period, and the patients experienced no adverse events linked to the analgesia scene. Patient satisfaction was excellent, and quality of recovery score was superior.

[J Hand Surg Br](#). 2003 Aug;28(4):300-6.

## Local anaesthetic infusion for postoperative pain.

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### Author information

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### Abstract

The role of continuous bupivacaine infusion either into the wound or as a local nerve block, following hand surgery was investigated in 100 patients. After excluding six patients with complex pain problems in whom neither the bupivacaine infusion nor any other conventional analgesic techniques provided adequate analgesia post-operatively, 86 of 94 (91%) patients were adequately treated for post-operative pain by this system during the first night after surgery when pain is presumed to be greatest. This system also provided adequate on-going analgesia for up to 1 week after surgery, controlling nerve pain and allowing mobilization of tendons after tenolysis. Continuous bupivacaine infusion is of particular use in these two groups of patients and after major hand injuries, when considerable pain can be anticipated. Pain during the first night was not controlled adequately by the bupivacaine infusion system in eight of the 94 patients (8%). All eight had a technical failure of the system, which was rectified in six cases to restore adequate analgesia by the infusion system. Two patients developed infection at the infusion cannula insertion site, which occurred only after 1 week and was successfully treated by removal of the cannula and oral antibiotics.

[Best Pract Res Clin Anaesthesiol](#). 2002 Jun;16(2):321-43.

## Incisional and intra-articular infusions.

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**Abstract**

Incisional and intra-articular local anaesthetic techniques are simple, safe and inexpensive analgesic methods for the management of post-operative pain following a variety of surgical procedures. These techniques are capable of providing effective analgesia over a limited field and with minimal systemic effects. In the literature single-dose local anaesthetics have been administered in most of the studies; however, the duration of analgesia is short-lived. In recent years catheter techniques have been increasingly used as intermittent bolus or continuous infusion in the surgical wound or intra-articularly for long-lasting post-operative analgesia in both hospitalized and day-case patients. The incisional and intra-articular use of opioids and several non-opioids, either alone or in combination with local anaesthetics, has also been evaluated. This chapter reviews the current status of single dose and infusions of local anaesthetics and adjuvants for incisional and intra-articular analgesic techniques and also looks at future perspectives.

[Best Pract Res Clin Anaesthesiol.](#) 2002 Jun;16(2):285-94.

## Major surgery in the ambulatory environment: continuous catheters and home infusions.

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- <sup>1</sup>Department of Anesthesiology, University of Florida, College of Medicine, Gainesville, Florida, [USA](#).

**Abstract**

The ability to provide continuous peripheral nerve blocks to patients safely on an outpatient basis has been a major advance in ambulatory surgery over the past several years. The first reports of patients self-administering local anaesthetic via wound and perineural catheters were published in 1998. Such infusions have now become a necessary component for the success of various ambulatory procedures. The rapid development of these techniques has been based on advances in equipment manufacturing, drug development and the need to provide a greater degree of analgesia for patients in the ambulatory setting. Many of the concepts used to provide safe ambulatory infusion have been drawn from studies of patients receiving these types of therapies in a hospital setting. Few studies have actually examined these techniques in an outpatient environment. However, the advantages of these analgesic techniques over traditional oral narcotics for patients undergoing major surgery in the ambulatory environment have led to their rapid acceptance as a standard of care at many institutions.

[Reg Anesth Pain Med.](#) 2002 May-Jun;27(3):316-8.

## Periosteal infusion of bupivacaine/morphine post sternal fracture: a new analgesic technique.

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**Abstract**

**BACKGROUND AND OBJECTIVES:**

Sternal fracture pain is severe and is difficult to alleviate due to the forces acting on the chest wall during respiration. We describe a continuous infusion regional analgesic technique for pain due to sternal fracture.

**CASE REPORT:**

A 47-year-old woman presented with a spontaneous sternal fracture, precluding effective coughing. Diclofenac and increasing doses of opioids did not give adequate pain relief and led to opioid toxicity. Two brief periods of analgesia were achieved with deep subcutaneous infiltration of bupivacaine. An epidural catheter was positioned periosteally, and an infusion of bupivacaine was commenced at 5 mL/h, achieving long-lasting analgesia. The bupivacaine concentration was reduced in a stepwise fashion from 0.5% to 0.25% and was changed to levobupivacaine after 3 days. Adding morphine (5 mg/60 mL levobupivacaine) permitted a reduction in infusion rate. The catheter was removed after 14 days because a local infection developed that resolved uneventfully with antibiotic therapy.

**CONCLUSIONS:**

Continuous infusion of local anesthetic and opioid to a sternal fracture site using a periosteally positioned catheter led to successful analgesia and hence improved respiratory function. Clinicians should consider placing a periosteal catheter when pain associated with sternal fracture cannot be adequately controlled with conventional methods.



[Br J Surg.](#) 2001 Mar;88(3):357-9.

## Randomized clinical trial of local bupivacaine perfusion versus parenteral morphine infusion for pain relief after laparotomy.

[Cheong WK<sup>1</sup>](#), [Seow-Choen F](#), [Eu KW](#), [Tang CL](#), [Heah SM](#).

### Author information

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### **Abstract**

#### **BACKGROUND:**

Opioids are often used to decrease pain following laparotomy but are associated with unwanted side-effects. The effectiveness of local perfusion of bupivacaine 0.5 per cent following laparotomy was studied.

#### **METHODS:**

A prospective randomized study involving patients undergoing laparotomy for major colorectal surgery using a left iliac fossa skin crease incision was undertaken. Patients were randomized to receive either intermittent intravenous morphine infusion on demand with patient-controlled analgesia (PCA group) or continuous wound perfusion of local bupivacaine 0.5 per cent for 60 h (LA group).

#### **RESULTS:**

Seventy patients were recruited, 35 in each group. Patient demographics, surgical and recovery variables and complications were comparable in the two groups. The wound lengths were similar (median 14 cm in both groups). There was no statistically significant difference in postoperative pain scores at rest and with movement between the two groups, except for pain scores at rest on the first postoperative day ( $P = 0.03$ ). The median total amount of morphine used was significantly greater in the PCA group (median 38 versus 0 mg in the LA group;  $P < 0.001$ ).

#### **CONCLUSION:**

Direct continuous local wound perfusion of bupivacaine 0.5 per cent is as effective as PCA for postoperative pain relief after laparotomy. It is a safe and feasible alternative to parenteral opioids.

[Can J Anaesth.](#) 1996 Sep;43(9):914-8.

## Wound infiltration with lidocaine prolongs postoperative analgesia after haemorrhoidectomy with spinal anaesthesia.

[Morisaki H<sup>1</sup>](#), [Masuda J](#), [Fukushima K](#), [Iwao Y](#), [Suzuki K](#), [Matsushima M](#).

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- <sup>1</sup>Department of Anaesthesiology, School of Medicine, Keio University, Tokyo, [Japan](#).

### **Abstract**

#### **PURPOSE:**

There are few clinical data examining whether sensitization of peripheral nerves contributes to postoperative pain when the entry of noxious impulses to the central nervous system is blocked. We hypothesized that wound infiltration with lidocaine would provide better postoperative analgesia than with normal saline following haemorrhoidectomy with spinal blockade.

#### **METHODS:**

In a randomized, placebo-controlled, blinded study, 168 adults undergoing haemorrhoidectomy were allocated to two groups. In Group L ( $n = 88$ ) local infiltration was provided with lidocaine 1% and in Group S ( $n = 80$ ) with normal saline. Following spinal anaesthesia with lidocaine 3%, the surgeon infiltrated 15 ml of either infiltration solution to the surgical area. Postoperative analgesia was obtained by continuous epidural administration of 90 mg eptazocine in normal saline for 48 hr. Supplemental analgesics were given on request. Postoperative pain control was assessed at rest and during coughing with a 10 cm VAS on the 1st, 2nd, and 3rd postoperative days (POD).

#### **RESULTS:**

The VAS scores at rest in Group L were lower than those in Group S throughout the postoperative period. During coughing, VAS scores in Group S were increased on the 3rd postoperative day, while those in Group L remained constant ( $4.42 \pm 0.27$  vs  $3.14 \pm 0.28$ ,  $P < 0.05$ ). Fewer patients in Group L than in Group S required supplemental analgesics.

#### **CONCLUSION:**

Preoperative lidocaine infiltration to the surgical area provided prolonged postoperative analgesia in patients receiving haemorrhoidectomy with spinal anaesthesia.

[J Trauma.](#) 1995 Jan;38(1):22-7.

# Extraleural bupivacaine for amelioration of multiple rib fracture pain.

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## Author information

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### **Abstract**

#### **OBJECTIVE:**

The pain associated with multiple rib fractures can be surprisingly variable. The objective of this study was to determine the efficacy of an indwelling, percutaneously placed intercostal catheter in relieving the pain associated with multiple rib fractures.

#### **DESIGN:**

Prospective nonrandomized study setting: Surgical intensive care unit in a level 1 trauma center.

#### **SUBJECTS:**

Fifteen blunt chest trauma patients with a minimum of three rib fractures who had failed an intravenous patient controlled analgesia protocol.

#### **INTERVENTIONS:**

Insertion of an epidural catheter within the intercostal space. Bupivacaine 0.25% with epinephrine was injected in a volume of 20 mL. Subsequent doses were limited to a total of 400 mg per 24 hours.

#### **MEASUREMENTS AND MAIN RESULTS:**

Severity of injury was estimated by using the Injury Severity Score. For each patient a preinjection visual analogue scale (VAS) and incentive spirometry (IS) lung volume were determined. Fifteen minutes following injection of 0.25% bupivacaine with epinephrine the VAS and IS were repeated. The Injury Severity Score ranged from 9 to 32 (mean 19.0 +/- 1.6). Overall, mean VAS pain scores improved significantly following the initial bolus of bupivacaine (before VAS = 7.5 +/- 0.6, after VAS = 3.5 +/- 0.5,  $p < 0.05$ ) and this was associated with significant increase in IS lung volumes (before IS = 0.77 +/- 0.09, after IS = 1.3 +/- 0.13,  $p < 0.05$ ). No patient experienced either insertion-related or drug administration complications.

#### **CONCLUSIONS:**

These results confirm that an indwelling intercostal catheter provides a continuous nerve block resulting in a simple, safe procedure that can ameliorate the pain and splinting associated with multiple rib fractures. Although we experienced no complications, additional investigation is clearly needed.

[Br J Urol](#). 1994 Aug;74(2):155-9.

# Intermuscular bupivacaine infusion for control of pain after renal surgery: a preliminary report.

[Chen TF<sup>1</sup>](#), [Clarke N](#), [Bowman R](#), [Harper NJ](#), [Payne SR](#).

## Author information

- <sup>1</sup>Department of Urology, Manchester Royal Infirmary, [UK](#).

### **Abstract**

#### **OBJECTIVE:**

To assess the value of continuous bupivacaine wound infusion for post-operative pain relief after renal surgery.

#### **PATIENTS AND METHODS:**

The analgesic efficacy of continuous intermuscular wound infusion with 0.25% bupivacaine was studied in 10 patients (four men, six women), with a mean age of 47.5 years (range 25-71) and a mean weight of 71.2 kg (range 44-99), after renal surgery in a single-blind randomized trial. The results were compared with those of an age- and weight-matched control group of 10 patients (five men, five women) with a mean age of 47.7 years (range 27-73) and a mean weight of 67.3 kg (range 51-85). Post-operative pain was studied objectively by assessing individual patient's morphine requirements administered via a patient controlled analgesia system, and subjectively with pain scores. Patient mobility was assessed by ward nursing staff using mobility score charts.

#### **RESULTS:**

There was a lower demand for post-operative analgesia in the bupivacaine group compared with the control. Although there was no significant difference in the pain scores between the two groups, the bupivacaine group was significantly more mobile than the control group after surgery. There was no significant difference in the mean post-operative hospital stay between the two groups.

#### **CONCLUSION:**

Continuous intermuscular bupivacaine wound infusion is a simple and safe procedure which lowers the patients' post-operative analgesic requirements, allows for earlier mobility and may promote more rapid discharge from hospital

[Masui](#). 1993 May;42(5):669-76.

# [Intrapleural regional analgesia in pain management after chest trauma].

[Article in Japanese]

[Iwama H](#)<sup>1</sup>, [Kawamae K](#), [Katsumi A](#), [Okada K](#), [Tase C](#), [Akama Y](#).

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## **Abstract**

Twelve chest trauma patients with severe pain were studied. All of them had multiple rib fractures, hemopneumothorax or pulmonary contusion, and needed the continuous chest drainage. 16 G epidural block catheter was introduced 20 cm into the apex of the pleural space. Furthermore, another catheter was placed into the base of the pleural space. After injecting 1% lidocaine 10 ml, the analgesic effect, the analgesic range according to injected point (apex or base), and the changes of vital signs, PaO<sub>2</sub>/FIO<sub>2</sub> and PaCO<sub>2</sub> were evaluated. The average pain scale before interpleural regional analgesia (IPA) was 2.9 and 1.0 after 15 min. The time to return to pre-IPA condition took about 150 min. The mean blood pressure did not show significant changes, although pulse and respiratory rate decreased. PaCO<sub>2</sub> did not show significant changes, although PaO<sub>2</sub>/FIO<sub>2</sub> increased significantly. The present study indicates that IPA in chest trauma reduces pain and improves PaO<sub>2</sub>/FIO<sub>2</sub> significantly without circulatory changes. It was reported that it was difficult to obtain effective pain relief after thoracotomy. However, when the catheter is placed at the apex, it seems to be effective to relief pain on the chest site. In conclusion, IPA seems to be simple, effective and useful to remove pain from chest trauma when epidural block is difficult to induce.

[Chest](#). 1992 Apr;101(4):981-4.

# Pain control after thoracotomy. An extrapleural tunnel to provide a continuous bupivacaine infusion for intercostal nerve blockade.

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- <sup>1</sup>Department of Surgery, Faculty of Medicine, University of Malaya, Kuala Lumpur, [Malaysia](#).

## **Abstract**

This study was undertaken to determine whether an infusion of local anesthetic (LA) delivered through an extrapleural tunnel could provide satisfactory control of pain in the postthoracotomy period. Twelve patients undergoing thoracotomy were studied. A T-shaped tunnel was created by elevating the parietal pleura at the posteromedial end of the thoracotomy wound. An irrigation catheter was then inserted and an infusion of bupivacaine commenced, initially at 5 mg/kg/24 h and subsequently at 3 mg/kg/24 h. Pain was well controlled in eight patients and satisfactory in four patients. The latter required one dose of opiate analgesia each in the 48-h postoperative period. We conclude that an infusion of bupivacaine into the extrapleural space is an effective means of control of pain after thoracotomy.

[Crit Care Clin](#). 1990 Apr;6(2):451-81.

# Non-narcotic modalities for the management of acute pain.

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## **Abstract**

The possible options for the management of acute pain are quite numerous and continue to expand as our understanding of the mechanisms of pain becomes increasingly sophisticated. Many of the options discussed have been available for years, and their present underutilization may be a reflection of the lack of emphasis on the importance of management of acute pain. An illustration of this would be our present ritual of prescribing narcotics postoperatively, a longstanding, but unfortunately inadequate practice. Because of poor selection and scheduling of doses, postoperative analgesia is typically a less than satisfactory experience for many patients convalescing in a hospital following surgery. The clinician should of course be guided by the clinical situation itself in order to determine what modality or combination of modalities may be appropriate for pain management. Certain techniques, such as continuous local anesthetic infusions, may warrant an escalated level of monitoring and ancillary care. Other techniques, such as the infiltration of a wound with local anesthetic or the addition of a nonsteroidal anti-inflammatory agent to a regimen of mild oral narcotics are so simple that excluding them from patient care is almost callous and inconsiderate.

Attention to the mechanisms of pain that may be present in a given situation, whether it be muscle spasm, ischemia, inflammation, edema, or nerve injury, may guide the clinician toward a more rational approach in managing that pain.

[Ann R Coll Surg Engl.](#) 1989 Nov;71(6):394-6.

## Wound perfusion with bupivacaine: objective evidence for efficacy in postoperative pain relief.

[Chester JF<sup>1</sup>](#), [Ravindranath K](#), [White BD](#), [Shanahan D](#), [Taylor RS](#), [Lloyd-Williams K](#).

### Author information

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### **Abstract**

Conflicting reports exist for the efficacy of intermittent wound perfusion with bupivacaine in the relief of postoperative pain. A study was devised to assess postoperative pain relief objectively using a Patient Controlled Analgesic Device (PCAD) during continuous wound perfusion with bupivacaine or saline. Thirty consecutive patients undergoing cholecystectomy were randomised to receive continuous postoperative wound perfusion with 0.5% bupivacaine for 24 h followed by normal saline for a further 24 h or vice versa. During the study period, conventional analgesia was provided using a PCAD set to deliver (and record the number of) on-demand bolus doses of intravenous pethidine 0.2 mg/kg at half-hourly intervals as required. Pethidine requirements were higher on the first postoperative day, regardless of which solution was given, but bupivacaine perfusion almost halved mean linear analogue pain scores compared to those recorded with saline. Likewise, the number of bolus doses of pethidine demanded was reduced by an average of 68% compared to those recorded during saline perfusion on day 1 ( $P = 0.01$ ) and by 82% on day 2 ( $P = 0.01$ ). When assessed by objective criteria, perfusion of surgical wounds with bupivacaine after cholecystectomy produces better pain relief than wound perfusion with saline.

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## The direct perfusion of surgical wounds with local anaesthetic solution: an approach to postoperative pain?

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### **Abstract**

A simple technique of wound perfusion with bupivacaine (Marcain) which provides sustained postoperative analgesia is described. No complications nor side effects related to toxicity, hypersensitivity, infection, or impaired wound healing were encountered. Postoperative pain was reduced and analgesic requirements were significantly lower in patients undergoing both intermittent ( $P$  less than 0.01) and continuous ( $P = 0.1$ ) wound perfusion (Student  $t$  test). Perfusion with isotonic saline was also found to be effective. This may represent a true therapeutic effect attributable to the removal or dilution of pain mediating substances in the wound.