procedures via a minimally invasive thoracotomy were studied. Patients were enrolled and randomly allocated to two groups with different modalities of postoperative analgesia. The thoracotomy wound infusion group received 0.15% bupivacaine infused continuously at 2 mL/h through a catheter embedded in the wound, as well as intravenous patient-controlled analgesia. The control group had patient-controlled analgesia alone with a sham thoracotomy wound infusion of normal saline. Verbal analog pain scores (0-10 points) and recovery profiles were investigated. There were 19 patients in each group for complete data analysis. On the first day after the operation, infusion of local anesthetics significantly reduced the verbal analog pain scores both at rest and during motion (thoracotomy wound infusion vs control). The improved pain relief with thoracotomy wound infusion persisted at day 3 and even at 3 months after the operation. No difference was noted about time to extubation, length of intensive care unit stay, or hospital stay. In this controlled double-blind study, thoracotomy wound infusion and patient-controlled analgesia were superior to patient-controlled analgesia alone in reducing pain at 1, 3, and 90 days after minimally invasive cardiac surgery (1).
1. Chiu KM, Wu CC, Wang MJ, Lu CW, Shieh JS, Lin TY, Chu SH. Local infusion of bupivacaine combined with intravenous patient-controlled analgesia provides better pain relief than intravenous patient-controlled analgesia alone in patients undergoing minimally invasive cardiac surgery. J Thorac Cardiovasc Surg. 2008 Jun;135(6):1348-52.

Tramadol Wound Analgesia

It has been demonstrated that tramadol is an effective analgesic. Demiraran et al. (1) aimed to compare postoperative analgesic effects of wound infiltration with tramadol (T) or bupivacaine (B) and intramuscular tramadol (I) after herniotomy in children. In this study, 75 children were randomly assigned to group T, group B and group I. Wound infiltration was performed to the patients in group T (2 mg.kg-1 tramadol in 0.2 ml.kg-1 saline) and group B (0.2 ml.kg-1 0.25% bupivacaine) into the surgical incision. Twenty minutes before the end of the surgery 2 mg.kg-1 tramadol was injected i.m. in group I. Faces pain scale was used for assessing pain severity. Patients with pain score>2 were treated with paracetamol. The frequency of side effects and analgesic use were recorded. Patients were discharged on the next day. No side effects were recorded in any group. The pain scores of the patients at the first, fourth and eighth hours were significantly higher in group B and group I than group T ($P<0.05$). The pain scores of the patients at the first hour were significantly higher in group I compared with group B ($P<0.05$). Average time to first analgesic requirement was significantly longer in group T (6.72+/-4.09 h after herniotomy than both group I (4.49+/-3.9 h) and group B (6.04+/-3.7 h) ($P<0.05$). Wound infiltration with tramadol may be a good choice for postoperative analgesia in children having inguinal herniotomy (1).
1. Demiraran Y, Ilce Z, Kocaman B, Bozkurt P. Does tramadol wound infiltration offer an advantage over bupivacaine for postoperative analgesia in children following herniotomy? Paediatr Anaesth. 2006 Oct;16(10):1047-50.

Levobupivacaine Wound Analgesia

A prospective, randomized, controlled trial compared the efficacy of different protocols of local tissue infiltration with levobupivacaine or levobupivacaine-methylprednisolone at the surgical site for pain relief after lumbar discectomy. The objective of the study was to determine the efficacy of preemptive wound infiltration with levobupivacaine and levobupivacaine-methylprednisolone at the surgical site for pain relief. Patients usually suffer significant pain after lumbar discectomy. Wound infiltration with local anesthetics with or without corticosteroids is one method to address this. A total of 100 patients were randomly allocated to five equal groups as follows: Group I had the musculus multifidi near the operated level infiltrated with 30 mL 0.25% levobupivacaine and 40 mg methylprednisolone just before wound closure; Group II had the same region infiltrated with 30 mL 0.25% levobupivacaine alone before closure; Group III had this region infiltrated with 30 mL 0.25% levobupivacaine and 40 mg methylprednisolone before the incision was made; in Group IV this region was infiltrated with 30 mL 0.25% levobupivacaine alone before incision; and in Group C (controls) this region was infiltrated with 30 mL 0.9% NaCl just before wound closure. Demographics, vital signs, postoperative pain scores and morphine usage were recorded. All four

treatment groups showed significantly better results than the control group for most parameters. The treated groups had lower parenteral opioid requirements after surgery, lower incidences of nausea and shorter hospital stays. Further, the data indicate that, compared with infiltration of these drugs at wound closure, preemptive injection of levobupivacaine or levobupivacaine-methylprednisolone into the muscle near the operative site provides more effective analgesia after lumbar discectomy. Our data suggest that preemptive infiltration of the wound site with levobupivacaine alone or combined with methylprednisolone provides effective pain control with reduced opiate dose after unilateral lumbar discectomy (1).

1. Gurbet A, Bekar A, Bilgin H, Korfali G, Yilmazlar S, Tercan M. Pre-emptive infiltration of levobupivacaine is superior to at-closure administration in lumbar laminectomy patients. Eur Spine J. 2008 Sep;17(9):1237-41. Epub 2008 Apr 19.

Wound Analgesia for living kidney donors

Sorbello et al. (1) evaluated the efficacy of an analgesic regimen based on levobupivacaine continuous infusion into the surgical wound of living kidney donors (LKDs). 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 tramadole, 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. 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. Tramadole consumption was higher in the NWI group than in the WI group. 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-tramadole 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.

1. Sorbello M, Paratore A, Morello G, Tindaro Sidoti M, Rinzivillo D, Molino C, Di Tommaso C, Parrinello L, Veroux P, Corona D, Giuffrida G, Zerbo D, Veroux M. Wound levobupivacaine continuous infusion for postoperative analgesia in living kidney donors: case-control study. Transplant Proc. 2009 May;41(4):1128-31.

Wound Analgesia and the stress response in children

Cnar et al. (1) compared the postoperative analgesic effects of preincisional and postincisional wound infiltration with levobupivacaine and postoperative cortisol and prolactin levels in children following inguinal hernia repair. Ninety-six children aged 2-10 years who were undergoing elective inguinal hernia repair were randomly enrolled in this study. In group A (n = 32), 0.25 ml kg levobupivacaine (5 mg ml) was infiltrated after induction of general anaesthesia. In group B (n = 32), 0.25 ml kg levobupivacaine (5 mg ml) was infiltrated before the end of the surgery. Group C (n = 32) did not receive levobupivacaine infiltration at any time. Mean arterial pressure, heart rate, objective pain score, adverse effects and the number of rescue analgesics were recorded for 24 h. Blood samples were withdrawn following induction of anaesthesia and at 40 min after the end of surgery for measurement of blood cortisol and prolactin levels. The rescue analgesic administration, objective pain scores, heart rate, postoperative plasma cortisol and prolactin levels were higher in group C than in either group A or group B ($P < 0.05$). There were no differences in these parameters between the two treatment groups ($P > 0.05$). Postoperative plasma cortisol and prolactin levels were significantly higher in all three groups than preoperative plasma cortisol and prolactin levels ($P < 0.001$). Wound infiltration with levobupivacaine after induction of general anaesthesia and before

the end of the surgery both provide postoperative pain relief following hernia repair, and decrease the stress response to postoperative pain.
1. Cnar SO, Kum U, Cevizci N, Kayaoglu S, Oba S. Effects of levobupivacaine infiltration on postoperative analgesia and stress response in children following inguinal hernia repair. Eur J Anaesthesiol. 2009 May;26(5):430-4.

Intra-articular Wound Analgesia

In a randomized, double-blind, placebo, parallel and controlled study, 80 patients with osteoarthritis who underwent unilateral TKA were randomly assigned to two groups: Trial Group, where patients received intra-articular intraoperative injection containing morphine, bupivacaine and betamethasone, and Control Group, where patients received normal saline as control. All patients received patient-controlled analgesia (PCA) for 48 h postoperatively. It was found that intra-articular cocktail analgesic injection significantly reduced the morphine consumption during the 0-36 h postoperative period and the total morphine consumption. VAS at rest in Trial Group at postoperative 6, 10, 24 and 36 h was significantly lower than that in Control Group, and VAS during activity in Trial Group at postoperative 24 h and 36 h was significantly lower than that in Control Group. The time of ability to perform an active straight leg raise and to actively reach 90 degrees knee flexion, as well as ROM of the knee at the 15th postoperative day, was better in Trial Group than those in Control Group. There were no significant differences in postoperative wound healing, infection, blood pressure, heart rate, rash, respiratory depression, urine retention and DVT between the two groups. The occurrence of nausea and vomiting in Trial Group was lower than that of Control Group. This study revealed that intra-articular cocktail analgesic injection reduced the need for morphine and offered a better pain control, without apparent risks following TKA (1).
1. Fu P, Wu Y, Wu H, Li X, Qian Q, Zhu Y. Efficacy of intra-articular cocktail analgesic injection in total knee arthroplasty - A randomized controlled trial.
Knee, 2009 Mar 17.

Effects of different doses of levobupicaine infiltration on wound healing

The easiest method in postoperative analgesia is the infiltration of the wound with local anesthetic drugs. Although many local anesthetic drugs have been used for this type of infiltration, studies on levobupivacaine are rare. The aim of this study was to investigate the effects of different concentrations of levobupivacaine infiltration on wound healing. Forty female Wistar-Albino rats (280-300 g) were included in the study, which were randomly separated into four groups. Rats were infiltrated with 1.25 mg/mL levobupivacaine in group L(1.25) (n = 10), with 2.50 mg/mL levobupivacaine in group L(2.5) (n = 10), with 3.75 mg/mL levobupivacaine in group L(3.75) (n = 10), and with normal saline in control group (n = 10). Breaking-strength measurements, levels of hydroxyproline, and fibrotic index were evaluated in the tissue samples taken from the rats. When the breaking-strength measurements were evaluated, was found a significant difference between the control and the study groups ($p < 0.05$). In the intergroup comparison the difference between groups L(1.25) and L(3.75) was statistically significant ($p < 0.05$). In all of the levobupivacaine groups the levels of hydroxyproline were higher compared to the control group. Also significant differences were observed between groups L(1.25) and L(2.5) and groups L(1.25) and L(3.75) ($p < 0.05$). The levels of tissue fibrotic index were higher in all of the levobupivacaine groups compared to the control group ($p < 0.05$) and also a difference was observed between groups L(1.25) and L(3.75) in terms of tissue fibrotic index ($p < 0.05$). It was concluded that levobupivacaine used in clinical doses have a significant effect on the fastening of wound healing and this effect increases with an increase in the concentration of the levobupivacaine. It is believed that levobupivacaine will be more widely preferred in the near future in the postoperative analgesia (1).
1. Dere K, Sen H, Teksoz E, Ozkan S, Dagli G, Sucullu I, Filiz AI, Ipcioglu OM, Kucukodaci Z. The comparison of the effects of different doses of levobupivacaine infiltration on wound healing. J Invest Surg. 2009 Mar-Apr;22(2):112-6.

EMLA Vs. Lidocaine Wound Analgesia

EMLA cream (eutectic mixture of local anesthetics) has been shown to penetrate intact skin and provide analgesia of superficial layers. There are no studies on the effects of topical application of EMLA cream for postoperative pain relief after inguinal hernia repair. This randomized, double-blind, placebo-controlled study compared the efficacy of topical application of 5% EMLA cream before

surgery, with wound infiltration with 1% lidocaine for postoperative analgesia in children. Ninety children, aged 4 to 12 years, undergoing elective inguinal hernia repair under general anesthesia were enrolled in the study. Patients were randomly assigned to receive either placebo cream (group1), 5% EMLA cream (group 2), or placebo cream followed by 0.5 mL/kg 1% lidocaine (group 3) in the wound after induction of anesthesia. The anesthetic technique and monitoring were standardized, and postoperative pain was assessed using a 10-point objective pain scale. Fentanyl was used as rescue analgesic in immediate postoperative period, and acetaminophen was administered for postoperative pain in surgical ward. The number of patients requiring fentanyl in the immediate postoperative period was significantly less in the study groups compared with the placebo group. Sixty-seven percent of patients in the placebo group required more than 1 dose of acetaminophen in the first 6 hrs compared with 23% (EMLA group) and 20% (lidocaine group). Four patients (two in the lidocaine group, one in the EMLA group, and one in the control group) developed subcutaneous infection at the site of incision 10 to 15 days postoperatively. Topical application of EMLA (5%) provides postoperative analgesia comparable to infiltration with 1% lidocaine after inguinal hernia repair in children (1).

1. Usmani H, Pal Singh S, Quadir A, Chana RS. A comparison between EMLA cream application versus lidocaine infiltration for postoperative analgesia after inguinal herniotomy in children. Reg Anesth Pain Med. 2009 Mar-Apr;34(2):106-9.

Local anesthetics after total knee arthroplasty: intraarticular or extraarticular administration?

High-volume local infiltration analgesia with additional intraarticular and wound administration of local anesthetic has been shown to be effective after knee replacement, but the optimum site of administration of the local anesthetic (i.e. intraarticular or extraarticular) has not been evaluated. 32 patients undergoing total knee replacement with high-volume (170 mL) 0.2% ropivacaine infiltration analgesia were randomized to receive injection of 20 mL ropivacaine (0.2%) intraarticularly plus 30 mL saline in the extraarticular wound space 24 hours postoperatively or to receive 20 mL ropivacaine (0.2%) intraarticularly plus 30 mL ropivacaine (0.2%) in the extraarticular wound space 24 hours postoperatively. Pain intensity at rest and with mobilization was recorded for 4 hours after administration of additional local anesthetics. Intensity of pain at rest, during flexion, or straight leg lift was not statistically significantly different between the two groups, but there was a tendency of improved analgesia with administration of additional local anesthetic in the extraarticular wound space. The optimal site of administration of local anesthetic in total knee arthroplasty cannot be determined from the present study. However, the insignificant analgesic effect from additional administration of extraarticular local anesthetic may have been due to the relatively low pain scores observed 24 h postoperatively, confirming the efficiency of the high-volume infiltration analgesia technique. Further studies are required to define the optimal site of administration of local anesthetic following knee replacement surgery (1).

1. Andersen LØ, Kristensen BB, Husted H, Otte KS, Kehlet H.
Local anesthetics after total knee arthroplasty: intraarticular or extraarticular administration? A randomized, double-blind, placebo-controlled study. Acta Orthop 2008 Dec; 79(6): 800-5

"Heal Not Hurt"

All wounds have the potential to cause pain, and the nature of the pain varies with the type of wound. Many factors may exacerbate wound pain, including infection, trauma at dressing changes and poor technique when applying compression therapy. Failure to assess wound pain or inadequate pain assessment can cause the patient further anguish and extended suffering. Nurses caring for patients with painful wounds need to identify the source of the pain and exacerbating factors, and determine whether it has nocicoceptive and/or neuropathic elements in order to optimize pain management for the individual patient. Young (1) examines the assessment of wound pain and introduces an initiative that has been developed to improve the assessment process. The 'Heal not Hurt' initiative is an excellent example of the profession and industry working together to implement best practice guidance in patient-centered pain-free wound care in clinical care.

1. Young T. Assessment of wound pain: overview and a new initiative. Br J Community Nurs. 2007;12(12 Suppl):5-8.