BJA

British Journal of Anaesthesia, ■ (■): 1–9 (2018)

doi: 10.1016/j.bja.2018.05.069
Advance Access Publication Date: xxx
Clinical Investigation

CLINICAL INVESTIGATION

Femoral nerve catheter *vs* local infiltration for analgesia in fast track total knee arthroplasty: short-term and long-term outcomes

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Abstract

Background: The aim was to compare the effects on short-term and long-term pain and functional outcome of periarticular local anaesthetic infiltration (LIA) with LIA of the posterior knee capsule in combination with a femoral nerve block (FNB) catheter in patients undergoing total knee arthroplasty.

Methods: Eighty patients were randomised to one of two groups: Subjects in group LIA received periarticular LIA with ropivacaine 0.2% for postoperative analgesia; subjects in group FNB received LIA of the posterior capsule and a FNB catheter. The primary outcome parameter was functional capacity of the knee 12 months after surgery. Secondary parameters included mobility as determined by accelerometer data, pain, satisfaction with the analgesic regimen, hospital length of stay, and use of pain medication 3 and 12 months after surgery.

Results: There were no differences between groups in long-term functional capacity, patient satisfaction and hospital length of stay. In the first 2 days, subjects in group FNB had slightly lower pain scores and used less opioids, and subjects in group LIA had a higher level of accelerometer activity. Three and 12 months after surgery, subjects in group FNB had lower maximum pain scores and were less likely to use any pain medication 12 months after surgery.

Conclusions: Both techniques were similar regarding long-term functional outcome. Subjects in group FNB had slightly lower pain scores and lower opioid consumption after operation, lower maximum pain scores at 3 and 12 months, and were less likely to use any pain medication at 12 months.

Clinical trial registration: NCT01966263.

Keywords: local anaesthesia; arthroplasty; nerve block; postoperative pain

Editorial decision: 10 June 2018; **Accepted:** 10 June 2018

Editor's key points

- Low postoperative pain, early mobilisation, and no persistent pain are aims of total knee arthroplasty.
- Short- and long-term benefits of different analgesic techniques need to be understood.
- Local anaesthetic infiltration was compared with femoral nerve block catheter, assessing up to 12 months post-surgery.
- Femoral nerve block catheter reduced pain severity and analgesic consumption 12 months after surgery.
- Techniques associated with less long-term analgesic use after surgery should be considered.

Total knee arthroplasty (TKA) reduces knee pain and improves knee joint function in patients with knee osteoarthritis.[1] TKA may be associated with severe postoperative pain, which in turn may slow rehabilitation and predispose to the development of persistent pain.[2,3] Perioperative pain protocols therefore focus on achieving optimal pain relief with a minimum of side effects; however, these goals may conflict with changing surgical perspectives with emphasis on early mobilisation and reduced length of hospital stay. Recently developed fast track protocols (enhanced recovery protocols) aim for shorter hospital length of stay and better functional recovery.[4] Fast track protocols that incorporate early mobilisation have been shown to improve functional recovery and patient satisfaction, and are associated with a lower incidence of thromboembolic adverse events.[5]

Femoral nerve block (FNB) provides good analgesia[6] and is considered the standard of care by many.[7,8] However, use of FNB has become disputable, because like epidural analgesia it might hamper early mobilisation.

Recent developments such as local infiltration analgesia (LIA) aim at providing adequate analgesia while avoiding motor impairment.[9] Several RCTs comparing LIA with FNB have been conducted, and three meta-analyses show no differences in the two techniques regarding postoperative analgesia and complication rates.[10–12] Although LIA might provide acceptable perioperative analgesia, there are no data on long-term functional recovery and persistent pain.

We performed a blinded RCT comparing periarticular LIA of the knee with LIA of the posterior knee capsule in combination with a FNB catheter in terms of functional outcome and pain in patients undergoing primary TKA. Primary outcome measure was knee function, tested with functional tests. Secondary outcomes were perioperative and long-term knee pain, use of analgesics, length of hospital stay, and patient-reported functional outcome by questionnaires.

Methods

This blinded randomised study was approved by the local Medica MREC (IRBN, Independent Review Board Nijmegen IRBN2013005) and registered with an international clinical trials registry (www.clinicaltrials.gov, NCT01966263) before onset of participant enrolment. Patients undergoing primary unilateral TKA were assessed for eligibility during preoperative screening visit. Patients were informed about the study and written informed consent was obtained from all patients. The study was conducted between November 2013 and November 2015 at the Sint Maartenskliniek, Nijmegen, The Netherlands, according to the Declaration of Helsinki and later revisions thereof and in accordance with the ICH guidelines for Good Clinical Practice.

Patients

Eligible participants were all adults aged 50–80 yr with ASA physical health classification 1–3. Patients presented with non-inflammatory knee osteoarthritis and were scheduled for fast track, primary, unilateral TKA under spinal anaesthesia. Exclusion criteria were defined as: any contraindication for locoregional or spinal anaesthesia, traumatic osteoarthritis or rheumatoid arthritis requiring TKA, an active local or systemic infection, known intolerance or contraindication for local anaesthetics, paracetamol, NSAIDs or opioids, BMI >40 kg m^{-2}, inability to walk independently (inability to walk at least 10 m without a walking aid), undergoing contra-lateral TKA <1 yr, or undergoing another surgery <3 months, use of opioids or anti-neuropathic pain medication >1 yr, or physical, emotional, or neurological conditions that would compromise compliance with postoperative rehabilitation and follow-up.

Study procedure

Using a computer-generated sequence of random numbers in eight blocks of 10 and a sealed envelope technique, patients were randomised to one of two groups: group FNB or group LIA. The envelopes were opened just before surgery, when the patient arrived in the anaesthetic room. Patient, anaesthesiologist, and orthopaedic surgeon were informed about the study allocation. The physical therapists and research assistants who assessed the outcome variables were blinded for treatment allocation and the patient was instructed not to discuss the analgesic regimen with anyone.

Anaesthesia and surgical procedure

All surgeries were performed according to standard hospital protocol. In the anaesthetic room, standard monitoring (pulse oximeter, non-invasive BP, and ECG) was applied to all patients and i.v. access was established. Before spinal anaesthesia, patients in group FNB received a femoral catheter (Contiplex, B. Braun, Melsungen, Germany) with dual guidance (ultrasound and nerve stimulation). A correct position of the needle and catheter tip was verified by the spread 5–10 ml of NaCl 0.9% injected under ultrasound guidance. The catheter was secured with a transparent dressing with an antimicrobial gel pad.

In patients in group LIA, a sham femoral catheter was taped to the skin in a similar fashion as with patients in group FNB.

All patients received spinal anaesthesia with hyperbaric bupivacaine 0.5% (10 mg) in the sitting position. Upon completion of the subarachnoid injection, patients were turned to the lateral decubitus position, the side of surgery being dependent. This was maintained for 20 min to achieve a predominantly unilateral block, after which patients were turned to the supine horizontal position.

During surgery, patients received conscious sedation with propofol upon request. A pneumatic tourniquet was placed around the patient's thigh and inflated to 50 mm Hg above systolic BP with a maximum of 250 mm Hg. The knee was