Journal of Clinical Anesthesia (2016) **33**, 68–74

ELSEVIER

Journal of Clinical Anesthesia

Original Contribution

Combined preoperative femoral and sciatic nerve blockade improves analgesia after anterior cruciate ligament reconstruction: a randomized controlled clinical trial☆

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Received 17 July 2015; revised 31 December 2015; accepted 8 February 2016

Keywords:
Ambulatory surgical procedures;
Anterior cruciate ligament;
Femoral nerve;
Nerve block;
Sciatic nerve

Abstract

Study objective: To compare preoperative femoral (FNB) with combined femoral and sciatic nerve block (CFSNB) in patients undergoing arthroscopic anterior cruciate ligament (ACL) reconstruction.

Design: Prospective, randomized clinical trial.

Setting: Ambulatory surgery center affiliated with an academic medical center.

Patients: Sixty-eight American Society of Anesthesiology physical status I and II patients undergoing arthroscopic ACL reconstruction.

Interventions: Subjects randomized to the CFSNB group received combined femoral and sciatic nerve blocks preoperatively, whereas patients randomized to the FNB group only received femoral nerve block preoperatively. Both groups then received a standardized general anesthetic with a propofol induction followed by sevoflurane or desflurane maintenance. Intraoperative pain was treated with fentanyl. Pain in the postanesthesia care unit (PACU) was treated with ketorolac and opiates. Patients with significant pain despite ketorolac and opiates could receive a rescue nerve block.

Measurements: Our primary outcome variable was highest Numeric Rating Scale (NRS) pain score in PACU. NRS pain scores, opioid consumption, opioid adverse effects, and patient satisfaction were assessed perioperatively until postoperative day 3.

☆ Disclosures: none.

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http://dx.doi.org/10.1016/j.jclinane.2016.02.021

Main results: The highest PACU NRS pain score was significantly higher in the FNB group compared with the CFSNB group (7 [3-10] vs 5 [0-10], $P = .002$). The FNB group required significantly larger doses of opioids perioperatively (31.8 vs 19.8 mg intravenous morphine equivalents, $P < .001$). PACU length of stay was significantly longer in the FNB group (128.2 vs 103.1 minutes, $P = .006$). There was no significant difference in opioid consumption, pain scores, or patient satisfaction on postoperative days 1-3 between groups. **Conclusions:** Preoperative CFSNB for arthroscopic ACL reconstruction improves analgesia, decreases opioid consumption perioperatively, and decreases PACU length of stay when compared with FNB alone.

1. Introduction

Anterior cruciate ligament (ACL) reconstruction can cause a significant amount of postoperative discomfort. Femoral nerve blockade is established to improve analgesia following ACL reconstruction [1–5]. However, even patients with femoral nerve blockade still commonly complain about knee pain after ACL reconstruction, and this pain could possibly be prevented with sciatic nerve blockade. The articular branches of the tibial nerve provide sensory afferents to the posterior knee, whereas the articular branches of the common peroneal nerves contribute sensory afferents to the anterior knee. Therefore, blockade of the tibial and common peroneal nerves via a sciatic nerve block could reduce the severity of both anterior and posterior knee pain even in the setting of a femoral nerve block (FNB) [6–8].

The analgesic benefits of adding sciatic nerve blockade to femoral nerve blockade in knee surgeries are debated [9–12]. Retrospective data suggest that combined femoral-sciatic nerve blockade (CFSNB) performed before complex knee surgery may improve analgesia and decreases opioid consumption when compared with FNB alone [13–14]. Several recent randomized controlled studies of total knee arthroplasty suggest that CFSNB provides superior pain control [15–16], and a recent randomized controlled trial by Abdallah et al. [6] demonstrated that CFSNB specifically reduces posterior knee pain after total knee arthroplasty. Currently, there are limited data on the analgesic role of sciatic blockade in ACL reconstruction, with only 1 randomized study [19].

We performed a prospective randomized controlled study comparing preoperative single-shot FNB to CFSNB in patients undergoing ambulatory arthroscopic ACL reconstruction. We hypothesized that patients who received CFSNB preoperatively would have improved analgesia, fewer opioid-related adverse effects, greater patient satisfaction, and shorter postanesthesia recovery times. Our primary outcome variable was highest Numerical Rating Scale (NRS) pain score in the postanesthesia care unit (PACU). This trial was registered at Clinicaltrials.gov, identifier: NCT01447277.

2. Material and methods

After study approval by the institutional review board at University of California, San Francisco, written informed consent was obtained from adult patients who were scheduled for arthroscopic ACL reconstruction surgery at an ambulatory surgery center between October 2011 and May 2013. Inclusion criteria included age of at least 18 years, American Society of Anesthesiologists physical status I to II classification, and planned ACL reconstruction surgery by 1 of 2 surgeons. Exclusion criteria included inability to consent, preexisting neuropathy or coagulopathy, infection at block sites, dementia, allergy to local anesthetics and opioids, known history of intravenous (IV) drug abuse, preoperative chronic opioid requirements, chronic pain, and high risk for postoperative nausea and vomiting (PONV) (Apfel score III or IV) [17].

2.1. Procedures

Before the start of patient enrollment, allocation to either preoperative FNB or CFSNB was determined using simple randomization and consecutively numbered sealed opaque envelopes containing group assignment cards. The allocation sequence was concealed to all investigators and anesthesiologists involved in the trial. After written consent and enrollment occurred, the anesthesiologist performing the block opened the prepopulated envelope with the group assignment. Nerve blocks were performed in the preoperative holding area while monitoring heart rate, blood pressure, and oxygen saturation. Midazolam 1-2 mg and/or fentanyl 25-50 μg were administered intravenously to patients before or during the nerve block according to the anesthesiologist's discretion. Femoral nerve blocks were performed in the supine position. After the site of injection was cleaned with chlorhexidine gluconate and isopropyl alcohol, a 6- to 13-MHz linear probe (LOGIQ e; GE Healthcare, Wauwatosa, WI) transducer was covered with a sterile sheath, and 2-5 mL of lidocaine 2% was injected subcutaneously near the inguinal crease. A 5-cm, 22-gauge insulated needle (SonoPlex Stim cannula; Pajunk, Geisingen, Germany) was used for performance of the FNB. A total of 20-30 mL of ropivacaine 0.5% was injected around the femoral nerve with an in-plane approach using real-time ultrasonography guidance.

In addition to the FNB, patients in the CFSNB group received an ultrasonography-guided sciatic nerve block preoperatively. Patients were either placed in a lateral decubitus position or prone with the operative leg in a neutral position. The site of injection was located in the subgluteal or upper-to-middle thigh region. Disinfection of the puncture site and