The Journal of Arthroplasty xxx (2017) 1–6

Contents lists available at ScienceDirect

The Journal of Arthroplasty

journal homepage: www.arthroplastyjournal.org

Original Article

Does Patient Perception Differ Following Adductor Canal Block and Femoral Nerve Block in Total Knee Arthroplasty? A Simultaneous Bilateral Randomized Study

Hyun J. Koh, MD, PhD [a, b], In J. Koh, MD, PhD [c, d], Man S. Kim, MD [c], Keun Y. Choi, MD [c], Hyeon U. Jo, MD [a], Yong In, MD, PhD [c, d, *]

[a] Department of Anesthesiology and Pain Medicine, Seoul St. Mary's Hospital, Seoul, Korea
[b] Department of Anesthesia and Pain Medicine, College of Medicine, The Catholic University of Korea, Seoul, Korea
[c] Department of Orthopaedic Surgery, Seoul St. Mary's Hospital, Seoul, Korea
[d] Department of Orthopaedic Surgery, College of Medicine, The Catholic University of Korea, Seoul, Korea

ARTICLE INFO

Article history:
Received 30 September 2016
Received in revised form
31 December 2016
Accepted 18 January 2017
Available online xxx

Keywords:
multimodal pain management
adductor canal block
femoral nerve block
same-day bilateral total knee arthroplasty
peripheral nerve block

ABSTRACT

Background: Femoral nerve block (FNB) has been used as part of the multimodal analgesia after total knee arthroplasty (TKA), but leads to weakness in the quadriceps muscles. Recently, adductor canal block (ACB) was reported to provide effective pain relief while sparing the strength of the quadriceps. This simultaneous bilateral randomized study investigated whether patients perceived differences between ACB and the FNB after same-day bilateral TKA.

Methods: We performed a prospective simultaneous bilateral randomized study in 50 patients scheduled to undergo same-day bilateral TKA. One knee was randomly assigned to ACB and the other knee was assigned to FNB. All ACB and FNB were performed using ultrasound-guided single-shot procedures. These 2 groups were compared for pain visual analogue scale, straight leg raising ability and knee extension while sitting, and motor grade. At postoperative week 1, the peak torque for the quadriceps muscle was measured in both knees with an isokinetic dynamometer.

Results: There were no differences in pain levels between ACB and FNB during the entire study period. During the first 48 h after TKA, more of the knees that received ACB could perform straight leg raising and knee extension with greater quadriceps strength compared with FNB. However, no group differences in quadriceps functional recovery were found after postoperative 48 h and isometric quadriceps strength at postoperative 1 week.

Conclusion: This simultaneous bilateral randomized study demonstrates that patients did not perceive differences in pain level, but experienced substantial differences in quadriceps strength recovery between knees during the first 48 h (Identifier: NCT02513082).

As total knee arthroplasty (TKA) is increasingly recognized as a standard treatment option for end-stage knee disease with widespread acceptance, its use has increased substantially over the past few decades, and future demand is projected to rise rapidly [1-4]. Concerns are emerging about growing socioeconomic burden on the healthcare system [5] and there is a growing emphasis on the establishment of strategies to shorten the length of time spent in hospitals by facilitating faster recovery during the early postoperative period [6,7]. Great advances in pain management are well documented to be a major factor in the improvement of postoperative recovery after TKA and the preemptive use of multimodal modalities is currently accepted as a principle of pain management after TKA [8,9]. As peripheral nerve blocks (PNBs) provide effective analgesia, they are considered an essential part of the current multimodal pain management protocol following TKA [9,10].

Given the excellent pain relief and synergistic analgesic effect, femoral nerve block (FNB) is commonly used as an analgesic modality and is considered the standard PNB in patients undergoing TKA [11]. However, FNB is reported to be associated with a significant decrease in quadriceps strength, resulting in delayed rehabilitation, which is associated with the potential risk of falling

No author associated with this paper has disclosed any potential or pertinent conflicts which may be perceived to have impending conflict with this work. For full disclosure statements refer to http://dx.doi.org/10.1016/j.arth.2017.01.025.

* Reprint requests: Yong In, MD, PhD, Department of Orthopaedic Surgery, Seoul St. Mary's Hospital, College of Medicine, The Catholic University of Korea, 222 Banpo-daero, Seocho-gu, Seoul 06591, Korea.

http://dx.doi.org/10.1016/j.arth.2017.01.025
0883-5403/

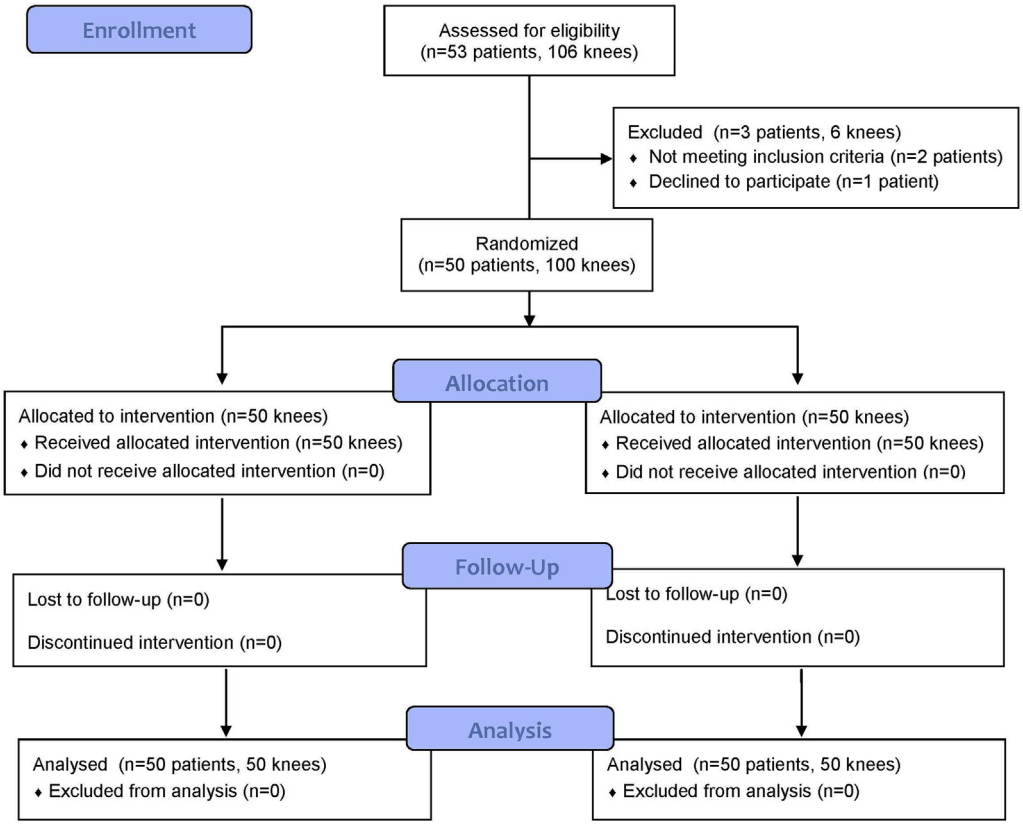

Fig. 1. A flow diagram showing the study design.

[12-15]. A potent pain management modality that preserves motor strength during early rehabilitation is becoming increasingly accepted as part of the current perioperative rehabilitation protocol following TKA. Within this context, a growing body of evidence supports the use of an adductor canal block (ACB), which offers pure sensory block with minimal motor involvement in patients undergoing TKA [16-31]. However, heterogeneities among studies regarding concomitant anesthesia and pain management protocols, infiltration techniques, and outcome variables make it difficult to judge the practical value of ACB in patients after TKA.

A comparison between knees that underwent different PNBs in a single patient might be the best method of assessing the difference between ACB and FNB. However, only one previous simultaneous randomized bilateral trial relating to different PNBs has been undertaken [21], and data comparing ACB to FNB in the same patient who underwent same-day bilateral TKA remain limited. However, unfortunately, as previous study used a combined spinal epidural anesthesia and maintained epidural PCA (patient-controlled analgesia) for 2 days after TKA, pain relief and quadriceps recovery might be affected by neuroaxial analgesia. Therefore, pure analgesia and quadriceps recovery between ACB and FNB remain to be determined.

Thus, this prospective simultaneous bilateral randomized study was conducted to determine whether patients perceive a difference in pain level, and to investigate how different patients experience functional recovery of the quadriceps muscle with ACB and FNB after undergoing same-day bilateral TKA.

Patients and Methods

This study included 53 patients scheduled to undergo same-day bilateral TKAs between July 2015 and April 2016. After obtaining approval from our Institutional Review Board, we randomly assigned one knee to receive ACB and the other knee to receive FNB for each patient. Eligible patients included those aged <75 years, with an American Society of Anesthesiologists (ASA) score of 1 or 2, and who were scheduled for same-day bilateral TKA for primary osteoarthritis. Exclusion criteria included patients who had postoperative complications such as periprosthetic infection, periprosthetic fracture, or venous thromboembolism that could potentially affect the postoperative outcomes. Patients who declined to participate in this trial or who were unable to provide informed consent were also excluded. Of the 53 patients enrolled in this study, 3 were subsequently excluded: 2 patients for a diagnosis other than osteoarthritis (1 rheumatoid arthritis and 1 post-traumatic arthritis) and 1 patient (2 knees) declined to participate. Thus, 50 patients (100 knees) in total were recruited. One knee was randomly assigned to the ACB group, which received the ACB, and the contralateral knee was assigned to the FNB group, which received the FNB. A computer-generated randomization table, permuted into blocks of 4 and 6, was used to randomly assign knees to either the ACB or FNB group. Allocation was assigned at the commencement of surgery by a scrub nurse who was not involved in patient recruitment for this trial. The patients, and an independent investigator who prospectively collected the clinical information, were unaware of group assignments until the final data analyses were complete. Finally, 50 patients (100 knees) were included in the final analyses (Fig. 1). Of these 50 patients, 49 were female and 1 was male. The mean age was 66.9 years, ranging from 51 to 75 years, and the mean body mass index was 27.1 kg/m^2, ranging from 20.4 to 34.1. Twelve patients (24%) had ASA scores of 1 and the others (76%) had ASA scores of 2. Final outcome adjudications were completed in July 2016. The study protocol was registered at ClinicalTrials.gov (NCT02513082).