

Comparison of continuous femoral nerve block with and without combined sciatic nerve block after total hip arthroplasty: a prospective randomized study

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Abstract

In association with the growing interests in pain management, several modalities to control postoperative pain have been proposed and examined for the efficacy in the recent studies. Various modes of peripheral nerve block have been proposed and the effectiveness and safety have been examined for each of those techniques. We have described our clinical experiences, showing that continuous femoral nerve block could provide a satisfactory analgesic effect after total hip arthroplasty (THA) procedure. In this study, we compared the effectiveness and safety of continuous femoral nerve block with and without sciatic nerve blockade on pain control after THA. Forty patients scheduled for THA were included in the study and randomly divided into 2 groups. Postoperative analgesic measure was continuous femoral nerve block alone, while the identical regimen of continuous femoral nerve block was combined with sciatic nerve block. The amount of postoperative pain was evaluated in the immediate postoperative period, 6 hours, and 12 hours after surgery. Moreover, postoperative complications as well as requirement of supplemental analgesics during the initial 12 hours after surgery were reviewed in the patient record. The obtained study results showed that the supplemental sciatic nerve blockade provided no significant effect on arrival at the postoperative recovery room, while the NRS pain score was significantly reduced by the combined application of sciatic nerve blockade at 6 and 12 hours after surgery. In the investigation of postoperative analgesia-related complications, no major complication was encountered without significant difference in complication rate between the groups.

Introduction

Pain after total hip arthroplasty (THA) induces problems such as physical and emotional distress and delay in rehabilitation that leads to retarded recovery and extended hospital stay.¹⁻³ Major surgical procedures are followed by pain, a catabolic stress response with increased demands on body organs, fatigue, nausea and vomiting, and impaired nutrition and mobilization. These factors may be of pathogenic importance towards an increased risk of cardiac, pulmonary, and thromboembolic complications as well as to retard rehabilitation and prolong convalescence⁴. In the case of patients undergoing hip or knee arthroplasty, these factors may indeed be relevant, since such patients are often elderly with limited organ function capacity.⁵ It may therefore be important to treat postoperative pain effectively in such patients in an attempt to hasten recovery and reduce complications. Therefore, postoperative pain management in THA is of imperative importance. Conventionally, systemic administration of acetaminophen, nonsteroidal anti-inflammatory drugs (NSAIDs), and opioids were adopted as principal options. However, these medications may not be able to afford adequate pain relief and can be associated with systemic complications.^{6,7} The majority of the patients who undergo this procedure are concerned about postoperative pain. Thus, successful control of postoperative pain can improve patient satisfaction.^{8,9} In association with the growing interests in pain management, several modalities to control postoperative pain have been proposed and examined for efficacy in recent studies.¹⁰⁻¹³ Many patients having discretionary orthopaedic surgery take opioids daily, either with a prescription or illicitly; however, little is known regarding the prevalence and effect of high-risk opioid use (e.g.: abuse, dependence) in the perioperative orthopaedic setting.^{14,15} Peripheral regional nerve blocks are commonly used for pain management after THA.^{3,16-20} We have described our clinical experiences, showing that continuous femoral nerve block could provide a satisfactory analgesic effect after THA procedure.¹⁷ In this study, we compared the effectiveness and safety of continuous femoral nerve block with and without sciatic nerve blockade on pain control after THA.

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Materials and Methods

Patients scheduled for THA were included in the study. The inclusion criterion was unilateral THA, while patients with neurological or psychological problems who potentially posed a difficulty for pain assessment were excluded from the study population. Institutional Review Board approval was obtained and all patients signed their informed consent before participating in the study. Originally, 40 consecutive patients who met the above mentioned criterion were included in the study and randomly divided into 2 groups using the closed envelope method. During the course of the analysis of the study results, forty patients scheduled for THA were included in the study and randomly divided into 2 groups (groups A and B) based on the postoperative analgesic measure to be employed. All surgeries were performed under general anesthesia with the patient in the lateral position through a lateral approach by one of the authors (SN). Patient characteristics, such as age at surgery, body weight, and height, were comparable among the groups with no significant intergroup difference. Preoperative diagnosis was OA in 36, necrosis in 4, and loosening requiring revision THA in 5 cases. The postoperative analgesic measure was continuous femoral nerve block (0.15% ropivacaine, 3 mL/hour) alone in group A, while the identical regimen of continuous femoral nerve block was combined with sciatic nerve block (single dose injection of 0.75%

ropivacaine 10 mL and 2% and mepivacaine 10 mL) in group B (Table 1). The blockade procedure was performed under ultrasound guidance (S-Nerve; SonoSite, Bothell, Washington, DC, USA). The femoral artery was located below the inguinal ligament by ultrasound, and an 18-gauge short-beveled cannula (Contiplex A set; B Braun, Melsungen, Germany) was inserted just lateral to the artery. Finally, the location of the femoral nerve was determined with the aid of a peripheral nerve stimulator (Stimuplex; B Braun). The Seldinger technique was employed to thread a 20-gauge catheter to a depth of 10 cm into the femoral nerve sheath. We recorded the number of times as requirement of supplemental NSAIDs [diclofenac sodium (50 mg) or flurbiprofen axetil (50 mg)] during 12 hours after surgery.

The amount of postoperative pain was evaluated in the immediate postoperative period at 6 and 12 hours after surgery. The analgesic effect was assessed using an 11-point numerical rating scale (NRS) that ranges from 0 (no pain) to 10 (worst pain imaginable for the patient). Moreover, requirement of additional supplemental analgesics during the initial 12 hours and complications as well as functional recovery in the early postoperative period (within 14 days after surgery) were

reviewed in each patient's record. The NRSs were evaluated by one of the authors who was independent of the operating surgeon. In the statistical analysis, a repeated-measures ANOVA was used to detect the difference between the groups.

Results

Clinical data about surgery were comparable for each group as shown in Table 2, and no significant difference was demonstrated in any of the patient-related parameters between the groups. Additionally, there was no significant difference in the dose of fentanyl used during the surgery between the groups. The NRS scores at each of the postoperative time periods in each group were shown in Table 3 and Figure 1. The NRS scores on arrival at the recovery room in group A and group B showed no significant difference. At both 6 and 12 hours after surgery, the NRS scores in group B were significantly lower than that in group A ($P < 0.05$). The amount of analgesics requested by the patient was not significantly different between the groups in Figure 2. Regarding the complications related to the analgesia, seven patients in group A and eight patients in group B complained of nausea and vomiting and received antiemet-

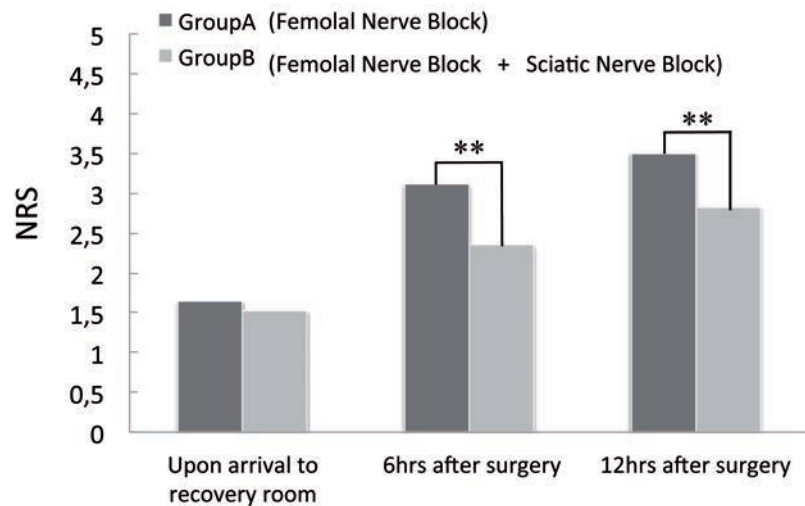


Figure 1. Numerical rating scale scores at each of the postoperative time periods in each group.

Table 1. Pain management protocol.

Group	Technique	Medication
A	Continuous femoral nerve block	0.15% ropivacaine 3 mL/hour
B	Continuous femoral nerve block and sciatic nerve block	0.15% ropivacaine 3 mL/hour; 0.75% ropivacaine 10 mL; 2% mepivacaine 10 mL

Sciatic nerve block is single dose injection in group B.

Table 2. Patients' characteristics.

	Group A (n=20)	Group B (n=20)
Age (years)	60.1	66.8
Female/male ratio	14/6	17/3
Weight (kg)	58.5	62.9
Height (cm)	161.4	155.8
Preoperative diagnosis (OA/Necrosis/Revision)	17/2/1	14/2/4
Blood loss (g)	605.5	655.2
Surgical time (min)	100.8	128.4

Table 3. Numerical rating scale score.

	Upon arrival to recovery room	6 hrs after surgery	12 hrs after surgery
Group A	1.64±0.45	3.11±1.30	3.50±1.95
Group B	1.52±0.52	2.35±0.62	2.83±1.26

Values are expressed as mean±standard deviation.

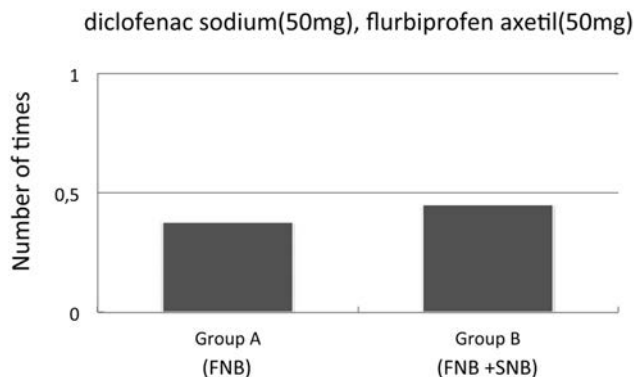


Figure 2. Amount of analgesics requested by the patient.

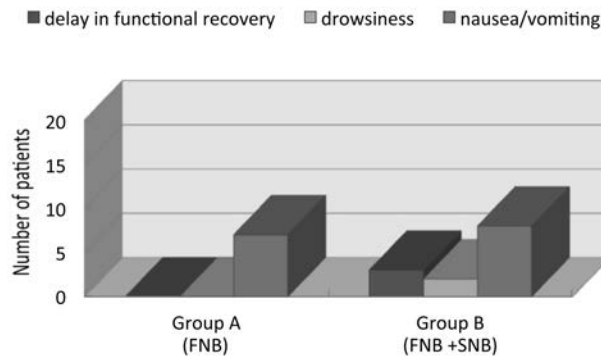


Figure 3. Complications related to the analgesia.

ic drugs. Three patients in group B experienced drowsiness, while no such adverse event was observed in group A patients as shown in Figure 3.

Discussion

Recent progress in postoperative pain control modalities has improved the quality of patient management and satisfaction.^{8,9} Pain control measures following THA employed in clinical practice include systemic administration of NSAIDs or opioids, intravenous PCA, epidural block, local infiltration analgesia and peripheral nerve block. Nakai *et al.* reported intraoperative periarticular injection with multimodal drugs can significantly reduce pain on the day of the operation with no apparent risks following THA.²¹ Sing *et al.* reported that opioid therapy is an increasingly used modality for treatment of musculoskeletal pain despite multiple associated risks. Compared to nonusers, preoperative long-acting use was associated with increased postoperative mean opioid consumption and independently predicted complications within 90 days. Preoperative opioid use should be disclosed as a risk factor for complication to patients and taken into consideration by physicians before initiating opioid management.¹⁵ Among these management options, peripheral nerve block has attracted interest based on consideration of the analgesic effect as well as the risk for complication. Various modes of peripheral nerve blockade have been proposed and examined in previous literatures.^{1-3,10,11,17-20,22-25} The effectiveness and safety have been examined for each of those techniques.^{2,18,19}

Among the procedures, use of continuous femoral nerve block with or without combined sciatic nerve block is one of the most frequent options for pain management after THA. This study was designed to examine whether the addition of a single-injection sciatic nerve block to continuous femoral nerve block could enhance the anagologic effect in patients who underwent THA. The obtained study results showed that the supplemental sciatic nerve blockade provided no significant effect on arrival at the postoperative recovery room, while the NRS pain score was significantly reduced by the combined application of sciatic nerve blockade at 6 and 12 hours after surgery. In investigation of the postoperative analgesia-related complications, no major complications were encountered, and there was no significant difference in complication rate between the groups. Prolonged drowsiness observed only in the combined blockade group (Group B) may be related to the increased dose of anesthetics. Although this event did not substantially retard the postoperative recovery, further investigation of its pathogenesis seems to be required.

There were limitations and weaknesses included in the design and contents of this study. First, the sample size (20 cases in each group) was small with wide variation of patient characteristics. Secondly, clinical evaluation for pain was conducted only until 12 hours after surgery and limited to the pain at rest. Thirdly, there was variability among studies in administration methods of peripheral nerve blocks, time of infiltration, type of nerve block, injection components and respective doses, and anesthesia/analgesic protocols.

Conclusions

In conclusion, addition of sciatic nerve block to continuous femoral nerve block enhanced the analgesic effect at 6 and 12 hours after surgery without a significant increase in complication rate.

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