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Intra-Articular Bupivacaine Reduces Postoperative Pain and Meperidine Use After Total Hip Arthroplasty: A Randomized, Double-Blind Study

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ABSTRACT

One hundred patients receiving unilateral total hip arthroplasty (THA) were randomized to receive an intra-articular injection of 300 mg bupivacaine or normal saline after completion of surgery. Pain scores of the bupivacaine group were significantly lower than those of the control group the first 12 hours postoperatively (all, $P < 0.001$). A significantly lower dose of meperidine was used in the study group than in the control group the first 24 hours postoperatively (median, 25 vs. 45 mg, $P < 0.001$). Nineteen patients in the study group required meperidine the first day after surgery, as compared to 45 patients in the control group. We conclude that intra-articular injection of bupivacaine after THA reduces pain and meperidine use in the first 12 hours after surgery.

Although many methods of pain control after total joint arthroplasty have been investigated, parenteral narcotics still play a major role in postoperative pain management [1]. Peri-articular injection of local anesthetics has become an area of interest because local anesthetics block pain conduction at its origin, and do not have the systemic side effects associated with postoperative narcotic use [2–4].

A single-dose intra-articular injection of bupivacaine has been shown to be better than placebo at relieving pain after knee arthroscopic surgery [5]. Studies have examined the use of peri-articular injection of local anesthetics [6,7] and opioids [8–10] to reduce postoperative pain and analgesic requirements after total knee arthroplasty (TKA), and results have not been consistent. Studies examining the use of peri-articular injection of anesthetics during total hip arthroplasty (THA) are fewer in number. In a study including both knee and hip arthroplasty, Parvataneni et al. [4] reported that a multimodal protocol with local peri-articular injections containing bupivacaine (200–400 mg) and morphine sulfate (4–10 mg) reduced narcotic usage and improved early functional recovery. However, a study in which intra-articular infusion of 0.5% bupivacaine at a rate of 2 ml/h for 48 h after THA reported little or no pain relief [11].

The purpose of this double-blind, randomized study was to investigate the use of intra-articular injection of a long-acting local anesthetic (bupivacaine, 300 mg) in patients undergoing total hip arthroplasty (THA). Our hypothesis was that intra-articular anesthetic is not effective for reducing postoperative pain after THA.

Patients and Methods

Study Design

This study was approved as a randomized, double-blind, placebo-controlled trial by the Institutional Review Board before patient enrollment. It was registered in clinicaltrials.gov as a phase 2/3 interventional trial (clinical trial identifier NCT01040273). Informed written consent was obtained from all participants prior to inclusion in the study.

Patients

From January 2010 to August 2010, all patients scheduled for unilateral THA were evaluated for eligibility. One hundred consecutive patients were approached, and all consented to be in the study. The inclusion criteria included an age of 18 to 80 years, preoperative diagnosis of osteoarthritis or osteonecrosis, undergoing primary unilateral THA, and the ability to tolerate surgery under general anaesthesia. Exclusion criteria included refusal or lack of mental ability to provide informed consent, neuropathic pain or sensory disorders in the leg requiring surgery, previous surgery of the hip joint, coagulation abnormalities, severe renal or hepatic impairment, chronic opioid use, known history of intolerance to the drugs used in

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the study, the presence of additional conditions requiring surgical correction at the time of THA, and reoperation or trauma to the hip within the study period. Administration of anti-inflammatory drugs was suspended for at least 1 week prior to surgery.

Anaesthesia and Surgical Procedure

All enrolled patients received induction of general anesthesia with propofol (2 mg/kg) and fentanyl (2 μg/kg), and orotracheal intubation was facilitated with vecuronium (0.15 mg/kg). Anesthesia was maintained with isoflurane in a mixture of 70% nitrous oxide and 30% oxygen. Fentanyl was administered in doses of 0.5–1 μg/kg during the surgical procedure as required, but none was given during the last 30 minutes of surgery in all cases. All surgical procedures were performed by the same orthopedic surgeon using standard techniques through the anterolateral approach [12]. The same total hip prosthesis (Trilogy Acetabular Cup, VerSys Fiber Metal Taper Stem; Zimmer, Warsaw, IN) was implanted in all patients without using bone cement. No post-operative drainage was used in any patient. After closure of the joint capsule, an intra-articular injection of 60 ml of 0.5% bupivacaine (study group) or 60 ml of 0.9% normal saline solution (control group) was given in one injection directly into the joint space.

A random-number generator was used to generate the group assignment. Group assignments were sealed in sequentially numbered identical envelopes. The bupivacaine and saline solutions were prepared by the hospital pharmacy, and were identical in appearance; thus, the surgeon and operating room staff were unaware of which was being used. Data collection was performed in a double-blinded manner, such that neither the patients nor the health-care personnel were aware of the medication assignment. To ensure blinding, the randomization code was kept confidential until all data were available for analysis.

Analgesia Protocol

All patients received the same pre-operative and postoperative pain management. All patients received a 40 mg injection of parecoxib 1 hour prior to surgery. In the recovery room all patients received meperidine (0.5 mg/kg, intravenous [iv]) at 10 minute intervals if the pain intensity was more than 40 mm on a visual analogue scale (VAS) where 0 was no pain and 100 was the worst pain imaginable (VAS-100). In the orthopedic ward, patients were given 40 mg parecoxib, iv, every 12 h for 2 days, acetaminophen 500 mg orally every 6 h, and 50 mg meperidine intramuscularly at 4 hour intervals if the pain intensity was more than 40 on the VAS pain scale. This protocol and choice of analgesic medications is a standard postoperative analgesia protocol in our country.

Postoperative Care

Postoperative care and physical therapy regimen was the same for all patients. Early post-operative mobilization was encouraged, and all patients were allowed to bear weight as tolerated and to use a walking

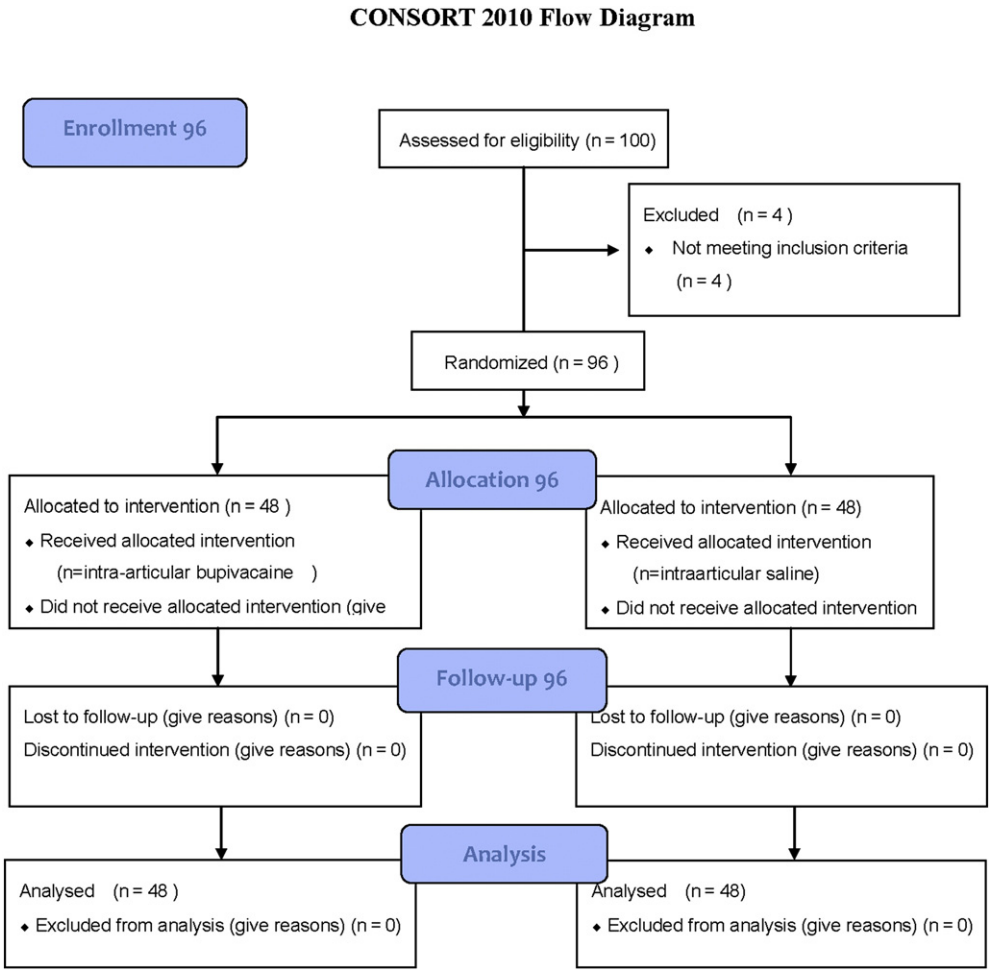

Fig. 1. CONSORT diagram of the study.