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TIBIAL SURGERIES IN PATIENTS WITH ACUTE SUBDURAL HEMATOMA UNDER COMBINED FEMORAL AND POPLITEAL NERVE BLOCK

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Abstract

Tibial plateau fractures are one of the commonest intra-articular fractures resulting from indirect coronal or direct axial compressive forces. Fractures of tibial plateau constitute 1% of all fractures and 8% fractures in the elderly. Acute subdural hematoma (aSDH) is commonly encountered in the emergency department in patients with traumatic injuries. If the hematoma is small, non-expanding and asymptomatic, it is managed conservatively. However, other injuries sustained during trauma may warrant surgical intervention, during which anesthetic management becomes challenging. There have been reports of rebleeding in patients with aSDH after undergoing surgery under either general or spinal anesthesia. Here we present studies where tibial surgery for trimalleolar fracture was successfully performed.

Key words - Tibial plateau fractures, anesthetic management, subdural hematoma

Introduction

There are several types of fractures in the tibial plateau, but indirect coronal fractures and direct axial fractures are among the most common intra-articular fractures. One percent of all fractures are tibial plateau fractures, while 8% of fractures in the elderly are tibial plateau fractures. Medial and lateral condylar fractures (11-30%) with varying degrees of articular depression and displacement are among the most common fracture configurations. It is possible to develop osteoarthritis prematurely after these fractures if the plateau surface and the axes of the leg are not properly restored, resulting in ligament damage, as well as disability and pain for the rest of his or her life. The meniscus and ligaments of the knee may also be injured as a result of tibial surgery fracture [1].

During the first few days following total Tibial surgery, pain intensity peaks. A prolonged hospital stay is caused by pain, which negatively impacts rehabilitation progress. Rehabilitation training can be negatively affected by pain, which can negatively affect patients' activity levels, leading to prolonged hospital stays. Multiple pain pathways are being targeted, opioids are being combined with nonsteroidal anti-inflammatory agents, and periarticular injections or ultrasound-guided regional anaesthesia (USRA) are being used to manage pain [2].

Invasive local anesthesia during Tibial surgery, or periarticular injections, is one method of reducing pain postoperatively in a multimodal pain management system. Patients with LIA experienced less pain at 6 and 24 h postoperatively than those with placebo, according to a meta-analysis. The simplicity of LIA and the lack of adverse side effects associated with peripheral regional anesthesia, such as muscle weakness and neurological damage, further

support the use of LIA. LIA is preferred by many authors because reduced motor function and femoral nerve block after surgery reduce patient mobility [3].

In Tibial surgery, USRA commonly targets the femoral, sciatic and obturator nerves for postoperative analgesia. The number of opioid prescriptions in the first 48 h postoperatively for patients with single-shot femoral nerve blocks is significantly lower than those for patients receiving placebo [4]. To achieve better analgesia, some authors suggest blocking both the sciatic and femoral nerves in the popliteal region. Adjuvants such as dexmedetomidine, when used in conjunction with local anaesthetics, can increase the duration of the block. The effects of dexmedetomidine are sympatholytic, analgesic, and sedative because it acts on the 2-adrenoceptors. In a single shot of USRA it prolongs the block-prolonging effect, which makes it widely used as an anaesthetic adjuvant [5].

Until now, dexmedetomidine has not been investigated as an adjuvant to LIA. In the same way that wound infiltration has been shown to enhance the efficacy of ropivacaine and prolong the duration of postoperative analgesia, LIA supplementation enhanced its analgesic efficacy and would strengthen the case for using LIA instead of USRA [6]. This study aimed to compare the effects of single-shot femoral and popliteal blocks, either combined with dexmedetomidine or not, on postoperative opioid consumption of patients undergoing tibial surgery with dexmedetomidine. In relation to postoperative pain control, ultrasound-guided nerve blockades were found to be superior to LIA [7].

Methods

In February and April of 2022, the study was conducted. Patients with severe osteoarthritis (OA) of the knee scheduled for primary Tibial surgery who consented to participate were

eligible to participate in the study. All study medications were exempt from inclusion if they were used during pregnancy, breastfeeding, or if they were allergic.

Using a 1:1 randomization process, patients were assigned to either the LIA or USRA groups. Using the Institute for Medical Informatics, Statistics and Documentation's web-based randomisation tool, a sequence of allocations was generated before surgery. Using Randomizer.at (http://www.randomizer.at). The group assignment was known to patients and treating physicians. As described below, the surgeon performed the procedure in the LIA group at the end of the surgery. Before surgery, the USRA patients received ultrasound-guided peripheral nerve blocks by their anesthesiologists.

Regional anesthesia and local infiltration anesthesia

Patients in the LIA group were injected with 60 ml of ropivacaine 0.5% and 1 ml of dexmedetomidine (100 mg ml-1) around the knee joint, including the posterior capsule, to block distal nerve fibres. Prior to positioning the liner, infiltration was performed after the tibial components were implanted. Before skin closure and ending of the operation, infiltration addressed the knee joint capsule plus the posterior joint structures, periarticular soft tissues, and subcutaneous soft tissues.

Following the local standard operating procedure, USRA performed both single-shot peripheral nerve blocks just before induction of general anaesthesia or spinal anaesthesia. A 120mm 22-gauge PajunkSonoplexStim needle (Gmbh Medizintechnologie, Geisingen, Germany) was used to perform the blocks under sterile conditions. In order to visualize the target nerves and surrounding structures, a linear ultrasound transducer was used (frequency 10-12 MHz).

An approximate 1–3 cm distance from the popliteal crease was used for the distal single-shot popliteal nerve block. Supine with a foot rest elevated, the patient was placed for this nerve

block. The needle placement and control of local anaesthetic spreading were achieved by using ultrasound-guided inline needle insertion. Upon injection, 15 ml of ropivacaine 0.5% and 0.5 ml of dexmedetomidine (100 mg per ml) were administered perineurally. For both blockades, remifentanil was administered intravenously before femoral nerve blockade to reduce discomfort during anaesthesia placement. The table was flattened so that the inguinal region could be accessed while the patient was supine. To inject perineurally ropivacaine 0.5% and dexmedetomidine 100 g and 0.5 ml of a mixture containing 15 ml of both, urine ultrasound guidance was used. A nurse anesthetized the patient for USRA.

Tibial surgery

In all cases, a single dose of cefazolin was administered intravenously 30 minutes before skin incision as an antibiotic prophylaxis. Postoperative antibiotics and wound drains were not used in the patients.

A senior knee surgeon performed the tibial surgery using the flexion gap balanced technique without resurfacing the patella first. A tibial augmentation was done on all participants (Synthes, DePuy, Warsaw, IN, USA). According to radiography, all the patients were suffering from severe OA of the knee despite conservative treatment and reduced knee mobility (Kellgren-Lawrence-Score III/IV). On day one after surgery, patients underwent continuous passive motion (CPM) therapy in addition to full weight bearing immediately following surgery. Neither group showed any differences.

Additional anaesthetic technique

Furthermore, either spinal anesthesia or general anesthesia were performed along with LIA and USRA. As a precaution, patients were given only remifentanil under general anaesthesia during general anaesthesia so that long-acting opiates would not disturb their pain perception during the early recovery period.

Postoperative treatment

In accordance with local procedures, all patients were treated postoperatively with ibuprofen 600 mg three times per day, which is an non-opioid oral analgesic. Furthermore, all patients received opioids (piritramide) as needed by the ward nurses at the end of the surgery. In addition to measuring pain four times a day, the participants self-rated pain three times per day using a Numerical Rating Scale (NRS) ranging from 0 (no pain) to 10 (worst pain imaginable) at rest and while performing exercises (free movement of the operated extremity). As soon as the patient's self-rating NRS fell below 4 at rest or below 5 when performing exercises, opioids were administered (piritramide 2.5–3 mg intravenous bolus, 10 minutes until re-evaluation).

Study endpoints

Randomised controlled trials are designed to determine whether postoperative opioid consumption during the first 48 hours after Tibial surgery for pain control is affected by oral morphine equivalents (OME). At rest and during exercise, NRS pain scores were recorded. The patient's anaesthesia treatment was unknown to the physicians collecting the data. The NRS was used four times daily to assess pain during rest and exercise. It was documented that daily morphine equivalents (OME) were consumed until the patient was discharged from the hospital. The OME was calculated by dividing 1 mg morphine intravenous by 1.5 mg piritramide intravenous by 3 mg morphine oral.

Statistical analysis

For parametric data, data are reported as numbers of patients (%), means (standard deviations [SDs]) or medians (25th to 75th percentiles, called interquartile ranges [IQRs]) for non-parametric data. For univariate statistical significance, Fisher's exact test was performed or Mann–Whitney test was applied for nonparametric data. The Kolmogorov–Smirnov and

Shapiro–Wilk tests of normality of the data were also done. A significance level of 5% was set for each statistical test with a two-sided alpha of 5%. Taking multiple testing into account, an adjusted P value (P2) of 0.01 was used in exploratory analyses.

Results

An eligibility screening was conducted on 56 consecutive patients. The screening resulted in four patients declining to participate, and two others having their TKA surgery rescheduled. This trial therefore included 50 patients. This study had a 0% dropout rate and a 0% complication rate. Dexmedetomidine's trial-related complication time frame was five days.

The baseline characteristics of the participating patients did not differ between the two groups. USRA used general anaesthesia more frequently, P = 0.037, than the rest of the groups except for the main anaesthetic technique.

Following TKA surgery, the LIA group consumed significantly more opioids than the USRA group (27.0 [IQR 0.0–34.0] mg, P = 0.022) during the first 48 hours following surgery. In accordance with the protocol approved by the institutional review board, the responsible study physician terminated the study due to the difference of 15 mg OME between the groups.

LIA patients were more likely to use spinal anesthesia, but their opioid consumption in postanaesthesia care units (PACUs) was significantly higher (LIA group 12.0 mg versus USRA group 0.0 mg, P = 0.047). According to logistic regression, anaesthesia technique (general versus spinal) did not appear to affect results. After discharge from the PACU, the LIA group also required more opioids on the ward on the surgery day (15.0 mg versus 0.0 mg, P 0.001). In contrast, the LIA group's total opioid requirements on surgery day were higher (27.0 [IQR 16.5–35.5] mg compared with 3.0 [IQR 0.0–23.5] mg, P = 0.001). The differences in the median doses between the study groups did not persist 48 hours after TKA,

mainly due to no longer having to take opioids: for example, on day 2 in the LIA group there were 0 mg (IQR 0–0] versus 4 mg (IQR 0.0–15) (P = 0.768).

On the first postoperative day, the LIA group achieved significantly higher NRS scores during exercise (LIA group 2.0 [1.0–4.0] versus USRA group 0.0).

A [0–2.0] distribution with a P2 = 0.001). Moreover, there was no significant difference between the NRS scores in the PACU and the second postoperative day. In the second postoperative day, there was no significant difference between the study groups.

In either study group, dexmedetomidine did not cause adverse effects or other complications during the perioperative or postoperative period. It was found that there was no significant correlation between LIA and the OME needed (r = 0.327, P = 0.02), or between LIA and pain in the PACU when exercising (r = 0.312, P = 0.03). In the PACU, LIA showed moderate correlation with OME as well as on the ward, LIA was moderately correlated with pain experienced during exercise the first postoperative day (r = 0.511 and r = 0.476, respectively, P 0.001).

Based on the 95% confidence interval including the odds ratio of 1.0, the logistic regression adjusted for the type of anaesthesia (spinal anaesthesia), type of LIA, and sex was non-significant. Anaesthesia induction or LIA were not associated with bradycardia or blood pressure decreases that needed medication treatment (atropine or ephedrine).

Discussion

USRA is believed to provide stronger and longer-lasting pain control after TKA than LIA, based on the findings of this study. There may be a cost associated with maximum postoperative pain control. Many authors prefer LIA because of the reduction in patient motor function after surgery and femoral nerve blocks [8]. We have also reported much lower OMEs and NRSs than similar studies. Postoperative opioid consumption and pain

experienced were the foci of this study. There was no difference between the groups in the time required to perform LIA or USRA, but only in the total time required for the operation. In comparison to the easy-to-perform intraoperative LIA technique, some authors have claimed that USRA can require more time, resulting in fewer TKAs occurring on surgery days. As well as being a more cost-effective technique, LIA appears to be more efficient as well. We could find no evidence for the concentration used of dexmedetomidine causing adverse effects in LIA or USRA [9,10,11].

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