

Periarticular Cocktail Injection is More Useful than Nerve Blocks for Pain Management after Anterior Cruciate Ligament Reconstruction

Tomoyuki Kanayama¹, Junsuke Nakase², Yoshihiro Ishida³, YUSUKE YANATORI⁴, Yu Arima, TAKUYA SENGOKU⁴, Yushin Mizuno

¹Kanazawa University Hospital, ²Junsuke Nakase, MD Phd, Department of Orthopaedic, ³Kanazawa-University, ⁴Kanazawa University

INTRODUCTION:

Anterior cruciate ligament (ACL) rupture is a commonly encountered injury in sports medicine, and ACL reconstruction is the gold standard treatment. Postoperative pain control after ACL reconstruction is key to improving patient satisfaction and outcomes as well as reducing the cost of health care. Several strategies such as intra-articular injection, periarticular injection (PI), and peripheral nerve blocks have been investigated. Oshima et al. reported that the combination of adductor canal block (ACB) with lateral femoral cutaneous nerve block (LFCNB) significantly reduced postoperative pain in the early phase compared to the combination of femoral nerve block (FNB) with LFCNB. However, approximately 40% of patients complained of pain within 12 h after surgery, and better pain relief had to be considered. Among patients undergoing ACL reconstruction, those receiving PI had significantly better pain scores than those receiving FNB, with no increase in the complication rates. However, no studies have compared FNB combined with LFCNB, ACB combined with LFCNB, and PI for pain control after ACL reconstructive surgery. Therefore, this study aimed to clarify the effects of these injection techniques on pain during the early postoperative period after ACL reconstruction. We hypothesized that PI would provide better pain relief than a combination of FNB with LFCNB or ACB with LFCNB. This study is important for improving pain control, patient satisfaction, and outcomes after ACL surgery.

METHODS:

This study included 299 patients who underwent primary ACL reconstruction at our hospital between April 2016 and October 2022. Patients received FNB combined with LFCNB (FNB group), ACB combined with LFCNB (ACB group), and PI multidrug cocktail injections (PI group) in the early, middle, and late phases of the study period, respectively. ACL reconstruction was performed using a hamstring-tendon autograft. Each group comprised 40 patients matched for age, sex, and body mass index (BMI). The study included 47 men and 73 women with a mean age of 25.3 ± 13.0 years and mean BMI of 23.1 ± 3.8 kg/m² at the time of surgery. In the FNB and ACB groups, a single experienced orthopaedist performed ultrasound-guided nerve blocks following the administration of general anesthesia 30 min prior to surgery. In the FNB and ACB groups, 10 mL of 0.75% ropivacaine was injected, and in the LFCNB group, 5 mL of 0.75% ropivacaine was injected. In the PI group, local infiltration analgesia was administered by the operating orthopaedic surgeon using 20 mL of 7.5 mg/mL ropivacaine, 20 mL of saline, and 6.6 mg of 6.6 mg/2 mL dexamethasone, totaling 42 mL. Patients received half the PI before the start of the surgical procedure, and half before wound closure. Prior to the start of surgery, 11 mL, 5 mL, and 5 mL of this solution was injected into the infrapatellar fat pad, subcutaneous tissue of the portal, and subcutaneous tissue of the incision at the hamstring-harvest site, respectively. Prior to skin closure, 5 mL of the solution was injected into every visible region around the hamstring harvest site, 11 mL was injected around the hamstring muscle-tendon transition area, and 5 mL was injected into the medial and lateral synovial/capsule above the meniscus. The patient demographics (age, sex, height, body weight, and BMI) were evaluated. Additionally surgical data, including presence of meniscal repair, operative time, and tourniquet inflation time were evaluated. For clinical evaluation after ACL reconstruction, pain was recorded using a numerical rating scale from 0 to 10 at 30 min and 4, 8, 12, 24, 48, and 72 h after returning to the hospital room. Suppositories were used at intervals ≥ 4 h, according to the patient's desire. All statistical analyses were performed. One-way analysis of variance was used to test for differences in patient demographics, surgical data, and clinical evaluations between the three groups. Statistical significance was set at $P < 0.05$.

RESULTS:

There were no significant differences in age, sex, height, body weight, BMI, presence of meniscal repair, operative time, tourniquet inflation time, and number of suppositories used between the groups (Table 1). Pain scores were significantly higher in the PI group than in the FNB and ACB groups at 30 min but significantly lower at 12, 24, 48, and 72 h (Fig. 1). No complications were observed in any group at the end of the study.

DISCUSSION AND CONCLUSION:

After ACL reconstruction using a hamstring autograft, PI significantly reduced pain 12 h postoperatively compared to combined nerve blocks.

Figure 1. Postoperative NRS changes in the three groups

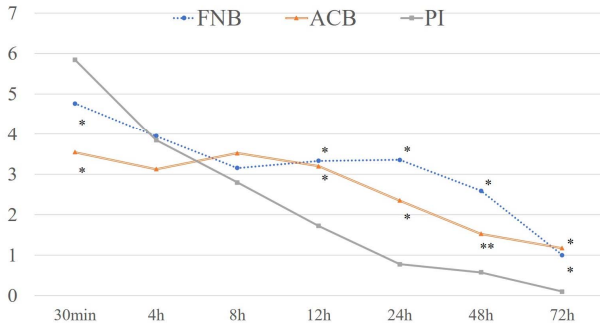


Table 1. Comparison of patient demographic data between the groups

	FNB group n=40	ACB group n=40	PI group n=40	P value
Age (years)	22.4 ± 12.4	26.4 ± 13.7	26.2 ± 12.2	* 0.353 ** 0.405 *** 0.995
Male / female (knees)	16 / 24	18 / 22	13 / 27	* 0.932 ** 0.722 *** 0.494
Height (cm)	163.5 ± 7.9	165.4 ± 8.5	166.4 ± 7.2	* 0.544 ** 0.234 *** 0.828
Body weight (kg)	61.5 ± 11.6	64.0 ± 12.4	63.3 ± 13.6	* 0.658 ** 0.590 *** 0.994
BMI (kg/m ²)	22.9 ± 3.6	23.3 ± 3.6	23.2 ± 4.2	* 0.898 ** 0.968 *** 0.979
Presence of meniscal repair (knees)	21	22	23	* 0.942 ** 0.847 *** 0.973
Operation time (min.)	105.6 ± 22.1	102.8 ± 21.4	106.0 ± 25.2	* 0.853 ** 0.997 *** 0.809
Tourniquet inflation time (min.)	90.6 ± 19.5	89.9 ± 19.3	85.7 ± 18.7	* 0.985 ** 0.484 *** 0.587
Number of suppository use (times)	1.0 ± 0.8	1.0 ± 0.9	0.9 ± 1.2	* 1.000 ** 0.943 *** 0.942

Data are presented as mean ± standard deviation

*Comparison of FNB group and ACB group

**Comparison of FNB group and PI group

***Comparison of ACB group and PI group

Abbreviations: FNB, femoral nerve block; ACB, aductor canal block; PI, periarticular injection; BMI, body mass index