Comparison of continuous femoral nerve block, caudal epidural block, and intravenous patient-controlled analgesia in pain control after total hip arthroplasty: a prospective randomized study

INTRODUCTION
Pain after total hip arthroplasty (THA) induces physical and emotional distress, leading to delay in rehabilitation and extended hospital stay. Therefore, reduction of the postoperative pain may improve quality of management with patient’s satisfaction. On the other hand, in association with the growing interests in pain management, several modalities to control postoperative pain have been proposed and examined for the efficacy in recent studies. In this study, we examine the efficacy and occurrence of complication in the use of continuous femoral nerve block, caudal epidural block with morphine, and intravenous patient-controlled analgesia with fentanyl when used after THA for pain control.

METHODS
Twenty-eight patients scheduled for THA were included in the study and randomly divided into 4 groups. All surgeries were performed under general anesthesia with the patient in the lateral position through a lateral approach by one of the authors (SN). Preoperative diagnosis was OA in 20 cases, necrosis in 6 cases, and loosening requiring revision THA in 2 cases. Postoperative analgesic measures included continuous femoral nerve block (0.15% ropivacaine, 3ml/hour) in group A, caudal epidural block (single dose injection of 3 mg morphine with 0.375% ropivacaine) in group B, intravenous patient-controlled analgesia (PCA) with fentanyl (0.3μg/kg/hour) in group C, and pain medication (NSAIDs) only in group D (Table 1).

The amount of postoperative pain was evaluated on the immediate postoperative period, 6 hours, and 12 hours after surgery. The analgesic effect was assessed using an 11-point numerical rating scale (NRS) ranging from 0 (no pain) to 10 (worst pain imaginable for the patient). Moreover, postoperative complications as well as requirement of supplemental analgesics during the initial 12 hours after surgery were reviewed in the patient record. In the statistical analysis, a repeated-measures ANOVA was used to detect the difference between the groups.

RESULTS
Patient demographic data were shown in Table 2. No significant difference was demonstrated in any of the patient-related parameters among the groups. There was no significant difference in the dose of fentanyl used postoperatively between each of 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, group B and group C were significantly lower than group D (p<0.05). At 6 hours after surgery, the pain scores in groups A, B, and C was lower than that in group D, while a significant difference was detected only between groups C and D (P<0.05). At 12 hours, the pain score remained lower only in group C, and the values in other groups (A, B, and D) were similar. However, the amount of analgesics requested by the patient was smaller in groups A, B, and C as compared to group D.

Regarding the side effects and complications related to the analgesia, three patients in group C complained nausea and vomiting and received antiemetic drugs, while one patient showed drowsiness with subsequent delay in rehabilitation in this group. No such event was observed in other three groups.

DISCUSSION
Recent progress in postoperative pain management modalities has improved quality of patient management and satisfaction. Among the techniques to relieve pain, various modes of peripheral nerve block have evolved and use of continuous femoral nerve block is one of the frequent options for pain management after reconstructive hip and knee surgeries. Alternatively, caudal epidural block with single injection of morphine can afford prolonged analgesic effect and safely for the patients under postoperative anticoagulant therapy. In this study, both of these analgesic techniques achieved significant reduction in postoperative pain compared with the pain control with NSAIDs only without causing side effects and complications related to the analgesia. Use of PCA with fentanyl also provided significant analgesic effect.

However, the virtue of this technique may be jeopardized by the occurrence of analgesia-related complications. In conclusion, considering both analgesic effect and potential risk of complications, continuous femoral nerve block and caudal epidural block for postoperative pain are thought to be recommended techniques for postoperative pain control after THA procedure.

**REFERENCES**