

# Local or Spinal Anesthesia in Acute Knee Surgery

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## ABSTRACT

The aim of the study was to assess the efficacy, safety and complications of two anesthetic techniques including local and spinal anesthesia. A total of 436 patients received local (LA group=250) or spinal (SA group=186) anesthesia during a year period. SA group received 0.5% Bupivacaine 5 mg/mL. LA group received portal injection (5 mL lidocaine 2% with adrenaline) and intra-articular injection into the knee (10 mL lidocaine 2% with adrenaline). The following parameters were assessed: intraoperative pain (10 cm VAS: 0=no pain, 10=extreme pain), surgical operating conditions, patient satisfaction score (1=very satisfied, 4=very unsatisfied), postoperative analgesia, and time to discharge. In LA group, 97.6% (244/250) of patients experienced no pain throughout the procedure. Only six (2.4%) patients required conversion to general anesthesia. In SA group, two patients required conversion to general anesthesia. In both groups, 93.6% of patients were either satisfied or very satisfied with their anesthesia. The need of postoperative analgesics was higher in SA compared with LA group ( $p=0.001$ ). The mean postoperative stay was significantly shorter in LA than in SA group ( $p=0.001$ ). Ninety-four percent of LA and only 68% of SA patients were discharged from the hospital within 2 hours of the procedure. The rate of complications differed significantly between LA and SA groups ( $p=0.037$ ). Outpatient arthroscopy of the knee under local anesthesia is a simple, reliable, and safe alternative to spinal anesthesia, for patients in whom intraarticular disorders requiring diagnostic arthroscopy and arthroscopic surgery.

**Key words:** outpatient, local anesthesia, spinal anesthesia, knee arthroscopy, efficacious, complications

## Introduction

The use of local anesthesia (LA) in operative arthroscopy has been increasing and is reported to be effective<sup>1–8</sup>. Although there are many combinations of solutions for LA, many anesthesiologists and surgeons are still trying to improve the technique of local anesthetic administration to obtain a pain-free knee, suitable for arthroscopic surgery without either technical disadvantages or complications. Intraarticular administration of local anesthetic is generally preferred because of the lower risk of side effects and better analgesia<sup>1–3,6–8</sup>. Concerns about LA include fear that it will take longer to perform the surgery, that it is not useful for arthroscopic operative procedures, and that the anesthesia will be inadequate, leading to poor patient satisfaction. On the other hand, SA may be a useful procedure for knee surgery but it is not advisable for all patients. If the surgical procedure is short, LA is more practical than SA. However, SA may be inappropriate for young patients be-

cause of the occurrence of post-lumbar-puncture headache (up to 20% of cases)<sup>9,10</sup>. SA affects the cardiovascular system<sup>11</sup>, but the mortality rate in healthy patients undergoing SA is 1:10,000<sup>9,11</sup>.

The aim of this study is to present our technique of performing surgical arthroscopy of the knee under LA with minimal intravenous sedation and compare the efficacy, safety and complications of local *versus* spinal anesthesia when performing outpatient knee arthroscopy. The following parameters were assessed: surgical and patient satisfaction, postoperative analgesia, and time to discharge.

## Material and Methods

In a prospective study, 436 patients (159 women and 277 men), mean age 34 (range 14 to 61) years, scheduled

for primary elective knee arthroscopy were randomized into two groups: 250 outpatient arthroscopic procedures were done using LA with minimal intravenous sedation, whereas 186 procedures were performed under SA. The type of anesthesia was decided by the surgeon in agreement and after discussion with the patient. If the patient had an acute injury and painful ROM, the surgeon suggested SA. The procedures were performed from January to December 2005. Upon approval by the Hospital Ethics Committee and an informed consent obtained from the patients, 436 patients with the American Society of Anesthesiologists (ASA) physical status 1 or 2 were enrolled in the study.

Patients were excluded from the study if they had taken analgesic or psychoactive drugs during the preceding 24 hours. In addition, patients who had undergone prior ipsilateral knee surgery or who had used NSAIDs, COX-2 inhibitors, or salicylates within 5 days of the surgery were excluded. A few patients with very painful knees, those who were considered too young or too sensitive to be able to cooperate, and those who rejected arthroscopy under local anesthetic were offered a general anesthetic.

Preoperative weight, blood pressure, and heart rate were recorded, and the patients were instructed on the use of the 10-cm visual analog scale (VAS) for pain scoring, 0 denoting »no pain« and 10 denoting »extreme pain«.

### Local anesthesia

Two hundred and fifty patients received LA for their outpatient knee arthroscopy. A standard three-portal (lateral, medial and suprapatellar) arthroscopic technique was used in all cases. At our institution, surgical arthroscopy of the knee under LA is performed as follows: an intravenous (IV) infusion is established, and IV sedating agent is administered to the patient. The anesthesiologist monitoring the patient throughout the procedure provides IV sedation. Sedation is individualized for each patient, as some prefer to be awake enough to watch the video monitor, whereas others prefer full sedation. Typically, 2 to 5 mg of midazolam hydrochloride (Roche) are administered IV prior to patient transfer to the operating theater. Before the administration of local anesthetic, patients receive a short-acting opioid, 5 to 10 µg/kg of alfentanil hydrochloride IV (Janssen). Each patient requiring intraoperative redosing of sedation and analgesia is administered accordingly. If the patient experiences pain during the procedure (VAS >3), alfentanil 0.5 mg IV is administered. Five minutes later, if the patient still has pain, an additional dose of 0.5 mg alfentanil IV is administered. No further analgesics are administered. If the patient continues to experience unacceptable pain, conversion to general anesthesia (GA) is made. Standard monitoring includes electrocardiography, blood pressure, and pulse oximetry.

The leg is prepared and draped. No tourniquet is used. The patient is warned prior to each needle stick to help reduce anxiety. LA consisting of intraarticular injection of a mixture of 2% lidocaine 10 mL with 1:200,000

epinephrine is injected into the joint cavity, and five mL of 2% lidocaine with 1:200,000 epinephrine are injected into the skin and subcutaneous tissues at each arthroscopic portal site. Care is taken to avoid infiltration of the fat pad. It is a relatively aneural structure; however, too much local infiltration causes it to balloon out into the joint during the surgery. Spread of intraarticular lidocaine is encouraged by flexion and extension of the knee joint several times and then 15 minutes allowed for anesthesia to take effect.

The arthroscope is inserted into the knee, and inflow through the sheath is established. Saline inflow is maintained through the arthroscope by the gravity system; no pump is used. Gravity outflow takes place through the superolateral portal. A separate egress cannula is used if needed. The arthroscopic examination and surgery are carried out with constant verbal communication between the surgeon and the patient. This facilitates manipulation of the leg and thorough examination of the entire joint by keeping patient anxiety and muscle tension to the minimum. The patient is encouraged to view the intraarticular problem and its treatment on the video monitor. When finished, the instruments are removed and portals are closed with a 4–0 absorbable suture in the subcutaneous layer and steri-strips. A compression dressing is applied to the knee for three days.

### Spinal anesthesia

One hundred and eighty-six patients underwent SA for their outpatient knee arthroscopy. A standard three-portal arthroscopic technique was used in all cases. Premedication with 7.5 mg of oral midazolam was administered 45 minutes to 1 hour before the start of SA. Lumbar puncture was performed in sitting position. The patient was returned to supine position immediately upon completion of the spinal. Lumbar punctures were made with 25- or 26-gauge pencil-point needles positioned midline at the L2-3 or L3-4 interspace with the orifice directed cephalad. The intrathecal block was performed by hyperbaric 0.5% bupivacaine (Marcaine 5 mg/mL). The spinal block degree (sensory and motor block) was assessed by pin-prick and modified Bromage score<sup>12</sup>. If the patient was unduly anxious or still in pain, conversion to GA was made. Standard monitoring techniques were used, including electrocardiography, automated blood pressure at 5-min intervals, and pulse oximetry. After the operation, all patients were transferred directly from the operating room to the postanesthesia care unit (PACU). Patients were checked at 15-, 30-, 60-min and 2-hour intervals for home readiness. The criteria used to determine home readiness were the following: a) vital signs within 20% of preoperative value, b) fully awake and oriented, c) able to stand up and remain standing for >1 min, d) minimal nausea and vomiting, e) minimal to moderate pain, f) minimal bleeding, and g) having had, and tolerated *per os* fluids<sup>13</sup>. Voiding was not a requirement for determination of home readiness and was not required before discharge. Before discharge, it was recorded whether the patient was able to void.

### Postoperative analgesia

At PACU, vital signs, temperature, need of analgesic or antiemetic medication, and duration of recovery room stay were recorded. Additional analgesia was given at PACU if required (VAS >3). When the patient's VAS score was more than 3 points, diclofenac 75 mg was administered IV. In order to standardize the postoperative analgesic consumption and because postoperative analgesia is successfully managed with oral analgesics, while peripheral nerve blocks do not significantly enhance rehabilitation or functional outcome<sup>11,14</sup>, each study patient was supplied with a set of diclofenac (100 mg) tablets. Patients were reviewed at discharge, given standard take-home diclofenac prescriptions, and instructed to use this medication postoperatively as needed.

### Postoperative stay

Postoperative stay was defined as the time between transfer from the operating room to PACU and discharge. All patients were assessed 15, 30, 60 minutes, and 2 hours after surgery. VAS was used to assess pain and postoperative nausea and vomiting (PONV). The scale consisted of 10 cm horizontal lines with the following anchor words: no pain (0 cm) and extreme pain (10 cm), and no nausea (0 cm) and extreme nausea (10 cm). For postoperative nausea or vomiting, if required, patients received metoclopramide 20 mg IV, and if further treatment was necessary, then dolasetron 12.5 mg was administered. Pruritus was treated with diphenhydramine 12.5 mg IV.

Patients were also asked to describe their satisfaction with the level of pain control during surgery and whether or not the patient would like to have any future arthroscopic knee procedures performed in this way (patient satisfaction score 1=very satisfied, 4=very unsatisfied). The surgeon was also asked if the allocated anesthesia technique was optimal and, if not, which technique he would have preferred. Intraoperative adverse events were also reported. Patients were discharged from the hospital after 2 hours if no side effects were recorded. Standard written instructions regarding activity, mobilization, and positioning were given to all patients.

### Statistics

The median, arithmetic mean, and standard deviation (SD) were calculated. Data on LA and SA were compared and statistically analyzed using Kruskal-Wallis and Wilcoxon signed-rank sum tests, and were used to test the results of VAS measurements;  $\chi^2$ -test was used to test other nonparametric data. The level of statistical significance was set at  $p=0.005$ .

## Results

Our prospective study were performed during a year period, and 502 patients randomly allocated to treatment scheduled for primary elective knee arthroscopy. The patients were randomized into two groups: LA group = 282

outpatients for local anesthesia with minimal intravenous sedation, and SA group=220 outpatient for spinal anesthesia. In LA group 250 outpatients were successfully implantation into the procedure, but 32 patients did not include in trial as planned. Reason for those were: 25 patients had taken analgesic drugs during the presiding 24 hours, and 7 had taken salicylates within 5 days of the surgery. In SA group 186 outpatients received spinal anesthesia while 34 patients did not received spinal anesthesia as planned, because of 26 patients rejected SA and preferred general anesthesia, 5 patients had undergone prior ipsilateral knee surgery, and 3 had very painful knee. Finally, 436 patients were completed treatment in main analysis.

Baseline demographic data and American Society of Anesthesiologists (ASA) Status are presented in Table 1. The two groups did not differ significantly according to age, weight and ASA status ( $p=0.056$ ). There was a significant male predominance in LA group ( $p=0.023$ ) but not in SA group.

Both, diagnostic and therapeutic procedures were performed on an outpatient basis. Arthroscopic knee surgery was performed in 417 of 436 patients, and only knee arthroscopy was performed in 19 of 436 patients. The procedures performed are presented in Table 2.

A wide variety of operations were performed. The procedures performed and postoperative diagnoses are presented in Table 3, showing that similar operative procedures were performed in the two study groups. The most commonly performed procedure was partial medial meniscectomy 52.5% (229/436).

**TABLE 1**  
PATIENT DEMOGRAPHIC DATA AND AMERICAN SOCIETY OF ANESTHESIOLOGISTS (ASA) STATUS

Characteristics	Local anesthesia (LA) (n=250)	Spinal anesthesia (SA) (n=186)
Men numbers, n (%)	167 (66.8)	110 (59.1)
$\bar{X}\pm$ SD, y	33.9 $\pm$ 13.1	35.3 $\pm$ 13.6
Women, n (%)	83 (33.2)	76 (40.8)
$\bar{X}\pm$ SD, y	34.1 $\pm$ 15.2	35.9 $\pm$ 16.0
Weight $\pm$ SD, kg	63.2 $\pm$ 8.23	65.1 $\pm$ 7.14
ASA 1, n (%)	91 (36.4)	73 (39.2)
ASA 2, n (%)	159 (63.6)	113 (60.7)

Data on age and weight are expressed as  $\bar{X}\pm$ standard deviation (SD)

**TABLE 2**  
ARTHROSCOPIC PROCEDURES

Procedure	Number n (%)
Arthroscopy, n	436 (100)
Arthroscopic surgery	417 (95.6)

**TABLE 3**  
ARTHROSCOPIC FINDINGS IN 436 PATIENTS

Procedure	Number (n=436) n (%)	LA (n=250) n (%)	SA (n=186) n (%)
Partial medial meniscectomy	229 (52.5)	130 (52)	99 (53.2)
Partial lateral meniscectomy	32 (7.3)	19 (7.6)	13 (6.9)
Bilateral meniscectomy (med.& lat.)	34 (7.8)	20 (8)	14 (7.5)
Debridement of patella and patellofemoral joint	35 (8)	23 (9.2)	12 (6.4)
Lysis of adhesions,	4 (0.91)	3 (1.2)	1 (0.53)
Abrasion arthroplasty medial condyle	30 (6.8)	11 (4.4)	19 (10.2)
Abrasion arthroplasty lateral condyle	4 (0.91)	3 (1.2)	1 (0.53)
Abrasion arthroplasty med. & lat. condyle-degenerative changes	40 (9.1)	23 (9.2)	17 (9.1)
Removal of loose body	7 (1.6)	4 (1.6)	3 (1.6)
Synovectomy	10 (2.29)	8 (3.2)	2 (1.0)
Meniscal repair medial	7 (1.6)	4 (1.6)	3 (1.6)
Meniscal repair lateral	2 (0.45)	1 (0.4)	1 (0.53)
Meniscal repair med. & lat.	2 (0.45)	1 (0.4)	1 (0.53)

Intraoperative time interval was recorded as the time when the surgeon began surgical skin preparation until the end of the operation.

*Local anesthesia*

Arthroscopic knee surgery with local anesthesia was performed in 250 patients. A total of 442 procedures were performed, yielding a mean of 1.3 procedures *per* patient. The mean operating time was 82 (range, 29 to 112) minutes, and mean arthroscopy time 23 (range, 15 to 57) minutes. The mean total anesthesia time was 92 (range, 52 to 124) minutes. The median VAS score during arthroscopy for LA patients was 2.2 (range, 0 to 10) and for the operation 2.5 (range 0 to 6.4).

In the group of 250 LA patients, 97.6 % (244/250) patients experienced no pain from surgical maneuvers during the procedure performed under LA with minimal intravenous sedation. Only 2.4% (6/250) of patients required conversion to GA. Nine (3.6%) LA patients required additional sedating agent after 30 min and 6.8 % (17/250) patients needed intravenous alfentanil because of discomfort caused by the operation after 50 minutes. The patients experienced pain mostly during liquid flushing at high pressure and when attempting to see medial joint space (valgus stress). In addition, in three (1.2%) patients with stiff-degenerative hips, manipulating the leg was difficult and painful.

The pain experienced during the injection of lidocaine was more severe than the pain experienced during the surgical procedure itself (p=0.001). During the course of

this experience, we observed that the ease of manipulating the knee depended on the level of relaxation and cooperation of the patient.

The difference in the duration of arthroscopy and operation time between LA and SA, presented in Table 4, were not statistically significant (p=0.006)

No side effects such as central nervous system or cardiac symptoms due to LA (lidocaine or adrenaline) were observed.

*Spinal anesthesia*

In SA group 186 patients underwent spinal anesthesia for their outpatient knee arthroscopy. A total of 279 procedures were performed, with a mean of 1.5 procedures *per* patient. The mean operative time was 78 (range, 26 to 146) minutes, and mean arthroscopic time 21 (range, 12 to 55) minutes. The mean time of total anesthesia was 115 (range, 57 to 192) minutes. In SA patients, the median VAS score during arthroscopy was 1.8 (range, 0 to 10) and for the operation 2.1 (range, 0 to 6.4). Two patients subsequently required general endotracheal anesthesia when the spinal block was inadequate.

*Surgeon evaluation*

The evaluation of operative conditions (visualization and access of intra-articular structures) was generally satisfactory and completely acceptable, with no between-group differences. In 2.9% (13/250) patients, LA was not

**TABLE 4**  
DURATION OF ARTHROSCOPY AND SURGERY

Time	LA	SA
Time of arthroscopy, min	23	21
Operation time, min	82	78

**TABLE 5**  
POSTOPERATIVE PAIN VISUAL ANALOG SCALE (VAS)  
ACCORDING TO TYPE OF ANESTHESIA

VAS in PACU	15 min	30 min	60 min	120 min
Local anesthesia	3.4 (2.7)	3.5 (2.8)	3.2 (2.9)	3.1 (2.9)
Spinal anesthesia	3.2 (2.2)	4.3 (3.6)	4.7 (3.9)	4.2 (3.6)

considered by the surgeon to be the optimal anesthetic technique. In these 13 patients, the median VAS pain score during the surgery was 3.6 (range, 0 to 10). Five of these patients were unable to reach relaxation. Technical difficulties were encountered in seven patients; the most common reasons were a narrow joint capsule and/or extensive surgery. In 14.5 % (27/186) SA patients, the anesthesia method used was not optimal because the procedure was short and easy to perform according to the surgeon. LA would have been more optimal.

### *Patient evaluation*

In the two groups taken together, 93.6% of patients said they would have the same procedure done under the same type of anesthesia. In both groups, patients were either satisfied or very satisfied with their anesthetic. The level of satisfaction predicted whether the patient would have chosen the respective anesthetic again, with the exception of three patients in the SA group who were only »moderately satisfied« yet would have chosen the same anesthetic again. Only 6.4% (28/436) of patients reported pain during the surgery, 10% (27/250) from LA group and one (0.2%) from SA group.

In LA group, 10% (27/250) patients would have preferred another form of anesthesia. Eighteen of these patients would not have chosen another LA, because of pain from subcutaneous infiltration of the local anesthetic, seven patients because of pain from manipulation of the leg during the operation and an awkward sensation of pressure from having the leg manipulated during the procedure, and two patients because of nervousness during the operation. Six of these were in the group where both the patient and the surgeon considered anesthesia to be less than optimal.

### *Postoperative pain*

Differences were found between the groups in the VAS pain score during the first 2 postoperative hours at PACU. The mean postoperative VAS pain score after LA was statistically significantly lower ( $p=0.001$ ) than in SA group (Table 5), because of that, the use of analgesics in 0- to 2-hour interval was significantly lower in LA group ( $p=0.001$ ; 95% CI=-1.4 to 1.46). The mean postoperative VAS pain score after SA, was statistically higher ( $p=0.001$ ), and the use of analgesic was significantly higher in SA group ( $p=0.001$ ; 95% CI=1.12 to 1.98). Of those using analgesics, the majority of patients used diclofenac 100 mg or less *per os* postoperatively. One SA patient required morphine during the first 2 hours postoperatively for pain relief (VAS>5).

### *Postanesthesia recovery room (PACU)*

The mean length of time at PACU was 57 (range, 40 to 150) minutes for LA patients and 100 (range, 50 to 210) minutes for SA patients, the difference being statistically significant ( $p=0.001$ ). Of LA patients, 94% (235/250) were discharged from the hospital within 2 hours of surgery, whereas only 68% (126/186) of SA patients were discharged within this time. The reason for patient dis-

charge delay beyond 2 hours were as follows: nausea ( $n=11$ ), surgeon logistics (waiting for a ride home;  $n=5$ ), sedation ( $n=3$ ), pruritus ( $n=2$ ), nursing logistics ( $n=4$ ), headache ( $n=3$ ), and prolonged paralysis ( $n=2$ ). More LA patients were able to void before discharge (68% *vs.* 42%), but this did not affect discharge times because voiding was not a criterion for discharge.

### *Adverse events*

Differences in the number of complications between LA and SA group were statistically significant ( $p=0.037$ ). Complications related to the use SA anesthesia ( $n=14$ ) included PONV severe enough to require medication ( $n=5$ ); need of GA ( $n=2$ ); postdural puncture headache ( $n=3$ ); hypotension during SA ( $n=2$ ); transient neurologic symptoms (TNS;  $n=2$ ).

Complications related to the use LA anesthesia ( $n=9$ ) included need of GA to allow for completion of the procedure ( $n=6$ ); effusions after arthroscopy that resolved spontaneously after using crutches for several days, so aspiration was not considered necessary ( $n=2$ ); and hypotension ( $n=1$ ). Apart from these cases, there were no other complications and no infections.

All procedures were performed on an outpatient basis. None of the patients required admission for any intraoperative or postoperative complications.

## **Discussion**

Study result showed that most patient who were scheduled for knee arthroscopy could undergo diagnostic and surgical procedures on an outpatient basis with the use local or spinal anesthesia techniques. Furthermore, a variety of operative procedures were successfully completed (98.1%), with an invariably high rate of patient satisfaction (93.6%). This approach would help control pain adequately during certain types of arthroscopic knee surgery.

### *Local anesthesia*

This study showed that in the majority of patients (97.6%) scheduled for knee arthroscopy, both diagnostic and surgical procedures could be performed under LA with minimal sedation. The success of this protocol supports the notion that knee arthroscopy can be successfully done in the office setting, with high expectation that most pathologic problems can be treated successfully, including recessing plicae, shaving synovia and/or chondral defects, and most commonly partial meniscus resection. LA alone has been used successfully by some surgeons for knee arthroscopy<sup>6-8,15,-9</sup>. Some authors have reported a high degree of success and efficiency performing arthroscopy of the knee under LA alone<sup>2,5,7</sup>, or with minimal sedation<sup>8,9,16</sup>. Our experience shows that LA alone is frequently insufficient to provide the patient with a comfortable operative experience. LA in combination with IV midazolam and/or alfentanil enhances patient comfort without compromising rapid recovery. Sha-

piro et al.<sup>6</sup> compared the efficacy and safety in a series of knee arthroscopic procedures that were completed using LA, GA or regional anesthesia. They found LA with intravenous sedation to compare favourably with other techniques, a large variety of operative procedures were successfully completed, and patient satisfaction remained high. Ben-David et al.<sup>9</sup> have also reported that LA alone might not be fully reliable in providing a comfortable patient experience or optimal operating conditions. They showed that LA in combination with intravenous sedation may provide excellent anesthesia while still allowing for rapid recovery and patient discharge.

This study showed it advantageous to use LA in arthroscopic surgery, especially if the surgical result and patient satisfaction are equal. In our study, some patients declined to have LA as the anesthetic technique to be used for their surgical procedure. Preoperative evaluation is essential to be able to reduce the number of patients in whom intraarticular pathology necessitates switch to other forms of anesthesia. Careful selection of eligible patients and better information with respect to the potential advantages of LA might further reduce the number of patients declining LA. In those cases where the surgeon and the patient had agreed on LA as not being an optimal type of anesthesia, hypertrophic synovitis (presented as capsular swelling and diagnosed on clinical examination) was the predominant problem, indicating the unsuitability of using LA in connection with extensive synovitis<sup>3,8</sup>. Administration of LA is painful for patients with synovitis. The surface of the synovium becomes larger when it is inflamed and the standardized dose may not be sufficient to produce adequate anesthesia in these patients.

The patients experienced pain mostly during the liquid flushing at high pressure and when attempting to see medial joint space (valgus stress). Pain experienced during the injection of lidocaine was more severe than pain experienced during the surgical procedure itself ( $p=0.001$ ). Takahashi et al.<sup>18</sup> evaluated pain during arthroscopic knee surgery performed on 63 joints under LA. They found that LA provided good pain control, and that pain was occasionally experienced during partial synovecomy and during the treatment of the suprapatellar pouch, including the plica and tear end of cruciate ligament. They also concluded that the injection of lidocaine was more severe than pain experienced during the surgical procedure itself.

Dahal et al.<sup>22</sup> have reported that 20 mL of lidocaine concentrations of 1.0% or 1.5% can be instilled intra-articular for knee arthroscopy. In the present study, the level of patient satisfaction with LA was similar to other reports and comparable to different techniques. Our experience suggests that a single intraarticular dose of lidocaine with epinephrine provides satisfactory analgesia for arthroscopic procedures on the knee. We recommend the use of a mixture of 15 mL 2% lidocaine with epinephrine, based on patient comfort intraoperatively, and the absence of lidocaine toxicity in any of our patients.

The surgeon's evaluation of operative conditions (visualization and access of IA structures) was generally satisfactory and completely acceptable. In 15 (10.2%) patients, LA was not considered by the surgeon to be the optimal anesthetic technique. Jacobsen et al.<sup>8</sup> showed that elective knee arthroscopy could be performed under LA in 92% of patients from the technical point of view. From the surgeon's point of view, technical problems are to be expected in 5% of patients where an alternative anesthesia method should be considered. Munk et al.<sup>19</sup> report on conversion to GA in 15%, and Sharpio et al.<sup>6</sup> in 2% of patients. Differences in the results may be due to differences in surgical and patient expectation, as well as to variation in the postoperative nursing management. Individualization is necessary, taking into account surgical technique and duration, patient preference, and institutional practice model. Improvements in surgical, anesthetic, and pain management techniques now allow more patients to return home on the day of extensive knee surgery. The patient questionnaire showed nearly universal acceptance and satisfaction with the use of LA (93.6%).

In LA group, one patient experienced hypotension, indicating that careful monitoring and preoperative preparation are vital to perform an uneventful LA arthroscopy. Hypotension showed the risk of a vasovagal reaction due to pain and/or discomfort to be a reality in an awake patient<sup>11</sup>.

### *Spinal anesthesia*

Study results showed that intraoperative pain was negligible and the procedure was well tolerated. As expected, complications related to the use SA included hypotension, PONV, postdural puncture headache, and TNS. It is unusual that two patients had TNS, as TNS commonly occur in outpatients undergoing SA with lidocaine but rarely with bupivacaine<sup>9,11</sup>. Ben-David et al.<sup>9</sup> showed that traditional methods of SA proved problematic in the outpatient setting. Some other authors have reported<sup>3,6,8</sup> that although the widespread availability of small-gauge pencil-point needles has largely quelled the concerns of spinal headache, SA for ambulatory surgery has nevertheless fallen into disfavour for fear of TNS, delayed recovery and discharge. This technique, however, introduces other possible risks: headaches, infection (myelitis, meningitis), and prolonged back pain<sup>9,12</sup>. The risks of LA are minimal. Anaphylaxis from lidocaine or bupivacaine is extremely rare. There also are rare patients who have some type of resistance to these agents and therefore have inadequate pain control. Systemic effects are extremely unusual, and numerous studies have documented low serum levels of anesthetic agents with intra-articular injection<sup>20–23</sup>. As demonstrated in this study, there are advantages of LA beyond the reduced risk of complications. The differences in the rate of complications between the LA and SA groups were statistically significant ( $p=0.037$ ). More LA than SA patients were able to void before discharge (68% vs. 42%), however, it

did not affect discharge times because voiding was not a criterion for discharge.

### Postoperative analgesia

There were differences between the groups with respect to postoperative pain. However, significantly more SA patients used analgesics postoperatively ( $p=0.001$ ) as compared with LA patients. Of those using analgesics, the majority of patients used diclofenac 100 mg or less *per os* postoperatively. This is surprising because the type of postoperative pain management and types of surgical procedures were similar in both groups. Our results showed diclofenac administered postoperatively to be effective in reducing postoperative pain. Because this study was addressing acute pain control from the trauma induced by surgery rather than the condition leading to surgery, the authors considered the acute postoperative period to be most important to analyze. The aim should be to get control of both spontaneous pain and pain associated with movement. Furthermore, the present study showed that more, than 94% of LA patients were discharged from the hospital within 2 hours of surgery, whereas only 68% of SA patients were discharged within this time ( $p=0.001$ ).

### Conclusion

Study result indicate that outpatient arthroscopy of the knee under LA with intravenous sedation is a simple, reliable and safe alternative to SA for arthroscopy procedures. From our prospective studies we found that elective knee arthroscopy could be performed under LA in 97.6% of patients from the technical point of view. Consequently, the standard anesthetic procedure for outpatient knee arthroscopy under lidocaine LA can be performed in many patients who want to stay awake. We recommend the use of 2% lidocaine with epinephrine based on patient comfort intraoperatively and absence of lidocaine toxicity in our patients. Some form of intravenous sedation in minimal therapeutic dosage is recommended for optimal surgical conditions. A combination of midazolam and/or alfentanil appears to suppress the patient's perception of painful stimuli and the use of minimal therapeutic doses did not significantly prolong the patient's recovery room stay nor resulted in postoperative nausea. If the patients who do not want LA and those with excess knee joint synovitis are excluded, based on our experience, knee arthroscopies can be performed as safely and effectively under LA as under any other form of anesthesia. The more prolonged postoperative analgesia also plays a role in choosing LA.

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### BOL PRI KIRURŠKOJ ARTROSKOPIJI KOLJENA KOD LOKALNE VERSUS SPINALNE ANESTEZIJE

#### SAŽETAK

Cilj istraživanja u prikazanoj studiji bio je ispitati učinkovitost, sigurnost i komplikacije dviju anestezioloških tehnika koje uključuju lokalnu i spinalnu anesteziju. Ukupan broj ispitivanih bolesnika je bio 436, kada je lokalna (LA grupa=250) ili spinalna (SA grupa=86) anestezija ordinirana tijekom godine dana. SA grupi ordiniran je 05% levobupivacain 5mg/mL. LA grupa primila je portalnu injekciju (5 mL lidokaina 2% sa adrenalinom) i intra-artikularnu injek-

ciju u koljeno (10 mL lidocaina sa adrenalinom). Sljedeći parametri su praćeni: intraoperacijska bol (10 cm VAS: 0= nema boli, 10=neizdrživa bol), kirurški operacijski uvjeti, bolesnikovo zadovoljstvo (1=jako zadovoljan, 4=jako nezadovoljan), postoperacijska analgezija, te vrijeme napuštanja bolnice. U LA grupi, 97,6% (244/250) nije imalo boli za vrijeme operacijskog zahvata. Samo šest bolesnika, (2,4%) je zahtjevalo konverziju u opću anesteziju. U SA grupi, dva bolesnika su zahtjevala konverziju u opću anesteziju. U obje grupe, 93,6% bolesnika je bilo zadovoljno ili jako zadovoljno sa primjenjenom anestezijom. Potreba za postoperacijskom analgezijom bila je veća u LA u usporedbi sa SA grupom ( $p=0,001$ ). Srednji postoperacijski ostanak je značajno bio kraći u LA nego u SA grupi ( $p=0,001$ ). Devedesetičetiri bolesnika sa LA i samo 68% od SA su napustili bolnicu unutar 2 sata nakon zahvata ( $p=0,001$ ). Učestalost komplikacija se značajno razlikovala između LA i SA grupe ( $p<0,037$ ). Ambulantna artroskopija koljena učinjena u lokalnoj anesteziji je jednostavna, pouzdana i sigurna alternativa spinalnoj anesteziji, za bolesnike u kojih intraartikularni poremećaji zahtjevaju dijagnostičku ili artroskopsku kirurgiju.