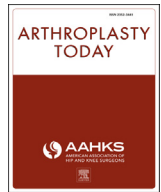




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## Original research

## Single-dose lidocaine spinal anesthesia in hip and knee arthroplasty

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## ABSTRACT

**Background:** With the increasing interest in fast recovery and outpatient joint arthroplasty, short-acting local anesthetic agents and minimal narcotic use are preferred. Lidocaine is a fast-onset, short-duration local anesthetic that has been used for many years in spinal anesthesia. However, lidocaine spinal anesthesia has been reported to have a risk of transient neurologic symptoms (TNSs). The purpose of this study is to determine the safety and efficacy of single-dose lidocaine spinal anesthesia in the setting of outpatient joint arthroplasty.

**Methods:** We performed a prospective study on 50 patients who received lidocaine spinal anesthesia in the setting of outpatient hip and knee arthroplasty. All patients received a single-shot spinal injection, with 2% isobaric lidocaine along with titrated propofol sedation. We evaluated demographic data, length of motor blockage, time to ambulation, time to discharge readiness, patient-reported symptoms of TNS. **Results:** Of the 50 patients studied, 11 had total hip arthroplasty, 33 total knee arthroplasty, 5 unicompartmental knee arthroplasty, and 1 underwent isolated polyethylene liner exchange in a total knee arthroplasty. The average total duration of motor blockage was 2.89 hours (range 1.73–5.17, standard deviation 0.65). Average time from postanesthesia care unit to return of motor function was 0.58 hours (range 0–1.5, standard deviation 0.48). None of the patients reported TNS.

**Conclusions:** Isobaric lidocaine spinal anesthesia appears to be a safe and effective regimen for outpatient hip and knee arthroplasty. All patients were discharged on the day of surgery with isobaric lidocaine spinal injection. There were no reports of TNSs.

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## Introduction

Spinal anesthesia has become increasingly popular in the setting of hip and knee arthroplasty. Several reports suggest that spinal anesthesia is associated with a lower risk of complications when compared with general anesthesia [1,2]. Furthermore, with the increasing interest in fast recovery, including same-day ambulation and even outpatient joint arthroplasty, short-acting local anesthetic agents and minimal narcotic use are preferred. Lidocaine is a fast-onset, short-duration

local anesthetic that has been used safely since the 1940s as a spinal anesthetic. However, some reports have shown a higher risk of transient neurologic symptoms (TNSs) with the use of lidocaine, which has discouraged its use in the total joint population [3–6].

TNS is defined as transient buttock pain, radicular lower extremity pain, and dysesthesias that present within the first 24 hours following recovery from spinal anesthesia. Reported incidence of TNS after lidocaine spinal anesthesia has ranged up to 40%, but TNS is not unique to lidocaine and has been reported with the use of other spinal anesthetics [3,4,6,7]. Some believe that baricity of the anesthetic plays a role in the incidence of TNS, and many reports of TNS are associated with hyperbaric 5% solutions. Spinal anesthesia, with isobaric 2% lidocaine, is one of several regimens used at our institution. There has been a resurgent interest in lidocaine as an agent in spinal anesthesia for joint arthroplasty with the advent of same-day ambulation and outpatient joint arthroplasty. Faster return of motor function allows

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**Table 1**  
Combined data set.

All patients	n	Mean	SD	Minimum	Maximum
Age	50	61.22	7.97	41.00	77.00
Height (in)	50	67.10	4.00	59.00	76.00
Weight (lb)	50	180.00	35.10	118.00	260.00
BMI	50	28.10	4.41	18.98	36.14
Time: Spinal-twitch motor <sup>a</sup>	31	2.54	0.54	1.62	4.33
Time: Spinal-full motor recovery	50	2.89	0.65	1.73	5.17
Time: PACU to motor	50	0.58	0.48	0.00	1.50
Time: PACU to ambulation	50	3.02	2.38	1.28	12.75
Time: PACU to discharge	50	5.84	2.66	1.87	11.17
Time: Block to PACU	50	2.31	0.45	1.15	3.75

BMI, body mass index; PACU, postanesthesia care unit.

<sup>a</sup> Time reported in hours.

patients to progress through physical therapy and meet criteria for discharge more quickly.

The purpose of this study is to determine the safety and efficacy of single-dose lidocaine spinal anesthesia in the setting of outpatient joint arthroplasty. Our hypothesis is that this method of anesthesia will not only be safe but also allow quick recovery of motor function and decreased time to ambulation and discharge, without increasing the incidence of TNS.

## Material and methods

After the institutional review board approval, we performed a prospective study of 50 patients who received lidocaine spinal anesthesia in the setting of outpatient hip and knee arthroplasty. Inclusion criteria for this study included patients aged over 18 years who underwent single-dose lidocaine spinal anesthesia in conjunction with total or partial knee or hip arthroplasty performed by the senior author and same anesthesiologist. We enrolled 50 consecutive patients who were undergoing planned outpatient total joint arthroplasty (TJA) with the senior author when the included anesthesiologist was covering his cases.

All patients received a single spinal injection of 2% isobaric lidocaine along with titrated propofol sedation. Data were collected through hospital and clinical chart records. We evaluated demographic data, length of motor blockage, time to ambulation, time to discharge readiness, and patient-reported symptoms of TNS; TNS symptoms were monitored before discharge, and each patient was followed up for TNS symptoms through telephone interviews for 7 days. All patients were required to meet specific criteria before discharge. These criteria include (1) medically stable, (2) able to void, (3) well-controlled pain, (4) able to tolerate regular diet, (5) independently navigate from bed to chair and chair to ambulation, (6) independently walk with or without an assist device 100 feet, and (7) ascend and descend a full staircase. Means, ranges, and standard deviations were calculated for this data and stratified according to the procedure performed. Given the sample sizes of the individual procedure cohorts, comparative analysis was not performed because it would have been underpowered. All descriptive statistics were calculated using Stata (College Station, Texas). We also recorded any need for supplemental anesthesia other than the single isobaric lidocaine injection and titrated propofol sedation.

## Results

Of the 50 patients studied, 11 (22%) had total hip arthroplasty (THA), 33 (66%) total knee arthroplasty, 5 (10%) unicompartmental knee arthroplasty, and 1 (2%) underwent polyethylene exchange. The average age was 61.2 years (range 41–77, standard deviation [SD] 7.97), and 52% were female with an average body mass index 28.1 (range 19.0–36.1, SD 4.41; Table 1).

The average duration of motor blockade was 2.89 hours (range 1.73–5.17, SD 0.65) from administration of the spinal anesthesia. Average time from admission to postanesthesia care unit (PACU) to return of motor function was 0.58 hours (range 0–1.5, SD 0.48). Average time from admission to PACU to ambulation was 3.02 hours (range 0.67–7, SD 2.38) (Table 1). Averages for each outcome were further divided according to the procedure and were similar between groups (Tables 2–4).

None of the patients reported TNS during their hospitalization or after discharge. No patients required intubation, redosing of lidocaine during the procedure, or any additional intervention. All patients were discharged home on the day of surgery as planned. Time from PACU admission to discharge averaged 5.84 hours postoperatively (range 1.87–11.17, SD 2.66). There were 2 early complications including 1 deep infection, and 1 patient with back pain requiring emergency department evaluation.

## Discussion

Perioperative pain management and intraoperative anesthesia have become areas of increasing interest in joint replacement surgery. The rise in short-day arthroplasty, same-day ambulation, and even outpatient arthroplasties has only enhanced this interest. Furthermore, the shift of health-care policy shifts from volume-centric to value-based reimbursement encourages decreased costs of care, improved clinical pathways, decreased length of stay, and a reduction in postoperative complications [8–11].

Significant effort has been put toward optimizing anesthesia, and there has been a shift away from general anesthesia toward neuropil anesthesia [2,12]. Whether neuraxial anesthesia results in improved outcomes in joint arthroplasty has been debated [13]. Some authors have reported no difference in surgical complications [13–15]; yet others have demonstrated a lower risk of complications, improved pain control, and decreased operative cost associated with neuraxial anesthesia [1,12,14]. Despite lack of consensus, neuraxial anesthesia continues to grow in popularity, particularly in the outpatient setting [16–18].

Zaric et al. [3] performed a Cochrane review on TNS following spinal anesthesia in 16 randomized control trials consisting of 1479 patients. They showed that lidocaine has a significantly higher relative risk of developing TNS compared to other agents (bupivacaine, prilocaine, mepivacaine, procaine, ropivacaine and levobupivacaine, and 2-chloroprocaine) regardless of baricity. Fourteen percentage of the patients receiving spinal anesthesia with lidocaine developed TNS. The risk of TNS was not dose dependent nor was there an association with baricity. No patient, regardless of anesthetic, reported permanent neurologic deficit. The majority of reported TNS symptoms resolved between the second and fifth postoperative day, and only one study reported symptom duration extending to postoperative day 10. Similarly, when comparing

**Table 2**  
Total hip arthroplasty.

THA	n	Mean	SD	Minimum	Maximum
Age	11	57.18	8.10	41.00	69.00
Height (in)	11	66.45	4.20	59.00	71.00
Weight (lb)	11	172.82	35.93	118.00	222.00
BMI	11	27.86	5.77	19.08	36.10
Time: Spinal-twitch motor <sup>a</sup>	11	2.38	0.37	1.67	2.83
Time: Spinal-full motor recovery	11	2.95	0.41	2.25	3.83
Time: PACU to motor	11	0.70	0.33	0.33	1.43
Time: PACU to ambulation	11	2.37	0.91	1.37	4.10
Time: PACU to discharge	11	6.83	2.64	2.58	10.87
Time: Block to PACU	11	2.25	0.34	1.67	2.75

BMI, body mass index; PACU, postanesthesia care unit.

<sup>a</sup> Time reported in hours.

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