



Comparison of Intradural Bupivacaine With Epidural Levobupivacaine in Lumbar Endoscopic Spinal Surgery

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Objective: In lumbar endoscopic spinal surgery, the choice of a regional anesthetic is important for reducing complications and can affect patient recovery and comfort.

Methods: A retrospective analysis was conducted of 66 lumbar microdiscectomies (LMDs) under epidural anesthesia (EA) (n = 45) or intradural anesthesia (IA) (n = 21) performed by the same surgeon and anesthesiologist. The choice of regional anesthesia in LMD (epidural or intradural) differs between anesthesiologists, and the most frequently anesthetic method used in LMD is general or IA.

Results: EA may be more reliable than IA, as it enables the surgeon to perform a neurological exploration by requesting the patient to make leg or foot movements during surgery, but few studies have compared these 2 anesthetic methods in LMD. We found that there was a statistically significant difference ($p < 0.05$) between the 2 groups in the postoperative recovery times and in the use of vasopressors during surgery.

Conclusion: We suggest that EA reduces the length of time to ambulate, length of stay in the postanesthesia care unit, and the time until initiation of postoperative rehabilitation. Compared to IA, it offers greater hemodynamic stability and allows neurological exploration during surgery.

Key Words: Locoregional anesthesia, Endoscopy, Endoscopic spine surgery, Anesthesia options, Intrathecal bupivacaine, Epidural levobupivacaine

INTRODUCTION

Surgical techniques with endoscopic approaches for the treatment of lumbar disc herniation have been developed to reduce the length of hospitalization and to allow a rapid recovery with shorter length of stay in the postanesthesia care unit (PACU).

The choice of a regional anesthetic (epidural, intradural) is

important for reducing complications during and after surgery and can affect patient recovery and comfort.

Studies have reported that intradural anesthesia (IA) may be more reliable than general anesthesia and although IA is the most frequently used method during regional anesthesia for lumbar endoscopic approach only few studies have compared epidural or IA in intraoperative and postoperative period.

MATERIALS AND METHODS

Permission was granted by the San Rafael Hospital Ethics Committee prior to retrospectively screening a total of 66 lumbar microdiscectomies (LMDs) under IA (n=21) or epidural anesthesia (EA) (n=45).

All patients provided written consent for the surgical procedure and anesthetic method. Patients with radicular pain or neurological deficits linked to disc compression as identified by magnetic resonance imaging.

Exclusion criteria included patients with contraindications to IA (international normalized ratio 1.5, platelets < 75,000, use of anticoagulant drugs).

All patients fasted for at least 6 hours before the procedure. After arrival in the operating room, a 20G peripheral intravenous catheter was inserted. Standard monitoring was used throughout the procedure, including noninvasive arterial blood pressure, electrocardiogram, and pulse oximetry. Decrease in systolic arterial blood pressure > 80 mmHg and bradycardia (heart rate < 50 beats/min) was treated with ephedrine.

Patients were recorded for age, sex, weight (body mass index, BMI), previous lumbar surgery, surgical endoscopy technique, comorbidities (diabetes, hypertension, obstructive sleep apnea [OSA]), American Society of Anesthesiologist (ASA) physical status (PS) classification, preoperative analgesic drugs, visual analogue scales (VAS) in radicular pain, operated disc levels, length of anesthesia technique and length of surgery, need of vasopressors (ephedrine), discomfort during surgery and need to convert to general anesthesia. In the postoperative period, the following was recorded: duration of the motor block, time to get up, time to ambulation, VAS in radicular pain, the need for urinary catheterization, and length of PACU stay. Only patients who underwent outpatient surgery have been analyzed (length of hospital stay < 12 hours).

1. Anesthesia Procedure

In the operating room, EA was administered in the sitting position under aseptic conditions at one level above the operation field. After local anesthesia with subcutaneous 2% mepivacaine, an 18-gauge Tuohy needle was inserted into the epidural space using the loss of resistance method and a 15 mL 0.5% bupivacaine was administered. Based on our experience, there were fewer technical difficulties in identifying the epidural space on the first attempt with patients in the sitting position compared to the lateral position. In the lateral position, epidural blocks extended more cephalad than with the sitting po-

sition. The insertion time in the sitting position is significantly shorter than in the lateral position. However, the lateral decubitus position is better for avoiding vagal reflexes. Most anesthesiologists prefer to perform EA with the patient sitting, although in fearful or agitated patients, it is preferable to perform it in the lateral position.

IA was administered in decubitus lateral position, a 25G spinal needle was used for lumbar puncture and 3 mL 0.5% isobaric bupivacaine were administered. After the injection, the patients were placed in the most comfortable prone position, and they were sedated using 0.03-mg/kg midazolam and 3 L/min flow rate of oxygen through nasal cannula. Patients with discomfort during surgery were administered low doses of propofol or remifentanyl.

Additionally, antibiotic prophylaxis was administered using 1 g of cefazolin before skin incision and 1 g every 8 hours postoperatively. Prednisone 8 mg intravenous (IV), paracetamol 1,000 mg IV and dexketoprofen 50 mg IV was administered in all patients.

2. Statistical Analyses

IBM SPSS Statistics ver. 21.0 (IBM Co., Armonk, NY, USA) was used for the statistical analyses. Descriptive statistics for continuous variables are given as the mean±standard deviation and median (range) values. Comparisons between the groups were completed with Mann-Whitney tests and independent sample t-tests for continuous variables, and chi-square tests for categorical variables. A correlation analysis was also completed. Statistical significance was accepted at $p < 0.05$.

RESULTS

A total of 45 LMD surgeries were performed under EA and 21 were performed under IA. There was no significant difference between the EA and IA patients in terms of sex, BMI, smoker, diabetes, hypertension, OSA, motor dysfunction, preoperative anti-inflammatory analgesics (NSAIDs), opioids or antiepileptics. ($p > 0.05$) (Table 1).

Twenty-seven of the operations performed under EA were 1 level and 18 were 2 levels. Six of the operations performed under IA were 1 level and 15 were 2 levels ($p < 0.05$). Forty patients with EA were ASA PS classification grade I-II and 5 were ASA PS classification grade III. In the IA group, 20 patients were ASA PS classification grade I-II and 9 were ASA PS classification grade III ($p < 0.05$) (Table 1). Comorbidities such as hypertension, OSA, urinary dysfunction and previous lumbar surgery were

Table 1. Patient demographics and preoperative variables

Variable	Epidural anesthesia	Intradural anesthesia	p-value
Age (yr)	54.13 ± 15.50	69.24 ± 14.30	< 0.001
Body mass index (kg/m ²)	26.13 ± 4.11	27.97 ± 4.40	0.217
Female sex	20	9	0.904
Smoker	2	1	0.954
Diabetes	1	1	0.538
Hypertension	10	11	0.023
Obstructive sleep apnea	0	4	0.008
ASA PS classification grade, I-II	40	12	0.008
Previous lumbar surgery	2	5	0.029
One-disc herniation	27	6	0.033
Urinary dysfunction	0	2	0.098
Motor dysfunction	5	2	1.000
Opioids	12	5	0.414
Antiepileptics	11	2	0.182
NSAIDs	26	9	0.29
Ephedrine	8	9	0.039
Root pain (VAS)	7.85 ± 1.54	7.77 ± 1.35	0.678
Discomfort during surgery	8	2	0.483

Values are presented as mean ± standard deviation or number. ASA PS, American Society of Anesthesiologists physical status; NSAIDs, nonsteroidal anti-inflammatory drugs; VAS, visual analogue scale.

more frequent in IA group ($p < 0.05$).

No patient needed to be converted to general anesthesia. Two patients with EA needed additional sedation due to some discomfort or slight pain. All patients with EA during surgery could mobilize their feet and legs if ordered, they did not have a complete motor block.

The time for performing the epidural or IA technique was similar. Eight patients with EA and 2 patients with IA required additional sedation with propofol and remifentanyl due to slight pain and discomfort ($p > 0.05$). Length of surgery was longer in patients with IA and more frequent use of vasopressors ($p < 0.05$). In PACU minimal root pain in both groups ($p > 0.05$). However, the need for urinary catheterization, duration of motor block, time to get up, time to ambulation and length of PACU stay was much higher in patients with IA ($p < 0.05$).

Patients discharge in PACU after recovery of the motor block and had no adverse effects like shivering, nausea, vomiting or urinary retention.

There was no difference in length of hospital stay or patient satisfaction with different anesthetic techniques ($p > 0.05$) (Table 2).

Table 2. Patient intraoperative and postoperative variables

Variable	Epidural anesthesia	Intradural anesthesia	p-value
Length of anesthesia technique (min)	9.07 ± 3.70	7.52 ± 2.70	0.10
Length of surgery (min)	72.98 ± 29.11	96.67 ± 36.41	0.006
Ephedrine	8	9	0.039
Discomfort during surgery	8	2	0.483
Duration of the motor block (min)	4.41 ± 15.02	99.72 ± 61.32	< 0.001
Time to get up (min)	53.92 ± 32.09	264.44 ± 238.39	< 0.001
Time to ambulation (min)	62.26 ± 31.49	358.33 ± 290.94	< 0.001
Length of PACU stay (min)	80.34 ± 35.02	139.74 ± 51.22	< 0.001
Length of hospital stay (min)	415.74 ± 118.55	469.57 ± 115.12	0.154
Root pain (VAS)	0.45 ± 1.04	0.11 ± 0.44	0.151
Urinary catheterization	1	5	0.005
Excellent patient opinion	42	20	0.236

Values are presented as mean ± standard deviation or number. PACU, postanesthesia care unit; VAS, visual analogue scale.

DISCUSSION

LMD is usually performed under general anesthesia but in recent years, IA and EA methods have been determined to be effective and reliable for lumbar disc surgeries with reduced complications linked to GA [1-8].

In our study, the anesthetist determined the appropriate anesthetic technique, opting between epidural and IA, based on the anticipated duration of the surgery. For surgeries expected to be longer in duration (particularly in patients with multiple comorbidities, hypertension, advanced age, previous lumbar surgeries, or multilevel herniations) IA was chosen due to its duration exceeding 3 hours. Conversely, single-dose EA was selected for surgeries anticipated to last less than 2 hours. This criterion explains why surgical time is shorter when EA is performed. Nevertheless, these factors did not influence the length of hospital stay (no statistical difference, $p > 0.05$) in patients who received epidural or IA.

The need for vasopressor drugs is more frequent in IA than in EA; in our study it was much higher, probably due to the comorbidities of the patients who received IA [9-13].

Neurological examination can be easily completed in patients operated under EA as their superficial sensation and motor strength remain intact during surgery. A patient with IA needs hours to neurological recovery and, in spinal surgery, it is very important to perform an early assessment of the neurological status, as facilitated by EA [14,15].

Patient comfort during the intra and postoperative period was excellent. In the current study, although all patients received analgesia (NSAIDs and corticoids) in the operating room, patients with minimal root pain did not require analgesia in the PACU. The combination of intravenous analgesic and IA was very effective to keep the patient pain-free.

Our study compared duration of the motor block in PACU, time to get up, time to ambulation and time to discharge in PACU between epidural and IA. The study demonstrates that EA provides quick recovery from motor block and reduces time to get up, time to ambulation and time to discharge in PACU in comparison to IA. In other studies, with IA, the results were very similar to ours [16-18].

Patients who received IA were discharged in PACU after recovery of the motor block, but time to get up and time to ambulation were delayed until the patient was admitted on the hospital floor. However, all patients who received EA ambulated in the PACU.

In our study, the need for urinary catheterization is relatively frequent in IA and has an undesirable effect on the postoperative period, since it increases the length of stay in the PACU. In patients who received EA, it was a rare adverse effect [19-22].

CONCLUSION

The regional anesthetic method used during LMD surgery affects time to recovery of motor block, time to ambulation and the length in the PACU stay. We suggest that EA in LMD procedures can contribute to improving patient recovery and rehabilitation during hospital admission.

NOTES

Conflict of Interest

The authors have nothing to disclose.

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