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Research Article

Retrospective Review of Lumbar Disc Surgeries Performed Under Spinal Anesthesia During the COVID-19 Pandemic: Can Spinal Anesthesia Be a Practical Alternative for Surgical Procedures in Pandemic Periods?

Kenan Kart[1], Nagehan Umit Karaca[2], Duygu Taskin[2], Ufuk Karadavut[3]

[1]Karabük University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Karabük, Türkiye
[2]Karabük Training and Research Hospital, Department of Anesthesiology and Reanimation, Karabük, Türkiye
[3]Karabük University, Faculty of Medicine, Department of Biostatistic, Karabük, Türkiye

Abstract

Aim: Recent studies report that spinal anesthesia may be an alternative to general anesthesia in lumbar surgeries. Considering the benefits that spinal anesthesia provides to patients over general anesthesia, it is a positive development. Depending on the importance and priority of the work to be done, surgical interventions must be performed when necessary. In the present study, a retrospective review was made regarding Lumbar Disc Herniation (LDH) surgeries under spinal anesthesia in our hospital during the COVID-19 pandemic.
Material and Method: LDH surgeries performed under spinal anesthesia in 184 patients between March 14, 2020, and December 31, 2022, were evaluated retrospectively in the present study.
Results: A total of 196 patient files were scanned and the files of 184 were examined retrospectively. A total of 12 patients were excluded from the study because of insufficient data. It was found that the surgery times of patients with surgical levels L5-S1 were significantly higher. The first postoperative analgesia requirement was significantly later in patients who underwent surgery at the L5-S1 level. Ephedrine was administered to 13 of the patients and atropine was administered to 14 of them. Perioperatively, 14 of the patients required additional analgesia. Postspinal headache developed in 16 of the patients and urinary retention developed in 12. SAP, DAP, and MAP of the patients decreased significantly after the intraoperative spinal anesthesia.
Conclusion: The results of the present study showed that spinal anesthesia is safe in awake lumbar disc surgery patients, which supports the increasing literature data emphasizing the superiority of spinal anesthesia in awake lumbar surgery procedures. It was also shown that spinal anesthesia can be preferred for sustainable surgery during pandemic periods when the need for ventilators is intense and opportunities are limited.

Keywords: Spinal anesthesia, lomber disc hernia, COVID-19, pandemic period, sustainable resource use

INTRODUCTION

Many anatomical changes occurred after bipedalism in the process of human evolution. The tempo of human evolution has caused some of these changes to remain uneliminated through natural selection. Low back pain is just one of the undesirable consequences of these changes. Low back pain is a common problem in society and causes loss of workforce. Its lifetime prevalence reaches 80% and annual hospital admission rates in the adult population reach 15% (1-3). One of the most common causes of low back pain is Lumbar Disc Herniation (LDH), which occurs as a result of the herniation of the intervertebral disc into the spinal canal. If LDH causes severe motor losses and severe sciatica that does not resolve within 3-4 weeks, surgical intervention is recommended (4).

Lumbar disc surgery is among the most common spine procedures and is usually performed under general anesthesia (5). Some surgeons and/or patients prefer general anesthesia for their comfort, but recently, they prefer spinal anesthesia in compatible and selected patients who do not need general anesthesia (e.g., in unilateral/single-level discectomies with short surgery times) (6).

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Corresponding Author: Kenan Kart, Karabük University, Faculty of Medicine, Department of Anesthesiology and Reanimation, Karabük, Türkiye
E-mail: kenankart@karabuk.edu.tr

We have observed that the risk of pulmonary complications has increased significantly due to COVID-19 during the pandemic period, and this has created anxiety for patients and surgeons. The increased preference for spinal anesthesia in LDH surgeries performed in our hospital during the pandemic period supports our observation.

The present study aimed to retrospectively examine LDH surgeries performed under spinal anesthesia during the COVID-19 pandemic.

MATERIAL AND METHOD

The material of the study consists of the retrospective evaluation of the records of the patients who underwent LDH surgeries performed under spinal anesthesia between March 14, 2020, and December 31, 2022. After obtaining ethics committee approval from Karabük University, Non-Interventional Ethics Committee (No: 2023/1271, Date: 24.02.2023) at Karabük Training and Research Hospital, a retrospective study was designed in light of data obtained from the surgery room and archives of Karabük University, Training and Research Hospital. Spinal anesthesia of the patients was performed electively by an experienced specialist or an anesthesia assistant who had completed at least 2 years of experience under the surveillance of a specialist. American Society of Anesthesiologists (ASA) I-III patients over the age of 18, who underwent LDH surgery under spinal anesthesia within the specified dates, were included in the study. The data obtained from patient files such as ASA scores IV and above, patients with a history of allergies, patients with respiratory or heart failure, or patients who underwent general anesthesia because of long surgery times were not evaluated. Age, sex, ASA scores, preoperative, intraoperative, and post-operative hemodynamic data of the cases (systolic arterial pressure (SAP), diastolic arterial pressure (DAP) and mean arterial pressure (MAP), heart rate peaks, saturations), intraoperative additional sedation needs, whether inotropes were needed after spinal anesthesia, at what time and how often post-operative analgesia was needed, and discharge times were recorded.

The patients were tested for COVID-19 with the Polymerase Chain Reaction (PCR) Test. Before spinal anesthesia was applied to all patients, 6-8 kg ml-1 crystalloid fluids were administered i.v. in the preoperative waiting room. All patients were administered an antiemetic protocol with pantoprazole and ondensatron.

Anesthesia Technique

After the patients were taken to the surgery room, it was found in the file reviews that pulse oximetry, non-invasive blood pressure monitoring, and electrocardiogram were applied as standard monitoring on the stretcher before being taken to the surgery table. It was also understood that the patients were placed in a sitting position and the area to be treated was sterilized and covered in line with the rules of asepsis and 12.5-15 mg hyperbaric bupivacaine was administered with a 15 G Quincke spinal needle from the 3rd or 4th lumbar vertebra, depending on the level of the surgery. The patients were kept in the supine position for approximately 10 minutes and were then taken to the surgery table in the prone position after the block level reached the T10 level. Also, 0.02-0.04 mg kg-1 i.v. midazolam was administered in the presence of anxiety, and 1-2 mcg kg-1 fentanyl i.v. was administered in the presence of pain.

All patients were taken to the postoperative recovery room after the surgery was completed and were then transferred to the wards after the block levels reached the L5. All patients were discharged after being monitored for at least 24 hours in the ward.

Statistical Analysis

In the statistical analysis of the data, descriptive statistics were determined. The data were defined by determining the mean and standard deviation in demographic data, and percentage amounts in non-parametric data. The Kolmogorov-Smirnov Test was applied to determine the compliance of the data with normal distribution. In the case of comparison of three or more variables, ANOVA was performed for parametric data, while Kruskal Wallis test was applied for non-parametric data, if it did not meet the normality assumption depending on the nature of the data, or Chi-square test was applied according to the structure of the data. The critical value for significance was determined as 0.05 and all analyses were made in the SPSS 23V statistical program.

RESULTS

The data of 184 patients who underwent LDH surgery were examined retrospectively in the study. Demographic data, ASA scores, presence of comorbidities, and drug use status of the patients are given in Table 1. A total of 49.5% of the patients included in the study were female and 50.5% were male. The average age of the patients was 48.7±8.3. 66.3% of the patients had ASA II scores, 50.5% of the patients faced comorbidity, and 44.6% used at least one medication.

Surgery times according to spinal and surgical levels are given in Table 2. When the table is examined, spinal anesthesia was performed in 91.8% of the patients at the L3-4 level and in 8.2% at the L4-5 level. Surgery was performed at the L4-5 level in 55.9% of the patients, at the L5-S1 level in 40.2%, and the L3-4 level in 3.9%. The average surgery time of the patients was 90 minutes and was significantly higher in patients who underwent surgery at the L5-S1 level.

The spinal anesthesia levels, surgical procedure levels, and first postoperative analgesia administration times are given in Table 3. When the table is examined, it is seen that 57.4% of the patients who underwent spinal anesthesia at the L3-4 level underwent surgery at the L4-5 level, 38.5% at the L5-S1 level, and 4.1% at the L3-4 level. The differences between all surgical levels at the L3-4 spinal level were found to be statistically insignificant. Among the patients who underwent spinal anesthesia at the L4-5 level, 60% underwent surgery at the L5-S1 level, and 40% underwent surgery at the L4-5 level. The first postoperative analgesia requirement was significantly later in patients who underwent surgery at the L5-S1 level.

In some cases, patients might have intraoperative complications and need for sedoanalgesia. Knowing these is important in terms of directing and managing the transactions to be performed. Intraoperative complications and sedoanalgesia needs of the patients are given in Table 4. Ephedrine was administered to 13 of the patients and atropine was administered to 14 of them. Perioperatively, 14 patients required additional analgesia. The relationship between the patients' need for additional intraoperative analgesia, spinal level, and surgical level is given in Table 4.

Postoperative complications such as headaches and urinary retention might occur during surgeries. Eliminating these with immediate intervention is important for patient health. Postoperative complications of the evaluated patients are given in Table 5. Postspinal headache developed in 16 of the patients and urinary retention developed in 12. The differences observed between postoperative complications were found to be statistically significant.

The hemodynamic data of the patients and the graphical views of the data are given in Table 6. SAP, DAP, and MAP of the patients decreased significantly after intraoperative spinal anesthesia. Average pulse rates also decreased but were not statistically significant. No changes were detected in the peripheral saturated oxygen levels of the patients.

Table 1. The demographic data, ASA scores, presence of comorbidities, and drug use status of the patients

Characteristics		Values	Significance (P)
Age (years) (Mean±SD)	Mean	48.7±8.3	P>0.05 (Insignificant)
	Female	48.6±10.2	
	Male	49.0±6.9	
Sex (n/%)	Female	91 (49.5)	P>0.05 (Insignificant)
	Male	93 (50.5)	
ASA (Score/%)	I	49 (26.6)	P<0.05 (Significant)
	II	122 (66.3)	
	III	13 (7.1)	
Weights of the patients (kg)	Mean weight	76.7	P>0.05 (Insignificant)
	Female	81.8	
	Male	71.8	
Comorbidities (n/%)	Yes	93 (50.5)	P>0.05 (Insignificant)
	No	91 (49.5)	
Medication status (n/%)	Yes	82 (44.6)	P>0.05 (Insignificant)
	No	102 (55.4)	

Table 2. Surgery times according to spinal and surgical levels

Spinal level	n/%	Surgical Level	n/%	Significance (P)	Surgery time (minute)	Significance (P)
L3-4	169 (91.8)	L3-4	7 (4.1)	P<0.05 (Significant)	84.28	P>0.05 (Insignificant)
		L4-5	97 (57.4)		85.87	
		L5-S1	65 (38.5)		89.45	
L4-5	15 (8.2)	L4-5	6 (40.0)	P>0.05 (Insignificant)	73.31	P<0.05 (Significant)
		L5-S1	9 (60.0)		90.00	

Table 3. The spinal anesthesia, surgical procedure levels, and first postoperative analgesia application times of the patients

Spinal level	Surgical level	Time to first analgesia need (minute)	Significance (P)
L3-4	L3-4	461.43	P>0.05 (Insignificant)
	L4-5	444.85	
	L5-S1	464.88	
L4-5	L4-5	406.67	P<0.05 (Significant)
	L5-S1	515.55	

Table 4. The intraoperative complications and sedoanalgesia needs of the patients

Spinal level	Surgical level	Number of patients administered ephedrine (%)	Significance (Chi-square)	Number of patients administered atropine (%)	Significance (Chi-square)	Intraoperative additional analgesia			Significance (Chi-square)
						Total	Yes	No	
L3-4	L3-4	1 (0.59)	P>0.05 (Insignificant)	1 (0.59)	Insignificant	7	0	7	P<0.05 (Significant)
	L4-5	8 (4.73)		7 (4.40)		97	7	90	
	L5-S1	2 (1.18)		5 (2.95)		65	4	61	
L4-5	L4-5	1 (6.67)	P>0.05 (Insignificant)	0 (0.00)	Insignificant	6	2	4	P>0.05 (Insignificant)
	L5-S1	1 (6.67)		1 (6.67)		9	1	8	

Table 5. Some postoperative complications of the patients

Postoperative complications	Total	Headache		Urinary retention	
		Yes	No	Yes	No
	184	16	168	12	172
Significance (Chi-Square)		P<0.05 (Significant)		P<0.05 (Significant)	

Table 6. The hemodynamic data and graphical views of the patients

Characteristics	Measurement times	Measured mean values (minute)	Significance (P)
Systolic arterial pressure (SAP) mmHg	Preoperative period	142.36	P<0.05 (Significant)
	5 min	129.73	
	15 min	119.94	
	30 min	119.49	
	Postoperative period	124.76	
Diastolic arterial pressure (DAP) mmHg	Preoperative period	84.59	P<0.05 (Significant)
	5 min	76.03	
	15 min	70.00	
	30 min	69.11	
	Postoperative period	73.25	
Mean arterial pressure (MAP) mmHg	Preoperative period	104.04	P<0.05 (Significant)
	5 min	93.78	
	15 min	86.89	
	30 min	86.01	
	Postoperative period	90.36	
Pulse rates	Preoperative period	84.51	P>0.05 (Insignificant)
	5 min	84.59	
	15 min	82.14	
	30 min	81.27	
	Postoperative period	80.49	
Peripheral saturated oxygen levels	Preoperative period	97.61	P>0.05 (Insignificant)
	5 min	98.03	
	15 min	97.58	
	30 min	98.10	
	Postoperative period	98.15	

DISCUSSION

When the data of 184 patients to whom we applied spinal anesthesia because of LDH surgery were examined, it was determined that spinal anesthesia was sufficient for all of the patients. None of the patients required general anesthesia. This result was found to be important because it showed that spinal anesthesia was successful. The present study shows that spinal anesthesia provides adequate anesthesia in LDH surgeries, increases patient safety, and clinical results are at least as good as those of patients undergoing general anesthesia. It was considered very important that these results were compatible with the studies in the literature (7-11).

In our present day, general anesthesia is still the most commonly used method in spinal surgeries. This may be because of reasons such as spinal surgeries taking a long time, the possibility of bleeding being high, surgical procedures requiring good airway control, and patient movements during surgery (12,13). However, in recent years, the development of new surgical methods and increased familiarity with the spinal region have increased the popularity of spinal anesthesia practices, as surgical procedures are shorter and are performed in a more controlled manner (14).

The incidence of hypotension is more common during spinal anesthesia than during general anesthesia. However, this complication can be eliminated by appropriate fluid replacement, not keeping the surgical procedure long, and appropriate patient positioning (15). The patients also developed hypotension that did not require significant intraoperative inotropic support, which was evaluated as spinal anesthesia minimally affecting hemodynamics in selected patients. There are publications in the literature stating that this type of hypotension, which does not impair hemodynamics, increases surgical vision (16). Only 14 of the cases developed bradycardia requiring atropine administration. 13 of the patients developed hypotension requiring ephedrine administration. It was thought that these complications were not related to the surgical procedure performed but were events that could be observed during spinal anesthesia.

A total of 14 patients required additional intraoperative analgesia in the study. However, it is noteworthy that at surgical levels where the surgery time is short, the need for additional analgesia is less, which was interpreted as the effect of surgery duration on the need for additional analgesia. In addition, the relationship between the level of spinal anesthesia and the requirement for intraoperative additional analgesia was analyzed, and it was observed that lower spinal levels were associated with increased analgesia needs, especially in longer surgeries. This may suggest that both the anatomical level of anesthesia and surgical duration play a role in intraoperative analgesia demand.

It is already known that complications such as respiratory problems, nausea and vomiting, deep vein thrombosis, and bleeding are less common in spinal anesthesia than in general anesthesia (17). Opioids and inhalation agents increase nausea and vomiting. None of the patients had nausea and vomiting that would prolong hospitalization, nor did any of the patients have bleeding that required blood product transfusion in the present study.

Headache and urinary retention after spinal anesthesia are serious complications and are annoying for anesthesiologists and will prolong the hospital stays. In the present study, 2 patients had severe headaches that prolonged their hospital stays. However, these patients responded well to medical treatment. Urinary retention occurred in 12 of the patients. These patients were treated with a urinary catheter. There was no urinary retention that prolonged hospital stays. The rates of urinary retention and headache in the present study are consistent with the literature data (18-20). The incidence of postspinal complications observed in our study—specifically postdural puncture headache (PDPH) in 8.7% of patients and urinary retention in 6.5%—is generally consistent with previously published data. In the literature, the incidence of PDPH has been reported to range between 0.8% and 5%, depending on factors such as needle type, patient age, and duration of surgery (21). Similarly, studies have reported urinary retention rates of approximately 2–7% following spinal anesthesia, particularly in urologic and orthopedic cases (22). The average surgical duration of 90 minutes in our study likely contributed to these outcomes being within the expected clinical range. These findings support the safety and predictability of spinal anesthesia in lumbar disc surgeries under standard conditions.

There are some difficulties with spinal anesthesia in LDH surgeries. Postoperative neurological examination and the pressure and stress it causes on anesthetists are very important. This may push anesthesiologists away from spinal anesthesia (23). However, several advantages of spinal anesthesia compared with general anesthesia have been reported. Some studies reported it to be superior in relieving postoperative pain, maintaining hemodynamic stability, and reducing postoperative adverse effects (24). Some other advantages include superior glycemic control, preservation of intraocular pressure, and cost reduction in diabetic patients. It also decreases the possibility of pressure injuries that may occur because of a prone position (13,25).

Many surgical procedures decreased because of the COVID-19 pandemic along with spinal surgeries. Most elective cases were postponed. There were significant disruptions in pharmaceutical and material manufacturers and suppliers, and most of the available resources were transferred to the fight against COVID-19. For these reasons, there were efforts to establish guidelines for appropriate courses of action when considering specific surgical spine pathologies. Validation of such guidelines and retrospective analyses are critical to establishing evidence-based systems for spine care in the event of a future viral outbreak (26,27).

During the COVID-19 pandemic, where ventilator and intensive care unit (ICU) capacities became critically limited, none of the patients in our study who received spinal anesthesia required postoperative ventilator support or ICU admission. This highlights the potential of spinal anesthesia to preserve essential hospital resources in times of medical crisis. Moreover, surgical procedures under general anesthesia often involve aerosol-generating procedures (AGPs) such as endotracheal intubation and extubation, which significantly increase the risk of viral transmission to healthcare personnel. In contrast, spinal anesthesia eliminates the need for airway manipulation and thereby reduces this transmission risk. Studies in the literature have reported spinal anesthesia as a safer alternative for both COVID-19 positive and negative patients during the pandemic. For instance, it has been demonstrated that spinal anesthesia can be safely used with minimal aerosol exposure and without compromising surgical outcomes (28,29). Therefore, spinal anesthesia should be considered not only as a clinically effective anesthetic method but also as a strategic option in resource-limited and high-risk pandemic settings.

There are data that spinal surgeries with spinal anesthesia decrease costs, decrease the length of hospital stay, and decrease the use of healthcare resources (30). For this reason, in the setting of any potential future medical limitations, awake spinal surgery is likely to increase a hospital's capacity to perform spinal surgical procedures (31). In this sense, spinal anesthesia has the potential to play an important role in spinal surgery procedures in the event of a future pandemic (32).

The present study had some limitations. Firstly, the study had a retrospective design. Although only LDH surgeries were included in the study, they were performed by different surgeons. The anesthesia procedure was also performed by more than one anesthesiologist. The intraoperative sedation preferences of anesthesiologists may differ. Also, the data on complications were obtained by retrospectively examining inpatient, surgery room notes, and outpatient notes rather than a single database. Patient satisfaction and surgical satisfaction could not be examined.

CONCLUSION

In conclusion, it is considered to be an alternative to general anesthesia in LDH surgeries, provided that appropriate communication is established between the surgical team and the patient. Also, the present study shows that spinal anesthesia may play critical roles in lumbar surgeries in future epidemics.

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