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Retrospective Evaluation of Anesthesia Approaches for Lumbar Disc Surgery

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Abstract

Objective: Lumbar spinal surgeries have been performed with either spinal or general anesthesia. In this study, we aimed to evaluate the superiority of either spinal or general anesthesia on one-level lumbar discectomies.

Methods: After approval of Ethics Committee, we retrospectively analysed 328 patients those administered either spinal or general anesthesia for elective one-level lumbar discectomies over a two-year period. Patient records were reviewed to obtain demographic features, type of anesthesia, baseline heart rate, mean arterial pressure, intraoperative maximum heart rate and mean arterial pressure, duration in the operating room, amount of intravenous fluids, estimated blood loss, incidence of perioperative complications such as bleeding, nausea-vomiting, hypotension and bradycardia, and postoperative analgesic consumption.

Results: Patient characteristics including baseline/intraoperative mean arterial pressure and heart rate values did not differ between groups. However, the spinal anesthesia group experienced significantly shorter durations in the operating room and had a lower incidence of nausea-vomiting ($p = 0.002$ and $p < 0.01$, respectively). Analgesic comsumption in general anesthesia group was significantly higher than in spinal anesthesia group ($p < 0.01$).

Conclusion: The present study revealed that spinal anesthesia is an effective alternative to general anesthesia in lumbar spinal discectomy.

Keywords: Anesthesia; Spinal; General; Discectomy; Neurosurgery; Retrospective Studies; Complication; Intraoperative; Perioperative

Introduction

Both general and spinal anesthesia have been used for elective lumbar disc surgical procedures; however, there has been no satisfactory findings detailing which method is more advantageous since general anesthesia is the more frequently used method.

Additionally, the main reasons leading to a tendency towards the use of general anesthesia are associated with a higher acceptance by patients and the ability to perform longer operations with a secured airway in the prone position. In contrast with general anesthesia, spinal anesthesia reduces blood loss, improves the view in the operating field by decreasing venous blood pressure and can lead to a decrease in the length of inpatient stays and overall costs [1-3]. However, recent controlled trials showed distinct results, hence there remains no consensus on the appropriate anesthesia method for lumbar disc surgery [4,5].

The primary goal of this study is to investigate the efficiency of spinal anesthesia in one-level lumbar discectomy. Secondary goal is to report the retrospective analyses of 328 patients in whom spinal anesthesia was used in the great majority of patients to assess the perioperative outcomes of spinal and general anesthesia for elective lumbar discectomy.

Methods

After obtaining approval from the Ethics Committee, patients underwent one level elective lumbar discectomy for lumbar disc herniation at the L4 - L5 or L5 - S1 levels were identified in the period between January 2009 and January 2011 in the Gaziosmanpasa University Hospital and Tokat State Hospital. The patients underwent with either a general or a spinal anesthesia. Patients those received general anesthesia with propofol 2-3 mg/kg intravenous (IV), fentanyl 1-1.5 mcg/kg IV, and rocuronium bromide 0.6 mg/kg IV in induction, and sevoflurane - % 50 N_2O - % 50 O_2 in maintenance of anesthesia, and patients whose administered spinal anesthesia using bupivacaine % 0.5 15 mg intrathecally at L3 - L4 or L4 - L5 space in the sitting position were included in the study. Additionally, all spinal anesthesia procedures were performed in the block room instead of the operating room. In this two institutions, the anesthesia procedure either spinal or general anesthesia that performed for one-level lumbar discectomy was preferred by the patient. All surgical procedures were performed with the patient placed in the prone position. Patient records were reviewed to obtain demographic features (age, gender, weight, height, Body Mass Index [BMI], American Society of Anesthesia Score [ASA]), type of anesthesia (general or spinal anesthesia), baseline Heart Rate (HR), Mean Arterial Pressure (MAP), intraoperative maximum HR and MAP, duration in the operating room, amount of intravenous fluids, estimated blood loss (either greater than or less than 400 ml), analgesic consumption, and incidence of perioperative complications such as bleeding, nausea-vomiting, hypotension and bradycardia. The incidence of urinary retention and Post-Dural Puncture Headache (PDPH) were also collected for those who received spinal anesthesia. In these instutitons, patients, those performed general anesthesia, were routinely received tramadol 1 mg/kg IV in the peroperative period for postoperative analgesia. Thereafter, patients were seperated into two groups according to the anesthesia technique. Patients those received

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spinal anesthesia were gahthered in Group Spinal (SA), and those received general anesthesia were in Group General (GA).

Statistical Analysis

Normality and variance were analysed by using skewness, kurtosis and one sample Kolmogorov-Smirnov test. Quantitative data were presented as the means and standard deviation, and qualitative data as the frequency and percentage. Comparisons between groups for qualitative data were conducted by using Chi-square test, and for quantitative data by Mann-Whitney U test. All statistical analyses were performed by the Statistical Package for Social Sciences (SPSS) version 20 program. Statistical significance for all analyses was set as $p < 0.05$.

Results

Demographic data and baseline MAP and HR results did not show any differences between groups (Table 1). Patients those received spinal anesthesia was heavier than the general anesthesia patients. Durations in the operating room were significantly shorter in the SA group ($p = 0.002$). Intraoperative maximal HR, intraoperative maximal MAP and the amount of intraoperative fluid usage were not significantly different between groups (Table 2). Analgesic comsumption in GA was significantly higher than in SA (p < 0.01). Nausea-induced vomiting frequency was higher in the GA compared to the SA ($p < 0.01$; Table 3).

	Spinal Anesthesia	General Anesthesia	p
	n (Mean ± SD)	n (Mean ± SD)	
Number of patients	294	34	—
Age	49.61 ± 12.18	46.97 ± 9.13	0.247
Gender			
Male (n, %)	165 (56.2%)	14 (41.2%)	0.097
Female (n, %)	129 (43.8%)	20 (58.8%)	
Weight	70.84 ± 8.12	71.35 ± 9.66	0.982
Height	168.68 ± 7.27	168.02 ± 6.31	0.455
BMI	24.88 ± 2.3	25.22 ± 2.8	0.613
Baseline HR	80.54 ± 12.34	76.41 ± 13.64	0.072
Baseline MAP	92.22 ± 9.95	89.43 ± 11.97	0.197
ASA			
n (I/II/III)	102/167/25	16/12/6	0.113[a]
% (I/II/III)	34.6/56.8/8.6	47/35/18	
Duration in operating room	77.21 ± 21.62	102.2 ± 44.23	0.002*[b]

*: p<0.05, a: Fisher's exact test, b: Mann-Whitney U test

Table 1: Demographic data of the patients.

	Spinal Anesthesia	General Anesthesia	p
	(Mean ± SD)	(Mean ± SD)	
Intraoperative maximal HR	76.18 ± 15.97	72.67 ± 11.34	0.103
Intraoperative maximal MAP	82.82 ± 12.33	84.04 ± 12.76	0.991
Intravenous fluids	1711.22 ± 598.38	1579.41 ± 634.26	0.162

Mann-Whitney U test

Table 2: Intraoperative outcomes.

	Spinal Anesthesia	General Anesthesia	p
	n (%), Mean ± SD	n (%), Mean ± SD	
Bleeding	1/294 (%0.3)	1/34 (%2.9)	0.197
Nausea-vomiting	36/294 (%12.2)	13/34 (%38.2)	< 0.01*[c]
Hypotension	46/294 (%15.6)	8/34(%23.5)	0.241
Bradycardia	30/294 (%10.2)	3/34(%8.8)	0.545
Urinary retension	15/294 (%5.1)	2/34(%5.8)	0.544
PDPH	2/294 (%0.7)	—	—
24 hours analgesic comsumption	95.37 ± 10.46	140.58 ± 19.53	< 0.01*[d]

*: p<0.01, c: Chi-Square test, Fisher exact test, d: Mann-Whitney U test.

Table 3: Postoperative outcomes.

Discussion

The present study revealed that operating room durations in the spinal anesthesia group were shorter than in the general anesthesia group. The analgesic consumption after spinal anesthesia was substantially lower. Associated with complications, nausea-vomiting had a higher prevalence in the general anesthesia group.

Regional anesthesia and general anesthesia are both applicable anesthetic techniques for lumbar discectomy. McLain et al. reported that regional and general anesthesia have similar effectiveness for performing elective lumbar decompression surgeries, and also regional anesthesia showed some advantages over general anesthesia, including improved perioperative hemodynamic stability, decreased analgesic requirement, and decreased occurance of postoperative nausea [6]. Several studies comparing spinal anesthesia and general anesthesia in lumbar disc surgery have reported spinal anesthesia as the preferred method for lumbar spine surgery [1,5-8]. In relation, some centers have been routinely performing regional anesthesia for lumbar laminectomy and discectomy [3]. As a consequence of this current study, spinal anesthesia was more frequently used anesthetic approach.

To decide the most effective method, a recent randomized clinical trial by Attari et al. revealed that spinal anesthesia has adequate advantages over general anesthesia in providing postoperative analgesia and decreased blood loss by preserving a better hemodynamic stability. These factors resulted in higher satisfaction rates for the surgeon and patients [5]. Spinal anesthesia may lead to a reduction in blood loss associated with vasodilation and hypotension produced by sympathetic blockade and less distension of epidural veins resulting from lower intrathoracic pressure [2]. A retrospective analysis by Tetzlaff et al. demonstrated that spinal anesthesia was a safe and effective alternative to general anesthesia for elective lumbar spine surgery with reduced perioperative complication rates. They concluded that spinal anesthesia could be an excellent choice for lumbar spine surgery [9]. Additionally, reduced surgical time and blood loss in spinal anesthesia were reported by Jellish et al., whose results were in agreement with the present study [2].

However, to show the amount of blood loss from the data in this study can be difficult, which can be related to the uncertainty of the data taken in a retrospective analysis. Only in two cases, one that used SA and the other with GA showed blood losses over 400 ml, which was considered the threshold of blood loss in this study.

Various studies have also shown that spinal anesthesia provided shorter anesthesia durations, decreased nausea incidence and analgesic consumption, and was associated with fewer total side effects [2,7,8,10]. Nausea and vomiting are already common problems that anaesthesiologists must cope with during the postoperative period. These symptoms appear to be associated with many factors such as age, gender, ASA, obesity, duration of anesthesia, use of volatile anaesthetics, nitrous oxide and intraoperative or postoperative opioids [11,12]. In the current study, demographic data were well matched between groups, therefore, the main variables affecting the occurrence of nausea and vomiting in the GA are most likely anesthesia-related factors. First, N_2O use can be blamed for leading to an increased rate of nausea-vomiting. Second, the GA had a higher severity of pain and required an increased amount of opioids in the postoperative period. Hence, opioids associated with sensitizing the vestibular apparatus to movement could raise the incidence of nausea and vomiting [2].

In the present study, lower analgesic requirements in the SA during the postoperative period can be explained by two mechanisms. Spinal anesthesia may lead to a reduced sense of pain by inhibiting afferent nociceptive pathways that result from pre-emptive analgesia [13]. Additionally, residual sensory blockade may remain after the spinal anesthesia process, which may decrease analgesic consumption [14].

Urinary retention has been observed with spinal anesthesia in the current study. However, the prevalence was similar in both groups. This finding may be associated with the use of intrathecal opioids, which evidently increase the frequency of urinary retention [15]. No neuraxial opioids were used in this study.

Furthermore, the significant conclusion for this study is that discectomies with spinal anesthesia have shorter durations in the operating room. This time difference is considered to be a consequence of the elapsed time needed to perform spinal anesthesia, which is conducted in the block room instead of an operating room, and also having no missing time for extubation. In the absence of satisfactory differences between spinal anesthesia and general anesthesia, cost, associated with the duration, could be judged to be an acceptable reason to decide on an optimum option [16]. In a clinical evaluation, Wodlin et al. reported that spinal anesthesia is considered cost-effective compared to general anesthesia in abdominal hysterectomy procedures [17]. Moreover, Gonano et al. described spinal anesthesia as a cost-effective alternative to general anesthesia after an evaluation in the postoperative period for hip and knee replacement patients [18]. Clinical directors have typically focused on the single issue of maximizing operating room efficiency and have indicated that reducing waiting times plays an important role in solving this problem [19]. Similar to these results, the present study associated the duration differences in the operating room with costs and the data suggests that SA appeared to provide a lower cost than GA. It can be speculated that spinal anesthesia may lead to greater cost-effectiveness in lumbar discectomies.

This study has several limitations. First, the numbers of the cases in the groups are overproportional that led to a quite small size of general anesthesia group, hence the study period can be extended. Second, long-term complications could not be obtained and assessed associated with the lack of the data. Third, the patient satisfaction is one of the important assessment value for spinal anesthesia, however it could not be evaluated.

Conclusion

Spinal anesthesia seems to be a cost-effective technique associated with shorter durations in the operating room and providing a lower nausea-vomiting incidence with discectomy procedure. Additionally, further prospective studies are needed to elucidate the superiority of spinal anesthesia compared to general anesthesia in lumbar discectomies.

Conflict of Interest

All authors declare that there is no conflict of interest.

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