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Comparison of low back pain incidence following general and spinal anesthesia in lower limb orthopedic surgery

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Abstract

Background: Low back pain (LBP) is one of the most common complications after lower limb orthopedic surgery, which leads to many significant limitations and problems for patients and society. The aim of the present study was to investigate LBP incidence rate following general anesthesia (GA) and spinal anesthesia (SA) in lower limb orthopedic surgery.

Methods: In this randomized clinical trial study, all patients who were candidates for elective orthopedic surgery referred to Shahid Beheshti Hospital in Babol, entered the study with informed consent.
Patients were divided into two groups and LBP incidence rate following spinal anesthesia and general anesthesia was evaluated.

Results: Out of 110 patients, 46 (41.8%) complained of LBP as a postoperative complication and 64 cases (58.2%) did not report it. The mean pain decreased over time in patients with LBP. Results also showed that LBP intensity was higher in spinal anesthesia group one day and one week after surgery. One month after surgery, the general anesthesia group did not report LBP, but the spinal anesthesia group still complained of LBP. There was no significant relationship between sex, age, BMI, duration of surgery, type of surgery and cause of fracture with LBP incidence.

Conclusion: According to the present study, the mean LBP intensity in the general anesthesia group is significantly less than spinal anesthesia group one day, one week and one month after surgery. patients should receive necessary explanations about the complications of both types of anesthesia preoperatively so that they consciously choose the method of anesthesia.

Keywords: Low back pain, Spinal anesthesia, General anesthesia, complications.

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Introduction

The choice of appropriate anesthetic method for lower limb surgery has often been a controversial issue. Many of these patients are at both continuum of the age range: seniors with different types of underlying diseases on the one end, and the young injured people with different types of injuries on the other end. Recently, considerable attention has been paid to spinal anesthesia (SA) instead of general anesthesia (GA) before orthopedic surgery. spinal anesthesia

is a type of neuroaxial block that involves injecting local anesthetic drugs with a long, narrow needle into the subarachnoid space (1) . spinal anesthesia has been used since the late 19th century and is currently the most common method of nerve block anesthesia through which a wide range of surgeries can be performed. Although general anesthesia is known as a pioneering method that induces anesthesia and numbness through intravenous or inhaled agents, it is currently accepted by the anesthesiologist less frequently due to its serious complications (2).

All surgical procedures have complications which include headache and LBP for spinal anesthesia (3, 4) . The prevalence of post- spinal anesthesia headache varies and its incidence rate is between 0 and 37% (5) . However, the above rate is higher in the case of post- spinal anesthesia LBP (2.5-54%) (6, 7) .

Although LBP is often cited as a complaint after general anesthesia and spinal anesthesia, there is still no clear relationship between anesthetic method and LBP. Some studies have referred to LBP as the most common postoperative complaint in operated patients (8). While some studies have not reached this conclusion (9). Also some studies have stated that LBP incidence rate is equal in both types of anesthesia (10, 11).

Since that LBP is a major health problem and an important cause of disability, it is important to investigate whether there is a relationship between anesthetic method and LBP, especially in terms of economic costs. Therefore, it is essential to discuss the choice of anesthetic method by patients and the recommendations given to patients preoperatively. Thus, the aim of the present study was to investigate the LBP incidence rate and its relationship with the type of anesthesia in lower limb orthopedic surgery.

Methods

This study is a clinical interventional trial, and the study population included all candidates for elective orthopedic surgery of the lower limb (fracture, arthroplasty and other cases) referred to Shahid Beheshti Hospital in Babol from 2016 to 2017.

110 patients underwent elective orthopedic surgery of the lower limb. Sample size was estimated 55 patients each group using a sample size determined in previous studies and similar articles under the supervision of a statistical consultant. Inclusion criteria included age range of 20 to 55 years, American Society of Anesthesiologists (ASA 1 or ASA 2), elective surgery, duration of surgery of shorter than four hours in the supine position and shorter than three hours in lateral positions, spinal anesthesia success within three puncture attempts. Exclusion criteria also included history of lumbar or thoracic spine surgery, any congenital spinal disorders, no consent to participate in the study, history of lumbar disease, history of difficult intubation, BMI <30 kg/m2, history of alcohol and smoking addiction.

Other exclusion criteria of this study were any transient neurological syndrome (TNS) such as pain in one or both thighs, which spread to the pelvis, thigh, leg, history of systemic and localized infection, history of coagulation problems, inability to be in the sitting position before spinal anesthesia , and more than three puncture attempts.

Random sampling method using a table of random numbers was used and after obtaining informed consent, patients were divided into two groups, that is, spinal anesthesia and general anesthesia . general anesthesia group received fentanyl (1 μg / kg), midazolam (0.02-0.15 mg / kg)and propofol (2.5 mg / kg/per hour) andN2o /o2 (50%:50%) and spinal anesthesia group received 15 mg Bupivacain 0.5% using a 25-G Quinke needle.

Lumbar vertebrae are required to access cerebrospinal fluid via the midline between L2-L3 or L3-L4 space. The number of puncture attempt is within one to three. Patients with more than three puncture attempts were excluded from the study. A 25-G Quinke needle was used for all patients. All patient demographic information including age, sex,

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occupation, level of education, marital status, cause of fracture, height, weight, BMI, date of surgery, type of surgery, type of anesthesia, intraoperative patient intraoperative patient positiining, duration of surgery, number of puncture attempts to reach the subarachnoid space, and significant postoperative complications (nausea, headache, and LBP) were collected using a relevant checklist. LBP was evaluated based on VAS (visual analog scale) scoring system (score 0 and 10 indicate no pain the most severe pain, respectively). Patients were asked about their LBP status one day, one week and one month surgery.

Finally, data analysis was carried out using SPSS Ver. 16 and the relationship between data was analyzed using one-way ANOVA and chi-square tests. P-value<0.05 was also considered as the significance level.

Results

Out of 110 patients, 55 were included in the spinal anesthesia and 55 in the general anesthesia groups. The overall mean ± standard deviation (SD) of patients' age was 36.80 ± 12.94 years, and the possible age rage was also 20 and 55 years. The mean ± SD of age in the spinal anesthesia and general anesthesia groups was 37.12± 50.52 and 36.13± 10.41 years, respectively, and there was no significant difference between the two groups.

Out of 110 patients, 85 were male (77.3%) and 25 were female (22.7%). There were 45 men (81.8%) and 10 women (18.2%) in the spinal anesthesia group. There were also 40 men (72.7%) and 15 women (27.3%) in general anesthesia group. There was no significant difference between the two groups in terms of the sex distribution.

Out of 110 patients, 61 (55.5%) were married and 49 (44.5%) were single. In the spinal anesthesia group, 29 (52.7%) were married and 26 (47.3%) were single. In general anesthesia group, 32 (58.2%) were married and 23 (41.8%) were single and there was no significant difference between the two groups in this regard.

Out of 110 patients, 33 (29.5%) had no diploma, 48 (43.6%) had diploma and 29 (26.4%) had university education. There was no significant difference between spinal anesthesia and general anesthesia groups in terms of educational level.

The total mean weight of patients was 78.06 ±7.89 kg and the possible weight range was 59 to 95 kg. The mean ± SD of patients' weight in spinal anesthesia and general anesthesia groups was 79.5 ± 70.22 and 77.8 ± 07.46 kg, respectively. There was no significant difference between the two groups in terms of weight (p=0.19).

The total mean height in patients was 172.44 ± 8.66 cm, and the possible height range was 153 to 188 cm. Therefore, there was no significant difference between the two groups in terms of height. The mean ± SD of patients' height in spinal anesthesia and general anesthesia groups was 172.8 ± 98.14 and 171.9 ± 90.20 cm, respectively.

The mean ± SD of surgery duration in all patients was 104.18 ± 35.35 minutes, and the possible surgery duration range was 60 to 180 minutes. The mean of surgery duration in the spinal anesthesia and general anesthesia groups was 99.81 ± 36.08 and 108.34 ± 54.39 minutes, respectively, but there was no significant difference between the two groups in this regard.

Out of 110 patients, 63 (57.3%) did not mention any previous history of hospitalization or surgery, and 47 (42.7%) mentioned the history of hospitalization and previous surgery, which lasted 3 days or longer (No patient has a history of surgery more than once).

History of previous hospitalization was observed 25 patients (45.5%) and 22 patients (40%) of spinal anesthesia and general anesthesia groups, respectively, and there was no significant difference between the two groups in this regard (p= 0.56).

Out of 110 patients, surgeries were carried out due to the following reasons: to remove screws, bolts, and plates (n=41), to repair ligament and meniscus, anterior cruciate ligament (ACL), and knee or hip replacement (n=21), remove soft or hard tissue mass or skin graft (n=19), various types of fractures in the lower limb (n=24), and remove a foreign body from the lower limb (n=5). There was no significant difference between spinal anesthesia and general anesthesia groups in terms of distribution of type of surgery (p=0.27).

Out of 110 patients, 105 (95.5%) underwent surgery in supine position and 5 (4.5%) in lateral position. In the spinal anesthesia group, 54 patients (98.2%) underwent surgery in supine position and one patient in lateral position. In general anesthesia,

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51 patients (92.7%) underwent surgery in supine position and 4 patients in lateral position, but there was no significant difference between the two groups in terms of intraoperative position.

Out of 110 patients, 43 had no fracture surgery. Out of the remaining 67 patients who underwent surgery due to lower limb fractures (including patients who have now referred with a fracture or have a history of fracture surgery using plates and pins and referred for removal of the pin and plates), the cause of fractures was accidents in 54 cases (49.1%), falls from a height in 8 cases (7.3%), and other causes such as collision with a heavy object in 5 cases (4.5%).

In the spinal anesthesia group, accidents, falls, and other causes accounted for 26 cases (47.3%), 5 cases (9.1%) and 3 cases (5.5%) of fractures, respectively. In the general anesthesia group, accidents, falls, and other causes accounted 28 cases (50.9%), 3 cases (5.5%) and 2 cases (3.6%) of fractures, respectively. there is no significant difference between the two groups in terms of the distribution of the fracture cause.

All patients were asked about postoperative nausea and vomiting (PONV) and 40 patients (36.4%) reported this complication and 70 patients (63.6%) reported no postoperative nausea and vomiting. postoperative nausea and vomiting was reported in 8 (14.5%) and 32 patients (58.2%) of the spinal anesthesia and general anesthesia groups, respectively, which was statistically significant (P<0.001).

Of the 110 operated patients, 38 (34.5%) reported headache as a postoperative complication, while 72 (65.5%) did not experience headache. Also, postoperative headache we observed that in 21 (38.2%) and 17 (30.9%) cases of the spinal anesthesia and general anesthesia groups, respectively (P=0.42)

Out of all patients, 46 patients (41.8%) complained of LBP as a postoperative complication and 64 cases (58.2%) did not report LBP. The incidence rate of postoperative LBP in the spinal anesthesia and general anesthesia groups was 32 (58.2%) and 14 cases (25.5%), respectively (P= 0.001).

Table 1: Comparison of demographic variables, cause of fracture, patient positioning, type of surgery, previous hospitalization, nausea, headache and low back pain in spinal anesthesia and GA groups

Group / variable		Spinal (%)N	General (%)N	Pvalue
Gender	Male	45(81.8)	40(72.7)	0.25
	Female	10(18.2)	15(27.3)	
Marital status	Married	29(52.7)	32(58.2)	0.56
	Single	26(47.3)	23(41.8)	
Cause of fracture	does not have	21(38.2)	22(51.2)	0.85
	accident	26(47.3)	28(50.9)	
	Fall	5(9.1)	3(5.5)	
	Other	3(5.5)	2(3.6)	
Condition	Supine	54(98.2)	51(92.7)	0.17
	lateral	1(1.8)	4(7.3)	
education	High school	19(34.5)	14(25.5)	0.30
	Diploma	20(36.4)	28(50.9)	
	University	16(29.1)	13(23.6)	
Type of surgery	Remove screws and plates	18(32.7)	23(41.8)	0.27
	Knee and meniscus reconstruction, hip and knee joint replacement, ACL repair	14(25.5)	7(12.7)	
	Soft and hard tissue mass and skin rash	7(12.7)	10(18.2)	
	Fracture	14(25.5)	10(18.2)	
	foreign object	2(3.6)	3(5.5)	
Previous hospitalization	no	30(54.5)	33(60)	0.56
	yes	25(45.5)	22(40)	

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Nausea	8(14.5)	32(58.2)	0.001
Headache	21(38.2)	17(30.9)	0.42
Low back pain	32(58.2)	14(25.5)	0.001

Table 2: Comparison of surgery duration, age, height, weight and BMI variables in SA and GA groups

Group / variable	SA)Mean±SD(	GA)Mean±SD(	Pvalue
Surgery time	81.08±99.36	54.39±108.34	0.19
Age	50.52±37.12	10.41±36.13	0.57
Height	98.14±172.8	90.20±171.9	0.51
Weight	5.22±79.7	7.46±77.8	0.19
BMI	44.04±26.2	8.10±26.2	0.35

One day after surgery, all patients were asked about LBP intensity, and 66 (60%) of them did not complain of LBP. Moreover, 21 (19.1%), 13 (11.8%), and 10 patients (9.1%) reported mild, moderate, and severe LBP, respectively. One week after surgery, 65 patients (59.1%) did not have LBP. Also, 10 (9.1%), 22 (20%), and 13 patients (11.8%) reported mild, moderate, and severe LBP, respectively. One month after surgery, 85 patients (77.3%) did not have LBP. Furthermore, 9 (8.2%), 13 (11.8%), and 3 patients (2.7%) reported mild, moderate, and severe LBP, respectively (Table 3).

Table 3: Comparison of pain intensity variables one day, one week and one month after surgery in SA and GA groups

Group / variable		SA N)%(	GA N)%(	Pvalue
Severe pain one day after surgery	No	22(40)	44(80)	0.001
	mild	12(21.8)	9(16.4)	
	medium	11(20)	2(3.6)	
	severe	10(18.2)	0	
Pain intensity one week after surgery	No	24(43.6)	41(74.5)	0.002
	mild	6(10.9)	4(7.3)	
	medium	13(23.6)	9(16.4)	
	severe	12(21.8)	1(1.8)	
Pain intensity one month after surgery	No	30(54.5)	55(100)	0.001
	mild	9(16.4)	0	
	medium	13(23.6)	0	
	severe	3(5.5)	0	

Repeated measures ANOVA showed a significant difference in LBP intensity with intragroup changes or the effect of time and mean LBP decreased over time ($F = 17.89$, $df = 2$, $p < 0.001$).
Also, anesthetic method had a significant effect on LBP ($F = 27.28$, $df = 1$, $p<0.001$). However, there was no significant interaction between the type of anesthesia and time ($F = 1.61$, $df = 2$, $p = 0.02$). It was also found that the mean LBP intensity in general anesthesia group was significantly less than spinal anesthesia group one day, one week and one month after surgery (Table 4).

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Table (4): Comparison of lower-back pain variable one day, one week and one month after surgery in SA and GA groups

variable / Group	Severe pain the next day	Pain intensity in a week later	Pain intensity in a month later	Pvalue*
Spinal) Mean±SD(	44.45 ±3.3	40.44 ±3.3	16.8±2.2	0.001
General) Mean±SD	69.46±0.1	29.30±1.2	7.54±0	0.001
Pvalue**	0.001	0.001	0.001	-

*:Analysis of variance with duplicate data, **: Independent t-test

In the present study, out of 85 men who participated in the study, 35 (41.2%) had LBP and 50 (58.8%) did not mention LBP. Moreover, out of 25 women in the study, 11 (44%) of them reported LBP and 14 (56%) of them did not reported it. there is no significant relationship between patients' age and the LBP incidence rate (p= 0.80).

The relationship between the type of surgery and LBP incidence rate ,researchers investigated the effect, and results showed candidates complained of LBP almost equally in each type of surgery, and there was no significant relationship between the type of surgery and the incidence of LBP (P-value= 0.12).

Moreover, the relationship between the cause of fracture and LBP incidence rate, researchers investigated the effect, but no significant relationship was found between these two variables (P-value = 0.91).

The relationship between LBP incidence rate and previous hospitalization history s and the results did not indicate a significant relationship between previous hospitalization history and LBP incidence rate (p= 0.35) (Table 5).

Table (5): Comparison of variables of sex, cause of fracture, type of surgery and previous hospitalization with lower-back pain intensity

Group / variable		yes N(%)	no N(%)	Pvalue
Gender	Male	35(41.2)	50(57.8)	0.80
	Female	11(44)	14(56)	
Cause of fracture	does not have	19(44.2)	24(55.8)	0.91
	accident	21(38.9)	33(61.1)	
	Fall	4(50)	4(50)	
	Other	2(40)	3(60)	
Type of surgery	Remove screws and plates	19(46.3)	22(53.7)	0.12
	Knee and meniscus reconstruction, hip and knee joint replacement, ACL repair	13(61.9)	8(38.1)	
	Soft and hard tissue mass and skin rash	6(6.31)	13(68.4)	
	Fracture	7(29.2)	17(70.8)	
	foreign object	1(20)	4(80)	
Previous hospitalization	no	24(38.1)	39(61.9)	0.35
	yes	22(46.8)	25(53.2)	

The mean ± SD of the age of patients with and without LBP was 38.15 ±12.94 and 35.84 ±12.95 years, respectively. Results showed no significant relationship between the age of patients and the LBP incidence rate (p= 0.35).

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The mean± SD of surgery duration in all patients with and without LBP was 103.04 ± 38.28 and 105± 33.38, respectively. there was no significant relationship between the surgery duration and the LBP incidence rate in the present study (p = 0.77).
The mean± SD of BMI of patients with LBP and without LBP was 26.44 ± 2.24 and 26.13 ± 1.94, but there was no significant difference between the LBP incidence and BMI (Table 6).

Table (6): Comparison of surgery duration, age and BMI variables with lower-back pain

Group / variable		**Low back pain yes N(%)**	**Low back pain no N(%)**	**Pvalue**
Gender	Male	35(41.2)	50(57.8)	0.80
	Female	11(44)	14(56)	
Cause of fracture	does not have	19(44.2)	24(55.8)	0.91
	accident	21(38.9)	33(61.1)	
	Fall	4(50)	4(50)	
	Other	2(40)	3(60)	
Type of surgery	Remove screws and plates	19(46.3)	22(53.7)	0.12
	Knee and meniscus reconstruction, hip and knee joint replacement, ACL repair	13(61.9)	8(38.1)	
	Soft and hard tissue mass and skin rash	6(6.31)	13(68.4)	
	Fracture	7(29.2)	17(70.8)	
	foreign object	1(20)	4(80)	
Previous hospitalization	no	24(38.1)	39(61.9)	0.35
	yes	**22(46.8)**	**25(53.2)**	

Discussion

Considering the need to investigate the LBP risk factors in both general anesthesia and spinal anesthesia methods, all factors that were considered as the causes of LBP in previous studies were also investigated in the present study.
Compared to general anesthesia, spinal anesthesia reduces the risk of many complications such as deep vein thrombosis, intraoperative bleeding, respiratory problems, and the need for postoperative analgesia (4, 12). However, despite the high advantages of spinal anesthesia method, patients' postoperative complaints, including LBP, have always led researchers to pay attention its incidence rate and risk factors.
Considering the same underlying factors such as age, BMI, sex, intraoperative position and duration and type of surgery in both groups and the difference in LBP intensity and incidence in patients in the present study, it can be stated that only spinal anesthesia method can cause LBP.

Inconsistent with the Older studies of Dahl et al. (13) and Elman et al. (14) who reported the same LBP incidence rate after general anesthesia and spinal anesthesia. who questioned the relationship between spinal anesthesia and LBP incidence, the present study showed a significant difference between spinal anesthesia (58.2%) and general anesthesia (25.5%) in terms of LBP incidence rate.
Consistent with the present study, other studies, such as Joudi et al. (1) and Haghighi et al. (15)showed that LBP incidence was higher after spinal anesthesia. Edomwonyi (16)classified LBP as a part of postoperative transient neurologic syndrome (TNS). They investigated 120 patients and reported TNS in 10%, and LBP in 6.6% of cases, respectively. In the present study, out of all patients, 64 (41.8%) complained of LBP as a postoperative complication and 64 cases (58.2%) did not report it.
Sarma et al. (17) and CA Wong (18) also reported that the incidence of postoperative LBP was 2 to 26%. Forozeshfard et al. (7) also found that 56% of

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patients complained of LBP five days after surgery, which was 12.3% at the third-month follow-up. However, patients who had previously complained of LBP were not excluded from this study. In the present study, all patients were asked about LBP intensity one day after surgery and 66 (60%) did not complain of LBP. Moreover, 21 (19.1%), 13 (11.8%), and 10 patients (9.1%) reported mild, moderate, and severe LBP, respectively. This rate was measured separately in spinal anesthesia and general anesthesia groups, which was significantly higher in spinal anesthesia group. In one study, patients' satisfaction with spinal anesthesia was evaluated and results showed that 4% of patients were dissatisfied with spinal anesthesia, and 29% of them attributed their dissatisfaction to postoperative LBP and 26% of them stated that they were not willing to undergo spinal anesthesia again in later surgeries (19).

A study by Sprotte et al. (20) reported that prevalence of headache following spinal anesthesia was less than 1%. In our study, out of 55 patients in the spinal anesthesia group, 21 (38.2%) reported postoperative headache and 17 (30.9%) had postoperative headache in the general anesthesia group, which was not significantly different.

Studies on headache following spinal anesthesia mainly investigated headache depending on the type of needle tip (pencil-point, ball-pen,etc.) and the needle size was important in these studies (21). In our study, attempts were made to match the spinal needle type so that it does not have a confounding effect on the outcome of postoperative headache.

Taking a history of many patients is clearly influential on the incidence of headaches and LBP, and LBP is aggravated as a result of prolonged supine position or other positions in some patients who have a history of lumbar disc problems (4). patients with history of lumbar disc problems were excluded from the present study and the two groups were matched for the patient positioning during anesthesia and surgery (P = 0.17).

Also, the effect of factors such as sex, age, BMI, duration and type of surgery and the cause of fracture on LBP was investigated. Results showed no significant relationship between these factors and LBP.

One of the factors that affect LBP incidence after surgery is type and duration of surgery (22). The mean ± SD of duration of surgery in the present study was 104.18 ± 35.35 minutes, and the possible surgery duration range was 60 to 180 minutes, which was not significantly different between spinal anesthesia and general anesthesia groups. Investigating the relationship between the duration of surgery and LBP incidence showed no significant relationship between the duration of surgery and the incidence of LBP incidence and it seems that the duration of surgery is not a variable affecting patients' LBP incidence. Investigating the effect of the type of surgery on LBP incidence also showed that the type of surgery is not effective on the LBP incidence after surgery.

It is worth mentioning that most of the studies pursued other goals than LBP incidence and did not specifically investigate LBP risk factors. Also, some studies did not exclude confounding factors that cause recurrent LBP, such as a previous history of LBP, high BMI, or multiple needling attempts.

Therefore, our study can be unique and significant in the sense that it addresses this issue specifically by eliminating confounding factors. Attempts were also made to observe the use of the same needle size and anesthesiologists. However, patients consisted of a group of orthopedic patients who underwent surgeries for fractures, tendon repair, joint replacement, or lower limb masses, which is one of the strengths of the present study.

Conclusion

Results showed that the mean LBP in general anesthesia group is significantly less than spinal anesthesia group one day, one week and one month after surgery. It is recommended that patients first receive necessary explanations about the complications of both types of anesthesia and that patients consciously choose the type of anesthesia.

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