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Risk factors for post-spinal anesthesia headache and low back pain after orthopedic lower limb surgery in obese patients in Shohada hospital of Tabriz

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Abstract

Introduction: The various factors affecting the incidence of post-spinal anesthesia low back pain and headache, such as high body mass index (BMI), the anesthesiologist's expertise, and spinal needle gauge, make it impossible to adequately plan preventive measures.

Objectives: This study aimed to determine the risk factors for post-spinal anesthesia headache and low back pain after orthopedic lower limb surgery in obese patients in Shohada hospital of Tabriz, Iran.

Patients and Methods: This descriptive cross-sectional and prospective study was conducted on 200 obese candidates for lower limb surgery under spinal anesthesia in 2019. An anesthesiologist used a 25-gauge needle to induct spinal anesthesia for evaluating the incidence of post-spinal anesthesia headache, low back pain, and their risk factors.

Results: The incidence of post-spinal anesthesia headache in obese participants was 6.5% on the first day, 3.5% in the first week, and 1% in the first month; whereas the incidence of low back pain was 16% on the first day, 9% in the first week, and 3.5% in the first month. Postoperative headache and low back pain exhibited a significant correlation with the history of spinal anesthesia and low back pain; therefore, they were found as the main risk factors for these complications.

Conclusion: This study found lower post-spinal anesthesia headache and low back pain than in previous studies, which decreased further over time. Skilled anesthesiologists are recommended to use a small-gauge needle to induct spinal anesthesia to participants with a history of spinal anesthesia and low back pain.

Keywords: Headache, Low back pain, Spinal anesthesia, Lower limb surgery, Obesity

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Introduction

Numerous outpatient surgeries are performed under spinal anesthesia every day. Any method, no matter how good, will have complications, and spinal anesthesia has two: headache and low back pain (1). Although spinal anesthesia is simple to administer, it has a quick effect and provides good pain control while relaxing the muscles during surgery (2,3). The incidence of post-spinal anesthesia headache ranges from 2% to 32%, whereas the incidence of post-spinal anesthesia low back pain ranges from 5% to 55% (4). The incidence is influenced by a variety of factors, including needle shape and size, patient gender and age, and the number of previous spinal anesthesia inductions (5).

Shohada hospital of Tabriz, which specializes in orthopedic surgeries in northwest Iran, performs many orthopedic surgeries, including lower limb surgeries. The majority of participants have a high body mass index (BMI) and are considered high risk for anesthesia management (6). The purpose of this study is to determine the severity of post-spinal anesthesia headache and low back pain in obese patients and use the findings to develop methods to reduce their occurrence.

Objectives

The consistent needle size, induction by an anesthesiologist, and coverage of various obese orthopedic patients with fractures and arthroscopy and arthroplasty candidates distinguish this study.

Patients and Methods

Study design

This descriptive-prospective study examined 200 class I and II ASA (American Society of Anesthesiology) obese (>30 BMI kg/m^2) patients aged 18-65 years undergoing elective orthopedic lower limb surgery (fracture, arthroscopy, arthroplasty, etc). The sample size was determined based on the average sample size of previous studies. In case of any restrictions on spinal anesthesia induction, the patient was excluded from the study. These included the inability

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Implication for health policy/practice/research/ medical education

An anesthesiologist used a 25-gauge needle to induct spinal anesthesia for evaluating the incidence of post-spinal anesthesia headache, low back pain, and their risk factors in the 200 obese candidates for lower limb surgery under spinal anesthesia. This study found lower post-spinal anesthesia headache and low back pain than in previous studies, which decreased further over time.

to sit and the rejection of spinal anesthesia, any possibility of increased intracranial pressure, local and systemic infections, coagulation disorders, and undergoing over 150 minutes of surgery.

All anesthesia inductions were performed by an anesthesiologist with at least 10 years of experience (anesthesia attendant) using a 3.5-inch 25-gauge NESCO needle. The participants received 5-7 cc/kg normal saline serum half an hour before spinal anesthesia instead of any prodrugs. They were briefed on the anesthesia method and were encouraged to cooperate. For all participants, the midline method on the L3-L4 or L4-L5 levels was used for needle insertion, with a maximum of two anesthesia attempts. If the patient failed, he or she would be excluded from the study. Marcaine (bupivacaine) was the preferred local anesthetic for this procedure, with a slow injection lasting 5 seconds.

To reduce the possibility of a transverse section, the needle's cross-section or level was perpendicular to the dura during insertion. After inserting the needle into the subarachnoid space, it was rotated 90 degrees counterclockwise and a barbotage was used to confirm the tip's position. Following anesthesia, the bed was placed in neutral to prevent the block surface from rising abnormally and to reduce the possibility of saddling. The surface of the sensory block was pinprick tested to ensure it met T10, a good level for this type of operation. The pinprick test was repeated until the block was repaired. If the pain was not relieved by correcting the patient's head position below the block, they were removed from the study and became a general anesthesia candidate, receiving the anesthesia prodrug. All participants were sedated with 1-2 mg doses of midazolam as needed, and their vital signs, heart rate, and arterial oxygen saturation were monitored using standard non-invasive blood pressure, heart rate, and arterial oxygen saturation monitors. If blood pressure fell below 30% of the baseline, 10 mg of ephedrine was prescribed to raise it. Sub-55 bpm bradycardia was treated with 0.6 mg atropine administered intravenously. Participants were asked about their history of low back pain, preoperative headache, and post-spinal anesthesia headache using a specially designed questionnaire. The researcher then asked participants about their headaches and low back pain on a daily, weekly, and monthly basis. These questions were posed to participants via phone calls at one-week to one-month intervals. The participants were briefed on the possibility of spinal anesthesia headache. After ruling out headache-related factors such as migraines, tension-type headaches, and caffeine withdrawal, the pain was attributed to fronto-occipital dura puncturing, which is exacerbated by sitting and relieved by sleeping. It is pulsating and worsens with prostration, and it is thought to be a post-dural puncture headache (PDPH). In the case of chronic therapy-resistant headaches, treatments such as adequate hydration, opioid analgesic administration, and use of the epidural blood patch were required. Low back pain was assessed using the visual analogue scale (VAS) scale (0-100 mm), with a score of 20 representing severe pain and a score of 30 requiring opioid analgesics (50 mg of pethidine with repeated administrations if necessary to control the vital signs).

Statistical analysis

The collected data were inserted into SPSS version 23, and the preliminary information was presented using descriptive statistics (frequency, percentage, mean, and standard deviation). The chi-square and Fisher's exact tests were used for inferential statistical analysis. The significance level was decided to be $P<0.05$.

Results

There were 175 men and 25 women among the 200 participants of this study. The orthopedic surgeries included 78 cases of fixation of lower limb fractures, 26 cases of knee arthroscopy, 4 cases of arthroplasty, and 72 cases of femoral cincher implantation, tibia plating, and dynamic hip screw placement. There were 191 surgeries that took less than 90 minutes and 9 that took longer. In total, 25 participants reported a history of low back pain, 34 a history of normal headache, and 64 a history of spinal anesthesia. Thirteen participants had a normal preoperative headache, 18 had preoperative low back pain, and 13 had PDPH one day after surgery. Furthermore, 7 participants developed PDPH one week after surgery, and 2 developed it one month later. There were 32 cases of low back pain one day after surgery, 18 cases one week after surgery, and only 7 cases one month after surgery. There was no statistically significant change in the history of participants with preoperative low back pain (P=0.598). Analyzing the relationship between a history of spinal anesthesia and preoperative low back pain revealed that 15 out of 64 participants with a history of spinal anesthesia and only 3 out of 136 participants without a history of spinal anesthesia reported low back pain, indicating a statistically significant difference ($P=0.009$). The Fisher's exact test showed a statistically significant difference between the history of spinal anesthesia and preoperative headache, since 12 out of the 64 participants undergoing spinal anesthesia had a preoperative headache and only 1 out of the other 136 participants reported preoperative headache ($P=0.005$).

Another comparison made between the history of

headache and postoperative headache showed that all participants with a history of preoperative pain later experienced postoperative pain, which reveals a statistically significant difference ($P=0.012$). There was no statistically significant difference between preoperative headache and headache after one day, one week, or one month ($P=0.703$). A significant difference ($P=0.033$) was found among participants with a history of low back pain one day, one week, and one month after surgery. There was no statistically significant difference in headache and low back pain one day, one week, or one month after surgery when the type of surgery was compared ($P=0.552$). When the duration of surgery and low back pain one day after surgery were compared, 29 of the 191 cases with less than 90 minutes of surgery had low back pain. Although only three of the nine people who had surgery lasting more than 90 minutes were in pain, the difference was statistically insignificant ($P=0.256$).

The correlation analysis between duration of operation and low back pain one week after surgery revealed that pain was experienced by 16 of the 191 participants with sub-90 minute operations and 2 of the 9 participants with above-90 minute operations. After one month, the number of cases dropped to 7 in the 91-person group and 0 in the 9-person group.

Analyzing headaches one day after surgery revealed that 13 of the 191 participants in the sub-90 minute group had a headache, whereas none of the 9 participants in the over-90 minute group had pain. One week after surgery, 7 of the 191 participants in the sub-90 minute group reported headaches, whereas none of the 9 participants in the above-90 minute group reported headaches.

After one month, two participants in the sub-90-minute group experienced headaches, while none in the above-90-minute group did. There was no statistically significant difference between the groups when these cases were compared. However, there was a statistically significant gender difference among participants with headaches and low back pain ($P=0.001$).

Discussion

This study compared various variables such as surgical procedure type and duration, gender, history of headache or low back pain, history of spinal anesthesia, and time factors. The main variables, namely low back pain and headache, were prevalent the day after surgery, but decreased over time (one day to one month) (7, 8). Several factors influenced the results of this study (e.g. history of low back pain, headache, and spinal anesthesia). Headache and low back pain appear to be associated with

Table 1. Postoperative headache information

Variable	QTY (%)	Preoperative headache	Postoperative headache		
			One day after surgery	One week after surgery	One month after surgery
Age (y)	175 (87.5%)	12 (18.8%)	13 (7.4%)	90 (74%)	2 (1%)
Female	25 (12.5%)		0 (0%)	0 (0%)	0 (0%)
History of spinal anesthesia	64 (32%)		13 (6.5%)	7 (3.5%)	2 (1%)
History of headache	13 (6.5%)		5 (7.3%)	3 (4.7%)	0 (0%)
Lower limb fracture	78 (39%)		3 (8.8%)	0 (0%)	0 (0%)
Knee arthroscopy	46 (23%)		2 (15.4%)	3 (42.9%)	0 (0%)
Arthroplasty	4 (2%)		4 (30.8%)	1 (14.3%)	0 (0%)
Other operations	72 (36%)		1 (7.7%)	3 (42.9%)	2 (1%)
Sub-90 minute operation	191 (95.5%)		6 (42.2%)	7 (3.7%)	2 (1%)
Above-90 minute operation	9 (4.5%)		0 (0%)	0 (0%)	0 (0%)

Table 2. Postoperative low back pain information

Variable	QTY (%)	Preoperative low back pain	Postoperative low back pain		
			One day after surgery	One week after surgery	One month after surgery
Age (y)	175 (87.5%)		27 (84.4%)	13 (72.2%)	4 (57.1%)
Female	25 (12.5%)		5 (15.6%)	13 (72.2%)	4 (57.1%)
History of spinal anesthesia	64 (32%)	15 (23.42%)	32 (16%)	18 (9%)	7 (3.5%)
History of low back pain	25 (12.5%)	5 (20%)	7 (10.9%)	3 (4.7%)	2 (3.1%)
Lower limb fracture	78 (39%)		4 (16%)	3 (12%)	2 (8%)
Knee arthroscopy	46 (23%)		7 (9%)	3 (3.8%)	2 (2.6%)
Arthroplasty	4 (2%)		10 (21.8%)	8 (17.4%)	2 (4.3%)
Other operations	72 (36%)		2 (50%)	1 (25%)	1 (25%)
Sub-90 minute operation	191 (95.5%)		13 (18.12%)	6 (8.3%)	7 (3.7%)
Above-90 minute operation	9 (4.5%)		29 (0%)	2 (22.2%)	0 (0%)

a history of spinal anesthesia (9). There was a statistically significant correlation between previous low back pain and postoperative back pain, but not with a headache. This study showed a significant correlation between gender and postoperative low back pain, which did not apply to headaches. The type of operation had less of an effect on headache and low back pain, but an intriguingly greater effect in operations, especially arthroscopy. Although the duration of the operation was investigated as an important headache and low back pain variable, no statistically significant difference was found (10). Meanwhile, the study was unable to demonstrate the effect of inserting an epidural needle on low back pain during a painless delivery. The effect of using 2% chloroprocaine on calcium absorption was mentioned, as was the fact that calcium absorption and hypocalcemia would cause para-spinal muscle spasms (11, 12).

The incidence of headache and low back pain is clearly affected by obtaining the description of many patients. In some cases, prolonged sleeping on the back (supine) or specific positions that increase lordosis can aggravate the problem in patients with underlying lumbar disk disease (13). The majority of postoperative spinal anesthesia is related to the occurrence of postoperative low back pain. Low back pain occurred in 16%, 9%, and 35% of patients one day, one week, and one month after surgery, respectively, lower than in the previous studies (14). It should be noted that the overall prevalence of preoperative low back pain was 27.5%, which may have affected some participants. Many studies have shown that needle size is a major risk factor for low back pain (15).

Another cause of postoperative low back pain is the duration of the operation. The duration of immobility and position of the patient during spinal anesthesia are important factors in low back pain, and even the type and shape of the needle have a minor effect on postoperative low back pain. Repeated spinal puncture attempts may cause low back pain. However, as previously stated, more than two attempts resulted in exclusion from the study (16). The majority of operations lasted less than 90 minutes, with only nine exceeding that time limit. Despite the low ratio, the sub-90-minute group experienced more cases of low back pain (191 versus 9 participants). Another important factor in low back pain appears to be the type of operation. Given the study's sample size, a larger research sample could produce better results (17).

The literature on post-spinal anesthesia headache has mainly investigated headaches based on the medium (needle tips, including pencil point, ball-point needle, etc). In these studies, needle size was important. The use of single needle size for all cases, induction by an anesthesiologist, and analysis of orthopedic surgeries were all advantages of this study (18).

Headache and low back pain are caused by a variety of factors, only some of which were investigated in this study. Factors such as hemodynamic disorder, post-anesthesia urinary retention, and nausea and vomiting were omitted due to time constraints (19).

Conclusion

This study found lower post-spinal anesthesia headache and low back pain than in previous studies, which decreased further over time. Skilled anesthesiologists are recommended to use a small-gauge needle to induct spinal anesthesia to participants with a history of spinal anesthesia and low back pain.

Limitations of the study

This study was conducted in a single center with the participation of patients who are candidates for orthopedic surgery. These two cases were the limitations of our study and it is recommended that these limitations be solved in future studies.

Authors' contribution

Conceptualization; AM and NA, Methodology; AM, Validation; NA, Formal Analysis; NA, Investigation; AM and NA, Resources; AM and NA, Data Curation; AM and NA, Writing—Original Draft Preparation; AM and NA, Writing—Review and Editing; AM and NA, Visualization; NA, Supervision; NA, Project Administration; NA, Funding Acquisition; NA.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical issues

The research conducted in accordance with the tenets of the Declaration of Helsinki. The Ethics Committee of Tabriz University of Medical Sciences approved this study (IR.TBZMED.REC.1400.820). Ethical issues (including plagiarism, data fabrication, double publication) have been completely observed by the authors.

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