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Research Article

Effect of Bupivacaine Infiltration in the Track of the Spinal Needle on Back Pain for Elective Caesarean Section Under Spinal Anesthesia

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Abstract

Background: Back pain is one of the reasons for the patient's refusal of spinal anesthesia. ***Objective***: To evaluate the efficacy of bupivacaine infiltration at the site of a spinal needle injection in reducing post-spinal back pain and using analgesics for post-spinal back pain. ***Methods***: From July to August 2021, a prospective study was conducted on 60 patients getting spinal anesthesia for elective cesarean sections at Erbil Maternity Teaching Hospital. Group A (got bupivacaine) at the spinal needle track; group B (did not receive bupivacaine). We use a visual analog scale to assess pain severity. ***Results***: In the first and third postoperative days, group A experienced significantly less post-spinal back discomfort (1.87 and 0.33) than group B (3.90 and 1.77). Furthermore, group A used much fewer analgesics on the first postoperative day (0.20); on the third postoperative day, they used none, in contrast to group B's 1.07 and 0.30. ***Conclusions***: Bupivacaine infiltration along the spinal needle track is an excellent approach for reducing post-spinal back pain and the usage of analgesics.

Keywords: Bupivacaine, Back pain, Cesarean section, Spinal anesthesia, Spinal needle track.

تأثير تسريب بوبيفاكايين في مسار الإبرة الشوكية على آلام الظهر للعملية القيصرية الاختيارية تحت التخدير الشوكي

الخلاصة

الخلفية: غالبا ما يكون ألم الظهر أحد أسباب رفض المريض للتخدير الشوكي. **الهدف**: تقييم فعالية البوبيفاكايين في موقع إبرة التخدير الشوكي في الحد من آلام الظهر، وكذلك استخدام المسكنات لآلام الظهر بعد التخدير الشوكي. **الطريقة**: من يوليو إلى أغسطس 2021، أجريت دراسة مستقبلية على 60 مريضا خضعوا للتخدير الشوكي للعمليات القيصرية الاختيارية في مستشفى الولادة التعليمي في أربيل التعليمي. المجموعة أ (حصلت على بوبيفاكايين) في مسار إبرة التخدير الشوكي. المجموعة ب (لم تتلق بوبيفاكايين). نستخدم مقياسا تناظريا مرئيا لتقييم شدة الألم. **النتائج**: في اليومين الأول والثالث بعد الجراحة، شهدت المجموعة أ انزعاجا أقل بسبب الام الظهر بعد التحخدير الشوكي (1.87 و 0.33) من المجموعة ب (3.90 و 1.77). علاوة على ذلك، استخدمت المجموعة A عددا أقل بكثير من المسكنات في اليوم الأول بعد الجراحة (0.20) ؛ في اليوم الثالث بعد الجراحة، لم يستخدموا أي شيء، على عكس المجموعة B 1.07 و 0.30. **الاستنتاجات**: تسريب Bupivacaine على طول مسار إبرة التخدير الشوكي هو نهج ممتاز للحد من آلام الظهر بعد التخدير الشوكي واستخدام المسكنات.

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INTRODUCTION

A tiny spinal needle is used to inject local anesthetics into the spinal canal (subarachnoid space). This is a simple, effective, and predictable method of anesthesia that is commonly used for surgery below the umbilicus, such as cesarean sections and lower extremities surgeries [1]. The track of the spinal needle includes the layers of the patient's back that are entered to give spinal anesthesia. The midline approach entails passing through the following layers from outer to inner: skin, subcutaneous fat, supraspinous ligament, interspinous ligament, ligamentum flavum, dura mater, subdural space, arachnoid mater, and finally the subarachnoid space [2]. Trauma from the spinal needle, injury to the surrounding layers, nerve root damage in the cauda equina, or bone trauma resulting in localized bleeding could be the primary reasons for back pain after spinal anesthesia. Additional causes of back pain may include lumbar lordosis loss due to paraspinal muscular relaxation and spinal vertebral column immobility

caused by spinal anesthesia [3]. The sedated patient's joint capsules and paraspinal ligaments may tear or stretch while being positioned, particularly in the lithotomy position. Furthermore, moving the pelvis in any way can exacerbate the flattening of the lumbar vertebrae and increase strain and tension on the lumbosacral ligament, leading to back pain following spinal anesthesia [3-5]. Back discomfort is most common in people who have a history of back pain or who have had many spinal injections. Additional risk factors include lithotomy posture, obesity (BMI ≥ 32 kg/m²), and protracted surgical procedures (immobilization) lasting more than 2.5 hours [3,4]. Local anesthetic medicines cause nerve blocks by blocking action potentials in nerve cells. Numerous factors influence nerve block progression, including nerve fiber conduction velocity, myelination extent, and the diameter of the nerve affected by local anesthetics. In clinical practice, loss of nerve function is indicated by the loss of pain sensation, which is then followed by the loss of temperature sensation, touch sensation, proprioception, and muscle tone [6,7]. Bupivacaine is a potent local anesthetic (amide class) used for nerve blocks, local infiltration, and spinal and epidural anesthesia. It is available in several concentrations (0.25%, 0.5%, and 0.75%) [8]. Bupivacaine is not recommended for intravenous regional anesthesia in people who are hypersensitive to the drug or its ingredients or who are allergic to other amide-type local anesthetics. Bupivacaine at a dose of 0.75% is not recommended for spinal anesthesia or obstetric paracervical block [9]. The visual analog scale (VAS) is a measurement tool used in surveys. It is used to evaluate subjective features or attitudes that cannot be directly measured. Participants are asked to indicate their level of agreement with a statement by marking a continuous line between two endpoints [10]. The purpose of this study was to evaluate the efficiency of bupivacaine injected at the site of a spinal anesthetic needle in relieving back pain, as well as the use of analgesics for post-spinal back pain.

METHODS

Study design

This is a prospective randomized comparative study that was performed in the Erbil Maternity Hospital in July and August 2021.

Inclusion criteria

Females aged between 18-45 years, weight 70-100 kg, height 150-170 cm, and have class II (ASA II) American Society of Anesthesiology Classification were eligible for enrollment.

Exclusion criteria

Patient refusal, history of chronic back pain other than pregnancy, history of lumber spine surgery, patient already on analgesia, patient with psychological problems, and patients who received spinal anesthesia by more than 2 attempts of spinal needle insertion.

Patient selection and intervention

This study enrolled 60 patients receiving spinal anesthesia for the elective cesarean section. They were divided equally and randomly into two groups; one received the anesthesia with a novel technique, which was with the infiltration group, and the other 30 participants got classical spinal anesthesia (without the infiltration group). The patient lies down on an operating table while two 20-gauge intravenous cannulas are inserted, intravenous fluids are started with crystalloids, and vital signs such as heart rate, blood pressure, and peripheral capillary oxygen saturation (SpO2) are monitored. After that the patient sat down on the operating table, back exposed, sterile gloves used, sterilization done with betadine solution circularly from inner to the outer side, bupivacaine heavy 0.5% (20 mg/4ml), aspirated to 5 ml syringe, midline approach, appropriate vertebral interspace chosen using tuffier's line, sterile gauze used to cleanse skin at the site of needle insertion, 25 gauge needle used, 12.5 mg of bupivacaine (2.5 ml) injected into the subarachnoid space, then the needle withdrawn about 10 millimeters and the remaining 7.5 mg of bupivacaine (1.5 ml) injected at the track of a spinal needle in infiltration group with a negative aspiration to prevent intravascular injection, while the remaining 1.5 ml will be discarded in without infiltration group, then the patient lies down and operation started after testing the absence of pain in the lower abdomen. Ephedrine and atropine were used to manage hypotension and bradycardia, respectively. If the patient experienced spinal anesthesia after three attempts, it is considered a dropped case. All patients received the same medication as part of the post-operative treatment regime, which included pain medication, antibiotics, and anticoagulants.

Ethical consideration

The study protocol was approved by the scientific council of the Arab Board for Medical Specialties (Anaesthesia and Intensive Care), and written consent was taken from all participants.

Statistical analysis

Data entered and analyzed using the statistical package for social sciences version 28. Descriptive analyses were expressed as frequencies and percentages, and the inferential results were compared between the subjects with different variables using a statistical significance level of p-value < 0.05. The mean differences between the two study groups were analyzed by t-test.

RESULTS

This study included 60 pregnant women who had spinal anesthesia. There was no significant mean difference between groups A and B in terms of age, weight and height, BMI, and number of attempts. A t-test was used in all cases, and the p-values were more than 0.05. Table 1 shows that there was a statistically significant difference in the usage of analgesics and the VAS score for back pain between the two groups on the first and third postoperative days.

Table 1: Comparison of use of analgesics and VAS for back pain between groups A and B on first and third postoperative days (n=30 in each group)

Variables	Groups	Value	*p*-value
Analgesic for back pain on 1st day	A	0.20±0.55	0.001
	B	1.07±1.11	
Analgesic for back pain on 3rd day	A	0.00±0.00	0.01
	B	0.30±0.59	
VAS of back pain on 1st day	A	1.87±1.16	0.001
	B	3.90±1.82	
VAS of back pain on 3rd day	A	0.33±0.47	0.001
	B	1.77±1.22	

Values are presented as mean±SD. Group A: received bupivacaine; group B: do not receive bupivacaine.

Patients in the A group used fewer analgesics on average than those in the B group throughout the first day. Similarly, the usage of analgesics for back pain on the third day differed between the two groups; group A patients did not use any analgesics, but group B patients used them significantly more than group A. Similarly, during the first day following surgery, patients in group A reported much lower back discomfort (according to the visual analog scale) than patients in group B. On the third day after surgery compared to the first day, patients in group A still experienced less discomfort than those in group B. According to Figure 1, 26 patients in group A did not take any analgesics on the first day; only two cases needed one painkiller, and two patients used two to ease back pain. In contrast, only 13 patients in group B did not use analgesics, although the number of cases who used one, two, or three analgesics was 6, 7, and 4, respectively.

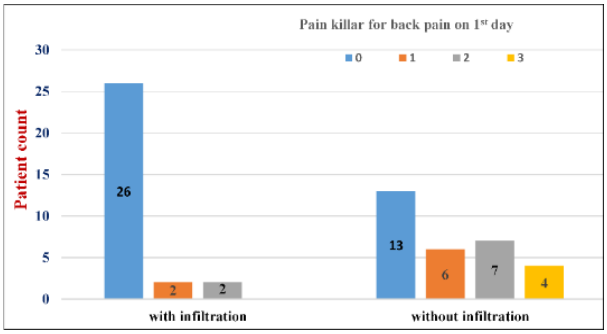

Figure 1: The use of painkillers for back pain among A and B groups on the first postoperative day.

During the third postoperative day, none of the patients in group A received analgesics for back pain, whereas 23 patients in group B did not, but 5 patients took one analgesic, and 2 patients took two (Figure 2).

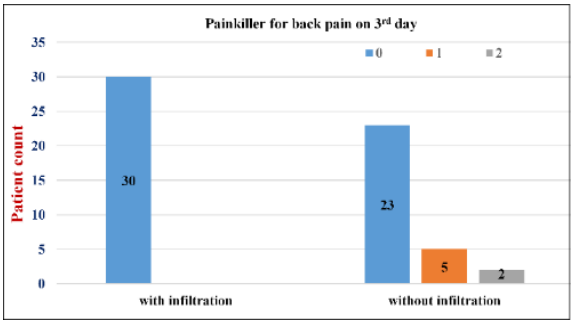

Figure 2: The use of painkillers for back pain among group A and group B on the third postoperative day.

On the first postoperative day, four patients in group A had 0 VAS for back pain, eight had VAS 1, VAS 2, or VAS 3, and only two had VAS 4, but none had VAS 5 or 6. Meanwhile, in group B, two instances reported VAS of zero, one, or three; four cases reported VAS of two, six; three cases had VAS of four; and the majority were scored at five. On the third postoperative day, group B patients still had a greater VAS for back pain than group B. The bulk of group A patients (20) had zero ratings, with only 10 having one. In contrast, only six patients in group B had a zero score, eight had a one, three had a two on the VAS for back pain, and the majority (13 cases) had a three. Table 2 shows that 22 of the 30 patients in group A received anesthesia on the first attempt, whereas 24 of the 30 patients in group B received anesthesia on the first attempt. On the first and third postoperative days, group A had a considerably lower mean VAS than group B.

Table 2: Comparison of VAS for back pain between study groups on the first attempt of spinal anesthesia during the first and third postoperative days

VAS for back pain	Groups	n	Value	*p*-value
First day	A	22	2.18±0.95	0.002
	B	24	3.67±1.97	
Third day	A	22	0.36±0.49	0.001
	B	24	1.75±1.18	

Values are presented as mean±SD. Group A: received bupivacaine; group B: do not receive bupivacaine.

Similarly, Table 3 shows that the average VAS for back pain for the second attempt at spinal anesthesia (eight instances with infiltration) was significantly lower than that of the six cases in group B on both the first and third postoperative days.

Table 3: Comparison of VAS for back pain between study groups on the second attempt of spinal anesthesia during the first and third postoperative days

VAS for back pain	Groups	n	Value	*p*-value
First day	A	8	1.00±1.30	0.001
	B	6	4.83±0.40	
Third day	A	8	0.25±0.46	0.014
	B	6	1.83±1.47	

Values are presented as mean±SD. Group A: received bupivacaine; group B: do not receive bupivacaine.

DISCUSSION

In clinical practice, back pain is the most common problem and the cause of patients' refusal of spinal anesthesia, especially those undergoing cesarean sections [11]. Trials aimed at reducing back pain are crucial for enhancing patient satisfaction and improving their quality of life [12,13]. This is particularly important for pregnant women, as this study reveals a higher prevalence of back pain compared to other studies that include all patients receiving spinal anesthesia, regardless of their age, height, weight, or type of operation. This study reported a 90% prevalence of back pain, surpassing the 40.5% reported by Zeleke *et al*. [14] in an Ethiopian study following spinal anesthesia. However, Lee *et al*. [5] revealed that the incidence of back pain was about 36% in the median approach for spinal anesthesia versus 16% in the paramedian approach. Another study by Singh *et al*. [15] found that the median approach of spinal anesthesia had a 20% prevalence of back pain, whereas the paramedian approach only had a 4% prevalence. Additionally, in the Dadkhah *et al*. [16] study, the incidence of post-spinal back pain was about 21% in the midline approach. Back pain has other consequences, like difficulty breastfeeding, difficulty with early mobilization, and a delayed return to functional life. Back pain and dissatisfaction are the factors that make patients refuse spinal anesthesia in subsequent operations [11]. On the first postoperative day of this novel technique, patients who received bupivacaine infiltration (group A) at the track of the spinal needle developed less back pain. In terms of patient numbers and pain intensity, 26 patients experienced back pain, with only 2 experiencing moderate pain with a maximum VAS of 4, and 24 experiencing mild back pain. On the other hand, 28 patients experienced back pain, with 20 experiencing moderate intensity with a maximum VAS of 6. On the third post-operative day, the number of patients experiencing back pain and its intensity were also significant; only 10 patients in group A remained in very mild pain, with a maximum intensity of VAS 1, while 24 patients in group B continued to experience pain, with a maximum intensity of VAS 3. Also, regarding the use of analgesics (paracetamol) on the first postoperative day in group A, only 4 patients received analgesics for back pain, while in the other group, 17 patients received analgesics to relieve pain. Regarding the use of analgesics on the third postoperative day, none of the patients in group A received them, while seven patients in group B received them for back pain. This technique proved effective in relieving back pain in patients who underwent spinal anesthesia on their second attempt, likely due to the spread of infiltrated bupivacaine around the spinal needle track. Rafique *et al*. [17] investigated what causes post-spinal backache, how to prevent it, and how to treat it. They found that acute post-spinal backache is a condition that usually goes away on its own within 7 days, even without any treatment. However, it is important to tell it apart from more serious neurological problems like epidural abscess or epidural hematoma, which can have similar symptoms. To ensure that the patient does not suffer from any serious underlying conditions, it is essential to rule out any significant causes of back pain before starting conservative management. Inform patients about the reversibility of this condition. Treatment of this condition may include mild analgesics like paracetamol, topical NSAID ointments, and hot and cold massages. The use of these treatments is to alleviate the pain and discomfort associated with the condition. We also recommend following up with patients to ensure they do not have persistent back pain that necessitates further examination and treatments [17]. Therefore, injecting bupivacaine into the spinal needle track is a smart management strategy for post-spinal back pain, as it reduces pain, reduces the need for medication, and increases patient satisfaction with spinal anesthesia. If severe pain occurs, we will take serious steps to rule out abscess formation and hematoma.

Study limitations

It is important to consider the limitations of this study, which include the small sample size, the restriction on cases presented to the Erbil Maternity Teaching Hospital, and the fact that most of our patients are afraid of spinal anesthesia and refuse it. Despite the study's focus on post-spinal anesthesia at the Erbil Maternity Hospital, it's important to note that the three-day monitoring period may not accurately reflect the long-term effects of this procedure, potentially leading to post-spinal back pain in these patients. Most study participants were illiterate, making the visual analog scale used to assess pain severity difficult to understand. Furthermore, because the pain assessment was conducted over the phone, we attempted to explain the pain score using examples and how it interfered with their ability to perform their daily activities, such as taking care of their baby. Future studies should consider a larger sample size due to the limited number of participants and follow-up for a longer duration.

Conclusion

This study confirms that bupivacaine infiltration at the track of the spinal needle is an effective technique that decreases post-spinal back pain and the use of analgesics to relieve discomfort.

Recommendation

We recommend this technique be used by all anesthesiologists for spinal anesthesia in all types of operations, especially in cesarean sections, because it’s a safe, easily learned, applicable, and cost-effective technique.

Conflict of interests

No conflict of interest was declared by the authors.

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Data sharing statement

Supplementary data can be shared with the corresponding author upon reasonable request.

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