Rev Bras Anestesiol. 2014;64(3):173–176

REVISTA BRASILEIRA DE ANESTESIOLOGIA

Official Publication of the Brazilian Society of Anesthesiology
www.sba.com.br

SCIENTIFIC ARTICLE

Comparison of the effects and complications of unilateral spinal anesthesia versus standard spinal anesthesia in lower-limb orthopedic surgery

Seyyed Mostafa Moosavi Tekye, Mohammad Alipour*

Department of Anesthesiology, Mashhad University of Medical Sciences, Mashhad, Iran

Received 15 April 2013; accepted 10 June 2013
Available online 25 October 2013

KEYWORDS
Spinal anesthesia;
Unilateral;
Bupivacaine;
Lower limb

Abstract
Introduction: A restricted sympathetic block during spinal anesthesia may minimize hemodynamic changes. This prospective randomized study compared unilateral and bilateral spinal anesthesia with respect to the intra- and postoperative advantages and complications of each technique.
Material and methods: Spinal anesthesia was induced with 0.5% hyperbaric bupivacaine and a 25-G Quincke needle (Dr. J) in two groups of patients with physical status ASA I–II who had been admitted for orthopedic surgeries. In group A, dural puncture was performed with the patient in a seated position using 2.5 cm^3 of hyperbaric bupivacaine. Each patient was then placed in the supine position.

In group B, dural puncture was performed with the patient in the lateral decubitus position with 1.5 cm^3 of hyperbaric bupivacaine. The lower limb was the target limb. The speed of injection was 1 mL/30 s, and the duration of time spent in the lateral decubitus position was 20 min.
Results: The demographic data were similar in both groups. The time to the onset of the sensory and motor block was significantly shorter in group A ($p = 0.00$). The duration of motor and sensory block was shorter in group B ($p < 0.05$).

The success rate for unilateral spinal anesthesia in group B was 94.45%. In two patients, the spinal block spread to the non-dependent side. The incidence of complications (nausea, headache, and hypotension) was lower in group B ($p = 0.02$).
Conclusion: When unilateral spinal anesthesia was performed using a low-dose, low-volume and low-flow injection technique, it provides adequate sensory-motor block and helps to achieve stable hemodynamic parameters during orthopedic surgery on a lower limb. Patients were more satisfied with this technique as opposed to the conventional approach. Furthermore, this technique avoids unnecessary paralysis on the non-operated side.

* Corresponding author.
E-mail: Alipourm@mums.ac.ir (M. Alipour).

0104-0014 http://dx.doi.org/10.1016/j.bjane.2013.06.014

Introduction

The patients who undergo orthopedic surgery on the lower limb differ in terms of age as well as the type of surgery performed. Regional anesthesia, especially spinal anesthesia, is beneficial for most of these patients. Over the past few years, bupivacaine has been used routinely for epidural and spinal anesthesia.[1,2] Unilateral and bilateral spinal anesthesia require different volumes and doses of bupivacaine.[3]

Unilateral spinal anesthesia is used during most surgical procedures performed on the lower limbs.[4] There are many benefits to this technique including fewer hemodynamic changes,[5] less urinary retention, more satisfied patients, better motility during recovery and the restriction of selective nerve block to the relevant limb.[6]

Several factors are required for successful unilateral spinal anesthesia, including: the type of needle and its bevel direction, the speed of injection,[7] volume, baricity, the concentration of local anesthesia as well as the position of the patient on the operating table.[8]

To comprehensively investigate the benefits of unilateral as compared with bilateral spinal anesthesia, we evaluated the effects on sufficient sensory and motor block, optimum analgesia, hemodynamic changes, nausea, vomiting and headache.

Materials and methods

The patients were divided in two randomized groups of 36 patients: A and B.

In group A, standard spinal anesthesia was used on even days. In group B, unilateral spinal anesthesia was used on odd days. Patient age ranged from 18 to 50 years. The patients were in ASA class I or II. The duration of Nil per os (NPO) time and the sedation regimen were the same in both groups. Any patient who had a history of cardiovascular disease, hypertension, neuropathy, addiction, or smocking was excluded from the study. Patients who could not be placed in a lateral position (e.g., due to a pelvis fracture) were also excluded from the study, as were patients who required general anesthesia during surgery or a surgery requiring over 2 h.

Ethical approval for this study (protocol number: 891001) was provided by the Mashhad University ethics committee, Mashhad, Iran (Chairperson Dr. Tavakkol Afshar) on 18 June 2011. Informed consent was obtained from each patient to ensure that he or she understood that the technique used for spinal anesthesia would be modified.

An IV cannula was inserted, then a 10 mL/kg intravenous infusion of lactated Ringer's solution was administered over 20 min. All patients underwent standard monitoring, including electrocardiography, non-invasive blood-pressure measurements and pulsoximetry.

In group A, spinal anesthesia was performed with the patient in the sitting position at the L3–L4 interspace using a 25-G Quincke spinal needle (Dr. J) in sterile condition. Once intrathecal placement had been confirmed, 2.5 mL of hyperbaric bupivacaine 0.5% was injected. The patient was then placed in the supine position.

In group B, the patients were placed in the lateral decubitus position with the target limb in the lower position.

Table 1 Bromage score.

Grade	Criteria	Degree of block
I	Free movement of legs and feet	Nil (0%)
II	Just able to flex knees with free movement of the feet	Partial (33%)
III	Unable to flex knees, but with free movement of the feet	Almost complete (66%)
IV	Unable to move the legs or feet	Complete (100%)

Similar to the technique used for group A, the L3–L4 intervertebral space was detected, then spinal anesthesia was performed with a 25-G Quincke spinal needle. After the confirmation of intrathecal needle placement, 1.5 mL of hyperbaric bupivacaine 0.5% was injected at a speed of 1 cm^3 every 30 s. The bevel of the needle pointed downward during the injection. The patients were kept in the lateral position for 20 min and then placed in the supine position for surgery.

To reduce patient anxiety, 2 mg of midazolam was injected I.V.

Hemodynamic variables such as blood pressure and heart rate were checked before spinal anesthesia and then every 5 min in both groups. If blood pressure decreased by more than 25% of baseline and heart rate dropped to less than 50 beats/min, the patient was considered to suffer from hypotension or bradycardia, respectively.

The hypotension was managed by rapid IV infusion of 250 mL of lactated Ringer's solution. Bradycardia was managed using 0.5–1 mg of intravenously administered atropine. If the hypotensive patient did not respond to treatment, ephedrine 5 mg was injected. A visual analog scale ranging from 0 to 10 was used for evaluation of nausea and the number of vomiting episodes were used to evaluate the extent of patient vomiting.

To check the level of sensory block, a cold object was held in contact with the skin. The Bromage scale was used to check the accuracy of the motor block (see Table 1).[9]

The clinical data including the onset of sensory and motor block, hemodynamic changes, the duration of sensory and motor block and the complications of spinal anesthesia were evaluated using SPSS version 19.6.

In this statistical analysis, a p value of <0.05 was considered as significant.

For statistical analysis of the hemodynamic changes, the paired t-test was used.

The independent t-test was used to compare the efficacy of the sensory and motor blocks. The Mann–Whitney U-test was used to evaluate the level of patient satisfaction.

Results

The demographics of both groups were similar (Table 2).

T10–T12 anesthesia was achieved in both groups. The average time to anesthetic onset in the unilateral group