Optimizing the duration of sensory and motor blocks and the use of substances affecting them in unilateral spinal anesthesia.

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ABSTRACT

Spinal anesthesia is a frequently used method with ease of performance and high success rate in orthopedic surgery of the feet. It is widely used to provide rapid and effective sensory and motor block that alleviates the body's stress response to surgical trauma, reducing intraoperative blood loss, postoperative thromboembolism, and morbidity and mortality compared with general anesthesia [142; 1493-1499-b]. However, spinal anesthesia is the most dangerous of all regional methods [163; 21-24 p]. It, like other methods of anesthesia, is not without disadvantages. Adverse effects include hypotension, bradycardia, nausea and vomiting, postpuncture headache, and urinary retention [55; pp. 906-916]. Hypotension is the most common complication of conventional bilateral spinal anesthesia, occurring in more than 30% of patients [144; pp. 387-393].

The most common complications of spinal anesthesia, especially in the case of a high block, are arterial hypotension and bradycardia caused by the rapid development of sympathetic blockade [67; p. 95-96, 15; p. 95, 31]. Therefore, it means to control the block height in its implementation and avoid high blocks if they are not planned in advance.

A decrease in sympathetic tone leads to a decrease in total peripheral vascular resistance (TPVR). In addition, in cases where sympathetic stimulation of the heart is limited, heart rate and stroke volume are reduced due to a decrease in myocardial contractility [96], [5]. According to the literature, stable depression of hemodynamics varies from 15 to 46% [136], [134]. In connection with the above, there is a need to further study and search for anesthesia methods for the safety of elderly and senile people.

For the first time unilateral spinal blockade was described by A. Barker in 1908 using hyperbaric solution of local anesthetic. To date, there is no single name for this method in the literature. There are names such as local spinal anesthesia, partial segmental spinal anesthesia, unilateral spinal anesthesia (USA), monolateral spinal anesthesia and unilateral spinal anesthesia. The distance between the left and right roots of the spinal cord is 10-15 mm [7], which allows the roots to be blocked only on one side. However, in order to achieve a definitive one-way block, certain conditions must be met, as outlined below.

Keywords: TPVR-total peripheral vascular resistance, Spinal anesthesia, HR-heart rate

.**Main purpose of the study.** Differential assessment of the duration of sensory and motor block times in patients using unilateral spinal anesthesia.

Research materials and results.

The operating table was placed in a strictly horizontal position. Spinal anesthesia (SA) was started for the patients. The patient's leg to be operated on was prepared for spinal anesthesia in the supine position under the operating table. The process began with the identification of anatomical landmarks. A line crossing the bony outgrowths of the spine connecting the top of the bone (Tufe's line) between the ribs and the abdomen was drawn and the level of the spine was determined by the intervertebral space L3 - L 4. During this period, spinal puncture was performed after treating the puncture site with an antiseptic solution. After the cerebrospinal fluid began to flow, a hyperbaric solution of 7.5 mg of 0.5% bupivacaine (Longocaine Heavy) was slowly injected intrathecally into the spinal cavity. After the injection, the patients were left in the lateral position for 20 minutes and then transferred to the horizontal position.

The obtained results and their analysis

In this group of patients, the onset of sensory block was noted by us after an average of 56.4 ± 5.7 seconds. It peaked at an average of 6.13 ± 1.5 minutes. The duration of the sensory block was adequate for the surgical procedure and averaged 87.9 ± 10.1 minutes at the Th-10 level, despite its slightly long regression to Th-12 (104.9 ± 7.5) of total hip arthroplasty it was shorter than total knee arthroplasty and averaged 118.8 ± 6.2 minutes.

The onset of the motor block and its duration were much longer than the sensory block. The duration of the motor block was 25.1% longer than the sensory block, with an average of 117.5 ± 8.5 minutes. However, it was shorter than the operation itself. All this forced the use of intravenous propofol and fentanyl at the end of the operation. In this group, the total surgical blood loss volume was 494.7 ± 24.3 and 6-8 ml/kg body weight. Blood loss during total knee arthroplasty was 12.5% and was not higher than total hip arthroplasty. In this group, the volume of IVT administered was 27.9 ml/kg, and the erythrocyte mass was 2.9 ml/kg.

Characteristics of sensory and motor blocks in patients operated on under the USA conditions

№	Sensory block	Value
1	Sensor block start, sec	56,4 ± 5,7
2	The beginning of the sensory block at the level of Th_{10}, min	5,48 ± 2,11
3	The distribution of the sensor block	Th_{10} -S_{-4}
4	Sensor block peak, min	6,13 ± 1,5
5	The maximum level of the sensor block	Th_9
6	Time to reach Th_{10} of the sensor block, minutes	11,9 ± 3,5
7	The duration of the sensory block at the Th10 level, minutes	87,9 ± 10,1
8	Regression time of sensory block to Th_{12} – L_{1-2}, min	104.9 ± 7,5

№	Motor block	Value
1	Motor block start, min	6,9 ± 2,9
2	Motor block duration, min	117,5 ± 8,5
3	Depth of motor block in the operated leg, score	3,1 ± 0,3
4	Regression time of motor block to Th_{11}	138,5 ± 5,4

Our attention was drawn to the presence of persistent sensory and motor blocks in unilateral US at a dose of 7.5 mg of 0.5% bupivacaine local anesthetic. The average duration of motor block under USA was 117.5 ± 6.1 minutes. We explained this fact by the higher concentration and duration of exposure time of the bupivacaine dose, which had a unilateral effect under the USA..

Bilateralization of anesthesia occurred in 1 (4.6%) patient in this group, without affecting the effectiveness of anesthesia. A 7.5 mg dose of bupivacaine has been shown to be effective in terms of hemodynamic stability under the USA. The time before surgery was 47.7+6.1 minutes, which consisted of the US technique itself, a long stay in the lateral position, and slow access to the surgical level (Th11).

The duration of the operation was close to 2 hours. The recovery time of cognitive functions was relatively quick and short.

Resume

Neuroaxial anesthesia is often used in traumatology and orthopedic surgery in elderly and senile patients with a high comorbid background. In elderly people, the decrease in compensatory mechanisms of the cardiovascular system significantly increases the risk of developing sympathetic block arterial hypotension caused by neuraxial anesthesia [119; 44-48 p].

Satisfactory hemodynamic stability during spinal anesthesia can be ensured by reducing the area of the spinal block. Continuous spinal anesthesia and unilateral spinal anesthesia have been suggested when low doses of local anesthetic are used. The purpose of our study was to study the hemodynamic status and homeostasis indicators in elderly and senile patients operated under unilateral spinal anesthesia and to determine its side effects.

Practical recommendations

1. The inevitable addition of an adjuvant (20 μg fentanyl) to the patient's operated leg with low doses of hyperbaric bupivacaine (7.5 mg) in the unilateral sensory and motor block, ensures their rapid recovery and stable hemodynamic status during surgery, and at the same time keeps the patient awake for 20 minutes. This method of unilateral SA, combined with epidural analgesia, ensures the maintenance of stable hemodynamic parameters, especially in the elderly and senile patients..
2. The use of balanced anesthesia options based on regional blockades (USA, UEA, unilateral SEA that reduces the concentration of local anesthetic) is justified in the anesthesiological maintenance of the endoprosthesis of the leg joints in elderly patients with high comorbidity and physical status according to ASA group III. Intrathecal administration of a mixture of fentanyl with bupivacaine in unilateral SA results in increased duration of sensory and motor blocks and prolonged pain relief following bupivacaine potentiation.

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