

# Hip and knee arthroplasties in military personnel improve unilateral spinal anesthesia combined with unilateral epidural analgesia.

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## Abstract

Surgery is often performed on the feet to produce the necessary sensory blockade with minimal effects on the sympathetic nervous system . application of local anesthesia (SA, EA). preferred [133; 105-115 p]. The purpose of unilateral US is to limit the spread of somatic and sympathetic blockade [ 106; 2379-2402-b ] it primarily reduces hemodynamic complications It provides a number of clinical advantages and [53; 298-311-p] our study patients with low cardiac output It is useful for elderly patients with hypodynamic circulatory conditions.

## Keywords

Charles number comorbidity index, it is unilateral spinal anesthesia, epidural anesthesia, hemostasis.

Selective spinal anesthesia has been studied relatively little, but ongoing research has shown that the hydrodynamics of local anesthetics during selective blockade have their own characteristics [15; 95, 43-b; 85-91-b, 59; 214-219-b, 42; 245-248, 71; 420-427-b]. In recent years, clinical and experimental studies have developed the principle of "small doses and slow rates of administration" [71; 420-427-b, 42; 245-248-b], although in the works of other scientists the rate of administration of the drug differs from that recommended by the researchers [71; 420-427-b, 42; 245-248 -b] 1 ml/min 2, and sometimes 3, 5, 10 and more times [48; 1473-1478-p, 59; 214-219-p]. Casati A showed in his studies that the principle of slow speed is not important, but the principle of the duration of the localization after the anesthetic is injected is important. There are no uniform recommendations in the literature on the use of specific types of spinal needles. The sources contain scientific articles on the implementation of the anesthetic with the help of pen-shaped needles with a lateral exit and faceted needles that provide direct exit of the anesthetic, while the results of all studies indicate the development of a unilateral block

## Research methods

Military personnel who underwent surgery under unilateral spinal-epidural anesthesia. The criteria for inclusion in this group were: age at least 53.9 years, ASA physical status I-II, Charles comorbidity index greater than 4 soldiers in this group underwent total cement endoprosthesis of leg joints (38-SChBTE, 5-TBTE ) in conditions of combined unilateral USA and unilateral UEA.

## Purpose of the study

The purpose of the research in this group, The aim of the study was to study the efficacy and safety of unilateral USA combined with unilateral epidural anesthesia and analgesia, as well as perioperative hemodynamic changes and complications, in military personnel undergoing total cemented ankle arthroplasty.

## Research materials and methods

In this group of patients, we performed a two- stage blockade. Initially, an intrathecal puncture was performed and a low dose of 0.5% hyperbaric bupivacaine (5 mg) and 20 µg of fentanyl were administered to the patient in the supine position ( operated leg down ).

Then, in the same position of the body, catheterization of the epidural space at the level of L2 - L3 was performed in the military. Combined with unilateral UEA The unilateral USA technique is described in detail in Chapter II of the dissertation entitled "Materials and Research Methods".

Adequacy of anesthesia during surgery and postoperative analgesia, its effectiveness and after 6, 24, 48 hours during immobility and flexion in operated joints and assessed during walking.

As part of the multimodal analgesia concept in the setting of EA, all patients in this group received NSAIDs ( ketoprofen 200 mg /day). Preoperative preparation of the soldiers in this group did not differ from the previous ones. In the operating room, before infusion, crystalloid-colloid solutions (25-27 ml / kg) were administered via infusion bags with the addition of vasopressors (5-7 mg) and corticosteroids (prednisolone 1-2 mg / kg or dexamethasone 0.07 µg / kg).

Basic hemodynamic parameters were recorded every 5 minutes for the first 30 minutes after intrathecal administration of bupivacaine with fentanyl, and then every 10 minutes until the end of the operation .

A distinctive feature of this group of patients, as before, was the age of the patients, with a comorbidity index of 5 or higher, and ASA physical status class II (62.5%) and III (37.5%).

All servicemen initially had a clear pain syndrome associated with the underlying pathology of the foot joints. Ethically , this is a randomized clinical trial conducted after obtaining informed consent from the patients. Research In the period from 2021 to 2025 , the Department of Traumatology and Orthopedics of the Central Military Clinical Hospital of the Republic of Uzbekistan also INTERTECHNOMED included 43 patients who were hospitalized and operated under supervision at Gavkhar private clinic.

patients in this group were: age at least 53.9 years, ASA physical status I-II, and Charlson comorbidity index of 4 or more.

Exclusion criteria for surgery were any contraindications to performing USA and UEA , including patient refusal, coagulopathy, allergy to local anesthetics, and most importantly, hypotension.

**3.3.1 . The results obtained**

The table below shows the demographics of patients in this group who underwent surgery with unilateral combined spinal-epidural anesthesia.

**Demographic and clinical characteristics of patients in this group ( n = 43).**

Indicators	Value
Age , years	53.9 ± 3.0
Gender , male / female , n %	5/38
TVI , kg/mg	23.9 ± 1.4
Operated side , s / h , n %	24/19
Comorbidity index	
Up to 3 , n %	19 (47.5)
Up to 4 , n %	24 (52.5)
Class according to A S A : II , n %	18 ( 35)
III , n %	25 ( 65)

A distinctive feature of this group of patients was the high comorbidity index (100%) and military personnel with ASA physical status class I (62.5%) and class II (37.5%).

The most common diseases in this group of patients were hypertension, previous MI (1), varicose veins of the leg veins , and severe pain syndrome.

The initial values of peripheral blood, hemostasis and their changes during surgery did not differ from those of the previous groups. Moderate hypovolemia, hemoconcentration and activation of the blood coagulation system, signs of a systemic inflammatory (aseptic) reaction to the main pathology are dystrophic-degenerative changes in the joints (7), fracture of the femoral neck (5), aseptic necrosis of the femoral head (2) and rheumatoid arthritis. (1). Peripheral venous catheters were placed in 30 patients , and central venous catheters were placed in 13 patients ( subcutaneous catheter according to Seldinger ).

**Systemic hemodynamic parameters of this group of patients during the operation and postoperative periods (n = 43).**

Indicators	Research stages
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	Beginnin g	At the beginning of the operation	During joint implantati on	At the end of the operation	30 minutes after surgery	60 minutes after surgery	120 minutes after surgery
A B syst , mm. s . u .	149.9 ± 6.0	136.7±5. 3	145.5±5.4	140.7±3. 7	132.4±4.1	138.4± 4.8	143.4±5. 5
A B diasmm . s . y .	83.4 ± 3.9	80.1±4.4	82.7±3.8	80.7±2.9	76.9±4.3	80.7±5. 2	81.2±4.9
UAB mm. s . u	105.5 ± 4.3	98.9±4.7	103.6±4.2	100.7±3. 4	95.4±4.1	100.0± 4.9	102.0±5. 2
YUCH minute	94.7 ± 4.9	89.4±2.6	82.1±2.6	77.6±2.3	88.9±2.3	88.5±2. 7	86.4±4.0
MVB (CVD) cm . water. he/she	6.3 ± 1.7	7.2±0.9	7.1±1.2	8.4±1.3	8.4±1.6	8.9±0.5	9.2±1.0
SpO2 , %	92.4 ± 0.9	94.0±1.3	93.7±1.4	92.8±0.9	93.1±1.2	92.6±0. 9	92.4±1.3

**Note :**  $x - r < 0.05$  compared to baseline values

The presented data indicate that relatively stable systemic hemodynamic parameters were maintained throughout the entire surgical procedure and in the postoperative period. A slight decrease in blood pressure and mean arterial pressure before the start of the procedure was observed in only one case. However, this phenomenon was short-lived and did not reach statistical significance, and hypotension was only 8.8% lower than the initial systolic BP values. A decrease in diastolic blood pressure and mean arterial pressure was observed by 4% and 6.3%, respectively ( $p > 0.05$ ).

in blood pressure and mean arterial pressure occurred due to the weakening of the sensory block in the operated limb in response to the introduction of 2.5 mg of bupivacaine into the epidural space at 80-90 minutes. However, in this case, the maximum decrease in blood pressure and mean arterial pressure was 11.7%, respectively., was around 7.8% and 9.6%.

Regarding heart rate, no obvious tachycardia or bradycardia was observed throughout the study period. A tendency for central venous pressure (CVP) to increase during the operation was observed. However, central venous pressure values remained within the physiological range, indicating that blood returned to the heart without any overload reactions from the cardiovascular system.

oxygen was delivered through the mask, during the operation, the pulse oximetry parameters improved slightly, then returned to their original values.

We analyzed changes in blood pressure and mean arterial pressure immediately after intrathecal bupivacaine 5 mg with 20 µg fentanyl for 30 minutes.

**Systemic hemodynamic parameters after unilateral spinal-epidural anesthesia before surgery (n = 4)**

Time	A B cyst	A B dias	UAB , mm. s . u	YUCH spot
0	149.9 ± 6.0	83.4 ± 3.9	105.5 ± 4.3	88.7 ± 4.9
5	141.6 ± 5.4	80.1 ± 2.7	100.6 ± 4.9	89.2 ± 5.0
10	136.6 ± 4.7*	78.3 ± 4.2	97.5 ± 3.8	82.5 ± 4.7
15	136.3 ± 4.3*	77.9 ± 3.9	97.3 ± 4.1	78.2 ± 4.0
20	137.7 ± 5.0	78.8 ± 4.1	98.4 ± 4.5	86.4 ± 2.7

25	138.6 ± 3.9	81.2 ± 3.3	100.3 ± 3.7	88.3 ± 4.2
30	137.4 ± 4.8	83.3 ± 4.1	101.3 ± 4.4	86.9 ± 5.1

Overall, hemodynamics were relatively stable. In this group, we observed one episode of decreased blood pressure and mean arterial pressure associated with the intrathecal administration of bupivacaine with fentanyl, which was followed by increases in systolic, diastolic blood pressure, and mean arterial pressure. pressure decreased by 9.3%, 6.6% and 4.7% respectively for a maximum of 10-15 minutes. The decrease in systolic blood pressure for 10-15 minutes was statistically significant, but it did not exceed 10%.

As for heart rate, its maximum decrease by 15 minutes was 11.9% compared to the 0-value (p < 0.05). We attributed this to the effect of fentanyl. In no case in this group did we record arterial hypotension exceeding 20%.

The vascular load in this group was 1869.4 ± 278.4 ml.

**MG indices in the operational and post-operational periods in the studied military of this group (n = 43).**

Indicators	Research stages						
	I	II	III	IV	30 in a minute V	60 in a minute VI	120 in a minute VII
IU ( IU ), ml/m <sup>2</sup>	25.7±0.6	22.6±0.7x	22.9±0.5x	23.8±0.7	24.0±0.6	24.9±0.8	25.6±0.5
IOH ( SI ), l/m <sup>2</sup>	2.28±0.4	1.89±0.3x	1.83±0.3x	1.88±0.5x	1.86±0.2x	1.95±0.3x	2.01±0.6x
UQTPQ ( OPSS ), religion s*sm <sup>-5</sup>	2058.1±267.0	2457.1±209.9	2550.1±248.8	2433.8±306.7	2578.4±215.1	2279.2±196.6	2260.3±246.4

**Note:** x - r < 0.05 relative to default values: xx - R < 0.05 relative to previous values.

**Discussion**

patients , we noted an initial hypodynamic circulatory regime with a decrease in single and minute cardiac output and a relative increase in the ventricular septal defect . Here we have two cases of ZI and JI. We noted. One of them was during the operation - in the III stage of the operation, the ZI and YI decreased by 10.9% and 19.8%, respectively. In both cases, p < 0.05. In response to the decrease in these indicators, a tendency for the UPQT to increase (by 20.1%) was observed. The second case of a decrease in ZI and YI by 6.7% and 18.5%, respectively (p < 0.05) was associated with patients complaining of postoperative wound pain before the introduction of bupivacaine into the epidural space, during which the UPQT an increase of 21.9% (p < 0.05) was observed .

In this group of patients, the initial values of the UPVTR exceeded the required values of this indicator by 5.5%, which indicates the spread of spastic processes in the system of low blood pressure due to the

excessive influence of the sympathetic nervous system. This was confirmed by the vegetative Kerdo index and the I of the study. and V - stages are also confirmed by the level of cortisol in the blood.

At the indicated stages of the study, the VI was +12 and +14, and in patients in this group (n = 8), the cortisol level at the time of admission to the hospital was relatively elevated ( $594.7 \pm 21.9$  nmol/l), but these indicators were not significant. did not exceed the reference limit. 60 minutes after the operation, a significant decrease in the amount of cortisol ( $399.8 \pm 36.8$  nmol / l) was noted - it was 32.8% compared to the initial values, and during this period was consistent with adequate analgesia.

#### **Practical recommendations**

1. Two- stage CSEA The implementation of the technique involves a relatively simple procedure , with intraoperative to the specified effect of anesthesia and allows timely resolution of motor block, as well as achieving all the positive effects of long-term epidural analgesia in the postoperative period.

2. The use of balanced anesthesia options based on regional blockades ( USA , UEA , unilateral SEA with reduced local anesthetic concentration ) in military personnel with high comorbidity and ASA physical condition group III , has proven itself in the anesthetic provision of ankle arthroplasty. Bupivacaine of fentanyl When administered intrathecally in the unilateral CA, bupivacaine causes an increase in the duration of sensory and motor blocks and the elimination of long- lasting pain after intense sweating .

3. In patients with a high ( $\geq 4$ ) Charles number comorbidity index and high anesthetic risk (ASA II-III), the recommended method of UEA may be the method of choice for total hip arthroplasty.

4. In middle -aged military patients with unilateral SA, along with epidural analgesia, it is important to perform crystalloid- colloid pre - infusion at a dose of 5-7.5 mg of vasopressors (ephedrine and dopamine) and corticosteroids (prednisolone) at a dose of 0.8-1.0 mg/kg, calculated on 5 ml/ kg of body weight, at all stages of hemodynamic stability ( GEC 130/4 ) in patients with unilateral SA.

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