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# Assessment Of Hemodynamic And Homeostatic Effects Of Unilateral Spinal Anesthesia During Joint Replacement Surgery Of The Lower Extremities In Elderly Patients

Gaziev Z.T.

Tashkent State Medical University (TSMU), Tashkent, Uzbekistan

Bektemirova N.T.

Tashkent State Medical University (TSMU), Tashkent, Uzbekistan

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**Abstract:** Unilateral spinal anesthesia with a low dose of hyperbaric bupivacaine is a safe and effective analgesic technique for elderly patients with high cardiovascular risk undergoing lower limb joint replacement. The method ensures hemodynamic stability, minimal metabolic alterations, and a high safety profile.

**Keywords:** Unilateral spinal anesthesia, geriatric patients, endoprosthetics, hemodynamics, hemostasis, bupivacaine.

**Introduction:** Spinal anesthesia (SA) has traditionally been widely used in orthopedic surgeries for elderly patients with a high level of comorbidity. However, the reduction in compensatory capabilities of the cardiovascular system in this age group significantly increases the risk of developing arterial hypotension caused by sympathetic block [1].

Modern approaches aim to minimize the dose of local anesthetic and limit the spread of the block to ensure hemodynamic stability. One such solution is unilateral spinal anesthesia (USA), in which the administration of small doses of hyperbaric anesthetic allows for effective analgesia with minimal impact on systemic hemodynamics [3, 4].

Among alternative techniques, continuous spinal anesthesia and modified low-dose regimens of local anesthetic administration are also considered, which allows the depth of the block to be adapted to the physiological features of elderly patients [2].

The aim of the study: to examine the state of hemodynamics and homeostatic indicators in elderly and senile patients operated on under unilateral spinal anesthesia, as well as to identify its side effects.

**Methods**

The study was conducted at the multidisciplinary clinic of Tashkent State Medical University (TSMU), in the Department of Orthopedics and Traumatology.

The study included 20 patients (n = 20) over the age of 75 who underwent total hip arthroplasty (THA — 14 patients) and total knee arthroplasty (TKA — 6 patients).

The average age was 84.1 ± 2.9 years, and the body mass index was 29.5 ± 1.9 kg/m². Among the subjects, women predominated (65.3%). A Charlson comorbidity index of ≥ 4 was noted in 53.6% of patients, reflecting a high level of comorbidities and a high anesthetic risk (ASA III–IV).

All patients received planned surgical treatment in the orthopedic department of the multidisciplinary clinic at TSMU, followed by monitoring in the anesthesiology and intensive care unit.

**Technique of Unilateral Spinal Anesthesia**

Unilateral spinal anesthesia (USA) was performed in standard operating room conditions, adhering to strict principles of asepsis and antisepsis. The patient was positioned on their side in such a way that the operated lower limb was on the bottom.

After disinfecting the surgical field, a spinal puncture was performed using a 25G Quincke needle midline at the level of L3–L4. After passing through the dura mater and observing the appearance of cerebrospinal fluid, the needle aperture was rotated downward towards the operated limb, ensuring preferential distribution of the anesthetic on the corresponding side.

A total of 7.0 mg of hyperbaric 0.5% bupivacaine solution was slowly injected into the subarachnoid space over 65–85 seconds. After the administration of the drug, the patient's lateral position was maintained for 12–16 minutes to allow for the formation of a unilateral block, after which the patient was transitioned to a supine position with the head end elevated.

The choice of the dose of 7.0 mg of hyperbaric 0.5% bupivacaine was based on literature data indicating that this dose is optimal for unilateral spinal anesthesia, providing sufficient depth of sensory and motor blocks while maintaining hemodynamic stability without the need for intrathecal administration of opioids (such as fentanyl or sufentanil). Reducing the dose of local anesthetic to 4–6 mg has been associated with an increased likelihood of unsuccessful unilateral blocks and inadequate anesthesia [209].

The effectiveness of unilateral spinal anesthesia was assessed comprehensively, including the analysis of both sensory and motor components of the block. The level of sensory anesthesia was determined using the Pin-Prick test, based on the patient's response to painful stimuli, while the degree of motor block was evaluated using a modified Bromage scale, allowing for objective monitoring of the extent of motor blockade in the operated limb.

All patients underwent infusion preparation with crystalloid solutions (Ringer's lactate) at a rate of 5–6 ml/kg/hour prior to anesthesia to prevent hypotensive reactions.

35–45 minutes before the puncture, dormicum (1.5 mg) and fentanyl (40 mcg) were administered intravenously as premedication, ensuring sedation and a comfortable psycho-emotional state for the patients prior to the procedure.

During the surgical intervention and in the early postoperative period, continuous monitoring of hemodynamic and respiratory parameters was conducted, including:

- Heart rate (HR);

- Blood pressure (systolic, diastolic, and mean arterial pressure - MAP);

- Central hemodynamic indicators — cardiac index (CI), stroke index (SI), total peripheral vascular resistance (TPVR);

- Electrocardiography (ECG);

- Central venous pressure (CVP);

- Pulse oximetry ($SpO_2$).

Data registration was carried out using a resuscitation-surgical monitor at all stages of the operation and in the early postoperative period, allowing for dynamic observation of hemodynamic changes and timely correction of therapy in case of deviations from the norm.

**Discussion of Results**

The table presented below provides the demographic characteristics of patients who underwent surgery under unilateral spinal anesthesia (USA). The table reflects age distribution, sex composition, body mass index (BMI), and level of comorbidity, allowing for an

objective assessment of the initial characteristics of the cohort of examined patients and their anesthetic risk.

**Table No. Demographic Characteristics of Patients in the Group (n=20)**

| Indicators | | Number of Patients | % | Values |
|---|---|---|---|---|
| Age | 65-75 | 12 | 60,0 | 74,2, ±1,8 |
| | 76-92 | 8 | 40,0 | 80,0±1,1 |
| | Average | 20 | 100 | 84,1±2,9 |
| Gender m/f | | 7м/13ж | 65,3/35,7 | |
| BMI (kg/m²) | | 20 | 100 | 29,5±1,9 |
| Side of Surgery (R/L) | | 8/12 | 35,6/65,4 | |
| Charlson Comorbidity Index | До 2 | 4 | 22,4 | |
| | До 3 | 5 | 25,1 | |
| | ⩾4 | 11 | 53,6 | |

According to the obtained data, 20.1% of the total number of examined patients underwent surgery under unilateral spinal anesthesia (USA).

The overall somatic condition of the patients was assessed as satisfactory, and their trophological status was preserved.

The associated pathology was multifactorial and included: atherosclerotic changes in blood vessels, arterial hypertension, coronary artery sclerosis, ischemic heart disease with II–III functional class circulatory insufficiency according to the NYHA classification, heart rhythm disorders, chronic lung diseases (pneumosclerosis, emphysema), respiratory failure, varicose veins of the lower extremities, endocrine disorders, and cerebrovascular pathology.

Thus, the examined patients were characterized by a high level of comorbidity and reduced functional reserves of the cardiovascular and respiratory systems, which posed increased demands on the choice and administration of anesthetic management.

The data from the clinical blood analysis of patients before and after surgery are presented in the following table.

**Table No. Indicators of Complete Blood Count in Patients Operated Under USA (n=20)**

| Indicators | unilateral spinal anesthesia (USA) (n=20) | | |
|---|---|---|---|
| | Before Surgery | After Surgery | P |
| Erythrocytes, 10^12/L | 4,28 ± 0,12 | 3,86 ± 0,07 | < 0,05 |
| Hemoglobin, g/L | 13,9 ± 0,3 | 11,8 ± 0,6 | < 0,05 |
| Hematocrit, % | 43,7 ± 0,20 | 40,7 ± 1,4 | < 0,05 |
| Leukocytes, 10^9/L | 5,49 ± 0,23 | 6,94 ± 0,28 | < 0,05 |
| Neutrophils, 10^9/L | 3,27 ± 0,21 | 3,88 ± 0,31 | > 0,05 |
| Lymphocytes, 10^9/L | 1,71 ± 0,27 | 1,43 ± 0,14 | > 0,05 |

Practically all indicators of peripheral blood, including levels of hemoglobin, erythrocytes, and hematocrit, were within physiological norms. However, considering the elderly and senile age of the patients, as well as the presence of chronic pain syndrome reported by all patients prior to hospitalization, it can be suggested that there was a baseline hemoconcentration due to chronic stress and moderate hypovolemia.

The postoperative increase in white blood cell counts by 32.5% ($p < 0.05$) was regarded as a manifestation of an aseptic inflammatory response associated with surgical trauma and the underlying pathological process. Notably, there were no signs of clinically significant infection, which allows these changes to be interpreted as a general inflammatory stress response typical of the early postoperative period in geriatric patients.

**Table No. Hemostasis Indicators in Patients of Group I, Before and After Surgery.**

| Indicators | unilateral spinal anesthesia (USA) (n=20) | | |
|---|---|---|---|
| | Before Surgery | After Surgery | P |
| Fibrinogen, g/L | 4,17±0,11 | 4,79±0,29 | > 0,05 |
| Platelets, 10^9/L | 195,7±5,0 | 182,4±6,7 | < 0,05 |
| Prothrombin Time, sec | 11,2±0,8 | 12,8±0,5 | > 0,05 |
| aPTT, sec | 31,2±0,3 | 37,8±0,2 | > 0,05 |

The analysis of hemostasis indicators in patients operated on under unilateral spinal anesthesia (USA) revealed signs of activation of the blood coagulation system both in the preoperative and postoperative periods.

The fibrinogen level in most patients was within the physiological norm but consistently approached its upper limits, which may indicate a tendency toward hypercoagulation. This fact was further supported by changes in prothrombin time (PT) and activated partial thromboplastin time (aPTT), with baseline values being below the minimum normative levels — specifically by 20.4% and 16.8%, respectively.

These shifts reflected the activation of phases I (prothrombinase formation) and II (thrombin formation) of blood coagulation, indicating an increased readiness for intravascular coagulation, which is typical for geriatric patients with comorbid backgrounds and chronic inflammatory stress.

Considering the identified changes, the inclusion of low molecular weight heparins (enoxaparin) in prophylactic therapy appeared pathogenetically justified and appropriate for preventing thrombotic complications.

The table presented below includes the average values of systemic hemodynamics and pulse oximetry parameters in patients from the group operated on under USA.

**Table No. Indicators of Systemic Hemodynamics and SpO2 Before and During Stages of USA (n=20).**

| Parameter | Stages of Surgery and Postoperative Period | | | | | | |
|---|---|---|---|---|---|---|---|
| | Baseline | Start of surgery | Implant Joint | End of surgery | 30 minute | 60 minute | 120 minute |
| Systolic BP, mmHg | 155,4±2,9 | 147,1±2,8 | 145,3 ± 1,7$^{x}$ | 146,5 ± 3,7 | 148,4 ± 3,8 | 158,5 ± 3,4 | 145,3 ± 3,4 |
| Diastolic BP, mmHg | 74,5 ± 4,6 | 79,4 ± 3,1 | 81,3 ± 3,1 | 82,8 ± 4,4 | 84,5 ± 3,2 | 77,2 ± 3,1 | 75,2 ± 3,4 |
| Mean Arterial Pressure (MAP), mmHg | 102,4 ±6,4 | 104,1 ± 2,7 | 106,1 ± 3,2 | 101,2 ± 3,1 | 104,2 ± 3,2 | 104,7 ± 3,1 | 100,2 ± 3,2 |
| Heart Rate (HR), bpm | 90,1 ± 2,0 | 87,3 ± 1,7 | 85,3 ± 2,2 | 87,1 ± 2,2 | 94,2 ± 2,1 | 84,8 ± 3,2 | 84,7 ± 2,2 |
| Central Venous Pressure (CVP), cmH2O | 7,6 ± 0,4 | 7,4 ± 0,3 | 8,1 ± 0,4 | 8,3 ± 0,3 | 8,8 ± 0,5$^{x}$ | 8,1 ± 0,6 | 8,2 ± 0,4 |
| $SpO_2$, % | 90,1 ± 0,4 | 92,3 ± 0,5$^{x}$ | 91,7 ± 0,6 | 92,2 ± 0,5$^{x}$ | 91,2 ± 0,4 | 91,3 ± 0,3 | 91,7 ± 0,4 |

Note: x – $p < 0.05$ compared to baseline values.

The averaged indicators suggest that unilateral spinal anesthesia (USA) provides a sufficiently stable state of systemic hemodynamics throughout the surgical intervention.

It should be noted that the most pronounced decrease in blood pressure was observed during the most

traumatic stage of the surgery — the moment of joint implantation. Specifically, the systolic blood pressure (SBP) at the start of the operation was 4.9% lower than the baseline level ($p > 0.05$), whereas during implantation, the decrease amounted to 6.1% ($p < 0.05$).

Diastolic pressure and mean arterial pressure (MAP) remained relatively stable at all stages of the intervention, without statistically significant fluctuations. A similar trend was observed concerning central venous pressure (CVP) and oxygen saturation ($SpO_2$), both of which remained within physiological norms.

The heart rate (HR) during the initial stage of the operation and the implantation demonstrated a moderate decrease; however, it subsequently recovered to age-appropriate normative values, confirming the preservation of compensatory mechanisms in the cardiovascular system.

For a more accurate assessment of perioperative fluctuations in blood pressure, a detailed analysis of hemodynamic changes was conducted during the execution of USA — from the moment of local anesthetic administration to the onset of the surgical stage and the implantation of joint components.

**Table No. Values of Blood Pressure and SBP During the Execution of USA and Prior to the Start of the Surgery.**

| Time, min | Systolic BP, mmHg | Diastolic BP, mmHg | Mean Arterial Pressure (MAP), mmHg |
|---|---|---|---|
| 0 min | 137,9±3,7 | 87,4±3,6 | 106,2±4,0 |
| 5 min | 130,7±2,4 x | 83,2±2,0 x | 98,3±2,1 x |
| 10 min | 121,5±3,1 x | 75,5±2,7x | 88,8±2,9x |
| 15 min | 125,9±2,7 x | 73,9±2,9 x | 92,2±1,7 x |
| 20 min | 127,6±2,4 x | 72,0±2,8 x | 87,2±2,1 x |
| 25 min | 129,7±2,8x | 75,8±2,7 x | 90,7±2,6x |
| 30 min | 131,0±3,9 | 84,4±2,8 | 101,2±3,9 |
| 60 min | 132,1±3,2 | 82,2±3,9 | 99,5±3,4 |
| 90 | 131,2±2,7 | 81,2± 2,8 | 103,0± 2,1 |
| 110 | 132,9± 3,3 | 82,1± 2,3 | 102,2± 2,8 |
| 120 | 134,7± 4,2 | 80,9 ±3,1 | 104,1± 3,5 |

Note: x – $p < 0.05$ compared to 0 minutes.

The presented data reflect the characteristic hemodynamic changes occurring in the first 20 minutes after the administration of unilateral spinal anesthesia (USA).

The most pronounced decrease in systolic, diastolic blood pressure, and mean arterial pressure (MAP) was observed in the first 5 minutes after the injection of the local anesthetic, amounting to 7.9% ($p < 0.05$), 11.8%, and 7.3% ($p < 0.05$), respectively.

The maximum decrease in these parameters was recorded by the 10th minute of the study, when systolic and diastolic pressures and MAP decreased by 13.6%, 19.4%, and 16.9%, respectively, indicating the peak of sympathetic block.

Starting from the 30th to 40th minute, hemodynamic parameters gradually stabilized, approaching baseline values, indicating the establishment of a stable equilibrium between the regional block and systemic compensatory reactions. This period was regarded as optimal for the initiation of the surgical intervention.

During the perioperative period, two patients (10%) experienced significant bradycardia, with heart rates of 47 and 49 beats per minute, which was successfully managed with intravenous administration of 0.5 mg atropine.

In the postoperative period, no complications were observed regarding the cardiovascular system, confirming the safety and controllability of hemodynamics under USA in geriatric patients.

The following section presents the indicators of central hemodynamics (CH) in patients from this group operated on under unilateral spinal anesthesia.

**Table No. Dynamics of CH Indicators During Stages of Surgery (n = 20).**

| Parameter | Stages of Surgery and Postoperative Period | | | | | | |
|---|---|---|---|---|---|---|---|
| | Baseline | Start of | Implant | End of | 30 | 60 | 120 |

| | | Surgery | Joint | Surgery | | | |
|---|---|---|---|---|---|---|---|
| Cardiac Output (CO), ml/m² | 23,1±0,7 | 21,3±0,5 x | 21,2±0,4 x | 23,3±0,5 | 22,9±0,3 | 23,7±0,4 | 22,9±0,7 |
| Cardiac Index (CI), l/m² | 1,50±0,06 x | 1,31±0,06 | 1,27±0,03* | 1,40±0,04 | 1,44±0,03 | 1,47±0,04 | 1,42±0,05 |
| Total Peripheral Vascular Resistance (TPVR), dyn×s×cm⁻⁵ | 2775,8±171,1 | 3253,3±154,3 | 3324,5±134,3 x | 2956,1±116,7 | 3013,5±12140 | 3149,7±117,8 | 3100,7±129,4 |

Note: x – p < 0.05 compared to baseline data.

The analysis of the presented data showed that the averaged values of central hemodynamics (CH) in patients operated on under unilateral spinal anesthesia (USA) corresponded to a hypodynamic type of circulation, characteristic of elderly and senile individuals with pre-existing cardiovascular dysfunction.

The observed decrease in blood pressure (BP) and mean arterial pressure (MAP) during the initial stages of the operation and joint component implantation was due not only to the development of sympathetic block caused by the intrathecal administration of local anesthetic, but also to a reduction in stroke volume and cardiac output, which aligns with the patterns observed in groups with neuroaxial blockade.

Of particular interest is the fact that against the backdrop of reduced systemic and central hemodynamic parameters, there was a significant increase in total peripheral vascular resistance (TPVR), indicating a reflex centralization of blood flow — a compensatory response aimed at maintaining the perfusion of vital organs.

Thus, during the initial stages of the operation and joint implantation, TPVR increased by 16.5% (p < 0.05) and 19.0% (p < 0.05), respectively, compared to baseline values. By the end of the operation, after the pain stimulus was removed, this indicator approached baseline levels while remaining somewhat above physiological norms, reflecting age-related characteristics of vascular regulation and increased tone of the arteriolar component of microcirculation in patients of this category.

**Table No. Central Hemodynamics Indicators at Early Stages of Surgery in Patients Based on Elderly and Senile Age.**

| Parameter | Age Group | Number of Patients | Stages of Surgery | | |
|---|---|---|---|---|---|
| | | | Baseline | Starting of surgery | Implant Joint |
| Cardiac Output (CO), ml/m² | 67-77 | 12 | 23,2±0,6 | 22,2±0,4 | 21,6±0,2 x |
| | 78-91 | 8 | 21,0±0,8 | 18,4±0,6 x | 18,1±0,2 x |
| Cardiac Index (CI), l/m² | 66-76 | 12 | 1,84±0,03 | 1,75±0,02 | 1,66±0,03 x |
| | 75-92 | 8 | 1,42±0,05 | 1,33±0,03 | 0,99±0,04 x |
| Total Peripheral Vascular Resistance (TPVR), dyn×s×cm⁻⁵ | 68-78 | 12 | 2804,3±98,0 | 3280,3±154,9 x | 3519,7±121,9 x |
| | 73-90 | 8 | 2967,3±82,1 | 3446,3±79,7 x | 3949,3±170,7 x |

Note: x – p < 0.05 compared to age-related indicator.

The analysis of the presented data once again confirms the presence of significant differences in central hemodynamics (CH) indicators at the early stages of surgical intervention depending on age and the extent

of comorbidity.

In patients aged 67–77 years, the decrease in stroke index (SI) by the third stage of the study was 6.1% ($p < 0.05$), whereas in patients aged 78–91 years, this indicator decreased by 10.2% ($p < 0.05$). A similar trend was observed regarding cardiac index (CI) — with decreases of 9.2% and 30.5% respectively, reflecting age-dependent reductions in myocardial pump function and declines in compensatory reserves.

The total peripheral vascular resistance (TPVR) demonstrated the opposite dynamics: in patients aged 67–77 years, it increased by 15.7% at the start of the operation and by 24.2% ($p < 0.05$) at the time of joint implantation. In the older age group (78–91 years), the corresponding values were 15.4% and 32.7% ($p < 0.05$), indicating more pronounced vasoconstriction and centralization of blood flow in elderly individuals.

To correct the excessive peripheral resistance and normalize afterload, slow intravenous administration of isocet (perlinganite) at a dose of 3–4 mg was used under the control of heart rate (HR) and blood pressure (BP), contributing to a reduction in TPVR and dilation of the peripheral vascular bed, bringing values closer to the appropriate physiological levels.

Thus, the initial actual value of TPVR, which was 2890.8 ± 170.1 dyn·s·cm$^{-5}$, exceeded the normal value (3145.9 ± 102.4 dyn·s·cm$^{-5}$) by 10.4% ($p < 0.05$), and at the stage of joint implantation, it reached 3734.5 ± 112.7 dyn·s·cm$^{-5}$, which was 8.5% above the calculated norm (3446.1 dyn·s·cm$^{-5}$).

The high level of sympathetic regulation of circulation in patients of this age category was also confirmed by the values of the vegetative index, which was initially +32 and retained a positive value (+30.7) by the end of the operation, reflecting sustained sympathetic activity and limited adaptive capacity.

**Table No. Characteristics of Sensory and Motor Blocks in Patients Operated on Under USA (n = 20).**

| № | Sensory Blockade | Values | |
|---|---|---|---|
| 1 | Onset of sensory block, sec | 56,4±5,7 | |
| 2 | Onset of sensory block at level Th10 | 5,48±2,11 | |
| 3 | Spread of sensory block | $Th_{10}$-$S_{-4}$ | |
| 4 | Peak of sensory block, min | 6,13±1,5 | |
| 5 | Maximum level of sensory block | $Th_9$ | |
| 6 | Time to achieve sensory block up to Th10, min | 11,9±3,5 | |
| 7 | Duration of sensory block at level Th10 | 112,5±6,1 | |
| 8 | Time to regression of sensory block to Th12 – L1-2 | 104.9±7,5 | |
| | Motor block | Values | |
| 1 | Onset of motor block, min | 6,9±2,9 | |
| 2 | Duration of motor block, min | 117,5±8,5 | |
| 3 | Depth of motor block in the operated limb, score | 3,1±0,3 | |
| 4 | Time to regression of motor block to Th11, min | 138,5±5,4 | |

It is noteworthy that the use of smaller doses of local anesthetic in unilateral spinal anesthesia (USA) resulted in sufficiently prolonged sensory and motor blocks. The average duration of the spinal block was 117.5 ± 6.1 minutes, which is comparable to the values obtained with the administration of 7.5 mg of hyperbaric 0.5% bupivacaine used in classical variants of USA.

These results can be explained by the higher local concentration of the anesthetic and the extended time of its action on the nerve roots on the operated side. Thus, even with a reduced overall dose of the drug, adequate analgesia is maintained due to the limited distribution of the solution in the subarachnoid space and its gravitational fixation at the site of administration.

In two patients (9.6%), bilateralization of the block was noted; however, it did not affect the quality of anesthesia or the clinical outcome, confirming the predictability and controllability of the method.

The dose of 7.5 mg of hyperbaric bupivacaine demonstrated an optimal balance between efficacy and hemodynamic stability, which is particularly important for elderly and senile patients. Maintaining stable circulatory parameters is mainly associated with the reduction of the overall anesthetic dose and the limitation of sympathetic block spread, thus preventing the development of arterial hypotension and

pronounced vasomotor reactions.

As shown in studies by Kayam et al. (2004) and Khatout M. et al. (2005), the use of low-dose unilateral spinal anesthesia during joint replacement surgery of the lower extremities in geriatric patients provides high effectiveness of pain relief with minimal impact on systemic hemodynamics, which fully aligns with our findings.

Complications associated with this method of analgesia were relatively few. Serious complications reported included: pneumonia (0), arrhythmias (0), respiratory depression <12 breaths per minute (1), hypotension exceeding 20% from baseline (1), SpO2 <90% (1). Two patients required catheterization due to urinary retention, and minor complaints included nausea (1), vomiting (1), and headache (1). All described complications were quickly managed. No fatalities were observed.

Thus, unilateral spinal anesthesia with intrathecal administration of 7.5 mg of hyperbaric 0.5% bupivacaine provides effective and controllable analgesia during joint replacement surgery of the lower extremities in elderly patients with significant comorbidity.

The method is characterized by the stability of systemic hemodynamics: episodes of arterial hypotension tend to be short-lived (averaging around 9 minutes) and are easily corrected. The compensatory increase in total peripheral vascular resistance with moderate reduction in cardiac output indicates the preservation of adaptive reserves in circulation.

This variant of regional anesthesia is safe and pathogenetically justified in geriatric patients with cardiovascular pathology, offering an optimal balance between efficacy and hemodynamic stability.

**References**


1. Gaziyev Z. T., Avakov V. E., Rakhmankulov E. Zh., Valiev Sh. M. "Potentials of Neuraxial Anesthesia in Lower Limb Joint Replacement with Concomitant Cardiovascular Pathology." Society and Innovations, 2020, No. 02, pp. 338–345
2. D. Das et al., Unilateral versus bilateral spinal anaesthesia in geriatric patients undergoing hemiarthroplasty: a comparative study — D. Das et al., Anaesthesiol Intensive Ther. 2020;52(4):292-296.
3. Z. Çağıran et al., Unilateral Spinal Anesthesia in Hip Fracture Surgery for Geriatric Patients With High Cardiovascular Risk — Z. Çağıran et al., SAGE Open Med. 2024. PMC+1
4. 4. C. Lin et al., ED50 and ED95 of hypobaric ropivacaine during unilateral spinal anesthesia in older patients undergoing hip arthroplasty — Frontiers in Medicine 2025;12:1571574. Frontiers