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Importance Of Neoaxial Anesthesia And Laboratory-Instrumental Examinations In Hip And Knee Arthroplasty, Their Impact On Surgical Practice.

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Annotation

Preparation for surgical intervention includes extensive laboratory and clinical examination of the patient. Its purpose is to identify any pathologies (chronic and acute diseases), as well as to identify any risks that may cause serious complications during the operation. Tests also help to make the most accurate diagnosis and find out the exact state of the disease.

Key words

Sincigraphy, duplex examination of deep veins, dysplasia of ankle joints. Neuroaxillary anesthesia.

The purpose of the study: to study the effectiveness of US in elderly and senile patients undergoing endoprosthetic surgery of the leg joints and to evaluate the criteria of their laboratory instrumental examination. In the process of total endoprosthesis of the leg joints, the pre- and post-operative periods are evaluated in terms of the safety and effectiveness of anesthesia and analgesia, as well as a comprehensive study of the blood circulation system and hemostasis indicators, that is, in the process of Unilateral spinal anesthesia (n=20).

Study methods

- general blood and urine tests to assess the state of health;
- biochemistry for markers of rheumatological diseases;
- CT, MRI to view joint condition and determine bone density; MRI is the most accurate examination method (up to 99%). Allows you to obtain tissue sections at any level.
- bone scintigraphy to assess the state of blood flow and the intensity of metabolic processes in bone tissue.

X-ray is used as an instrumental diagnosis - it allows to accurately assess the level of coxarthrosis. Sometimes it is possible to determine the cause of coxarthrosis with the help of X-rays - for example, if it appeared as a result of dysplasia or Perthes disease.

Ultrasound does not replace radiography, but complements it, because X-ray diagnostics allows to assess the state of bone tissue and the shape of the joint in general, and ultrasound helps to better visualize articular surfaces, synovial bursa, soft tissues and helps to identify defects in tendons and ligaments.

The obtained results and their analysis

The main purpose of X-ray of the hip joint is the basic examination appointed for the accurate diagnosis of joint diseases. Using X-ray data, a specialist can check the condition of bone structures and often make an immediate diagnosis.

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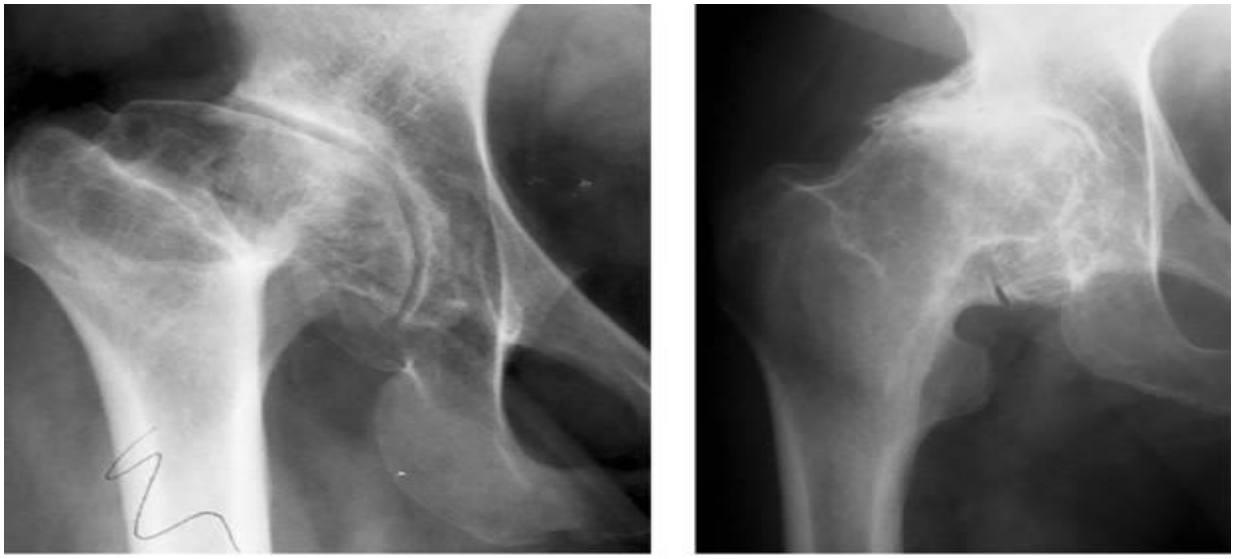

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Regarding the question of how often to take X-rays of the hip joints, it is recommended to take 1 x-ray of the hip joint no more than once every 6 months. In the x-ray of the hip joint, the patient's body receives a small amount of radiation up to 1.5 mSv. This dose is not harmful for adults.

From the X-ray image, we can see the narrowing of the joint space, and clinical examinations are carried out, where, using functional tests, it is concluded about the range of motion. Sometimes, in rare cases, an MRI, CT or ultrasound of the hip joint may be necessary.

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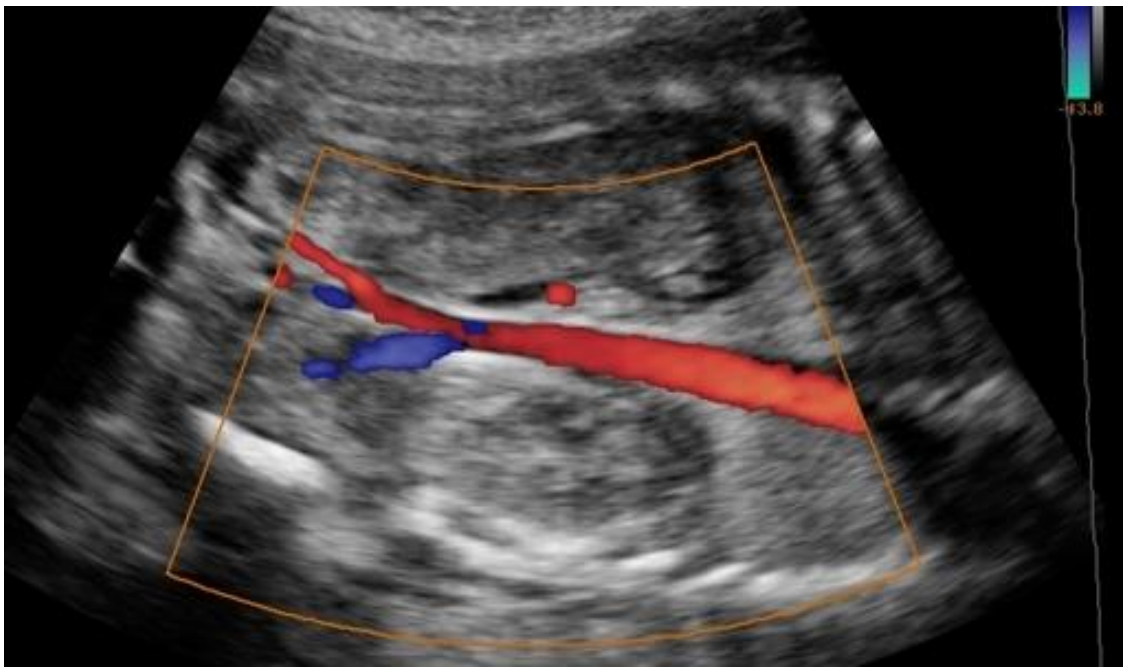
X-ray is one of the classic examination methods. This makes it possible to clarify the diagnosis and distinguish it from other pathologies, gives an idea of the depth of damage and the dynamics of the process. In this case, the initial stage is usually difficult to see. In the elderly, there are age-related changes, and in the absence of clinical signs, gonarthrosis is not diagnosed.

Ultrasound examination of the deep veins of the leg is performed to determine:

- accurate diagnosis of varicose veins.
- heaviness, swelling of the legs (during the day, during air travel).
- Knowing the condition of the valves of the leg veins.
- the presence of spider veins on the legs.
- varicose veins in the legs.
- trophic diseases (thickening, darkening of the skin).
- the presence of varicose veins of the small pelvis and hemorrhoidal veins.
- complex genetic anamnesis (varicose veins in relatives).
- long-term static load.
- heavy physical activity.



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Each test has its own "expiry date", so the patient must undergo a laboratory examination at the time specified by the operating surgeon and the therapist.

One of the modern requirements at the stage of preparation for surgery is an ultrasound examination of the deep veins of the leg and a consultation with a vascular surgeon. For some patients, this is surprising: if the operation is planned on the internal organs of the small pelvis, why should the legs be examined.

The fact is that surgery is a serious risk factor for thromboembolic complications. Pulmonary artery embolism is still one of the direct causes of death in the postoperative period. However, most cases of thromboembolic complications can be prevented by taking appropriate precautions.

Thrombosis is a small blood clot that forms inside a vein and under certain conditions can break away from its wall and travel through the bloodstream to the branches of the pulmonary artery and block them. This is pulmonary embolism - a very dangerous condition, difficult to treat and often fatal with a large blockage.

The main reasons for the formation of blood clots are well known - blood flow disorders in venous vessels, damage to the endothelium (inner wall) of blood vessels, increased blood coagulation. But there are many factors for these reasons: smoking, taking a number of drugs (for example, the same oral contraceptives), varicose veins of the lower deep veins of the legs, compression of blood vessels from the outside (for example, by a tumor) dehydration, long-term immobilization (for example, immobility during surgery and in the early postoperative period), etc.

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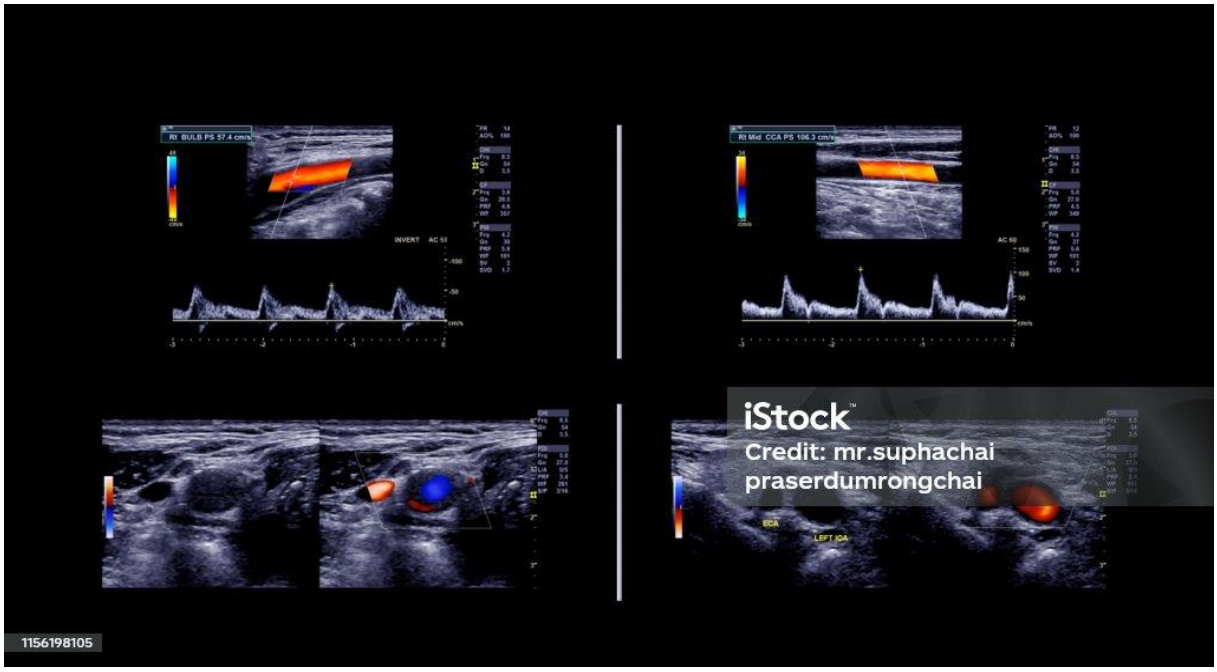

In most cases, the source of blood clots is the veins of the lower deep veins. In addition, you may not know about the presence of a blood clot for a long time - it may not manifest itself at all and turn into a dangerous complication after a successful operation against the background of complete health.

Therefore, patients should be examined before the operation - they must donate blood to study blood clotting ability, and ultrasound examination of the deep veins of the lower leg to rule out thrombosis.

There are more different types of local anesthetics (SA, EA, joint SEA, transfer) than the methods of anesthesia used in foot joint endoprosthetics [10; p. 16-21, 154; pp. 360-364, 108; 774-781-b], and the method of general anesthesia is used relatively little [6; p. 85-90, 157; 5-14-b].

Conventional general anesthesia, which eliminates pain sensibility (perception), leads to the release of neuropeptides and excitatory amino acids without interfering with nociceptive stimulation of central structures. This, in turn, leads to the development of inhibitory control deficiency, which causes the sensitivity of the dorsal branches of the spinal cord, their persistent depolarization and the emergence of postoperative pain syndrome [25; 5-12 p].

Considering the practice of endoprosthetics of leg joints, artificial ventilation of the lungs under general anesthesia with the help of tracheal intubation in the elderly and senile patients causes a large amount of blood loss [33; 24-31, 72; 420-425-b, 140; 427-435-b, 109; 1018-1025-b] increased risk of postoperative thrombosis and pulmonary embolism [64; 109-115-b, 119; p. 44-48, 119; 44-48-b] and is associated with other postoperative complications [78, 142; 1493-1499-b].

General description of clinical material

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 connecting the top of the bone between the ribs and the abdomen (Tufe's line) was drawn, crossing the bony processes of the spine, and the level of the spine was determined by the intervertebral space L3 - L4. During this period, spinal puncture was performed after treating the puncture site with an antiseptic solution. After obtaining cerebrospinal fluid, 7.5 mg of 0.5% bupivacaine (Longocaine Heavy) hyperbaric solution was slowly injected into the subarachnoid space. After the injection, the patients were left on the side position for 20 minutes and were then placed in a supine position.

During USA, all patients were supplied with oxygen-air mixture (60%, 40%) through a mask, ECG, heart rate, blood pressure, SPO2 were continuously monitored. Blood pressure was measured every 5 min before USA and after intrathecal injection until the end of the operation. Hypotension was defined as a drop in blood pressure (average BP) of 8-10% from baseline or systolic blood pressure less than 100 mm/hg in a

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5-minute interval. Normalization of the hypotonia that occurred was carried out by accelerated delivery of crystalloid preparations or by adding vasopressors and corticosteroids to them.

Hemostasis indicators of patients in I group before and after surgery.

Indicators	USA (n=20)		
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
PATT, sec	31,2 ± 0,3	37,8 ± 0,2	> 0,05

Hemostasis indicators in this group of patients showed the activation of the blood clotting system both before and after the operation. Thus, fibrinogen, although it is within the limits of physiological norms, but the convergence of its stable indicators to the upper limit of the norm can be interpreted as the activation of the coagulation component of hemostasis. This was confirmed by the indicators of prothrombin time and partial activated thromboplastin time (PATT), whose initial values were 20.4 and 16.8% lower than the minimum value of the norm, indicating a change in plasma coagulation factors in the direction of hypercoagulation. This required the addition of low molecular weight heparins (enoxiparin) in the care of these patients.

The presented table shows the average parameters of systemic hemodynamics and pulse oximetry in group I patients operated on in the USA.

SpO2 and systemic hemodynamic parameters before USA and during USA (n = 20).

Indicators	Operation and post-operation stages						
	Result	Beginning	Joint implantation	End of operation	30 mis	60 mins	120 дақиқа
PB syst	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
BP diast	78,5 ± 4,6	79,4 ± 3,1	81,3 ± 3,1	82,8 ± 4,4	84,5 ± 3,2	87,2 ± 3,1	75,2 ± 3,4
PB Mean	104,1 ± 3,7	101,9 ± 2,9	92,4 ± 2,6	104,0 ± 4,0	105,8 ± 3,4	110,9 ± 3,2	100,2 ± 3,2
Pulse	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
CVP	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 – r < 0.05 relative to initial values.

Average indicators characterize USA as anesthesia with more stable hemodynamic properties. We noticed that in the most traumatic phase of the operation, BP was the lowest compared to all other phases of the study. Thus, if the systolic BP at the beginning of the operation was 5.4% lower than the initial data (p> 0.05), this difference was 6.5% at the joint implantation stage (p < 0.05). As for diastolic BP and BP mean, they were relatively stable at all stages of the operation, and the same can be said about CVP and SpO2 indicators. At the beginning of the operation and during joint implantation, there was a tendency for the heart rate to slow down, but later the heart rate was at the level of age-specific characteristics.

Analyzing in more detail the period of USA (injection of anesthetic) and before surgery and implantation of joint components, the dynamics of PB and PB mean were as follows.

Age-related indicators of central hemodinamics in the early stages of surgery in patients of group I.

Indicators	Age	N of patients	Stages of operation		
			Result	Start	Implantation
II, ml/m^2	67 - 75	12	30,0 ± 1,0	27,4 ± 0,4	28,6 ± 0,6 ^{x}

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	76 - 84	8	24,2 ± 0,8	23,2 ± 0,6 x	21,4 ± 0,5 x
HI, l/m²	67 - 75	12	2,70 ± 0,03	2,39 ± 0,04	2,44 ± 0,03 x
	75 - 84	8	2,18 ± 0,05	2,02 ± 0,03	1,82 ± 0,04x
TPVR, dyn×sec×см -5	67 - 75	12	1632,9 ± 108,4	1811,5 ± 154,9	1606,9 ± 121,9 x
	76 - 84	8	2031,2 ± 102,3	2145,2 ± 109,9	2142,6 ± 141,4x

Note: x – r < 0.05 difference with respect to age indicator.

The presented data once again show a significant difference in CH parameters in the early stages of surgery depending on age and comorbidity. Thus, if in patients aged 67-75 years, the heart index decreased by 4.7% ($p < 0.05$), and in patients aged 76-84 years, it decreased by 11.6% ($p < 0.05$). In patients aged 67-75, during the same phase of the study, the decrease in cardiac index was 9.7%, and in the older group, it decreased by 16.6% without compensation for tachycardia. As for total vascular peripheral resistance (TPVR), it increased by 10.9% before surgery in patients aged 67-75 years and returned to the initial values in stage III, the same indicator in older patients was 5.6% and 5.4, respectively. The slow delivery of 3-4 mg of the drug isoket (perlinganite) under the control of the pulse and PB helped to reduce the total vascular peripheral resistance and open the periphery, reduce the afterload and bring it closer to the required values. Thus, the actual values of total vascular peripheral resistance (TPVR), which was 2890.8±170.1 dyn×s×cm-5 in this group at first, were lower than the corresponding values (3145.9±102.4 dyn×s×cm-5.) was higher by 10.4% ($p <0.05$). Total vascular peripheral resistance at the stage of joint implantation was on average 3734.5±112.7 dyn×s×cm-5, which is lower than the required values.

In this group of elderly and senile people, the high level of sympathetic regulation of the circulatory system was also affected by autonomic index indicators, which were +24 at baseline and positive +15.7 at the end of the operation.

Characteristics of sensory and motor blocks in patients operated on in USA conditions (n = 20).

№	**Sensory blockade**	**Indicators**
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, min	11,9 ± 3,5
7	$Th_{10,}$ the duration of the sensor block in min	87,9 ± 10,1
8	Regression time of sensory block to levels of $Th_{12} – L_{1-2}$, min	104.9 ± 7,5

№	**Motor block**	**Indicators**
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	Motor block regression time to Th_{11}	138,5 ± 5,4

We were interested in the fact that sensory and motor blocks were more lasting at a dose of 7.5 mg of 0.5% bupivacaine local anesthetic in unilateral USA. The average duration of motor block in USA was 117.5 ± 6.1 minutes. We attribute this fact to the higher concentration and duration of action of the unilateral bupivacaine dose in the USA.

Bilateralization of the process occurred in 2 (9.6%) patients in this group, without affecting the effectiveness of anesthesia. A dose of 7.5 mg of bupivacaine has been shown to be very effective in terms of relative hemodynamic stability in the USA. Perioperative instability in patients enrolled in the study is associated with cardiovascular consequences of neuraxial blockade due to aging and comorbidities. Therefore, its prevention is mainly based on limiting the cardiovascular effects of neuraxial blockade. The effectiveness

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of such low doses is confirmed by.a number of authors (Kayamm et al, 2004, Khatouf M. et al, 2005). [87; 591-596-b, 90; 249-254-b].

Total blood loss in this group of patients was 6.5 ml/kg, in total hip arthroplasty - 5.8 ml/kg, and in total knee arthroplasty - 6-8 ml/kg. The volume of infusion solutions given to patients in this group was 24.6 ml/kg, and the volume of transfused erythrocyte mass was 3.45 ml/kg.

Preoperative time was 47.7+6.1 minutes, which consisted of the USA technique itself, a long stay in the lateral position, and slow access to the surgical level (Th_{11}).

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

General description of the USA (n = 20)

Indicators	Value
Sensory block	
The beginning of the sensory block at the level of Th10, min	5,48 ± 2,11
Duration of block at Th_{10} level	87,9 ± 10,1
Motor block	
Available, n (%)	20 (95.3%) patients
No, n (%)	-
Bilateral block n (%)	2 (10,0 %)
Lack of USA, % n (%)	1 (5 %)
Number of minor episodes of hypotension, n (%)	18 (90,0 %)
Total consumption of vasopressors, mg	28,4 ± 7,2
Amount of intravenous infusion, ml	1956,9 ± 120,6
Satisfaction, n (%)	
Patients	19 (95 %)
Surgeons	18 (90,0 %)

Complications associated with this method of anesthesia were relatively rare. Serious complications: pneumonia (1), arrhythmia (2), respiratory depression <2/min (1), hypotension greater than 20% of baseline (1), SpO2<90% (1), nausea (1), vomiting (1), headache (1). Two patients required bladder catheterization due to urinary retention, and all of the complications listed above resolved rapidly.

Resume.

Neuroaxial anesthesia is often used in traumatology and orthopedic surgery in elderly and senile patients with a high comorbid background. In elderly people, a decrease in the compensatory mechanisms of the cardiovascular system significantly increases the risk of developing arterial hypotension in the sympathetic block 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..

Conclusions

1. An effective way to prevent hemodynamic disturbances in NA conditions is to optimize anesthesia depending on the state of the autonomic nervous system. A simple measurement of the autonomic index makes it possible to identify patients with a predominant sympathetic type of autonomic tone, who should be included in the risk group during NA, which requires a differential approach to the selection of the anesthesia method.

2. The addition of 20 μg of fentanyl to low doses of bupivacaine (7.5 mg) prolongs the duration of sensory blockade by 17.1% and the total anesthesia time (by 19.8%) using low doses of local anesthetic without increasing the duration of motor blockade.

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3. General preparation before surgery in elderly and elderly patients, i.e. deep and comprehensive laboratory instrumental examinations, as well as MRI, CT, X-ray, vascular Doppler, and the results and conclusions obtained from them during surgery in these patients are necessary for the successful transfer of surgery to the Traumatologist-Orthopedic doctor and post-operation became one of the important factors in the prevention of thromboembolic complications in the early period.

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