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THE SIGNIFICANCE OF AXILLARY BLOCK IN UPPER ARM AMPUTATION IN A PATIENT WITH SERIOUS COMORBIDITIES: A CASE REPORT

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Surgical management is sometimes the only viable treatment option for patients with peripheral arterial occlusive disease. However, performing surgery under general endotracheal anesthesia in patients with hemodynamic and respiratory instability poses a significant challenge. In such cases, neuraxial blocks may provide a safer alternative.

An 80-year-old male patient was urgently admitted to the Department of Internal Medicine at the Military Hospital Niš due to difficulty breathing and a livid discoloration of the left hand and forearm. Carpal pulses were absent, and the patient had experienced loss of movement and sensation in the hand for several days. Clinical examination and Multislice computed tomographc angiography of the pulmonary and major arteries of the left arm confirmed a diagnosis of pulmonary embolism and occlusion of the subclavian and brachial arteries. After evaluating the patient's condition, the anesthesiologist opted for a neuraxial block instead of general endotracheal anesthesia.

Avoiding general endotracheal anesthesia and utilizing neuraxial blocks could minimize the possibility of adverse events in high-risk patients.

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Key words: *neuraxial anesthesia, pulmonary embolism, peripheral arterial occlusive disease*

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Introduction

Peripheral arterial occlusive disease is a condition that impairs the normal function of the arterial system, leading to reduced blood flow to the extremities. Risk factors include hypertension, dyslipidemia, smoking, diabetes, physical inactivity, and genetic predisposition (1). Peripheral arterial disease is also considered a significant contributor to overall cardiovascular risk. The most common symptom is intermittent claudication, characterized by calf pain that worsens with walking and subsides with rest. In advanced cases, pain persists even at rest, especially in the supine position (2, 3). Upper limb ischemia of the is not as frequent as that affecting the lower limbs. From a clinical point of view, the anatomical region of the shoulder and elbow is much more resistant to ischemia due to its well developed collateral circulation; ischemic symptoms are thus more frequently observed in the forearm region. Ischemia-related amputation is far less frequently performed in the upper than in the lower limbs. In 2005, out of 1.6 million people with limb amputation, it was estimated that 573,000 had upper limb amputation (4). Traumas accounted for the most part of major upper limb amputations, while vascular diseases accounted for only 12% of these operations (5).

Axillary block is a peripheral nerve block performed under ultrasound guidance, often with the assistance of a peripheral nerve stimulator. The injection of local anesthetic into the axillary region blocks the brachial plexus, providing effective anesthesia for upper limb surgery (6–8).

This method is relatively easy to perform and carries a low risk of complications.

We report a case of irreversible ischemia of the left arm in a patient with pulmonary thromboembolism and multiple comorbidities, in whom upper arm amputation was a vital necessity.

Case report

A 80-years old male patient was transported by an ambulance to the Department for Internal Diseases of the Military Hospital in Niš needing immediate medical attention due to difficulty breathing. After admission, a clinical examination was performed and his blood samples were taken for laboratory analyses. The patient had dementia and was unable to communicate effectively, so his medical history was obtained hetero-anamnestically, from his wife. He was hypertensive, diabetic, and had a post-stroke status. He had difficulty breathing (Cheyne-Stokes type respiration). Hemodynamic parameters at admission were BP 80/50 mmHg, HF 137/min, O_2 saturation 83%. Laboratory parameters at admission were as follows: RBC 5.0 10^12/L, HGB 147 g/L, PLT 199 10^9/L, WBC 13.4 10^9/L, CRP 39 mg/L, glycemia 21.1 mmol/L, urea 14.8 mmol/L, creatinin 171 μmol/L, total proteins 66.8 g/L, albumin 35.3 g/L, AST 40 U/L, ALT 45 U/L, gamma-GT 24 U/L, alpha-amilase 91 U/L, LDH 552 U/L, CK 276 U/L, sodium 145 mmol/L, potassium 4.7 mmol/L, calcium 2.04 mmol/L, chlorids 114 mmol/L, phosphorus 2.17 mmol/L, D-DIMER 34533 ηg/mL. The vascular surgeon prescribed the following conservative therapy: Sol. 0.9% NaCl 250 ml + amp. Meropenem 500mg/8h i.v, Sol. Metronidazole 500mg/8h i.v, sir. Enoxaparine 80mg/12h s.c, amp. Pantoprazole 40mg/12h, amp. Furosemide 40 mg/12h, a vasoactive coctail (amp. Pentoxifylline 300mg+amp. Lidocaine No 60 mg+amp. Metamizole 2.5 g+amp. Ascorbic acid 500mg+amp. Thiamine 100 mg.

A neurologist was consulted and prescribed an endocranial MSCT. The results indicated no acute worsening of the existing neurological condition.

Clinical examination revealed a livid discoloration of the left hand and forearm. Left-sided carpal pulses were absent, and the hand had no motor or sensory function. Heteroanamnestically, it was reported that this condition had been present for several days. Multislice computed tomographc angiography of the pulmonary and major arteries of the left arm confirmed a diagnosis of pulmonary embolism and occlusion of the subclavian and brachial arteries. Due to serious comorbidities and the unavailability of vascular surgeons at the Military Hospital in Niš, the patient was referred to the Emergency Centre of the University Clinical Centre Niš.

Following admission and detailed clinical evaluation, emergency upper arm amputation was indicated due to irreversible ischemia. The patient was in critical condition upon arrival at the Vascular Surgery Clinic. After brief preoperative preparation, the patient was transferred to the surgical block for the planned operative treatment. After reviewing the patient's medical records and conducting a medical examination, the anesthesiologist determined that the procedure should be performed under an axillary block, as general anesthesia posed a significantly high risk due to the patient's hemodynamic instability.

After positioning the patient in supination with his arm abducted at 90°, the skin was disinfected and a tube was placed transversally to the anteromedial part of the upper arm, in the direction of *m. pectoralis major* attachment to the humerus. At the 1−3 cm depth, ultrasound visualized axillary artery, two veins (usually), hyperechogenic structures: *n. medianus* (laterally and superficially to the artery), *n. ulnaris* (superficially and medially to the artery) and *n. radialis* (posteriorly and laterally or medially to the artery) and three muscles*: m. biceps brachii*, *m. coracobrachialis* and *m. triceps brachii*, as well as *n. musculocutaneous*, extending between the tendons of *m. biceps brachii* and *m. coracobrachialis* (9, 10). Following the identification of the nerves and vascular structures, a local anesthetic (0.5% levobupivacaine, 20 ml) was administered perivascularly at a 45° angle using a 22G, 50 mm needle (Figure 1).

After administering the axillary block to the left arm, an upper arm amputation was performed (Figure 2). The patient's immediate postoperative course remained stable.

After surgery, the patient was transferred to the intensive care unit at the Anesthesia and Intensive Therapy Clinic. Upon admission, the patient was conscious but unable to communicate. He was breathing spontaneously with oxygen support via an O_2 mask at a flow rate of 8 L/min, maintaining blood oxygen saturation of 97–98% with this oxygen supply. His hemodynamic parameters at admission were as follows: blood pressure (BP) 148/80 mmHg and heart rate (HR) 80/min. The patient arrived in the intensive care unit with a urinary catheter in place, and his initial diuresis after admission was 1,400 mL. The immediate post-anesthesia and postoperative course were uneventful. The patient's hemodynamic and respiratory parameters remained stable, with no signs of fever. His total diuresis reached 3,600 mL by the following morning.

Figure 1. Ultrasound-guided axillary block – University Clinical Centre Niš;*AA – axillary artery, AV – axillary vein, RN – radial nerve, UN – ulnar nerve, MN – medial nerve

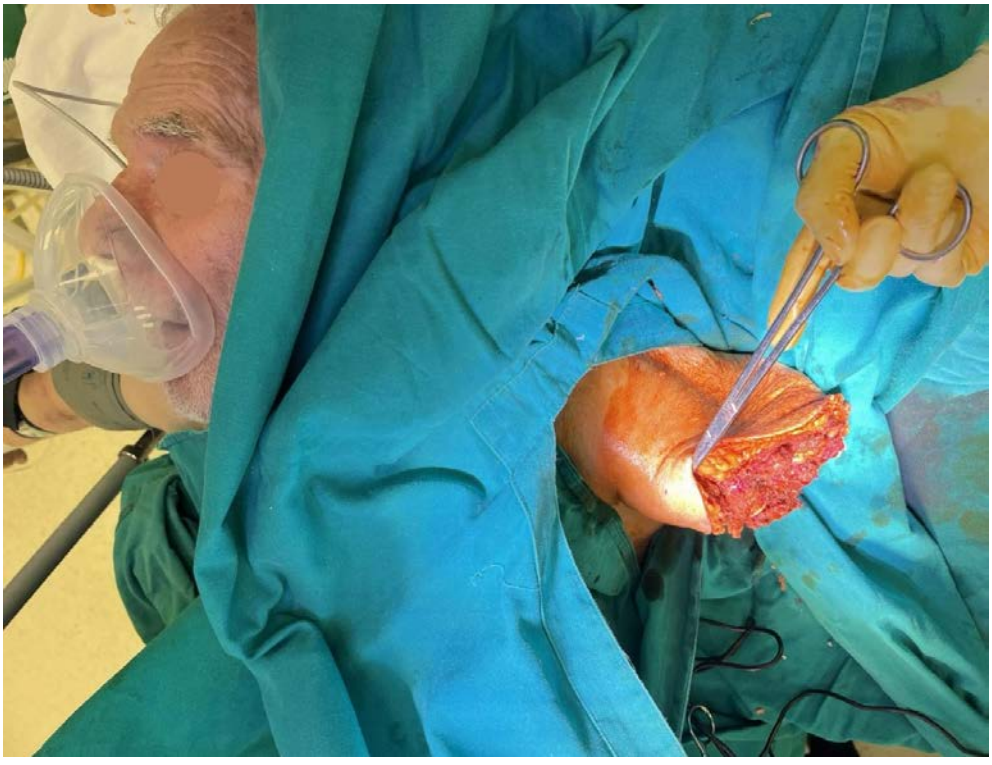

Figure 2. Upper arm amputation performed in an axillary block

On the second postoperative day, the patient remained conscious but was still unable to establish verbal communication. He was breathing spontaneously with oxygen supplementation via a mask at a flow rate of 7 L/min, maintaining an O_2 saturation of 99%.

The patient's hemodynamic parameters were as follows: BP 130/70 mmHg, HF 73/min; laboratory parameters: RBC 4.58 10^12/L, HGB 133 g/L, HCT 0.397 L/L, PLT 213 10^9/L, WBC 13.8 10^9/L, CRP 175.6 mg/L, glycemia 15.8 mmol/L, urea 30.5 mmol/L, creatinin 308.0 μmol/L, total bilirubin 8.7 μmol/L, direct bilirubin 2.0 μmol/L, total proteins 55 g/L, albumin 26 g/L, AST 54 U/L, ALT 56 U/L, alkaline phosphatase 58 U/L, gamma-GT 23 U/L, alpha-amilase 47 U/L, LDH 646 U/L, sodium 153 mmol/L, potassium 4.3 mmol/L, chlorids 116 mmol/L, calcium 2.11 mmol/L, magnesium 1.06 mmol/L.

After evaluation by the vascular surgeon and anesthesiologist, the patient was transferred to the intensive care unit of the Department of Surgery at the Military Hospital in Niš for further monitoring and treatment.

Discussion

Regional anesthesia and peripheral nerve blocks offer numerous advantages, including minimal patient preparation. Since intravenous anesthetics and opioids are avoided, better cardiorespiratory stability can be achieved compared to general anesthesia, along with a reduced incidence of postoperative nausea and emesis (11−13). All these factors contribute to early patient rehabilitation, a shorter hospital stay, increased patient satisfaction, and a reduction in overall treatment costs (14–16). The impact of regional versus general anesthesia on postoperative morbidity and mortality in older patients remains a topic of debate in the medical literature. However, numerous studies have examined this issue. For example, Neuman et al. demonstrated that regional anesthesia is associated with lower inpatient mortality and fewer pulmonary complications compared to general anesthesia (17). Rashid et al. emphasized in their study that anesthesia should be tailored to individual patient needs and preferences (18).

The choice of anesthesia should be based on the patient's overall medical condition and the type of surgery, carefully determined through communication between the surgeon, anesthesiologist, and patient (19). The debate over the advantages of peripheral nerve blocks versus general anesthesia in upper limb surgeries remains ongoing. In cases like this, where the patient has critical hemodynamic and respiratory parameters alongside multiple comorbidities, the anesthetic approach should be limited to methods that minimize hemodynamic and respiratory impact. This approach avoids additional complications associated with mechanical ventilation, intravenous anesthetics, opioids, and neuromuscular relaxants.

Conclusion

Upper arm amputation can be performed using a peripheral nerve axillary block, avoiding general anesthesia, mechanical ventilation, intravenous anesthetics, opioids, and neuromuscular relaxants, thereby reducing the risk of further compromising the patient's respiratory and hemodynamic status.

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ZNAČAJ UPOTREBE AKSILARNOG BLOKA KOD BOLESNIKA SA AMPUTIRANOM NADLAKTICOM I BROJNIM KOMORBIDITETIMA: PRIKAZ SLUČAJA

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Operativni tretman osoba sa okluzivnom bolešću perifernih arterija ponekad predstavlja jedini terapijski pristup. S obzirom na to da izvođenje hirurške intervencije u opštoj endotrahealnoj anesteziji kod hemodinamski i respiratorno nestabilnog bolesnika ponekad predstavlja pravi izazov, primena neuraksijalnih blokova može biti pravi izbor.

Osamdesetogodišnji bolesnik je prevezen kao hitan slučaj na Odeljenje za kardiovaskularne bolesti Vojne bolnice u Nišu zbog otežanog disanja, blede leve šake i podlaktice. Izostajale su karpalne pulsacije, a u šaci bolesnika poslednjih nekoliko dana nije bilo motorike i senzibiliteta. Posle kliničkog pregleda i laboratorijskih analiza urađena je višeslojna kompjuterizovana tomografska angiografija plućnih i magistralnih arterija leve ruke, prilikom koje je postavljena dijagnoza plućne embolije i okluzije a. *subclavia* i a. *brachialis*. Nakon uvida u medicinsku dokumentaciju i kliničkog pregleda, anesteziolog se opredelio za neuraksijalnu anesteziju.

Izbegavanje opšte endotrahealne anestezije i primena neuraksijalnih blokova mogli bi minimalizovati mogućnost pojave neželjenih efekata kod bolesnika sa hemodinamskom i respiratornom nestabilnosti.

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***Ključne reči**: neuraksijalna anestezija, plućna embolija, okluzivna bolest perifernih arterija*