Case Report

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Experience with Regional Anesthesia for Carotid Endarterectomy at the N.V. Sklifosovsky Research Institute for Emergency Medicine

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ABSTRACT Acute cerebrovascular accident is one of the major causes of death and disability of patients around the world. In 30-40% of cases, the cause of ischemic stroke is an extracranial lesion of the brachiocephalic vessels. Carotid endarterectomy is the main technique for preventing cerebrovascular accident in carotid artery stenosis. General anesthesia with endotracheal intubation has been the method of choice since the widespread introduction of this type of surgical intervention into clinical practice and in most centers remains so to this day. At the same time, many authors report, that the use of general anesthesia with endotracheal intubation has limitations in a number of patients, namely, in the presence of an embologenic plaque in the operated internal carotid artery, severe coronary artery disease, decompensated aortic and / or mitral stenosis, low ejection fraction, heart rhythm and conduction disorders, severe chronic diseases of the respiratory system, as well as patient refusal for general anesthesia.

THE AIM of the study was to show the possibilities of using regional anesthesia for carotid endarterectomy in a high-risk patient.

RESULTS The use of regional anesthesia allows surgeons to avoid instability or abrupt changes in hemodynamics in the intraoperative period. Indications for its use are also cases of critical contralateral stenosis of the internal carotid artery when it is necessary to carefully consider the advisability of installing an internal stent.

CONCLUSION The use of regional anesthesia made it possible to successfully perform carotid endarterectomy without cardiovascular events, neurological deficit and postoperative complications in a patient with relative contraindications to general anesthesia.

Keywords: eversion carotid endarterectomy, regional anesthesia, deep and superficial cervical plexus block
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Acute cerebrovascular accident is one of the main causes of death and disability of patients around the world. In 30-40% of cases, the cause of ischemic stroke is an extracranial lesion of the brachiocephalic vessels. Carotid endarterectomy is the main technique for preventing cerebrovascular accident in carotid artery stenosis. General anesthesia with endotracheal intubation has been the method of choice since the widespread introduction of this type of surgical intervention into clinical practice and remains so to this day in most centers. At the same time, many authors report, that the use of general anesthesia with endotracheal intubation has limitations in a number of patients, namely, in the presence of an embologenic plaque in the operated internal carotid artery, severe coronary

artery disease, decompensated aortic and / or mitral stenosis, low ejection fraction, heart rhythm and conduction disorders, severe chronic diseases of the respiratory system, as well as patient refusal for general anesthesia [1–3].

Therefore, regional anesthesia may be a safe alternative to provide anesthesia relief in high-risk patients.

Patient G., 69 years old, with a diagnosis of brachiocephalic atherosclerosis, hemodynamically significant stenoses of the carotid arteries on both sides, and complaints of dizziness, unsteadiness in gait, transient ischemic attacks, was admitted in a planned manner to perform carotid endarterectomy at the Department of Vascular Surgery of the N.V. Sklifosovsky Research Institute for Emergency Medicine.

For a long time the patient has suffered from arterial hypertension. A year ago, the patient underwent transcatheter aortic valve implantation (Corevalve Evolut R, 26 mm). Ultrasound examination revealed hemodynamically significant bilateral carotid artery stenosis up to 80%.

Concomitant disorders: ischemic heart disease; postinfarction cardiosclerosis (myocardial infarction of unknown age); class III angina pectoris. A history of stenting of the middle third of the right coronary artery (Resolute Integrity™ drug-eluting stent, 2.5x30 mm). Degenerative aortic valve disease with a predominance of stenosis. Coronary artery stenosis. Arterial hypertension of the 2nd degree, 2nd stage, the risk of cardiovascular complications: 4 (very high). Chronic heart failure 2A, functional class III. Transcatheter aortic valve implantation (Corevalve Evolut R, 26 mm) due to aortic stenosis. Chronic obstructive pulmonary disease. Chronic bronchitis. Pneumosclerosis. Emphysema. Groin hernia repair in 2011.

Right common femoral endarterectomy on August 27, 2021. Constant intake of clopidogrel.

Electrocardiogram: sinus rhythm, heart rate 68 beats per minute. Incomplete right bundle branch block. Frequent ventricular extrasystoles.

X-ray of the lungs revealed pneumosclerosis, left ventricular hypertrophy; aortic calcification.

Echocardiography. Condition after transcatheter aortic valve implantation (TAVI). Paravalvular regurgitation of the 2nd degree. Dilated cardiomyopathy. Left ventricular global systolic function is reduced - the ejection fraction is 30% (the Simpson Method) due to diffuse hypokinesis. Minor asymmetric left ventricular hypertrophy. Mitral valve insufficiency of the 2.5 degree, tricuspid valve insufficiency of the 2.5 degree. Signs of moderate pulmonary hypertension (pulmonary artery systolic pressure 65 mm Hg).

Examination by the neurologist. Dyscirculatory encephalopathy stage I, compensation. Pseudobulbar affect. Critical left internal carotid artery stenosis. Chronic cerebral ischemia.

Consultation with the cardiologist. The risk of cardiovascular complications: 4 (very high), low cardiac ejection fraction 35%.

Examination by the anesthesiologist. ASA (American Society of Anesthesiologists) class 4 physical status.

Thus, the results of the preoperative examination indicated a low ejection fraction, lesions in the coronary bed, which was a relative contraindication for general anesthesia with endotracheal intubation.

Multidisciplinary Council. A patient with a severe performance status, critical stenosis of both internal carotid arteries (more than 80%), a threat of developing acute cerebrovascular accident was indicated for surgical treatment of cerebral ischemia. However, there were contraindications for general anesthesia with endotracheal intubation. In this regard, the choice was made in favor of regional anesthesia.

The patient signed an informed consent for regional anesthesia.

In the operating room, under sterile conditions, using ultrasound navigation, superficial cervical plexus (subcutaneous tissue along the posterior border of the sternocleidomastoid muscle) and ipsilateral deep cervical plexus (prevertebral space, at the level of C2–C4) blocks were performed with ropivacaine solution. The total dose of 0.5% local anesthetic was 150 mg (Fig. 1). Intraoperatively, the patient underwent an additional blockade of the carotid sinus nerve which does not belong to the cervical plexus, but is a branch of the glossopharyngeal nerve.

The radial artery was catheterized for the purpose of direct measurement of arterial pressure. Oxygen saturation and heart rate were monitored. And neuromonitoring was performed using cerebral oximetry.

For the purpose of sedation, a solution of Dexmedine, 0.4 μg/kg/h, was started before surgery, and a maintenance dose of this drug of 0.3 μg/kg/h was used during surgery. The depth of sedation was assessed using Ramsay Sedation Scale, which was recorded at the level of 4 points.

During surgery, hemodynamic parameters were recorded as stable: blood pressure in the range of 140-160/60-80 mmHg, heart rate 59-64 beats per minute. Cerebral oximeter readings: 72% hemoglobin oxygen saturation (before carotid clamping), 64% (during carotid clamping), and 72% after restoration of blood flow through the carotid arteries (Fig. 2).

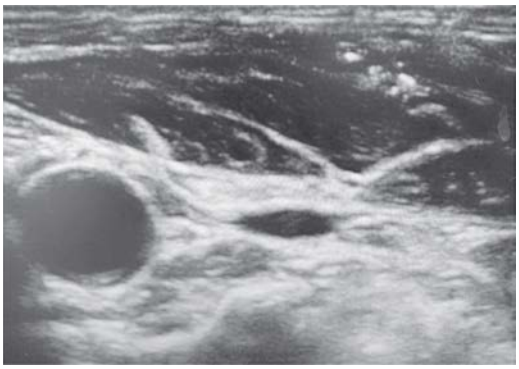

Fig. 1. Deep cervical plexus block

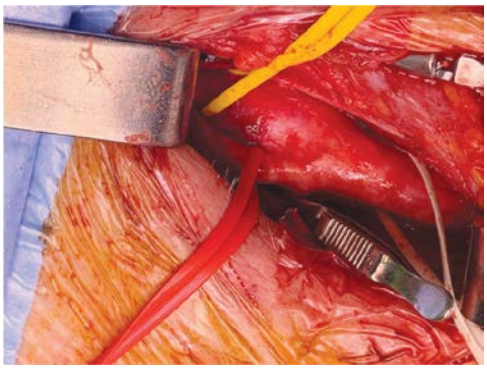

Fig. 2. Carotid arteries

Breathing is independent, spontaneous. Saturation - 99%.

The duration of carotid artery clamping was 20 minutes (Fig. 3). The duration of the surgical intervention was 60 minutes; a removed atherosclerotic plaque from the common, internal, and external carotid arteries is shown in Fig. 4.

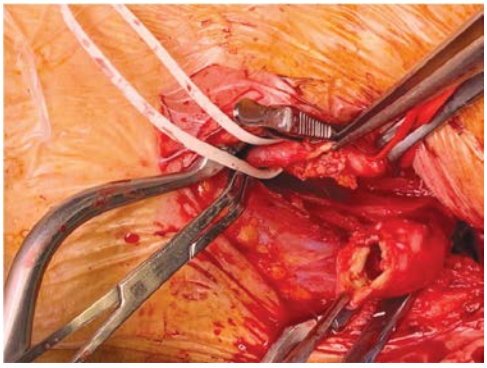

Fig. 3. Eversion carotid endarterectomy

Fig. 4. Removed atherosclerotic plaque from the common, internal and external carotid arteries

At the end of the surgical intervention, the patient, in a clear mind, on spontaneous breathing, was transferred to the intensive care unit and discharged from the hospital on the 3rd day after carotid endarterectomy.

DISCUSSION

It is well known that the use of general anesthesia with endotracheal intubation makes it possible to achieve guaranteed immobility of the patient, the most comfortable conditions for the surgeon's work, a lower level of brain cell metabolism, complete control of airway patency, respiratory minute volume, monitoring of carbon dioxide concentration at the end of expiration, as well as turning off consciousness and, as a result, reducing the patient's response to operational stress [4].

At the same time, the disadvantages of general anesthesia with endotracheal intubation include episodes of significant changes in hemodynamic parameters, first of all, frequent development of hypotension after general anesthesia induction and a sharp rise in blood pressure before or after tracheal extubation. These changes may lead to perioperative stroke or infarction, especially in patients with severe concomitant diseases of the cardiovascular system, as well as bleeding from the postoperative wound [5,6].

Some authors also note the impossibility of monitoring patient neurological status during surgery and late detection of neurological deficits and complications [7]. Over the past 3 years more than 600 operations of carotid endarterectomy have been performed at the N.V. Sklifosovsky Research Institute for Emergency Medicine. Regional anesthesia was used in 75 patients with serious performance status and severe bilateral lesions of the carotid arteries.

CONCLUSION

Regional anesthesia is the method of choice for performing carotid endarterectomy in high-risk patients.

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