

The stenting of carotid-subclavian shunt for the primary prevention of acute cerebrovascular accident

Shukurov F. B.¹, Rudenko B. A.¹, Feshchenko D. A.¹, Vasiliev D. K.¹, Aleshin I. I.²

¹ National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation, Moscow, Russia.

² City clinical hospital named after S. S. Yudin, Moscow City Health Department, Moscow, Russia.

Abstract

Acute cerebrovascular accident prevention is one of the most important medical and social issues. Revascularization after open reconstructive surgery is of particular technical difficulty due to structural changes of vascular bed and adhesion-related complications. Repeated carotid artery bypass grafting is not enough investigated and technically complex method that is associated with high operational risk. We performed stenting of the proximal anastomosis of the carotid-subclavian shunt using the cerebral protection system with right femoral and left radial approaches. This clinical case demonstrates the possibilities of modern endovascular surgery in the management of patients with extremely high cardiovascular risk.

Keywords: atherosclerosis, restenosis, stroke, prevention, stenting.

AUTHORS

Firdavs B. Shukurov*, M.D., senior researcher of the Department of Innovative Endovascular Therapy for the Prevention and Treatment of Cardiovascular Diseases of the National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation, Moscow, Russia.

Boris A. Rudenko, M.D., doctor of medicine, head of the Department of Innovative Endovascular Therapy for the Prevention and Treatment of Cardiovascular Diseases of the National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation, Moscow, Russia.

Daria A. Feshchenko, M.D., junior researcher of the Department of Innovative Endovascular Therapy for the Prevention and Treatment of Cardiovascular Diseases of the National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation, Moscow, Russia.

Dmitry K. Vasiliev, researcher of the Department of Innovative Endovascular Therapy for the Prevention and Treatment of Cardiovascular Diseases of the National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation, Moscow, Russia.

Ivan I. Aleshin, M.D., physician of the Department of X-ray Endovascular Diagnostic Methods and Treatment of the City clinical hospital named after S. S. Yudin, Moscow City Health Department, Moscow, Russia.

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Introduction

Acute cerebrovascular accident (CVA) is one of the main causes of disability and mortality worldwide. According to the Ministry of Health of the Russian Federation, the incidence of stroke is up to 3 cases per 1000 population, while its mortality reaches 30% [1].

The most common cause of stroke is brachiocephalic atherosclerosis that can be prevented by surgical techniques (endovascular stent grafting, carotid endarterectomy) in addition to pharmacotherapy [2–4]. Moreover, in patients with certain pathologies (subclavian steal syndrome, brachiocephalic artery stenosis, aortic arch replacement), carotid artery bypass can be used to preserve antegrade blood flow [5]. However, despite the success in the management of aortic arch atherosclerosis with invasive procedures, the issue of restenosis after carotid interventions is still highly relevant. From 10 to 15% of patients reported restenosis during the first year after carotid stenting, and over 50% — in 10 years. [6]. There are several methods of graft revascularization, however, according to various studies, stenting is the most effective treatment strategy compared with other interventions [7–10]. The development of cerebral embolic protection devices significantly reduced the risks of intraoperative complications during carotid angioplasty and stenting. Data on carotid shunting, in turn, are scarce. In this article we present clinical case of the stenting of carotid-subclavian shunt proximal anastomosis and its impact on the life quality that was performed at the Department of Innovative Endovascular Therapy for the Prevention and Treatment of Cardiovascular Diseases of the National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation.

Materials and methods

The analysis of endovascular treatment of patient with restenosis of the carotid-subclavian proximal anastomosis shunt including the examination of patient's medical history and the assessment of long-term consequences of treatment.

Clinical case

Patient M., 78-years woman, was admitted to the Department of X-ray Endovascular Diagnostic Methods and Treatment in October 2020. Patient had dizziness and unsteadiness, diffuse compressive headaches, memory loss, tinnitus, as well as syncope episode and short-term right-sided hemiparesis 2 weeks prior to hospitalization.

According to medical history patient has been suffering from arterial hypertension for over 30 years (despite multicomponent pharmacological treatment, the mean blood pressure (BP), self-measured for 3 weeks before the procedure, was 150/70 mmHg). In 1993, she underwent right side mastectomy followed by chemotherapy. In 2012 she had left subclavian artery occlusion that was treated with Amplatzer system, stenting of the aortic arch and descending aorta, followed by carotid-subclavian bypass grafting (left common carotid artery (CCA) prosthesis and bypass grafting of the left subclavian artery from the right CCA with a Vascutek 8 mm synthetic prosthesis). She also had stroke 2 years prior to hospitalization which manifested with loss of consciousness, right leg paresis, fine motor disability in both hands.

According to the duplex scanning of the brachiocephalic arteries, two months prior to hospitalization she had occlusion of the left CCA and left subclavian artery, the carotid-subclavian alloprosthesis anastomosed "end-to-side" with the proximal segment of

the right CCA (critical 90% stenosis of the prosthesis), 45% stenosis of the bifurcation of the left CCA.

According to multi-slice computed tomography (MSCT) data of the thoracic aorta and brachiocephalic arteries: condition after arthroplasty of the aortic arch, shunting of the left brachiocephalic arteries from the right CCA, hemodynamically significant (90%) stenosis of the proximal anastomosis. Since the summer of 2019, the patient began to notice episodes of a rare pulse with presyncope phenomena, a sick sinus syndrome was diagnosed, for which a pacemaker was implanted. It is known that 2 weeks prior to the current hospitalization she had a syncope with short-term right-sided leg weakness. She received conservative treatment at the Department of Neurology of the City Clinical Hospital after which she was transferred to the National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation for endovascular treatment.

Selective angiography of the brachiocephalic arteries revealed: occlusion of the CCA orifice and left subclavian artery, 95% stenosis of the proximal anastomosis of the carotid-subclavian bypass (Figure 1).



Figure 1. Stenosis of the proximal anastomosis of the carotid-subclavian bypass

A — right CCA;
B — left CCA (graft installed);
C — left subclavian artery (graft installed).

Considering neurological symptoms, as well as the anatomical characteristics of the carotid-subclavian bypass stenosis that can be improved by endovas-

cular treatment (favorable angle of alloprosthesis), it was decided to perform angioplasty with stenting of the proximal anastomosis using cerebral embolic protection device.

The right femoral artery approach has been chosen for the intervention. An introducer and the Judkins Right 7Fr guiding catheter were installed. The guiding catheter was passed beyond the area of stenosis to the proximal part of the left internal carotid artery. The cerebral embolic protection device with 7 mm diameter was installed ("umbrella filter" that prevents microembolization of cerebral arteries by particles of atheromatous debris during the stent dilatation and implantation). The occluded section of the proximal anastomosis of the carotid-subclavian bypass was predilated with 5x20 mm balloon catheter that had 10 atm. inflation pressure (Figure 2).

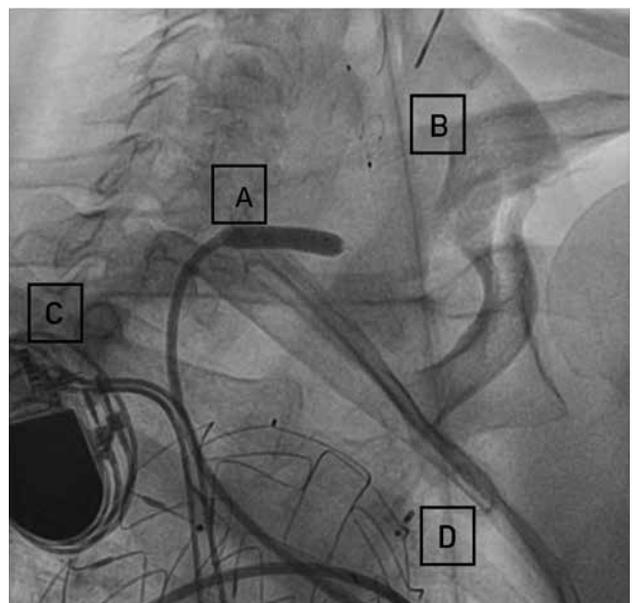


Figure 2. The predilation of the occlusion with 5x20 mm balloon catheter

A — balloon catheter;
B — distal part of the cerebral embolic protection device;
C — cardiac pacemaker;
D — contours of previously implanted stent-graft of the aortic arch.

For more precise stent placement at the carotid-subclavian shunt and the control of its implantation, the left radial access has been chosen. The stent was implanted using angioscopy control and maximum coverage of the proximal anastomosis area (Figure 3).

During the operation, the patient was conscious, verbally communicated with the staff, did not present any active complaints or focal neurological signs and her hemodynamic parameters remained stable. The

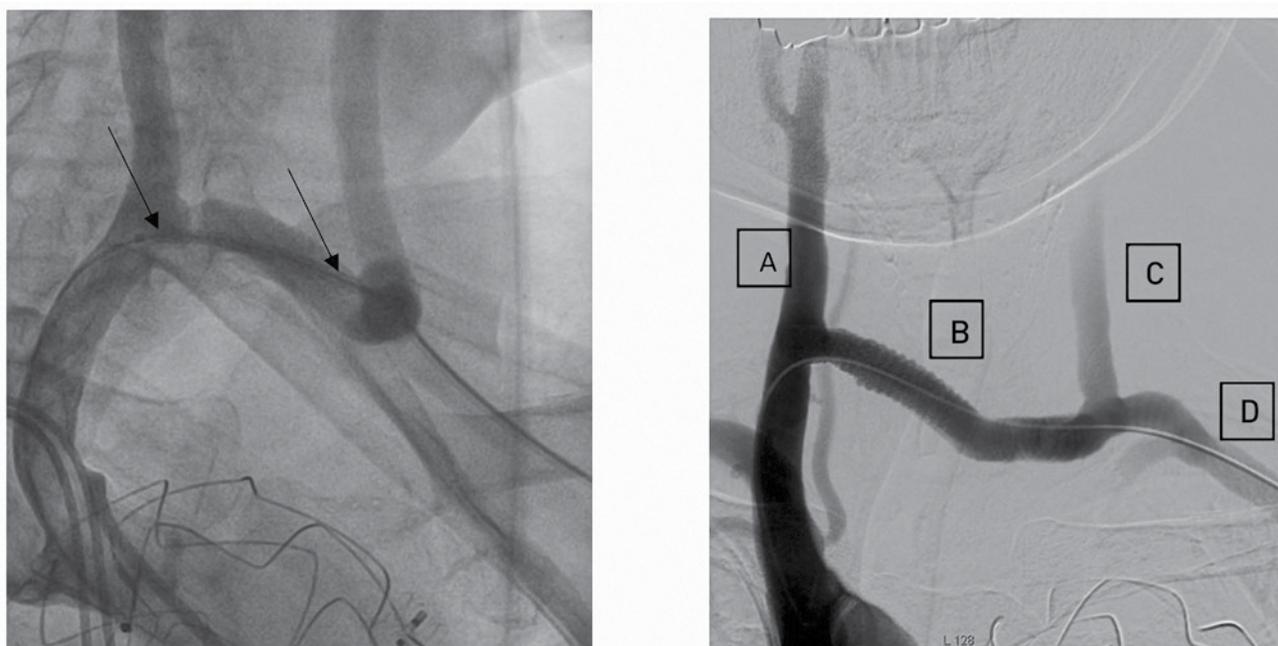


Figure 3. Left: stent placement (arrows indicate the contours of the stent); Right: control angiogram after stent placement. A — right CCA; B — carotid-subclavian anastomosis; C — left CCA; D — left subclavian artery.

patient was discharged two days after the surgery. In the immediate and late postoperative period (control visits at months 3 and 12), she was stable and has no neurological pathology.

Study results

78-year old woman was admitted to the National Medical Research Center for Therapy and Preventive Medicine of the Ministry of Healthcare of the Russian Federation with complaints of dizziness and unsteadiness, diffuse compressive headaches, memory loss, tinnitus, as well as syncopal episode and short-term right-sided hemiparesis 2 weeks prior to hospitalization. Additional examination revealed a hemodynamically significant (90%) stenosis of the proximal anastomosis of the carotid-subclavian shunt. Successful stenting was performed in the restenosis zone with a good angiographic and clinical results, no relapses of neurological symptoms were detected in 12 months after the surgery.

Discussion

Since there is no evidence base on the revascularization strategy of the carotid arteries with previously installed stents, the decision on the revascularization method should be made by the the surgeon [11]. Patients with multifocal ischemic pathology, previ-

ous intervention on carotid arteries and aortic arch present a special category with extremely high risk of periprocedural complications [12]. In the case presented above, considering patient's severe neurological symptoms (history of transient ischemic attack, dizziness and unsteadiness, diffuse compressive headaches, memory loss, tinnitus), as well as favorable anatomical characteristics of carotid subclavian shunt lesion for endovascular treatment, it was decided to perform endovascular revascularization. This method, due to high risk of complications in the early postoperative period, has been chosen as the safest, especially with the use of cerebral embolic protection device that allowed to perform the surgery without circulatory arrest.

Conclusion

In this clinical case we demonstrated the possibilities of modern endovascular treatment in patients with extremely high cardiovascular risk. The minimal invasive procedure, as well as the availability of necessary surgical instruments and the presence of experienced operator, significantly reduced perioperative complications and provided good long-term prognosis.

Conflict of interest: none declared.

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