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## RECONSTRUCTION OF BILATERAL DOLICHOARTERIOPATHY OF THE INTERNAL CAROTID ARTERY: CASE REPORT

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### Summary

Currently, in patients with bilateral dolichoarteriopathy of the internal carotid artery (DICA), the optimal tactics of surgical treatment has not been determined. We report the case of a 59-year-old woman with a history of transient ischemic attack. The patient was examined, ultrasound duplex scanning (USDS) of the brachiocephalic arteries revealed a bilateral DICA with an acceleration of the linear blood flow velocity (LBFV) at the site of angulation, up to 1.7 m/s on the right, up to 1.6 m/s on the left. Computed tomography (CT) of intra- and extracranial arteries with contrast confirmed the presence of a DICA. The patient was operated stage-by-stage on both sides.

USDS of the carotid arteries (CA) and CT of the extra- and intracranial arteries with contrast were performed 6 months after the second operation. Both showed normal results.

The result of surgical treatment of bilateral DICA showed that the right treatment tactics can lead to regression of cerebral and focal neurological symptoms.

**Keywords:** Dolichoarteriopathy, internal carotid artery, stroke.

### Резюме

## РЕКОНСТРУКЦИЯ ДВУСТОРОННЕЙ ПАТОЛОГИЧЕСКОЙ ИЗВИТОСТИ ВНУТРЕННЕЙ СОННОЙ АРТЕРИИ: КЛИНИЧЕСКИЙ СЛУЧАЙ

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В настоящее время у больных с двусторонней патологической извитостью (ПИ) внутренней сонной артерии (ВСА) не определена оптимальная тактика хирургического лечения. Мы сообщаем о клиническом случае 59-летней женщины с транзиторной ишемической атакой в анамнезе. При обследовании у больной, на ультразвуковом дуплексном сканировании (УЗДС) брахиоцефальных артерий (БЦА) выявлена двусторонняя ПИ ВСА с ускорением линейной скорости кровотока (ЛСК) в месте ангуляции, до 1,7 м/с справа, до 1,6 м/с слева. Компьютерная томография (КТ) интра- и экстракраниальных артерий с контрастированием подтвердила наличие ПИ ВСА. Больная оперирована поэтапно с обеих сторон.

Через 6 месяцев после повторной операции выполнили УЗДС сонных артерий и КТ экстра- и интракраниальных артерий с контрастированием. Оба показали нормальные результаты.

Результат хирургического лечения двусторонней ПИ ВСА показал, что правильная лечебная тактика может привести к регрессу общемозговой и очаговой неврологической симптоматики.

**Ключевые слова:** Патологическая извитость, внутренняя сонная артерия, инсульт.

Түйіндеме

**ІШКІ ҰЙҚЫ АРТЕРИЯСЫНЫҢ ЕКІ ЖАҚТЫ ПАТОЛОГИЯЛЫҚ  
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Қазіргі уақытта ішкі ұйқы артериясының (ІҰА) екі жақты патологиялық бұралуы (ПБ) бар науқастарда хирургиялық емдеудің оңтайлы тактикасы анықталмаған. Біз өтпелі ишемиялық ұстамамен ауыратын 59 жастағы әйелдің клиникалық жағдайын хабарлаймыз. Науқасты тексерген кезде брахиоцефалиялық артерияларды ультрадыбыстық дуплексті сканерлеуде (УДДС) ІҰА екі жақты ПБ бұрыштық жерде қан ағымының сызықтық жылдамдығының үдеуімен, оң жақта 1,7 м/с дейін, сол жақта 1,6 м/с дейін. Контрастты интра- және экстракраниальды артериялардың компьютерлік томографиясы (КТ) ІҰА ПБ болуын растады. Науқасқа екі жаққа да кезең-кезеңімен ота жасалды.

Қайта операциядан кейін 6 ай өткен соң ұйқы артерияларының УДДС және контрастпен интра- және экстракраниальды артериялардың КТ жасалды. Екеуі де қалыпты нәтиже көрсетті.

ІҰА екі жақты ПБ хирургиялық емдеу нәтижесі дұрыс емдеу тактикасы церебральды және ошақты неврологиялық симптомдардың регрессиясына әкелуі мүмкін екенін көрсетті.

**Түйінді сөздер:** Патологиялық бұрмалану; ішкі ұйқы артериясы; инсульт;

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**Introduction**

Dolichoarteriopathy of the internal carotid artery (DICA) includes three types: kinking, coiling and elongation. DICA occurs in 10-25% of the general population [11]. In almost half of the cases, DICA is bilateral [3]. To date, there are two theories of DICA, the first is a violation of the process of embryonic development (congenital), and the second is morphological changes with age (acquired), leading to lengthening of the artery [2, 11]. DICA may remain asymptomatic or may cause cerebrovascular accident (CVA) with the development of neurological symptoms [10, 11]. DICA leads to accelerated blood flow and loss of laminar properties and insufficient blood supply to the brain [8]. Another mechanism is the narrowing of the lumen at the site of the inflection of the artery - septal stenosis, which is analogous to stenosis of the vessel lumen in atherosclerosis. Surgical treatment of symptomatic DICA gives better results than medical treatment [5]. Currently, there is no single standard for the diagnosis and treatment of patients with DICA. According to some authors, the indications for surgical treatment are the acceleration of the

linear blood flow velocity (LBFV) max > 1.5 m/s and the presence of the CVA clinic [1]. Asymptomatic patients with DICA are not operated on. There are several methods of surgical reconstruction on the carotid artery (CA) with DICA, and these procedures include end-to-end anastomosis with resection, caudal end-to-side reimplantation of the ICA to the common carotid artery, ICA resection with bypass grafting [1,11].

The choice of surgical reconstruction method depends on the type of DICA. Currently, there is no recommendation on the method and sequence of surgical treatment of bilateral DICA. In this article, we present a case of successful surgical treatment of bilateral DICA.

**Case report.** A 59-year-old patient comes to our hospital with dizziness and headaches. From the anamnesis of the disease, an episode of transient ischemic attack dated October 1, 2020, with a temporary movement disorder in the left upper and lower limbs, which recovered within 24 hours. The patient was examined, ultrasound duplex scanning (USDS) of the brachiocephalic arteries revealed a bilateral DICA with an acceleration of the LBFV at the site of angulation,



Figure 1. CT of intra- and extracranial arteries with contrast, 3D reconstruction (before surgical treatment).

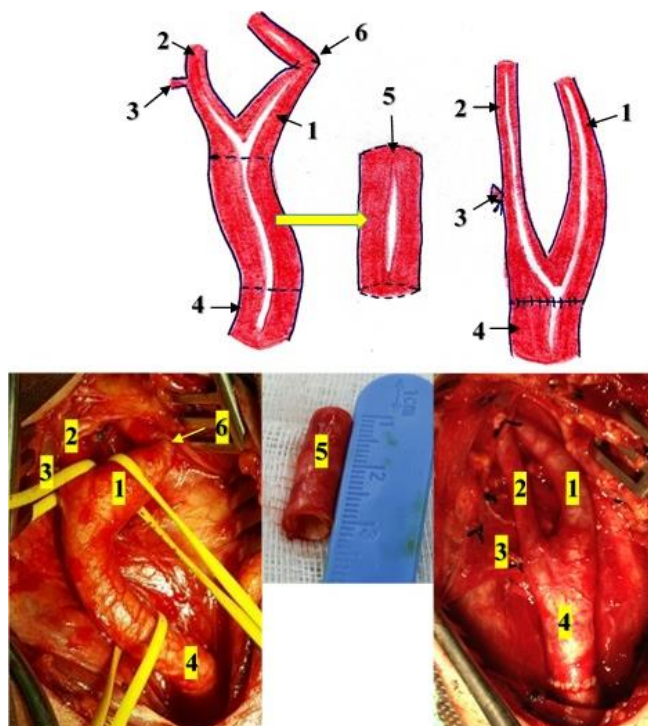


Figure 2. CCA resection with end-to-end anastomosis and bringing down the CCA bifurcation.

- 1 - internal carotid artery; 2 - external carotid artery;
- 3 - superior thyroid artery; 4 - common carotid artery;
- 5 - resected part of the common carotid artery
- 6 - deformed portion of the ICA (kinking)

up to 1.7 m/s on the right, up to 1.6 m/s on the left. Computed tomography (CT) of intra- and extracranial arteries with contrast as of 12/15/2020 confirmed the presence of a DICA (Fig. 1).

Clinical examination revealed systolic murmurs in the neck above the CCA on both sides. After a clinical discussion, it was decided to perform resection of the right common carotid artery (CCA) with bringing down the bifurcation of the CCA (Fig. 2).

The resected section of the CCA was 2 cm. Clamping time of the CCA 12 min. The patient was discharged on the fourth day after the operation while taking aspirin. On an outpatient examination after 4 weeks after surgery, the patient had headaches and dizziness, there were periodic episodes of numbness in the right upper limb. It was decided to hospitalize the patient for surgical treatment on the second side. Performed resection of the left CCA with bringing down the bifurcation of the CCA. The resected section of the CCA was 2.1 cm. The time of cross-clamping of the CCA was 13 minutes. The postoperative period was uneventful, the patient was discharged on the fourth day after the operation while taking aspirin. USDS of the carotid arteries and CT of the extra- and intracranial arteries with contrast were performed 6 months after the second operation (Fig. 3). Both showed normal results. Also, during the observation period, general cerebral and focal symptoms were stopped.

**Discussion.** Clinical improvement in the presented case confirms the correct choice of surgical treatment. To date, there is little publication on the treatment of bilateral DICA, where the treatment method is resection of the CCA with bringing down the bifurcation of the CCA. A literature search of the PubMed database was carried out. The search depth was 20 years (2002–2022). A total of 376 scientific publications were found, of which 4 articles were selected. But in these publications, resection of the common carotid artery was combined with ligation of the external carotid artery. Or they performed a phased elimination of the tortuosity of the internal, then the common carotid artery with a combined lesion. The advantage of performing resection of the common carotid artery is the absence of clamping of the ICA, which contributes to the preservation of blood flow in the ICA through the ECA. According to some authors, it is impractical to perform resection of the ICA in a degeneratively altered part of the ICA with an end-to-end anastomosis since the greatest morphological changes in the artery wall are in the area of tortuosity and the CCA wall and the ICA mouth are subject to less morphological changes [4, 9]. ICA prosthetics is accompanied by a higher incidence of complications; therefore, this technique should be performed in the presence of absolute indices [4]. Considering the above data, in our clinical case, the choice of surgical treatment was CCA resection with end-to-end anastomosis with ICA redress. In addition, with this type of reconstruction, the geometric parameters of the artery are preserved, which is confirmed by a CT of intra- and extracranial arteries with contrast after the operation.

When performing surgical interventions on the carotid



arteries, there is a certain risk of ischemic brain damage when the carotid artery is clamped and embolized during surgery. In our case, surgery was performed under regional anesthesia. Regional anesthesia during operations on the vessels of the neck makes it possible to predict the development of ischemic and other intraoperative complications. Highly informative and simple intraoperative neuromonitoring that allows for immediate diagnosis of developing cerebral ischemia during surgery. The level of consciousness, speech clarity, language deviation, strength and ability to move in the contralateral limbs are assessed. In addition, according to a number of authors, there is a lower incidence of severe cardiovascular complications in the perioperative period compared with general anesthesia [6, 7].

**Conclusions.** The result of stage-by-stage surgical treatment of bilateral DICA showed that the correct treatment tactics can lead to regression of cerebral and focal neurological symptoms. The hemodynamic parameters of the ICA also recovered.

**Ethical approval.** Consent was obtained from the patient, and all identifying information has been omitted

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#### References:

1. Batrashov V. A., Yudaev S.S., Zemlyanov A.V. Surgical correction of pathological tortuosities of internal carotid arteries: current state of the problem // Pirogov National Medical and Surgical Center, Moscow. 2021. T.16. P. 61-67. doi:10.25881/20728255\_2021\_16\_3\_61
2. Di Pino L., Franchina A.G. et al. Prevalence and morphological changes of carotid kinking and coiling in growth: an echo-color Doppler study of 2856 subjects between aged 0 to 96 years // Int J Cardiovasc Imaging. 2021. T.37. P. 479–484. <https://doi.org/10.1007/s10554-020-02014-0>
3. Dilba K, van Dam-Nolen DHK, Crombag GAJC, et al. Dolichoarteriopathies of the extracranial internal carotid artery: The Plaque At RISK study // European Journal of Neurology. 2021. T.28. P. 3133-3138. doi:10.1111/ene.14982
4. Gavrilenko A.V., Abramyan A.V. et al. Pathological tortuosity of the internal carotid artery: clinical picture, diagnosis and surgical treatment // Cardiology and Cardiovascular Surgery. 2016. T.9. P. 29-33. doi:10.17116/kardio20169129-33
5. Hao J., Zhang L., Lin K., et al. Surgical Revascularization of Symptomatic Kinking of the Internal Carotid Artery // Vascular and Endovascular Surgery. 2016. T. 50. №7. P. 470-474. doi:10.1177/1538574416671246

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**Figure 3.** CT of intra- and extracranial arteries with contrast, 3D reconstruction (after surgical treatment).

6. Hye R.J., Voeks J.H. et al. Anesthetic type and risk of myocardial infarction after carotid endarterectomy in the Carotid Revascularization Endarterectomy versus Stenting Trial // Journal of vascular surgery. 2016. T.64. P. 3-8. <https://doi.org/10.1016/j.jvs.2016.01.047>

7. Kfoury E. et al. Carotid endarterectomy under local and/or regional anesthesia has less risk of myocardial infarction compared to general anesthesia: an analysis of national surgical quality improvement program database // Vascular. 2015. T. 23. P. 113-119. doi:10.1177/1708538114537489

8. Medvedeva L., Zagorulko O., et al. An analysis of blood flow indicators in pathological kinked internal carotid arteries with their orthostatic and rotational positions // S.S. Korsakov Journal of Neurology and Psychiatry. 2019. T. 119. №8. P. 68-69. <https://doi.org/10.17116/jnevro201911908168>

9. Paltseva E., Oskolkova S. et al. The structure of the internal carotid artery wall in pathological tortuosity // Pathology archive. 2015. P. 77: 3-8. doi:10.17116/20157753-8

10. Wang J, Lu J, Qi P, et al. Association between kinking of the cervical carotid or vertebral artery and ischemic stroke/TIA // Front. Neurol. 2022. T.13. doi:10.3389/fneur.2022.1008328

11. Yu J. Current Understanding of Dolichoarteriopathies of the Internal Carotid Artery: A Review // Int J Med Sci. 2017. T.14. №8. P.772-784. doi:10.7150/ijms.19229.