American Journal of Case Reports

e-ISSN 1941-5923
© Am J Case Rep, 2026; 27: e951348
DOI: 10.12659/AJCR.951348

Received: 2025.09.01
Accepted: 2026.06.04
Available online: 2026.07.23
Published: 2026.XX.XX

Management of Shamblin Type III Carotid Body Tumor With Preoperative Embolization, Surgical Resection, and Rescue Endovascular Stroke Treatment: A Case Report

Authors' Contribution:
Study Design A
Data Collection B
Statistical Analysis C
Data Interpretation D
Manuscript Preparation E
Literature Search F
Funds Collection G

ABEF 1 **Michał S. Proczka**
EF 1 **Piotr Kaszczewski**
AE 2 **Michał M. Sajdek**
CE 2 **Amelia Maciąg**
A 2 **Rafał Maciąg**
ADE 1 **Ireneusz Nawrot**
AE 1 **Zbigniew Gałązka**

1 Department of General, Vascular, Endocrine and Transplant Surgery, Medical University of Warsaw, Warsaw, Poland
2 Department of Clinical Radiology, Medical University of Warsaw, Warsaw, Poland

Corresponding Author: Michał S. Proczka, Banacha 1a Street, 02-097 Warsaw, Poland, Phone: 00485992463, e-mail: michal.proczka@wum.edu.pl
Financial support: None declared
Conflict of interest: None declared

Patient: Female, 51-year-old
Final Diagnosis: Carotid body tumor
Symptoms: TIA
Clinical Procedure: —
Specialty: Surgery

Objective: Rare disease

Background: This report describes the case of a 51-year-old woman with a history of transient ischemic attack and a diagnosis of a large Shamblin type III carotid body tumor (CBT) encasing the carotid artery. The CBT was managed by preoperative embolization and surgical resection, which was complicated by postoperative stroke and arterial damage requiring surgical repair. CBTs are usually slow-growing, pulsatile cervical tumors that can cause clinical symptoms secondary to catecholamine secretion in functional lesions or symptoms related to compression of adjacent structures in nonfunctional lesions.

Case Report: The patient was diagnosed with CBT. Ten months prior, she had a transient ischemic attack with left-sided temporary hemiparesis. The surgical excision of the CBT was preceded by endovascular embolization. Despite this, significant bleeding occurred intraoperatively. The complete excision of the CBT was complicated by damage of the common carotid artery, with repair requiring temporal shunting. Two hours after surgery, the patient showed weakness of the left side of the body. Dissection of the right common and internal carotid arteries, occlusion of the external carotid artery, and a thrombus at the bifurcation of the right middle cerebral artery were identified on computed tomography. A successful endovascular intervention with stent implantation and mechanical thrombectomy was performed. Postoperatively, a slight face asymmetry and mild deterioration of upper limb mobility were observed, which resolved completely following successful rehabilitation.

Conclusions: Despite having a low incidence, CBTs remain a serious therapeutic problem. An interdisciplinary approach and availability of different specialties is key to successful treatment of complex CBTs.

Keywords: Vascular Surgical Procedures • Stroke • Paraganglioma • Carotid Body Tumor • Case Reports

Full-text PDF: https://www.amjcaserep.com/abstract/index/idArt/951348

2013 — 6 28

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

Introduction

Carotid body tumor (CBT) is a rare, benign, neuroendocrine neoplasm, with an incidence of 1 to 2 cases per 100 000 individuals [1,2]. CBTs account for approximately 0.5% to 0.6% of all neck tumors and are benign lesions in 90% of cases [1,2]. CBTs are usually slow-growing, pulsatile cervical tumors that can cause clinical symptoms secondary to calecholamine (epinephrine/norepinephrine) secretion in functional lesions or symptoms related to cranial nerve IX, X, and XII injury in non-functional lesions [3-5]. CBTs can also be an unusual cause of transient ischemic attacks [6]. They are highly vascularized tumors, primarily supplied by branches from the external carotid artery (ECA), internal carotid artery (ICA), and, less commonly, branches from the vertebral artery, thyrocervical trunk, and subclavian artery [2,7,8]. Venous drainage occurs through the internal and external jugular veins [2,7,8]. The diagnosis of CBT is based upon Doppler ultrasound examination, computed tomography (CT) angiography, and magnetic resonance imaging. Surgical excision remains the standard of treatment [5,9]. As CBTs are highly vascularized, preoperative embolization may be used to reduce blood loss [10,11]. However, data are lacking to support routine preoperative embolization [10]. The Shamblin classification is widely used for categorizing these neoplasms. Created in 1971, it classifies CBT into 3 types according to their size, their proximity to adjacent vessels, and the complexity of surgical excision. Shamblin type I tumors are localized, not involving carotid vessels, type II are adherent or partially surround the vessels, and type III are large and encase the vessels [2,5]. Usually, surgery can be performed safely in Shamblin type I and II tumors. However, type III CBTs require a more meticulous manipulation, and these procedures are usually associated with high complication rates [12].

Case Report

A 51-year-old woman was referred to a university hospital tertiary vascular center. The patient had a slow-growing pulsatile mass on the right side of her neck. Ten months prior, she had a transient ischemic attack with temporary hemiparesis on her left side of the body. Contrast-enhanced CT demonstrated a Shamblin type III CBT, as shown in **Figure 1**. The patient had no history of chronic disease or drug use. She had not undergone any prior surgeries or interventions. She had no medical history of symptoms of cranial nerve IX, X, or XII damage or of symptoms related to catecholamine excessive secretion. Her laboratory test results, including a complete blood count, sodium, potassium, C-reactive protein, and coagulation tests (international normalized ratio and activated partial thromboplastin time), were within the reference range.

Figure 1. Preoperative contrast-enhanced computed tomography showing Shamblin type III carotid body tumor.

Due to the tumor size and localization, we decided to perform preoperative embolization. Four weeks prior to the operation, the CBT vessels were embolized via direct puncture with the use of the liquid embolic agent Onyx (Medtronic, Minneapolis, MN, USA) (**Figure 2**). The procedure and recovery were uneventful.

The operation was performed under general anesthesia. The tumor and carotid artery bifurcation were exposed with a vertical incision along the anterior edge of sternocleidomastoid muscle. Most of the dissection was done without arterial clamping. Despite the prior embolization, significant bleeding was present during the operation. During dissection of the lower part of the tumor, a 6-mm tear was created on the arterial wall of the common carotid artery (CCA). A vascular shunt was immediately inserted, and end-to-end suturing of the arterial wall was performed. Low-molecular-weight heparin (40 mg) was administered intravenously. No dedicated protocol of heparin dosage for CBT resection exists in our institution, and administration is left to the operator's discretion. No activated coagulation time was measured during the procedure, and no protamine was given at the end of the operation. The overall clamping time was 15 minutes. No nerve damage during dissection was observed. After successful removal of the tumor, a proper pulse was palpable on the CCA, ICA, and ECA. Intraoperative images before and after removal of the CBT are shown in **Figure 3**. Primarily, no neurological symptoms were observed upon wakening. Two hours after extubation, the patient showed weakness of the left side of her body. During and after the surgery, the patient received

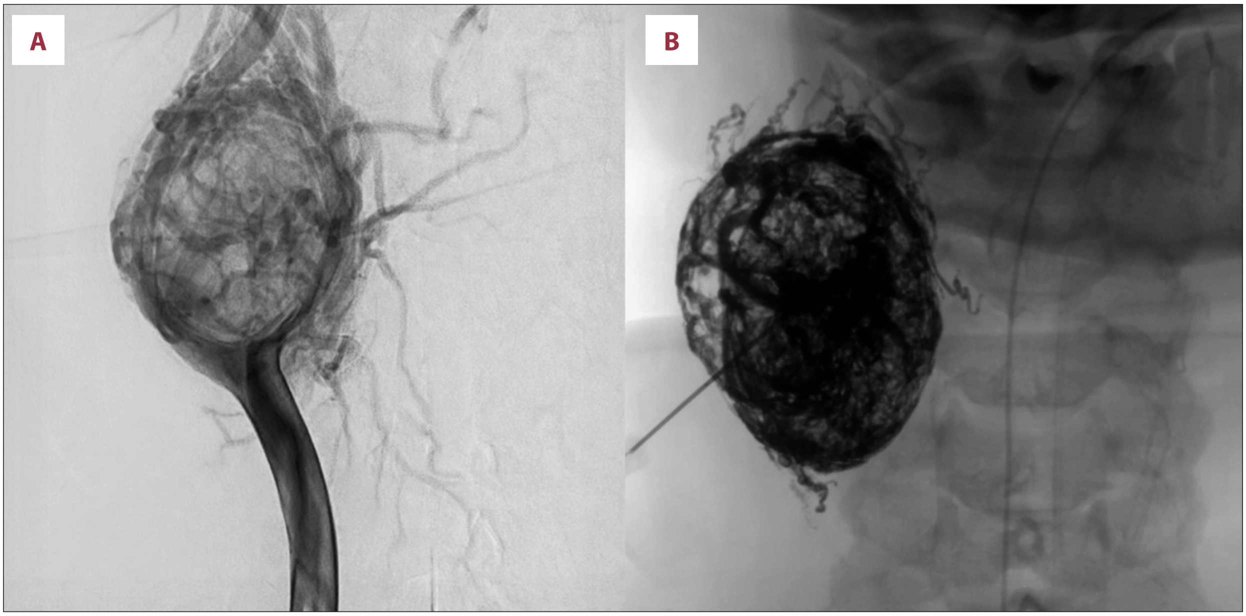

Figure 2. Pre-embolization angiography (**A**) and periprocedural fluoroscopy showing Onyx embolization (**B**).

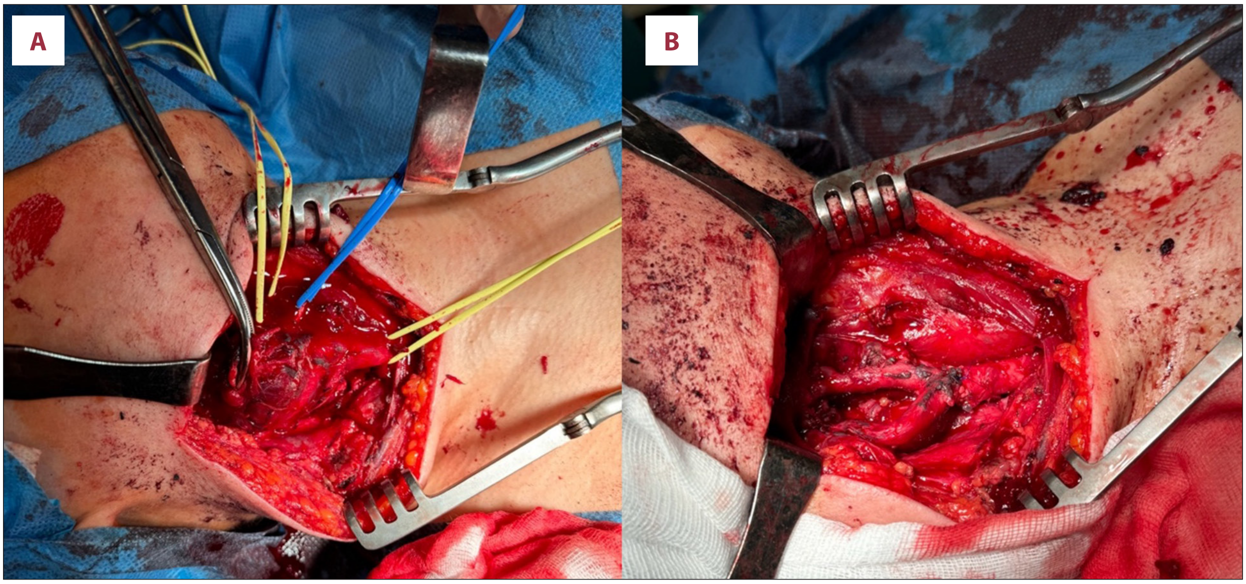

Figure 3. Intraoperative images before (**A**) and after removal (**B**).

hemodynamic and respiratory monitoring. No significant change in blood pressure (including hypotension) or heart rate was observed. Urgent CT angiogram and non-contrast CT of the brain was performed, showing dissection of the right CCA and ICA, occlusion of the ECA, and thrombus at the level of bifurcation in the right middle cerebral artery.

After neurological, surgical, and radiological evaluation, the patient was qualified for urgent endovascular intervention. The procedure began within 30 minutes from the occurrence of the symptoms. Vascular access was obtained through the right femoral artery. A selective angiography was performed, confirming the initial diagnosis suggested by the CT scan (**Figure 4**). At first, 2 carotid stents, RoadSaver 8×40 mm and 7×30 mm, were implanted in the ICA true lumen. Proper blood flow was restored in the ICA after stent implantation (**Figure 5**). Then, the Penumbra System was used for mechanical thrombectomy of the occluded right middle cerebral artery (**Figure 6**). According to the Thrombolysis in Cerebral Infarction (TICI) scale, recanalization of TICI 2C was achieved. During the procedure, the patient received boluses of 40 mg of low-molecular-weight heparin and 7.9 mL of eptifibatide. After the procedure, dual antiplatelet therapy was administered (75 mg of aspirin and 75 mg of clopidogrel), and gradual resolution

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

Figure 4. Selective angiography showing dissection of the right common and internal carotid arteries and occlusion of the external carotid artery (**A**), and thrombus at the bifurcation of the right middle cerebral artery (**B**).

Figure 5. Angiography showing proper blood flow was restored into the internal carotid artery after implantation of stents.

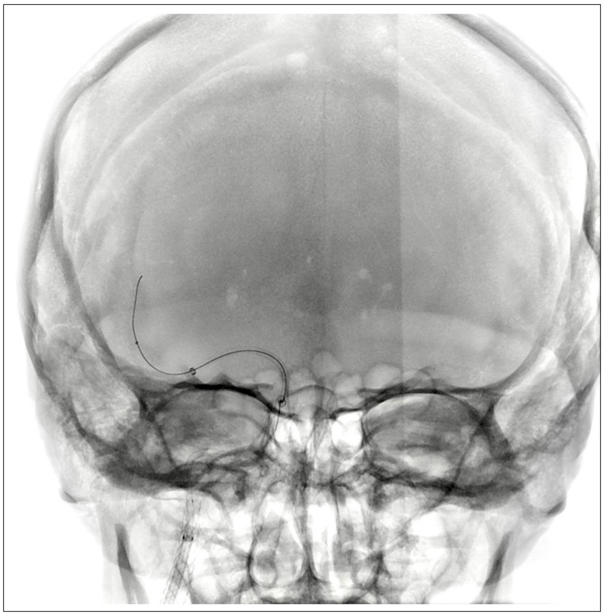

Figure 6. Mechanical thrombectomy of occluded right middle cerebral artery with the Penumbra System.

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

of the neurological symptoms was observed. The patient recovered well. Overall, 3 red blood cells units were transfused postoperatively. Only slight face asymmetry and mild deterioration of upper limb mobility remained. She was discharged home 6 days after the operation. No further blood transfusion was necessary.

The patient was followed up for 10 months after the procedure. Her further recovery was uneventful. Histopathological examination confirmed a head and neck paraganglioma. Before discharge home, and at 6 months after the procedure, duplex ultrasound was performed. Proper blood flow without any significant stenosis was seen in the CCA and ICA, while the ECA remained occluded. The patient underwent successful rehabilitation, resulting in complete resolution of neurological symptoms.

Discussion

We present a case of a successful Shamblin type III CBT removal, despite serious post-procedural neurological complications. We believe an interdisciplinary approach and availability of different specialties was crucial in the process of treatment.

Transient ischemic attacks have numerous causes, with CBT being a very rare cause [6]. Despite having a palpable mass in the neck, the patient was referred to the vascular surgeon after some time had passed. Usually, physical examination and ultrasound should be enough to make the initial diagnosis of CBT. Our patient did not present symptoms other than a slow-growing, pulsatile cervical mass. There were no symptoms of cranial nerve IX, X, or XII damage or symptoms related to catecholamine excessive secretion.

Some authors question the role of preoperative embolization [13]. We believe, however, that, especially in cases of massive Shamblin type II and III tumors, embolization should be considered as a way to lower the risk of periprocedural bleeding. Some studies suggest that adjuvant embolization results in significantly lower blood loss and shorter operative time [11,14,15]. It does not influence rates of neurological events and length of stay, which are more associated with the surgical technique itself [11]. Most studies, however, describe all Shamblin type (I-III) tumors combined. With smaller tumors, this potential benefit of embolization may not be as evident. Some reports suggest that the timing of embolization may play a significant role [16,17]. In the case of our patient, blood transfusion was necessary. This might have been avoided by performing embolization at a later stage, 1 or 2 days prior to the surgery.

CBT surgical resection remains very demanding technically. Especially in cases of Shamblin type II and III tumors, potential arterial reconstruction should always be considered. Shunting should be used whenever arterial reconstruction is necessary. Numerous studies have shown that intraoperative shunting is effective during the complicated surgical resection of CBTs [18,19]. As already broadly described in the literature, the shunting may be associated with some complications, including dissection of the ICA [20,21]. However, we believe that the benefits of its use significantly outweigh the potential risks.

The direct puncture technique for Onyx embolization in the treatment of CBTs is the preferred surgical approach within our local interventional radiology department. Based on our radiologist's extensive experience, this method has been the most effective, enabling rapid filling of the tumor parenchyma and associated vessels, surpassing the efficiency of selective embolization of feeding vessels.

Additionally, we use a glued catheter technique, which involves securing a microcatheter to the puncture needle. This innovation enhances the administration of ethylene vinyl alcohol copolymer, making it more effective, stable, and straightforward compared with traditional needle injections. The direct puncture technique is meticulously controlled through biplane fluoroscopy and angiography, ensuring precision and minimizing the risk of non-target embolization.

Anticoagulation therapy might have played a role in this complication. It is possible that a higher initial dose or repeated doses of heparin could have prevented the stroke; however, this is difficult to assess, as additional heparin might have increased the risk of prolonged bleeding. We do agree that the use of protamine could have been a solution. However, the tear in the arterial wall was repaired in a quick manner, and the overall clamping time was only 15 minutes. We believe that preparing a special anticoagulation protocol for CBT should be considered to optimize the results of CBT resection.

Occlusion of the ECA observed on postoperative CT is most likely related to dissection caused by a surgical tear of the arterial wall. As described in the literature, in cases of endarterectomy, ECA occlusion is usually asymptomatic [22]. Similarly, in CBT surgery, ECA resection without reconstruction generally does not result in significant adverse events [23].

The overall rate of neurological complications after CBT resection remains significant and is higher with tumors of higher Shamblin types. The perioperative stroke rate is 1.89% for Shamblin type I, 2.71% for Shamblin type II, and 3.99% for Shamblin type III [24]. In the present patient, access to urgent neurological consultation and an interventional radiology suite was crucial in managing this serious complication, particularly as intravenous thrombolysis was contraindicated due to the patient's recent surgery. The neuroradiological

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

intervention performed in the patient was successful and adhered to the established standard of care [25]. However, it was not without controversy, particularly regarding the use of eptifibatide (Integrilin) in a patient who had recently undergone open carotid artery surgery. Although the use of eptifibatide in the setting of acute carotid artery stenting is off-label and generally contraindicated shortly after surgery, this therapeutic approach has been supported by several published studies, and it is administered to selected patients at our center [26,27]. Typically, after a follow-up CT scan and the exclusion of intracranial bleeding, dual antiplatelet therapy is initiated [28]. This approach balances the risk of in-stent thrombosis against the danger of hemorrhagic transformation. In the present case, that risk was relatively low, as the intervention was performed within 1 hour of symptom onset. Nonetheless, we proceeded with the initiation of eptifibatide, partly due to the implantation of mesh stents, which in our opinion carry a higher thrombotic risk compared with other carotid stent designs. The decision to use mesh carotid stents was made to minimize the risk of arterial wall leakage and to help prevent another potential distal embolization event. We believe this strategy was appropriate and justified in the clinical context, and that a multidisciplinary approach is essential when treating these complex tumors.

Conclusions

Complex carotid body paragangliomas carry a high risk of perioperative vascular complications and demand an interdisciplinary surgical and endovascular approach to achieve good clinical outcomes. A case-by-case and interdisciplinary approach remains crucial for successful management of these tumors.

Department and Institution Where Work Was Done

Department of General, Vascular, Endocrine and Transplant Surgery, Warsaw, Poland; Medical University of Warsaw

Informed Consent

The patient gave his informed consent to publish his data for this case report.

Declaration of Figures' Authenticity

All figures submitted have been created by the authors who confirm that the images are original with no duplication and have not been previously published in whole or in part.

References:

1. Wieneke JA, Smith A. Paraganglioma: Carotid body tumor. Head Neck Pathol. 2009;3:303
2. Gonzalez-Urquijo M, Castro-Varela A, Barrios-Ruiz A, et al. Current trends in carotid body tumors: Comprehensive review. Head Neck. 2022;44:2316-32
3. Wernick BD, Furlough CL, Patel U, et al. Contemporary management of carotid body tumors in a Midwestern academic center. Surgery. 2021;169:700-4
4. Zeng G, Zhao J, Ma Y, et al. A comparison between the treatments of functional and nonfunctional carotid body tumors. Ann Vasc Surg. 2012;26:506-10
5. Ünlü Y, Becit N, Ceviz M, Koçak H. Management of carotid body tumors and familial paragangliomas: Review of 30 years' experience. Ann Vasc Surg. 2009;23:616-20
6. Chamorro Sanchez A, Varela de Seijas E, Matesanz Matesanz J, Trapero VL. Carotid body tumor: Unusual cause of transient ischemic attacks. Stroke. 1988;19:102-3
7. Amato B, Serra R, Fappiano F, et al. Surgical complications of carotid body tumors surgery: A review. Int Angiol. 2015;34:15-22
8. Katagiri K, Shiga K, Ikeda A, et al. Effective, same-day preoperative embolization and surgical resection of carotid body tumors. Head Neck. 2019;41:3159-67
9. Shamblin WR, ReMine WH, Sheps SG, Harrison EG. Carotid body tumor (chemodectoma). Am J Surg. 1971;122:732-39
10. Kaya MG, Romagnoli S, Mandigers TJ, et al. Role of preoperative embolization in surgical management of carotid body tumors: A systematic review and meta-analysis. Angiology. 2025;76:17-31
11. Texakalidis P, Charisis N, Giannopoulos S, et al. Role of preoperative embolization in carotid body tumor surgery: A systematic review and meta-analysis. World Neurosurg. 2019;129:503-13.e2
12. Erdem H. Does Shamblin classification affect the clinical outcomes following carotid body tumor excision? Cardiovasc Surg Int. 2021;8:91-97
13. Abu-Ghanem S, Yehuda M, Carmel NN, et al. Impact of preoperative embolization on the outcomes of carotid body tumor surgery: A meta-analysis and review of the literature. Head Neck. 2016;38(Suppl. 1):E2386-94
14. Felbaum DR, Syed HR, McCullough MF, et al. Embolization of carotid body tumors: Revisiting direct puncture technique, preliminary experience and literature review. Cureus. 2016;8(2):e483
15. Kafie FE, Freischlag JA. Carotid body tumors: The role of preoperative embolization. Ann Vasc Surg. 2001;15:237-42
16. Pouhin A, Die Loucou J, Malikov S, et al. Surgical management of carotid body tumors: Experience of two centers. Ann Vasc Surg. 2024;98:1-6
17. Li N, Zeng N, Wan Y, et al. The earlier, the better: The beneficial effect of different timepoints of the preoperative transarterial embolization on ameliorating operative blood loss and operative time for carotid body tumors. Surgery. 2021;170:1581-85
18. Zeng G, Zhao J, Ma Y, Huang B. Use of an intraoperative shunt for easy resection of complicated carotid body tumors. Head Neck. 2013;35:61-64
19. Sunar H, Keles C, Besirli K. Elective shunt use for easy resection of a carotid body tumor. Vascular. 2008;16:41-43
20. Chuatrakoon B, Nantakool S, Rerkasem A, et al. Routine or selective carotid artery shunting for carotid endarterectomy (and different methods of monitoring in selective shunting). Cochrane Database Syst Rev. 2022;6(6):CD000190
21. Katsuno M, Tanikawa R, Hashimoto M, Matsuno A. Distal internal carotid artery dissection due to the carotid shunt during carotid endarterectomy. Br J Neurosurg. 2015;29:862-64
22. Abbas SM, Adams D, Vanniasingham P. What happens to the external carotid artery following carotid endarterectomy? BMC Surg. 2008;8:20
23. Kruger AJ, Walker PJ, Foster WJ, et al. Important observations made managing carotid body tumors during a 25-year experience. J Vasc Surg. 2010;52:1518-23
24. Robertson V, Poli F, Hobson B, et al. A systematic review and meta-analysis of the presentation and surgical management of patients with carotid body tumours. Eur J Vasc Endovasc Surg. 2019;57(4):477-86
25. Berkhemer OA, Fransen PSS, Beumer D, et al. A randomized trial of intraarterial treatment for acute ischemic stroke. New Engl J Med. 2015;372:11-20

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]

26. Latacz P, Popiela T, Brzegowy P, et al. Safety and efficacy of low-dose eptifibatide for tandem occlusions in acute ischemic stroke. Neurol Int. 2024;16:253-62

27. Osteraas ND, Crowley RW, et al. Eptifibatide use following emergent carotid stenting in acute anterior circulation ischemic stroke with tandem occlusion. J Stroke Cerebrovasc Dis. 2020;29(9):105021

28. Waters MJ, Vargas J, Turk A, et al. Safety and efficacy of eptifibatide in acute ischemic stroke requiring extracranial carotid artery stenting. Interv Neuroradiol. 2026;32(1):39-42

Indexed in: [PMC] [PubMed] [Emerging Sources Citation Index (ESCI)] [Web of Science by Clarivate]