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# Large extracranial aneurysm of the internal carotid artery treated surgically — case report

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## Abstract

*Aneurysms of the extracranial segment of the internal carotid artery may be treated with open or endovascular surgery with the use of the covered stent. This paper presents an exceptionally large (50 × 40 × 33 mm) aneurysm of the right internal carotid artery treated with open surgery.*

**Key words:** extracranical internal carotid artery, carotid aneurysm, surgical treatment

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## Introduction

Aneurysms of the extracranial segment of carotid arteries are rare and usually occur as a result of atherosclerosis, injury, infection, dissection or surgical endarterectomy of the carotid artery.

Most commonly they manifest with neurological symptoms related to the pressure on cranial nerves or thrombosis, but they may also be asymptomatic.

These aneurysms can be treated with open or endovascular surgery, and the chosen mode of treatment depends on the aneurysm's location, size, morphology and aetiology.

## Case report

A 74-year-old woman was admitted to the Vascular Surgery Clinic, Provincial Polyclinic Hospital in Kielce due to a large aneurysm of the right internal carotid artery within its extracranial segment (Fig. 1). The aneurysm was diagnosed ca. 10 years before. The patient had her periodic check-ups in a different vascular centre where the surgical approach was not proposed to her due to the fear of complications after a high-risk surgery, and especially because the patient did not have any symptoms and the aneurysm was of a smaller size. The size of the aneurysm gradually increased — during the last year — by approx. 5 mm. The Doppler examination done upon admitting the patient to hospital revealed a saccular aneurysm 37 × 35 × 60 mm, without inclinations to rupture. Before making a decision as to the procedure (open or endovascular surgery), a CT scan of the carotid arteries was done, which showed an aneurysm 50 mm in length and a maximum diameter of 40 mm (Fig. 2). The patient reported neck pains in the aneurysm area and headaches located mainly in the right temple area. She did not have any symptoms

**Figure 1.** The patient before the surgery

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**Figure 2.** CT images (before the surgery)

earlier and she denied having any injuries in that area; the patient did not have a history of cerebral stroke or TIA. The patient was being treated for hypertension, she had six natural childbirths. The patient was admitted in a good general condition, with increased blood pressure (150/100) and normal pulse. She had normal body temperature.

During palpation of the neck on the right side a pulsing tumour was observed of an external diameter of approx. 4–5 cm (Fig. 1). The neurological test and results of basic laboratory tests were within the normal values.

After analysing CT scans the patient was qualified for open surgery. The patient was operated under general anaesthesia; the aneurysm removal was performed with end-to-end arterial anastomosis (Figs. 3–5), with temporary by-pass. No complications were observed during the surgery or in the post-operative period. The patient was discharged from hospital on a third day after the surgery with the instruction to appear for a follow-up in a vascular surgery clinic (Fig. 6). The histopathology revealed a dilated blood vessel with adhering thrombus, the vascular wall with fibrosis and calcifications. The CT scan done one month after the surgery showed a normal patency of the internal carotid artery without significant stenosis and without contrast extravasation. The contralateral carotid and vertebral artery were also patent (Fig. 7).

## Discussion

Aneurysms of the extracranial segment of carotid arteries are rare. In patients with no neurological symptoms, they are often diagnosed only after the aneurysm has grown to a considerable size, when it can be felt by a patient. Sometimes, the aneurysm seems to be a solid tumour — due to the lack of a perceptible pulse contained by calcification and thrombus. Sometimes it is misdiagnosed as an inflammatory or neoplastic tumour of a salivary gland, a neck abscess or tumour.

The term "aneurysm" denotes widening of the artery by more than 50% in relations to the normal parameter. In case of carotid arteries aneurysm is diagnosed when the diameter is larger than 0.55 ± 0.06 cm for men and 0.49 ± 0.07 for women. Carotid artery aneurysms are 0.8–1.0% of all aneurysms and nearly 4% of peripheral aneurysms [1]. They are the cause of 0.1–2.0% of all carotid artery surgeries [2]. They can be divided into true aneurysms (80%) and false aneurysms (20%). The main cause of true aneurysms is atherosclerosis, more rarely fibromuscular dysplasia, Recklinghausen disease, Takayasu disease, Behcet and Marfan syndromes, or neck radiation [1–3].

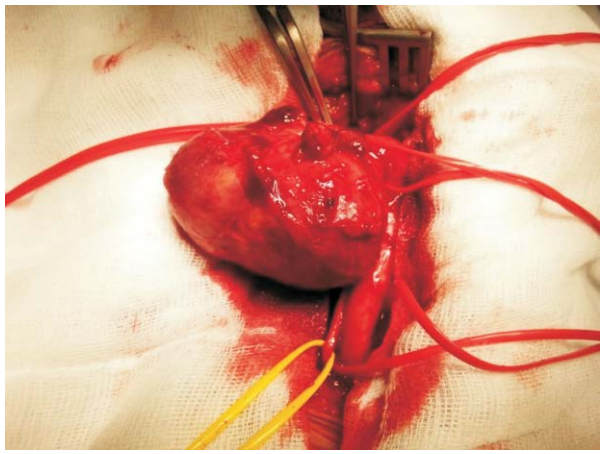

**Figure 3.** Intra-operative view of the aneurysm

**Figure 4.** Intra-operative view — after reconstruction

**Figure 5.** Post-surgery specimen

False aneurysms most commonly occur as a result of endarterectomy of a carotid artery, as a result of injury (stabbed wounds, road accidents, iatrogenic injuries — after central venous catheterization), or as a consequence of infections (tonsillitis, especially of chronic character, pharyngitis and PTA) [1].

**Figure 6.** The patient after the surgery (second day after the surgery)

No direct cause of aneurysm was determined for our patient.

Internal carotid aneurysms may remain asymptomatic for a long time. The most common symptoms are neck pains, dysphonia, dysphasia, and symptoms related to embolism or thrombosis within the aneurysm as well as pressing the cranial nerves by the tumour mass. In case of the infected aneurysm, life threatening haemorrhage into a patient's throat, ear or nose may occur [2].

The simplest and non-invasive examination facilitating the diagnosis is Doppler imaging. However, this method should not be the only diagnostic technique, because it may prove insufficient, especially in case of small aneurysms located in a distal segment of the artery, at the skull base. Therefore it is recommended to complete the examination with angiography (by CT, MRI or arteriography). In case of suspicion of injuries to the carotid artery, it is suggested to perform arteriography or CT images of the vessels [4].

The first-choice treatment is a surgical approach — surgical aneurysm removal in order to avoid permanent neurological deficits caused by embolism and thrombosis. Some authors report 71% mortality rate and 50% risk of cerebrovascular accident in not operated patient [5]. According to the literature review, the most frequently performed procedure is aneurysm removal with patch plasty (vein or synthetic). If the conditions allow, end-to-end anastomosis may be performed [4]. The success of the surgery depends on the aetiology, size and location of the aneurysm as well as the general condition of a patient.

The review of the research to date confirms that the surgical approach is an effective treatment, although it is not free of complications.

Mortality and massive cerebrovascular accidents occur in 4–9% of patients. In one of the research studies, the rate of post-surgery cranial nerve dysfunction was as high as 43% [4, 6].

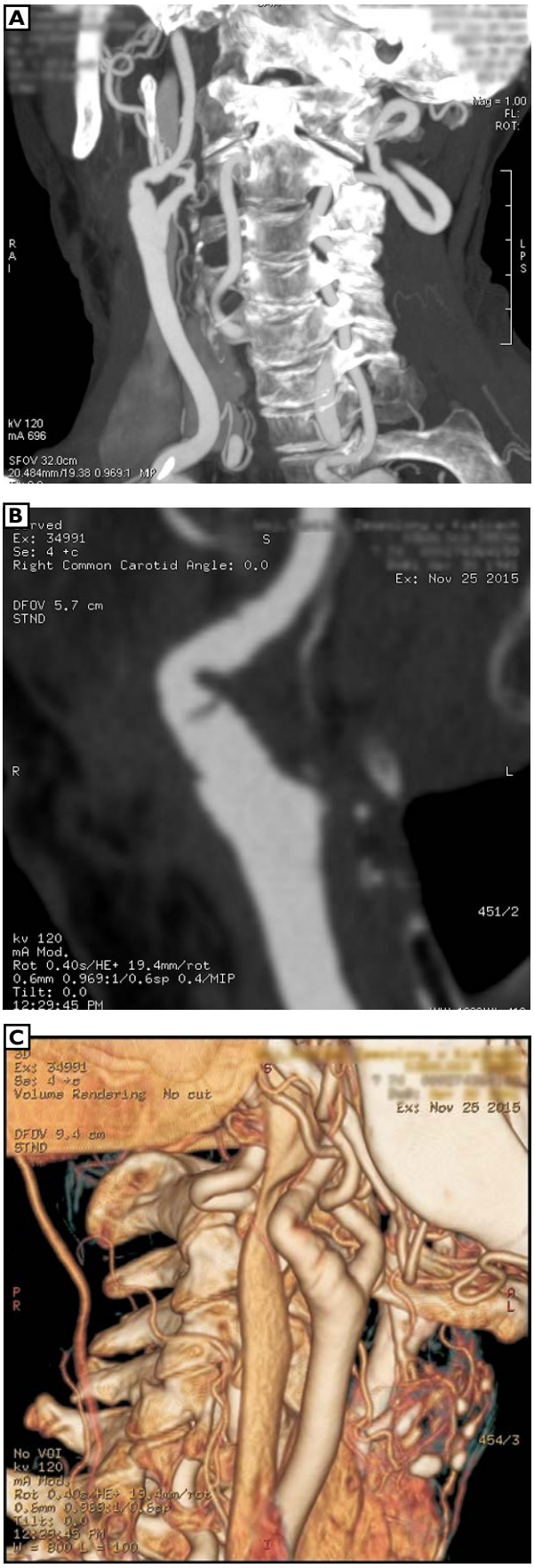


**Figure 7.** Follow-up CT scans — reconstructions (after one month)

Zhand et al. presented a group of 66 extracranial carotid artery aneurysms operated during a period of 17 years, where the mortality rate was 1.6% and serious complications were observed in 6% of patients [7].

Still, El-Sabrout et al. described 67 aneurysms treated surgically at the Texas Heart Institute over a period of 35 years (1960–1995) with overall mortality and extensive stroke incidence of 9% and damage to the cranial nerves in 6% of patients [6]. The risk of serious complications, including damages to the cranial nerves, increases in the cases where the aneurysm is located in the distal segment of the artery at the skull base; in such cases endovascular approach should be considered. In the case discussed in this paper, the aneurysm was located in the proximal segment of the artery and was of a large size, thus due to aesthetic reasons, potential pressure symptoms as well as the risk of embolization with the fragments of thrombus, the decision to perform open surgery was taken.

In some cases endovascular treatment may be considered — covered stent grafts made of nitinol (Wallgraft, Viabahn, Symbiote), more rarely of stainless steel (Jostent). There are a growing number of reports describing good results of such a treatment [8–12]; however, there are also papers describing leakages to the aneurysm sac and growth of the aneurysm diameter during longer follow-up periods [13–16].

There are no guidelines as to endovascular procedure, because there is no large scale clinical research available. The main indication for using stents are false aneurysms after endarterectomy of carotid arteries, aneurysms in patients with high risk factors and distal aneurysms of internal carotid arteries [17–19]. The advantage of the endovascular intervention is the possibility to eliminate the aneurysm without blocking the blood inflow to the brain, which decreases the risk of thrombosis in the distal segment of the artery. The procedure does not require general anaesthesia and, according to some research [8, 9, 10, 20], has a smaller risk of general and neurological complications. The essential condition of successful endovascular treatment is correct antiplatelet treatment; usually administration of clopidogrel and acetylsalicylic acid [21]. In case of large aneurysms, the disadvantage is a tumour still remaining after the surgery, which may give pressure symptoms.

## Conclusions

1. In the case of large aneurysms of carotid arteries, open surgery is the-first-choice method.

2. Endovascular methods of treatment of aneurysms of extracranial carotid arteries are effective and safe; however, due to the tumour left after such surgery, are applicable in treatment of smaller size aneurysms.

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