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## Embolisation of Internal Carotid Artery Aneurysm Using the Double Microcatheter Technique – A Case Report

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### Summary

**Background:**

A wide-necked aneurysm is defined as the one with a neck greater than 4 mm in diameter. Embolisation of wide-necked aneurysms is a great challenge for neuroradiologists. To overcome possible complications of endovascular treatment of this type of aneurysms, methods like intracranial stents, balloon remodelling, the double microcatheter and the microcatheter protective technique have been developed.

**Case Report:**

We report a case of embolisation of a 63-year-old woman with a wide-necked aneurysm using the double microcatheter technique. Introduction of the second microcatheter into the aneurysm allowed for crossing two coils and prevented protrusion into the parent vessel, which resulted in successful treatment without postprocedural complications. Both postembolic and follow-up angiography showed complete exclusion of the aneurysm.

**Conclusions:**

The double microcatheter technique, owing to creation of a stable coil frame across the neck of the aneurysm, is suitable for treatment of aneurysms with an adverse dome-to-neck ratio. This technique is easy to perform for an experienced neuroradiologist.

**MeSH Keywords:**

**Aneurysm • Embolization, Therapeutic • Endovascular Procedures**

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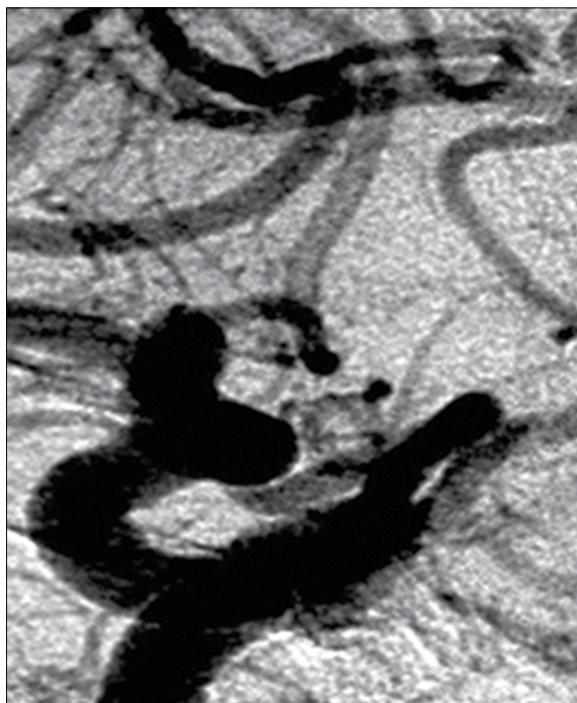
### Background

Embolisation of wide-necked aneurysms is a great challenge for neuroradiologists. An attempt to occlude an aneurysm with an unfavourable dome-to-neck ratio carries a risk of coil herniation or coil impingement on the parent vessel [1]. Therefore, to overcome these complications in endovascular treatment methods like intracranial stents, balloon remodelling, the double microcatheter and the microcatheter protective technique have been developed [1–8]. Also, a multi-microcatheter method has recently been proposed [9]. We described a 63-year-old patient with an unruptured aneurysm in the right internal carotid artery, which was successfully embolised with the double microcatheter technique. The aim of this report was to show another possibility of wide-neck aneurysm treatment which could be an alternative to the balloon remodeling method, when conventional coiling fails. To the best of our

knowledge, this is the first report describing the double microcatheter technique in Poland.

### Case Report

A 63-year-old woman experiencing recurrent headaches without focal neurological deficits was directed to computer tomography (CT) examination which revealed an unruptured aneurysm in the right internal carotid artery. She was admitted to the Department of Neurosurgery and Neurotraumatology, in Poznań, with the aim of undergoing endovascular treatment. Digital subtraction angiography in access via the right femoral artery showed an aneurysm in the right internal carotid artery, in the ophthalmic segment, measuring 7.4×4.2 mm, with an unfavourable configuration (the neck measured 3.4 mm) (Figure 1). The decision of ad hoc embolisation was made. The procedure was carried out under general anaesthesia. The patient received

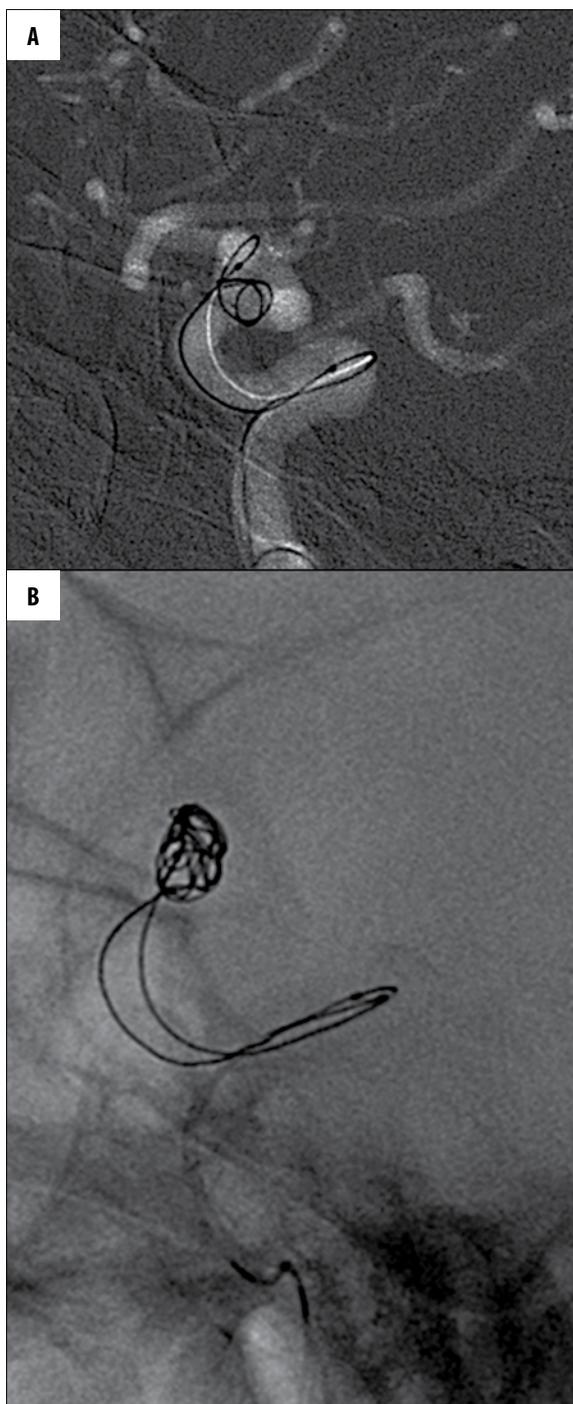


**Figure 1.** Right internal carotid angiogram showing a saccular, wide-necked aneurysm in the ophthalmic segment.

5000 IU of heparin intravenously (i.v.). What is important, the aneurysm configuration was not an a priori indication for stent-assisted embolisation. Firstly, standard embolisation with one microcatheter was performed (Vasco 10, Balt, Montmorency, France), but protrusion of the loop of the coil into the parent vessel was noticed (Figure 2A). After several attempts, it was decided to treat the patient using the double microcatheter technique. In case of unsuccessful treatment with the double microcatheter technique, the use of balloon remodelling technique would be considered. Two microcatheters (both Vasco 10, Balt) were introduced one by one, through the same guiding catheter, and positioned within the aneurysm. Afterwards, two coils (Target 360 Standard Coils 5×15 Stryker Cork, Ireland) were implanted simultaneously as an initial stable basket-frame for the next coils (Figure 2B). Together, four coils were implanted. Postembolic angiography showed complete exclusion of the aneurysm (Figure 3). After the procedure, the patient did not present any neurological deficits and the general clinical status was good. Angiographic follow-up was performed after 6 months and revealed no interval change (Figure 4).

## Discussion

For years, endovascular embolisation of intracranial aneurysms has been an efficient alternative to conventional neurosurgical treatment [10]. The effectiveness of the coil technique has been confirmed and it became the first-line method of treatment in intracranial aneurysms. However, wide-necked aneurysms remain a great challenge in terms of endovascular treatment [1-9]. The cerebral aneurysm rerupture after Treatment Study reported that the degree of occlusion was a strong predictor of a future rerupture [11], and so it strongly suggests that the key concept of aneurysm treatment is to achieve as complete coil packing



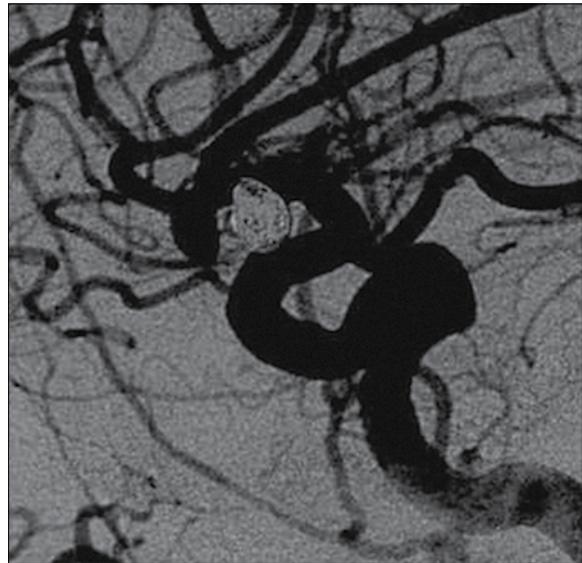
**Figure 2.** (A) Failed attempt of standard coiling with one microcatheter. (B) Simultaneous use of two microcatheters.

as possible. However, it is difficult to achieve complete coil packing in certain aneurysms with an unfavourable configuration and they may require the use of adjunctive techniques. Classic coil occlusion in such difficult cases is inadvisable, owing to the risk of coil protrusion into the parent vessel, which significantly increases thromboembolic events or may even lead to complete closing of the parent vessel. Nevertheless, various techniques such as three-dimensional coils, balloon remodelling, intracranial stents, double microcatheter and microcatheter protective



**Figure 3.** Postembolic angiogram showing complete aneurysmal occlusion.

techniques have been introduced to overcome such complications [1–8]. These methods allow dense coil packing but also have their limitations [2,4,12]. The double microcatheter technique was described for the first time in 1998 by Baxter and colleagues [1]. Since then, more reports have appeared in the literature about aneurysms treated with a similar method [3–8]. In the presented case, in the middle of the procedure, the use of conventional coiling failed. It was not advisable to expose the patient to another stress and risk connected with general anaesthesia and antiplatelet preparation and that is why it was decided to continue the procedure and perform the double microcatheter method. The concept of the double microcatheter technique is based on two coils intermingling with each other in order to create a stable, initial coil frame. The two coils are deployed in sequence through each microcatheter. Unlike other methods designed for wide-necked aneurysms, introduction of an additional microcatheter seems not to be related to an increased risk of intimal injury or vascular perforation compared with conventional coiling [3–5]. The main advantage of the double microcatheter technique is that there is no need for antiplatelet therapy, unlike in stent-assisted embolisation [2–4]. The patient did not receive a pre- or postembolic antiplatelet medication and did not develop any thromboembolic complication. That is why the double microcatheter technique could



**Figure 4.** Follow-up angiogram after 6 months since the procedure, showing no recanalization within the aneurysm.

be the method of choice for patients with contraindications for clopidogrel or aspirin therapy. The next issue is that in case of anatomical difficulties such as small side-branching arteries which could not be reached by a stent, by a balloon, or tortuous parent arteries, which are risky to navigate with these protective devices, the double microcatheter technique could be a useful alternative in wide-necked aneurysm treatment [4]. Lee et al. reported a 14.6% occurrence of thromboembolism in the treatment using the microcatheter protective technique [4]. However, other authors have not noted this association in double- and multi-microcatheter techniques [3,5,9].

## Conclusions

We reported on uneventful treatment and convalescence process of a patient with an unruptured aneurysm in the right internal carotid artery. This suggests that the double microcatheter technique, owing to creation of a stable coil frame across the neck of the aneurysm, is suitable for treatment of aneurysms with an adverse dome-to-neck ratio. However, further investigation and studies on a large group of patients should be conducted to reveal exactly what dimension of wide-necked aneurysms could be successfully treated with this type of procedure. Although it was our first experience with the double microcatheter technique, we did not encounter any technical difficulties, which suggests that this technique seems to be easy to perform for an experienced neuroradiologist.

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