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Retained neuroprotection filter after stenting of the internal carotid artery

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Abstract

Retained neuroprotection filter after carotid stenting (CAS) is an extremely rare complication. We report the case of a 61-year old patient with an accidentally retained neuroprotection filter after urgent CAS. The patient did not consent to open surgical removal of the retained basket. We did not observe any flow disturbances in the filter and the patient remains asymptomatic in ten years follow-up. In some cases, the neuroprotection filter left in the internal carotid artery may not cause cerebral flow disturbances or occlusion of the stent. In case of the poor neurological or general condition of the patient, we can wait for its improvement or stenting.

Key words: carotid stenting, embolic protection filter, retained neuroprotection, acute stroke, thrombolysis

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Introduction

The use of cerebral protection device (CPD) during CAS is a standard procedure [1, 2]. However, using distal CPD may be associated with complications [3–5]. Some meta-analysis found no evidence that CPD usage was associated with reduced perioperative stroke rates [6]. Retained neuroprotection filter after stenting of the internal carotid artery is an extremely rare complication but requires reintervention. Instruction for use does not include leaving the filter after the procedure in the artery.

This article was conducted according to the recommendations of the CARE — case report guidelines.

Case report

We report herein the case of a patient with a history of ischemic stroke, intravenous thrombolysis and stenting of the right ICA stenosis complicated by accidentally retained neuroprotection filter above the stent. Informed consent has been obtained from the patient for publication of the case report and accompanying images.

In October 2008, a 61-year-old man suffered a right hemispheric stroke (Table 1). Intracranial bleeding was excluded on computed tomography (CT). An ischemic stroke was confirmed by magnetic resonance imaging (MR-DWI). Occlusion of the right ICA was found in duplex ultrasound (DUS).

The patient underwent intravenous thrombolysis. Alteplase (Actilyse-Boehringer-Ingelheim) — a dose of 0.9 mg/kg/h, following a 10 mg intravenous bolus injection for one hour. A significant reduction of the left hemiparesis was observed. 90% stenosis of the right ICA was found in DUS. In the following hours the symptoms, however, intensified. Arteriography showed occlusion of this artery. Alteplase was therefore administered via a vascular sheet positioned in the right common carotid artery, in two boluses of 5mg each, with an interval of 2 minutes. Repeat arteriogram con-

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Table 1. Patient characteristic data

Sex		Male
Age		61
Weight		95 kg
Height		185 cm
BMI		27.8
ABI		1.1
Hba1c		< 6.5%
Neurological symptoms		TIA — weeks before CAS RICA Stroke — immediately before CAS RICA
Commorbidities Nicotinism		Hypertension, Diabetes — insulin dependent No
Neurological status		
	NIHSS Scale	Modified Rankin Scale
Before trombolysis	11	5
After CAS RICA	5	3
Current status (02.12.2020)	2	1

BMI: body mass index; ABI: ankle brachial index; Hba: glycosylated haemoglobin; TIA: transient ischemic attack; CAS: carotid artery stenting; RICA: right internal carotid artery; NIHSS: The National Institutes of Health Stroke Scale

firmed patency of the right ICA with 90% stenosis. An Accunet (Abbott Vascular) CPD was deployed, followed by implantation of an Acculink (Abbott Vascular) 6–8/ /30 mm stent. Then we used a recovery catheter and we removed it from the carotid artery after (as we thought) folding the basket. The patient did not cooperate during the procedure and we had no chance to angiographically control all this process. During CPD removal, the filter and guidewire were disconnected. Filter has stayed in artery. Control angiography showed a well-positioned, patent stent and excellent cerebral flow. Arteriogram also confirmed a retained neuroprotection filter above the stent. Due to the poor general and neurological condition of the patient no open surgical removal of the filter was attempted at this time.

The patient recovered without important complications. Clopidogrel (1 × 75 mg), ASA (1 × 75 mg) and Enoxaparine (1 × 40 mg) were administered postoperatively and he was discharged five days after CAS. The patient did not consent to elective filter removal.

DUS performed at 3-month intervals showed a patent stent without any relevant stenosis. Control CTA was performed in 2013 and 2018 (Fig. 1A). In October of 2016, he underwent CAS due to a 75% asymptomatic left ICA stenosis, without any complications. A right ICA angiography showed no evidence of stenosis nor migration of the filter (Fig. 1B). Eleven years after CAS and retained filter the patient remained asymptomatic with patent RICA (Figs 2A, B).

Discussion

Using a distal CPD during CAS may be challenging due to the ICA anatomy, the type of filter and the technical skill required of interventionists [7, 8]. The most common causes of difficult retrieval of CPD are strongly calcified plaques, residual in-stent stenosis, carotid tortuosity and re-CAS due to stent fracture [9–12]. Neurological complications may occur due to vasospasm, filter thrombosis, cerebral embolism or carotid artery dissection [13, 14]

The first choice in the retrieval of entangled CPD is endovascular technique, effective in most cases [15, 16]. In case of failure, conversion to open surgery is necessary [17–19]. In the available literature, both techniques are burdened with a small percentage of serious complications.

Our complication is very rare, but the risk of device entrapment should be considered during stenting procedures. We found a similar case described in the ARCHeR3 study [20]. The interventionist implanted stent pressing the basket to the artery wall. There was no description as to whether IFU was followed at the time of surgery. In our case, the neuroprotection basket was on the upper edge of the stent. It was against the IFU. On the other hand, the patient was not cooperated during the procedure, the effect of which basket became entangled with the deployed stent and detached from the guide wire during the retrieval attempt.

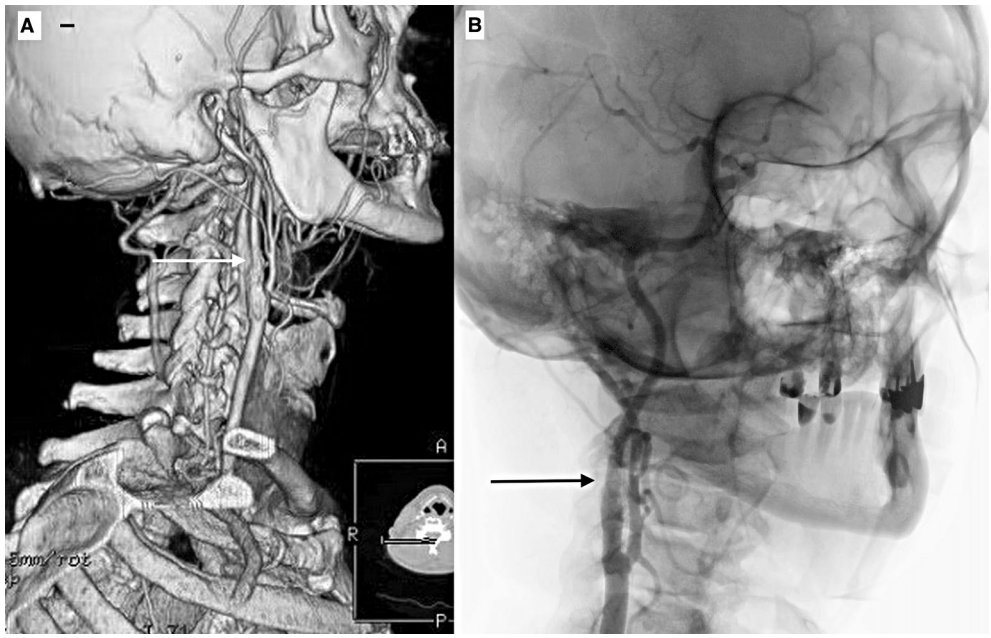

Figure 1. A — computed tomography angiography of the right carotid arteries — 10 years after RICA stenting. White arrow — a place of the retained filter; **B** — angiography of the right carotid arteries — 8 years after RICA stenting. Black arrow — a place of the retained filter

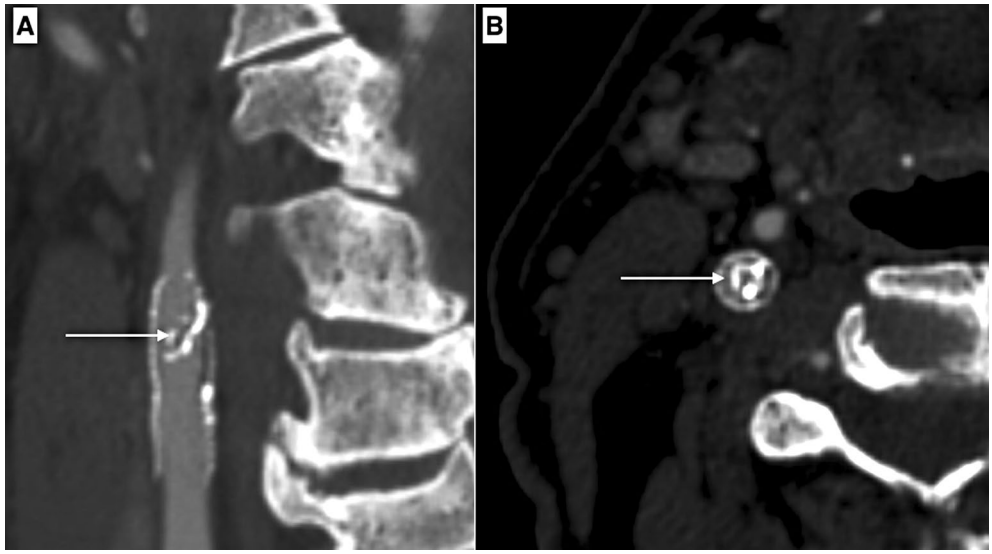

Figure 2. A — retained neuroprotection filter (arrow); **B** — retained neuroprotection filter (arrow)

A guidewire connected to the basket would give a chance for endovascular removal of the device.

Filter of the distal CPD is not suitable to leave it in situ like, such for example, vena cava filters. According to many authors, there is a huge risk of occlusion of the filter caused by thrombosis and occlusion of filter pores by embolization and hyperplasia. However, these observations concern acute, intraoperative occlusion [5, 16]. We did not find results regarding late carotid filter patency in the literature.

Application of the conversion to the open surgery or filter stenting should depend on the condition of the patient. Lack of patient cooperation was the main factor causing insufficient control in subsequent stages of the procedure. In the case of significant flow restriction by neuroprotection or the appearance of

neurological symptoms, we will propose the patient surgical treatment.

Conclusion

The removal of neuroprotection filter left in carotid artery does not have to be done at all costs- in some cases it is more reasonable to adopt a strategy „watch and wait".

Conflicts of interest

None.

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