FOREIGN body embolization is an unfortunate event that can complicate endovascular procedures. Intraluminal foreign bodies in the cerebral circulation are primarily described in the trauma, neurointerventional, and cardiac literature, although their true prevalence and incidence are unknown. There are no treatment guidelines for foreign body removal, and management depends on surgeon preference, previously described cases, and patient characteristics. We describe an unusual case of a guidewire introducer from a previous cardiac procedure that embolized within the right common carotid artery (CCA), causing the patient to experience a transient ischemic attack (TIA), and was surgically removed via a carotid cutdown approach.

Case Report

HISTORY AND EXAMINATION. A 64-year-old man presented to our facility with transient left-sided weakness and slurred speech consistent with a TIA several months after he had undergone complex mitral valve repair. The previous operation involved placement of a left-sided internal jugular venous catheter and a femoral artery cutdown for placement of an endovascular balloon for cardiac bypass. As in most endovascular procedures, guidewire introducers were probably used to facilitate the introduction of the guidewire into the system during the procedure. Although rare, iatrogenic embolization of the introducer probably occurred during use of the guidewire. The guidewire introducer was successfully retrieved without complication by using a standard carotid cutdown approach. It is extraordinarily unusual for an extracorporeal part of an implantable system to embolize to the carotid circulation. To the authors’ knowledge, this is the only reported case of an embolized guidewire introducer and the use of a carotid exposure to retrieve an intraluminal foreign body. This case demonstrates that a carotid cutdown approach can be used successfully for the retrieval of intraluminal extracranial carotid artery foreign bodies.

KEY WORDS • carotid foreign body • guidewire introducer • carotid cutdown • mitral valve repair • interventional neurosurgery

Abbreviations used in this paper: CCA = common carotid artery; ECA = external carotid artery; ICA = internal carotid artery; MCA = middle cerebral artery; TIA = transient ischemic attack.

This article contains some figures that are displayed in color online but in black-and-white in the print edition.
A contrast-enhanced CT angiogram of the cervical vessels obtained at our facility showed a right CCA intraluminal foreign object measuring 12 mm in length with a central phalange measuring 5 mm in diameter and the remaining portion measuring 3 mm in diameter. A soft thrombus at the right lateral aspect of the object was traversing the carotid bifurcation and extending into the origin of the right internal carotid artery (ICA; Fig. 1). A CT perfusion study demonstrated a subtle increase in time to peak in the right frontal convexity as compared with that in the left, without corresponding cerebral blood volume or cerebral blood flow changes (Fig. 2). A 3D reconstruction of the intracerebral vasculature did not reveal any occlusion or diminished flow through any of the major vessels (Fig. 3). Given the symptomatic nature of the lesion with clear localization and imaging findings consistent with a thrombus, we believed that the best option was retrieval of the foreign object.

**Operation.** A right-sided carotid cutdown approach was chosen given the favorable location at the carotid bifurcation. A standard opening was made anterior to the sternocleidomastoid muscle. After the hypoglossal nerve, CCA, external carotid artery (ECA), and ICA were identified, heparin (5000 U) was administered. Paper tape was placed around the CCA with vessel loops placed around the ICA and ECA. A 12-mm straight aneurysm clip was placed on the ICA and then the CCA. A 12-mm curved aneurysm clip was placed on the ECA, and a 6-mm straight aneurysm clip was placed on the superior thyroid artery. Using a No. 11 blade scalpel and Pott’s scissors, we made the arteriotomy in the CCA and carried it cephalad into the ICA. The foreign object was easily visualized and dissected away from the lumen of the CCA without dif-

![Fig. 1. Contrast-enhanced sagittal (left) and axial (right) head and neck CT angiograms demonstrating a foreign object within the right CCA. A hypodensity lateral to the object consistent with a soft thrombus is visible in the lower right axial image.](image1)

![Fig. 2. Computed tomography perfusion images showing a subtle increase in time to peak in the right frontal convexity (upper right) without any corresponding changes in cerebral blood volume (upper middle) or cerebral blood flow (lower left). Noncontrast CT (upper left) was normal.](image2)
Carotid cutdown for retrieval of guidewire introducer

Carotid foreign bodies have been described primarily in the trauma and endovascular literature. A number of case reports have documented metallic fragments from firearms within the extracranial carotid artery with most objects migrating into the intracranial circulation. Unusual foreign objects, including fish bones, penetrating the CCA without migration have also been described. The neurointerventional and cardiac literature also includes several reports of foreign bodies, including epicardial pacing wires, catheter tips, and detachable balloons. Given the size of foreign objects relative to vessel caliber, most objects embolize into the distal ICA and middle cerebral artery (MCA) branches. It is exceedingly rare for a foreign body to become lodged in the CCA because of the larger size of that artery. To our knowledge, there are no reports of inadvertent embolization of an extracorporeal component of an implantable system to the CCA.

The management of intraarterial foreign bodies has always been a challenge given the lack of evidence to support one method over another. Tranmer et al. successfully performed a microsurgical embolectomy of the supraclinoid ICA for migrated detachable balloons. Vascik and Tew reviewed 10 cases of MCA foreign body emboliza-
tion. Microsurgery was performed in 50% of these cases, with 20% having a complete neurological recovery—one case without surgical intervention. These authors concluded that attempts at removal should be performed to prevent infection, arterial erosion, thromboembolic events, and further migration. Heuer et al. described successful microsurgical retrieval of a coil fragment inadvertently emboлизized to M1 in a pediatric patient during endovascular treatment of a Blalock-Taussig shunt. The patient survived with mild left hemiparesis.

With the increasing use of indwelling catheters and endovascular techniques, catheter fragments, coils, and stents, inadvertent embolization has become a rare but serious complication. Endovascular devices for foreign body retrieval have also continued to improve, including helical baskets, loop snares, Fogarty catheters, “hook” guide wire retrieval, and further migration. Koseoglu et al. described their experience using goose neck snare in 15 patients for the successful retrieval of iatrogenic foreign bodies, including a microcoil in the left MCA and a fragmented catheter in the carotid artery. Using a stone basket retriever, Travelli and Cogbill successfully extracted a 4-Fr diagnostic catheter fragment from the right CCA. Liu et al. described their experience with 20 cases of catheter fragments that were dislodged into the cardiopulmonary circulation. They achieved 100% retrieval success using Dormia basket retrievers and loop snare catheters.

Endovascular retrieval techniques are certainly a viable and successful option for foreign body retrieval; however, there were disadvantages with their use in our case. Given the thrombus seen on the CT scan, embolic protection would have been necessary for safe retrieval. Distal protection would not have been possible given the size of the object relative to the vessel lumen and the inability to cross the lesion. Proximal embolic protection could have been used, but size constraints of available sheaths precluded this option. The largest sheath that could have been used to maintain proximal embolic protection was 9-Fr (3 mm in diameter), precluding the ability to pull the 5-mm-diameter object through for retrieval. Hypothetically, peripheral vascular sheaths ≥ 16-Fr could have been used to pull the object through, but without embolic protection.

The two most common mechanisms of foreign body introduction described in the literature are direct penetration with or without embolization and inadvertent embolization of implantable objects into the carotid circulation, which detach and migrate. We hypothesize that that the introducer was inserted into the femoral artery and brought up over the guidewire into the aorta during introduction of the aortic endovascular balloon for cardiac bypass during the patient’s mitral valve repair. The object probably dislodged from the guidewire and embolized from the aorta to the right CCA.

Conclusions

Distal migration of guidewire extracorporeal components, such as the guidewire introducer in the present case, is a rare but potentially serious complication. Our experience suggests that foreign bodies such as this and other objects lodged in the CCA can be successfully retrieved using a standard carotid cutdown approach.

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Disclosure

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References


Fig. 5. Guidewire introducer recovered from the ICA.

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