Annals of Case Reports & Reviews

Case Report

doi: 10.39127/2574-5747/ACRR:1000111.
Wilson SN, et al. Annal Cas Rep Rev: ACRR-111.

Use of Flow Diverter Stent for Treatment of a Cervical Carotid Artery Dissection and Pseudoaneurysm Causing Horner's Syndrome

Skylar N. Wilson[1], Monisha A. Patel[1], Lutheria Hollis[*1], Narlin B. Beaty[1,2]

[1]Florida State University College of Medicine, Tallahassee, FL 32306, United States
[2]Tallahassee Neurological Clinic, Tallahassee, FL 32308, United States

[*]**Corresponding author:** Lutheria Hollis, Florida State University College of Medicine, Tallahassee, FL 32306, United States. Email: LHollis@tnc-neuro.com

Citation: Wilson SN, Patel MA, Hollis L, Beaty NB (2020) Use of Flow Diverter Stent for Treatment of a Cervical Carotid Artery Dissection and Pseudoaneurysm Causing Horner's Syndrome. Annal Cas Rep Rev: ACRR-111.

Received Date: 22 April, 2020; **Accepted Date:** 27 April, 2020; **Published Date:** 04 May, 2020

Summary

In 2004, a 28-year old male presented with a traumatic dissecting pseudoaneurysm of the distal left cervical internal carotid artery was followed conservatively for 12 years with cross-sectional imaging. The patient was originally diagnosed with an acute left internal carotid artery (ICA) dissection, with significant luminal narrowing. Follow-up imaging revealed the dissection was not completely healed and a small pseudoaneurysm, about 4mm in size, was formed in the distal left cervical ICA. During the twelve-year observation period, the patient's pseudoaneurysm expanded from 4.0mm to 9.0mm and the patient presented with ptosis, aniscoria, and myosis. Flow diverter embolization resulted in radiographic cure of the pseudoaneurysm and resolution of the Horner's syndrome.

Background

Using a flow-diverter stent to treat a carotid aneurysm is a well-known study method. Flow diversion treatment of an expanding cervical pseudoaneurysm causing Horner's syndrome has not previously been documented. To our knowledge, this is the first time that Pipeline embolization using a flow diverter stent has successfully treated an expanding pseudoaneurysm causing Horner's syndrome.

Case Presentation

A 28-year old male presented to the hospital in 2004 with complaints of left-sided facial weakness, left jaw pain, chronic headaches, and signs of ptosis, myosis, and aniscoria, with the left pupil measuring 2.0mm and the right measuring 3.0mm. The patient denied any trauma and had not been participating in strenuous labor or lifting heavy objects at the time. An MRI of the brain and an MRA of the head and neck demonstrated an acute left internal carotid artery dissection extending from the distal left cervical internal carotid artery (ICA) to the level of the petrous ICA with significant subintimal hemorrhage and luminal narrowing. In 2005, one year after the carotid artery dissection had been discovered, follow-up imaging revealed that the appearance of the left internal carotid dissection had improved and the lumen returned to a more normal caliber. However, the dissection was not completely healed and there was a new finding of a small pseudoaneurysm formed in the distal left cervical ICA at the level of the hypoglossal canal, measuring about 4.0mm. Conservative medical management with follow-up imaging was performed until 2017 when the patient experienced worsening of his Horner's syndrome. Repeat imaging showed expansion of the aneurysm from 4.0mm to 9.0mm on both an MRA and a digital subtraction angiography (pseudoaneurysm; figure 1).

Treatment

From 2004 to 2017, the patient was on a varying regimen including Coumadin. On follow-up imaging, the pseudoaneurysm was found to have enlarged**.** The patient was treated with Pipeline flow diverter stent of the internal carotid artery dissection and pseudoaneurysm. Prior to placement of the stent within the ICA, the pseudoaneurysm was measured and confirmed to be 9.0mm. A 5.0mm x 20.0mm pipeline device was placed using standard techniques.

Outcome and Follow-up

A post-operative angiography documented a cured aneurysm on radiographic carotid study. A follow-up angiography six months after the Pipeline embolization demonstrated no evidence of in-stent stenosis and resolution of aneurysmal filling. Neuro-ophthalmologist evaluation 11 months after Pipeline embolization revealed normal lid function, 1mm anisocoria with dilator lag, and resolution of the Horner's syndrome.

Discussion

Horner's syndrome associated with traumatic internal carotid artery dissection is well recognized [1,2]. Post-ganglionic sympathetic fibers climb and encircle the internal artery. Adjacent expansion by dissection or

pesudoaneurysm lead to nerve compression and Horner's syndrome [3,4]. Other cranial nerve palsies are associated with aneurysmal disease. Cranial nerve III (CN III) palsies due to posterior communicating artery (Pcom) aneurysms are a classic example of this [5,6]. Management of Pcom aneurysms with associated oculomotor paresis using intraluminal techniques result in the resolution of oculomotor nerve palsy 60 -100% of the time [7,8,9].

Stenting is effective in the management of internal carotid artery dissections with peudoaneurysm development.[8] However, complications can arise from placement of carotid stents and lead to carotid wall hematoma and Horner's syndrome.[9] Pipeline stent embolization using flow diversion is indicated for treating intracranial aneurysms in the internal carotid artery from the petrous to the superior hypophyseal segments.[10] We successfully treated an extracranial, internal carotid artery dissection with associated pseudoaneurysm in the cervical region with resolution of Horner's syndrome.

Additionally, the Pipeline embolization device can be placed in tortuous vascular structures where a carotid stent would likely fail. Most traumatic dissections with pseudoaneurysms are located just below the base of the skull, which traditionally is more distal than a carotid stent could be placed in tortuous cervical anatomy. Since the pipeline embolization device has been proven to cure intracranial aneurysms, the expectation is that cervical pseudoaneurysms would also be improved with this technique, whereas a carotid stent might only provide structural support of the vessel and not eliminate the filling of the aneurysm. A limitation of the Pipeline embolization device in treating extracranial aneurysms is the maximum 5.0mm diameter size, which limits the treatment of more partial dissections with extracranial large parental vessel lumens. Future flow diverters, like Stryker's Surpass embolization device may be capable of expanding to a larger diameter.

Conclusion

Carotid dissections and resultant aneurysms can lead to Horner's syndrome. Pipeline stent embolization is a novel treatment of symptomatic carotid pseudoaneurysms. This case demonstrates resolution of Horner's syndrome after the use of a flow diverter stent for treatment of a cervical carotid dissection and pseudoaneurysm.

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