



Enhanced, Rapid Occlusion of Carotid and Vertebral Arteries Using the AMPLATZER Vascular Plug II Device: The Duke Cerebrovascular Center Experience in 8 Patients with 22 AMPLATZER Vascular Plug II Devices

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Key words

- AMPLATZER
- AVF
- Embolization
- Fistula
- Internal carotid artery
- Vertebral artery

Abbreviations and Acronyms

AVF: Arteriovenous fistula
AVP II: AMPLATZER Vascular Plug II
CCA: Common carotid artery
ICA: Internal carotid artery
IJ: Internal jugular vein
VA: Vertebral artery

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Citation: *World Neurosurg.* (2015) 83, 1:62-68.
<http://dx.doi.org/10.1016/j.wneu.2013.07.084>

Journal homepage: www.WORLDNEUROSURGERY.org

Available online: www.sciencedirect.com

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INTRODUCTION

Therapeutic embolization of the common carotid artery (CCA), internal carotid artery (ICA), and vertebral artery (VA) is necessary in the treatment of a subset of chronic arteriovenous fistulas (AVFs), hemorrhages, highly vascularized neoplasms before resection, and giant aneurysms. In the past, these procedures were most often performed using a detachable balloon occlusion device (DSB; Boston Scientific, Natick, Massachusetts, USA). After the balloon occlusion device was withdrawn from the market, coil embolization became the most common method for embolization of the CCA, ICA, and VA.

Coil embolization of the CCA, ICA, and VA is effective; however, there are drawbacks

■ **OBJECTIVE:** Therapeutic embolization of the common carotid artery (CCA), internal carotid artery (ICA), and vertebral artery (VA) is necessary in the treatment of a subset of chronic arteriovenous fistulas (AVFs), hemorrhages, highly vascularized neoplasms before resection, and giant aneurysms. There are currently no reports of the use of the AMPLATZER Vascular Plug II (AVP II) device to occlude the CCA, ICA, or VA. The objective of this article is to present the Duke Cerebrovascular Center experience using the AVP II device in neurointerventional applications.

■ **METHODS:** This case series is a retrospective review of all of the cases at Duke University Hospital in which an AVP II device was used in the CCA, ICA, or VA up to September 2012. The AVP II device was often used in conjunction with embolization coils or as multiple AVP II devices deployed in tandem.

■ **RESULTS:** During 2010–2012, 8 cases meeting criteria were performed. These included 2 chronic VA to internal jugular AVFs, 1 hemorrhagic CCA to internal jugular AVF secondary to invasive head and neck squamous cell carcinoma, 1 ICA hemorrhage secondary to invasive head and neck squamous cell carcinoma, 1 ICA hemorrhage secondary to trauma, 1 ruptured ICA aneurysm, 1 giant petrous ICA aneurysm, and 1 case of cervical vertebral sarcoma requiring preoperative VA embolization. Successful occlusion of the target vessel was achieved in all 8 cases. There was 1 major complication that consisted of a watershed distribution cerebral infarct; however, this was related to emergent occlusion of the ICA in the setting of intracranial hemorrhage and was not a problem intrinsic to the AVP II device.

■ **CONCLUSIONS:** The AVP II device is relatively large, self-expanding vascular occlusion device that safely allows enhanced, rapid take-down of the CCA, ICA, and VA with low risk of distal migration.

of the technique intrinsic to using small coils in large vessels. These drawbacks include distal migration of coils either into the cerebral vasculature or, in the case of AVFs, into the pulmonary arteries and long procedure times secondary to the need to deploy multiple coils to occlude a single vessel. The AMPLATZER Vascular Plug II (AVP II; AGA Medical Corporation, Plymouth, Minnesota, USA) device (Figure 1) is a large occlusion device that was approved by the U.S. Food and Drug Administration for clinical use in 2007 that mitigates these drawbacks.

Since the first iteration of the AVP II device was released in 2004, the device has been successfully used in a wide range of

therapeutic applications (12), including visceral arterial and venous embolization and embolization of congenital shunts such as pulmonary arteriovenous malformations. With regard to neurointerventional applications, there are relatively few reports (1-6, 8-11) of the use of the AVP I device and no reports of the use of the AVP II device. This article presents a case series from the Duke Cerebrovascular Center experience using the AVP II device in neurointerventional applications.

METHODS

This case series (institutional review board waiver; ID #41263) is a retrospective review

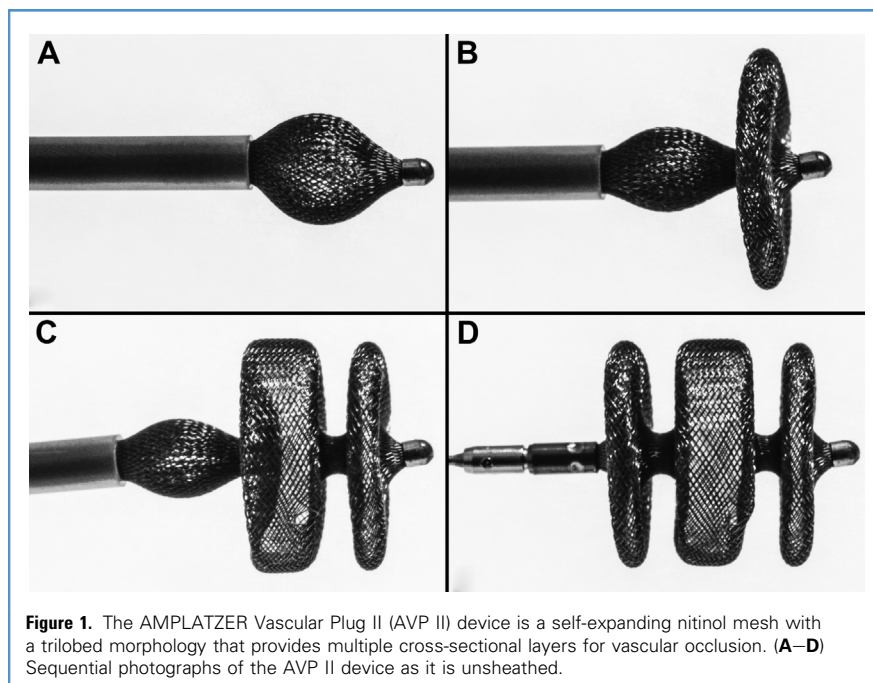


Figure 1. The AMPLATZER Vascular Plug II (AVP II) device is a self-expanding nitinol mesh with a trilobed morphology that provides multiple cross-sectional layers for vascular occlusion. (A–D) Sequential photographs of the AVP II device as it is unsheathed.

of all of the cases at Duke University Hospital in which an AVP II device was used in the CCA, ICA, or VA up to September 2012. The AVP II devices were deployed using standard technique, often multiple in tandem (“stacked AVP II” technique), and often in conjunction with embolization coils. The AVP II device is approved by the Food and Drug Administration for use in peripheral vasculature, but its use in the CCA, ICA, and VA is off-label.

RESULTS

The results are summarized in [Table 1](#). During 2010–2012, 8 cases meeting criteria were performed. These included 2 chronic VA to internal jugular (IJ) AVFs, 1 CCA to IJ AVF secondary to invasive head and neck squamous cell carcinoma, 1 ICA hemorrhage secondary to invasive head and neck squamous cell carcinoma, 1 ICA hemorrhage secondary to trauma, 1 ruptured ICA aneurysm, 1 giant petrous

Table 1. Duke Cerebrovascular Center Case Series

Case	History	AVP II Occluded Vessel	Number of AVP II Devices	AVP II Diameter	Coils Used (Number)	Reason AVP II Devices Used	Technique
1	13 years old, male, left VA-IJ chronic AVF secondary to remote pellet wound to neck	VA	3	12 mm × 3	Yes (1)	Unreleased coil migrated through AVF into IJ	Stacked AVP II
2	47 years old, male, hemorrhagic right CCA-IJ AVF secondary to invasive squamous cell carcinoma of the oropharynx	CCA	2	10 mm 8 mm	Yes (8)	Coils proved inadequate	Added to coil pack
3	34 years old, female, left VA-IJ chronic AVF of unknown etiology	VA	7	8 mm × 2 10 mm × 2 12 mm × 2 16 mm	No	Large high-flow fistula at risk for coil migration	Stacked AVP II
4	78 years old, female, left supraclinoid ICA aneurysm rupture	ICA	1	6 mm	Yes (10)	Coils proved inadequate	Added to coil pack
5	25 years old, female, left cervical spine malignant epithelioid sarcoma requiring preoperative embolization	VA	1	6 mm	Yes (3)	Coils proved inadequate	Added to coil pack
6	48 years old, male, left CCA acute hemorrhage secondary to invasive squamous cell carcinoma of the neck	ICA CCA	6	8 mm 10 mm 12 mm × 3 14 mm	No	Required rapid large vessel embolization	Stacked AVP II
7	50 years old, male, left ICA acute hemorrhage secondary to motor vehicle collision	ICA	1	5 mm	Yes (14)	Coils proved inadequate	Added to coil pack
8	54 years old, male, giant left petrous ICA aneurysm	ICA	1	8 mm	Yes (5)	Coils proved inadequate	AVP II used as a scaffold for coils

AVP II, AMPLATZER Vascular Plug; VA, vertebral artery; IJ, internal jugular; AVF, arteriovenous fistula; CCA common carotid artery; ICA, internal carotid artery.

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