

Balloon-Augmented Onyx Embolization Utilizing a Dual Lumen Balloon Catheter: Utility in Treatment of a Variety of Head and Neck Lesions

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Introduction

Endovascular embolization for tumors and vascular malformations has emerged as an important pre-operative adjunct prior to resection. We describe the advantages of utilizing a recently released dual lumen balloon catheter for ethylene vinyl alcohol copolymer, also known as Onyx (ev3, Irvine, California), embolization for a variety of head and neck pathologies.

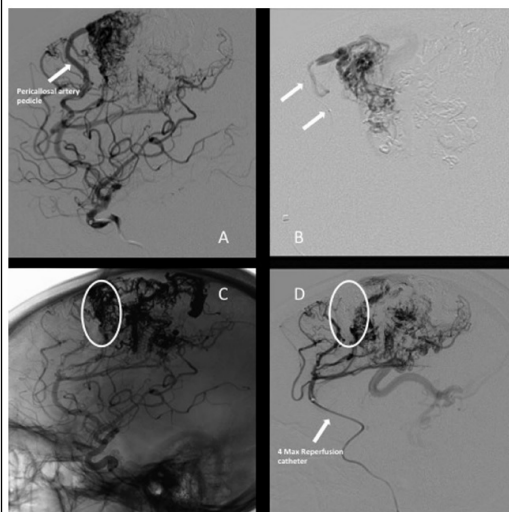
Methods

A retrospective review of all cases utilizing the Scepter C balloon catheter (MicroVention Inc., Tustin, California) for use in balloon-augmented embolization was performed over a four-month period from October 2012 to February 2013 at the Medical University of South Carolina, Charleston, SC. Charts and angiographic images were reviewed. Representative cases involving diverse pathologies are summarized illustrate the observed advantages of balloon-augmented Onyx embolization with a dual-lumen balloon catheter.

Results

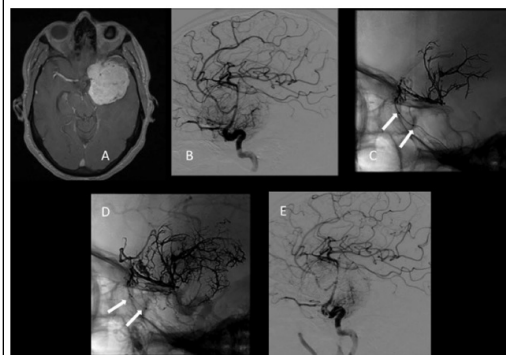
Balloon-augmented Onyx embolization utilizing a novel dual lumen balloon catheter was employed to treat both ruptured and unruptured arteriovenous malformations, intracranial dural

Figure 1. Medial frontal convexity AVM



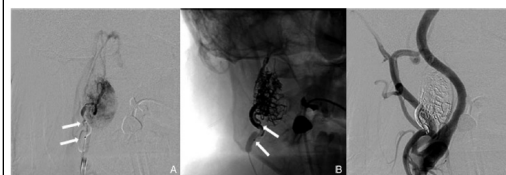
A. Pericallosal artery pedicle B. Inflated Scepter C balloon catheter superselective angiogram of pericallosal artery pedicle supplying AVM C. Post embolization native image demonstrating Onyx cast of anterior portion AVM D. Post embolization control angiogram with anterior portion of AVM no longer opacifying.

Figure 2. Left skull base meningioma



A. MRI with contrast demonstrating left skull base mass B. Lateral projection demonstrating hypervascular tumor C. Inflated Scepter C balloon catheter with early single injection Onyx cast D. Progressive single injection Onyx cast E. Post embolization control angiogram

Figure 3. Carotid body tumor



A. Hypervascular carotid body tumor B. Inflated Scepter C balloon catheter C. Occipital artery branch single injection Onyx embolization D. Post embolization control angiogram

Table 1.

Case No.	Access for embolization (guide position)	Guide catheter	Balloon catheter placement	Microcath	Notes
1. Unruptured medial frontal AVM	Transarterial (CA)	6 F MicroVention (CA)	AA superior anterior carotid artery left frontal	0.014 inch Truxton	6 MicroVention 602 intermediate catheter positioned into the left pericallosal artery. Presence of intermediate catheter provided additional support to Scepter C balloon catheter and allowed for better catheter advancement to the target.
2. Ruptured middle cerebral artery (MCA) AVM	Transarterial (CA)	6 F MicroVention (CA)	Perforating artery via	0.014 inch Truxton	Balloon positioned adjacent to nidus in the aneurysm. Balloon catheter delivery directly within the high velocity catheter allows for interplay penetration of nidus with Onyx and resulting angiographic cast.
3. Dural arteriovenous fistula	Transarterial (CA)	6 F Chaperon MicroVentris (CA)	Right middle meningeal artery	0.014 inch Truxton	Balloon to immediately adjacent to fistula. Single injection allowed for efficient (7 min) and easy penetration and angiographic cast.
4. Skull base meningioma	Transarterial (CA)	6 F Chaperon MicroVentris (CA)	Middle meningeal artery	0.014 inch Truxton	Control embolization allowed for safe and expedient surgical resection. High volume embolization performed with efficient and deep penetration.
5. Carotid body tumor	Transarterial (CA)	6 F Chaperon MicroVentris (CA)	Occipital artery	0.014 inch Truxton	Balloon wedged tightly across highly tortuous and deep occipital. Balloon inflation allowed for effective and deep penetration of Onyx. Results, allowing for complete tumor devascularization within minutes with safe and easy resection.
6. Thyroid mass	Transarterial (CA)	6 F Chaperon MicroVentris (CA)	Left inferior thyroid artery	0.014 inch Truxton	Flow within a large caliber pedicle. Conventional plug function would require large volume of Onyx. Balloon positioned immediately proximal. Balloon wedged in deep penetration and allows for embolization of distal left inferior thyroid artery.
7. Unruptured occipital arteriovenous fistula	Transarterial (CA)	6 F Chaperon MicroVentris (CA)	Left occipital artery	0.014 inch Truxton	Successful embolization of balloon catheter through very tortuous vessels. Able to achieve near complete occlusion of fistula connection in a retrograde fashion with a single injection of Onyx.

Summary of Scepter C and balloon augmented Onyx embolization in cerebrovascular and neoplastic lesions.

Conclusions

The dual lumen balloon catheter has several advantages for use with Onyx embolization over older devices including more efficient proximal plug formation and enhanced navigability for placement deep within pedicles. The balloon-augmented Onyx embolization technique represents a valuable tool to add in the armamentarium of the neurointerventionalist to address a variety of head and neck lesions.