

Case Report

Facial necrosis after endovascular Onyx-18 embolization for epistaxis

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Abstract

Background: Evolution in techniques and equipment has expanded the role, effectiveness, and safety of endovascular transarterial embolization for the treatment of severe epistaxis. Risks from this treatment approach include major ischemic complications. To date, there have been only a few reports of soft tissue necrosis following endovascular embolization for severe epistaxis; none involve the use of Onyx-18.

Case Description: We report the case of a 52-year-old woman who presented with epistaxis that was refractory to medical and surgical management, which lead to endovascular intervention and embolization with Onyx-18. The patient subsequently developed nasal ala and facial necrosis as a result of the procedure.

Conclusion: We report the use of Onyx-18 for the endovascular embolization of a patient with severe epistaxis and subsequent complications. In cases of severe epistaxis that warrant intervention in the form of embolization, ischemic complications are rare; however, ischemic complications may be unavoidable and should factor into the discussion regarding procedural risks.

Key Words: Endovascular embolization, epistaxis, Onyx, soft tissue necrosis

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INTRODUCTION

The treatment of severe epistaxis often involves endovascular embolization. Major ischemic complications following super-selective embolization for the treatment of epistaxis include tissue necrosis, cerebral infarction, and blindness; however, there have been no necrotic complications reported with the use of Onyx-18 (Covidien, Irvine, CA), a copolymer consisting

of ethylene vinyl alcohol, dimethylsulfoxide (DMSO), and tantalum powder. The properties of Onyx-18 make it suitable for embolization of high-flow vascular lesions, though complications relating to distal embolization with resultant tissue ischemia from the occlusion of small arterioles warrant consideration. We report the use of Onyx-18 for the endovascular embolization of a patient with severe epistaxis and subsequent complications.

CASE REPORT

A 52-year-old African-American woman with a history of aortic valve replacement, mitral valve repair, and deep venous thrombosis on chronic anticoagulation therapy with warfarin and aspirin presented after developing epistaxis from her right naris. She received blood products, underwent packing, ligation of the sphenopalatine artery, and silver nitrate cauterization with no resolution of her epistaxis.

The bleeding persisted and the patient underwent endovascular embolization. Under general anesthesia, transarterial embolization was carried out through a right femoral artery approach. A 6-Fr guiding catheter (Envoy; Cordis Endovascular Systems, Miami Lakes, FL) over a hydrophilic guidewire was placed into the left and right external carotid arteries (ECAs). A Marathon™ Micro Catheter (Covidien, Irvine, CA) was advanced over a X-pedion™ 0.010" Guidewire (Covidien, Irvine, CA) into the left and right internal maxillary arteries and the left and right facial arteries. After confirmation that no opacification of the orbital contents was seen after injection of contrast, the catheter was slowly flushed with 0.5 cc of DMSO. Onyx-18 was injected until a cap

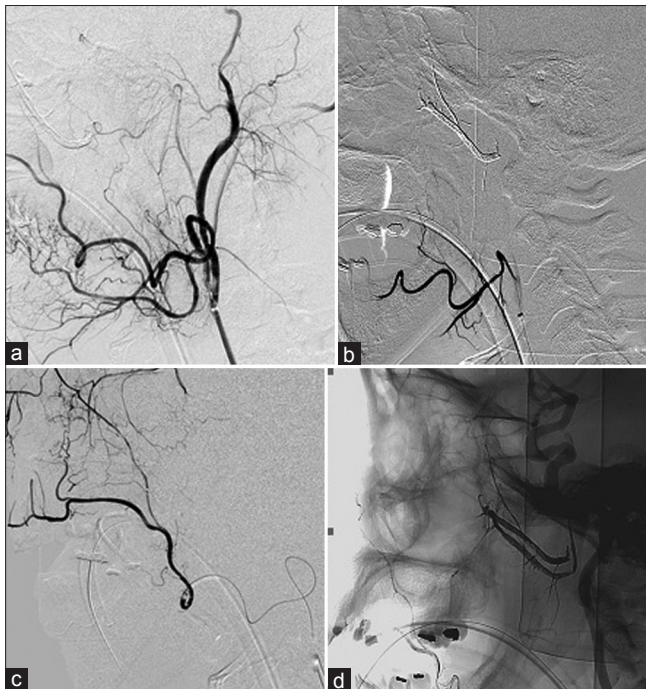


Figure 1: (a) Selective catheterization of the external carotid artery to just proximal to the facial artery demonstrates faint Onyx-18 cast of the ipsilateral internal maxillary artery (b) Superselective catheterization of the inferior division of the facial artery using a microcatheter with subsequent Onyx-18 embolization. Onyx-18 cast of the ipsilateral internal maxillary artery is readily visible (c) Superselective catheterization of the superior division of the facial artery using a microcatheter with subsequent Onyx-18 embolization (d) Nonsubtracted view with roadmap guidance showing Onyx-18 casts within the Internal Maxillary and Facial arteries

formed over the catheter tip that allowed a small amount of reflux. After allowing the cap to solidify, the vessels were embolized with 0.8 cc of Onyx-18 over a period of minutes [Figure 1]. Repeat runs showed that there was adequate occlusion.

On postembolization day 3, the patient noticed a hyperpigmented patch on her left cheek that appeared, prompting dermatologic evaluation [Figure 2]. The plaque exhibited hyperpigmentation with surrounding erythema and was tender to palpation. A punch biopsy was performed at the left melonasal junction. Examination of the biopsy revealed full-thickness epidermal necrosis, as well as necrosis of the upper and mid-dermis, follicles, sebaceous glands, and eccrine glands [Figure 3]. Topical ointment and dressing changes were recommended, and no further treatment was required with eventual resolution of her skin necrosis months later.

DISCUSSION

The majority of cases of epistaxis result from hemorrhage of Kiesselbach's plexus, the vascular supply of the lower anterior septal cartilage. Typically, tamponading the bleeding by inserting nasal packing controls the hemorrhage. When bleeding is refractory to these maneuvers, application of a topical vasoconstrictor, cryotherapy, or electrocautery may be utilized.^[9] Rarely, epistaxis arises from the posterior nasal fossa. The primary arterial supply to the posterior nasal cavity comes from the ECA via the internal maxillary artery (sphenopalatine and descending palatine branches) and the facial artery (ascending palatine branch). In addition, angiographically occult ECA-ICA anastomoses may exist involving the artery of the foramen rotundum, the vidian artery, middle meningeal artery, accessory meningeal accessory meningeal artery, and superficial temporal arteries, thus potentially precipitating a major



Figure 2: Photograph of patient on postembolization day 4, demonstrating hyperpigmented plaque on her left nasal ala and cheek with surrounding erythema

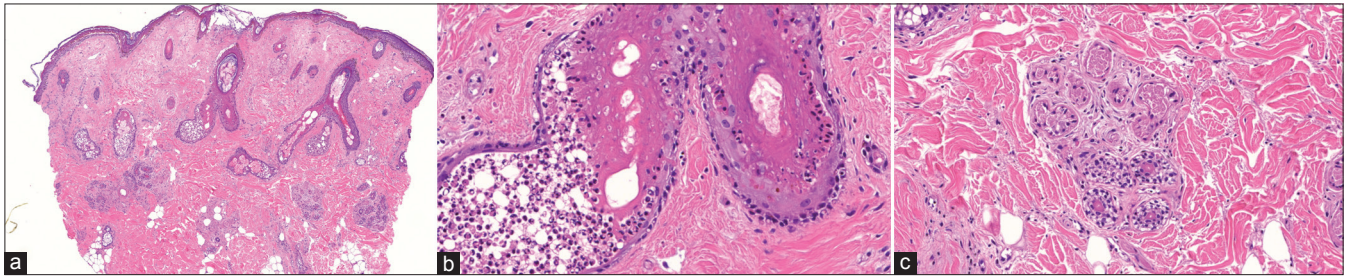


Figure 3: (a) Low magnification hematoxylin and eosin stain of biopsy specimen showing epidermis, dermis, and subcutaneous tissues with dermoepidermal separation (b) Higher magnification demonstrates necrosis of hair follicles (c) Higher magnification demonstrates necrosis of eccrine glands

complication in the form of cerebral infarction or retinal occlusion during embolization procedures.^[3,11]

The endovascular approach for treatment of epistaxis has evolved since Sokoloff *et al.* successfully treated a patient with intractable epistaxis using 1-2 mm sized Gelfoam (Pfizer, New York, NY) particles in 1974, particularly in the embolic agents used.^[7] Apart from Gelfoam pledgets or powder, materials that are used include platinum coils, and polyvinyl alcohol (PVA) particles. Animal models have demonstrated that all endovascular modalities perform equally well in acute cessation of flow.^[10] However, durability of effect is different based on several factors inherent to the materials and the technique used. Platinum coils can be deployed proximally to achieve rapid hemostasis, however, distal collateral formation is more likely to occur. PVA particles (usually between 150 and 500 μm) occlude more distal vasculature, with increased duration of effect.^[10] Finer materials, especially small PVA particles (50-150 μm) and Gelfoam powder carry the inherent risk of necrosis or cranial nerve palsy due to endarteriolar occlusion.^[4,10] Complications may occur when the internal maxillary or facial arteries are over-embolized or when agents reflux into parent arteries, resulting in stroke or cranial nerve palsy. Care must also be taken to avoid forceful injection to prevent particles from traveling through ECA-ICA anastomoses.^[5] Most recent reports describe the use of PVA particles, between 150 and 500 μm , with or without the subsequent addition of Gelfoam sponge pledgets or platinum coils.^[11]

Soft tissue necrosis after embolization for severe epistaxis is rare, owing to extensive collateral blood supply. However, cases of necrosis of the nasal ala, septum, columella, oral mucosa, and facial skin have previously been noted. Sadri *et al.* had tissue necrosis occur in 2 of 14 patients treated for intractable epistaxis.^[6] PVA microparticles sized between 100 and 700 μm were used to perform bilateral internal maxillary artery embolization in both patients, one of whom developed necrosis of the left alar skin and cartilage, and the other mucosal necrosis of the right side of the hard palate. Anderson *et al.* used smaller PVA particles in the range of

150-250 μm with one patient having nasal ala necrosis 3-weeks postprocedure.^[1] In another case, detailed by Ntomouchtsis *et al.*, embolization of the right internal maxillary artery with PVA particles led to a patient having ulcerative necrosis of the soft palate, diaphragm, and right nasal ala along with postprocedural hemiparesis and hemifacial weakness.^[5] Strach *et al.* reported on a patient who subsequently developed necrosis of the left nasal tip after embolization of the bilateral sphenopalatine and left descending palatine artery with 45-150 μm PVA particles.^[8] After this complication, the authors changed to using larger sized PVA particles (150-250 μm), with no further untoward complications noted.

Onyx-18 is a liquid embolic composed of ethylene-vinyl alcohol and DMSO copolymer that is mixed with tantalum powder. This agent's properties lend it to be used for treatment of intracranial arteriovenous malformations, dural vascular malformations, and direct carotid cavernous fistulas. Its use in extracranial vascular malformations has also been reported.^[2] Onyx may be injected in a slow, prolonged fashion forming a cast along the path of least resistance with good distal penetration. Drawbacks include permanent skin discoloration with extravasation and the risk of catheter entrapment.^[2]

Our preference to use Onyx as an embolic material in this case was due to its affording good penetration, visualization of embolic material, reduced risk of retrograde filling of collaterals, and the permanence of the material. The use of Onyx certainly offers benefits in embolization procedures, but does come with some disadvantages. First, Onyx is significantly more expensive than other embolic agents. Second, PVA particles and Gelfoam pledgets are resorbable, carrying a lower risk of permanent tissue ischemia. Finally, since Onyx is a liquid embolic agent, its use is more likely to lead to endarteriolar occlusion and necrosis, a phenomenon, which likely occurred in the case described herein.

Despite its drawbacks, our decision to use Onyx in this case owed to fact that the patient had failed both conservative and surgical management with packing, ligation of the sphenopalatine artery and silver nitrate cauterization. Thus, we believed that using a permanent

liquid embolic agent would afford the best chance of resolving her epistaxis without her having to require additional blood product transfusions or surgical procedures. Also, based on our experience, we felt that using another embolic agent would have come with the same inherent risks, as evidenced by the aforementioned complications experienced by other authors when performing endovascular, transarterial embolization procedures for treatment of epistaxis.

A previous report described a patient who had ischemic necrosis to the superolateral pinna following Onyx-18 embolization of a dural arteriovenous fistula fed by the posterior auricular artery.^[2] Similarly, we did not visualize any cutaneous vessels from our embolization starting point and thus believe that the embolic material most likely traveled into sub-millimeter, nonvisualized perforating vessels, resulting in tissue necrosis. Furthermore, embolization of the facial artery should be performed with caution, as its terminal branch, the alar artery, is the primary supply of the nasal ala.

CONCLUSION

We report unilateral ischemic necrosis of a patient's nasal ala and cheek after Onyx-18 endovascular embolization of bilateral internal maxillary arteries and facial arteries for treatment of intractable epistaxis. In cases of severe epistaxis that warrant intervention in the form of embolization, ischemic complications are rare, given the extensive collateral blood supply in the maxillofacial region; however, ischemic complications

may be unavoidable and should factor into the discussion regarding procedural risks.

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Commentary

Onyx at all costs?

Endovascular techniques continue to evolve at a rapid pace. Newer tools and embolization devices/materials are constantly introduced in clinical practice often with limited data to support their use. Classic example of such "frenzy" for novel agents/technologies is the use of Onyx at all costs. Onyx is a liquid embolic agent originally introduced and approved for the adjuvant (in preparation for surgery) treatment of parenchymal arteriovenous malformations (AVMs). Certain characteristics of this material make it a theoretically better choice for AVM embolization than more traditional embolic agents. Onyx is easier to handle than n-butyl-cyanoacrylate NBCA and thus injections can proceed slowly and be intermittently halted if the material seems to go to "un-intended" vascular territories away from the target. Moreover, Onyx has great penetration with the ability to fill the intricate

three-dimensional structure of the AVM nidus.

Without doubts Onyx has improved our ability to "cure" parenchymal AVMs with embolization although the incidence of complications is not insignificant.^[3] It still debated whether or not Onyx has indeed made surgery for complex AVMs safer and easier.^[1,4] As operators have gained increasing experience with Onyx, this embolic material has been used in a variety of vascular and neoplastic conditions other than parenchymal AVMs. In our practice, the introduction of Onyx has been a definitive advance for treatment of intracranial dural arteriovenous fistulas (AVFs) with exclusive retrograde cortical venous drainage, which we had previously considered for definitive surgical treatment.^[2] However, we do not think that there is a good rationale for extending Onyx use to embolization of tumors (except very

few exceptions) or for epistaxis and we strongly believe that its use in these situations should be discouraged. Instead, Onyx has become a classic example of operator's "frenzy" for newer agents without solid rationale for their use.

In this issue of the International Journal of Surgical Neurology, Granhi *et al.* describe a case of skin necrosis in a 52-year-old female after Onyx embolization of bilateral internal maxillary and facial feeders for refractory epistaxis. We do not agree with the rationale for using Onyx in this patient. poly-vinyl alcohol (PVA) has been demonstrated to be very effective in arresting hemorrhage in patients with epistaxis refractory to other methods. With experience we have learned (as discussed by Granhi *et al.* in their discussion) that larger poly-vinyl alcohol PVA particles (greater than 150 microns in diameter) are associated with much lower risk of distal territory necrosis as the larger size allows from some degree of collateralization through small branches. Moreover, larger size PVA particles are very safe as they will not embolize through "dangerous anastomoses." There is little justification in using Onyx for epistaxis or for tumor embolization since more traditional, and too often forgotten, methods are well established, effective, and cheaper. Onyx as used in the patient in question has a higher risk of distal ischemia because of the better penetration into the smallest branches. The risk of involvement of dangerous anastomoses is also not negligible as the material refluxes and it can be difficult

to visualize through the smallest collaterals through the bony skull base. Moreover, the much higher cost of Onyx compared with PVA is another critical consideration in this day and age of cost-containment. While the authors are to be commended for their honest reporting of their complication in using a novel embolization material, the widespread use of Onyx in this and other non-AVM/AVF conditions should be discouraged.

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