CASE REPORT

Onyx extrusion through the scalp after embolization of dural arteriovenous fistula

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SUMMARY

A man in his sixties referred with symptoms of episodic left lip numbness and left arm weakness was diagnosed with a Borden type 3 dural arteriovenous fistula (DAVF) on DSA. Successful Onyx embolization of the DAVF was performed via the distal left occipital artery using an ev3 Apollo detachable tip microcatheter. He underwent surgical obliteration for the residual DAVF 3 days later. Three months later during a routine postoperative clinic visit, the patient produced a plastic bag containing multiple small pieces of Onyx cast and the detached tip of the Apollo microcatheter that had extruded out from his scalp through small spontaneous holes about 5 weeks after the embolization procedure. This spontaneous extrusion of Onyx can be alarming to the patient not expecting it; however, prior knowledge and discussion can lessen the anxiety of both the treating physician and the patient dealing with such a situation.

BACKGROUND

Onyx (ev3, Irvine, California, USA), an ethylene vinyl alcohol copolymer dissolved in dimethyl sulfoxide (DMSO) is increasingly being used as an embolic agent in the management of intracranial vascular malformations. Transarterial Onyx embolization is now an established method of treatment of dural arteriovenous fistulas (DAVFs). Some degree of mild to moderate intra and perivascular inflammatory response is deemed necessary to achieve permanent occlusion of the nidus of a vascular malformation.¹ With the proper technique, the inflammation associated with Onyx/DMSO use has been reported to be mild and clinically insignificant.²

We present a report on a patient who presented with spontaneous extrusion of Onyx from the scalp a few weeks after embolization for a DAVF. We believe that inflammation associated with Onyx likely resulted in the extrusion. Such a complication with Onyx use has not previously been reported to the best of our knowledge.

CASE PRESENTATION

A man in his sixties was referred with symptoms of episodic left lip numbness and left arm weakness for few weeks. There was no other significant past medical or social history. The patient was neurologically intact on examination.

INVESTIGATIONS

Outpatient CT angiogram showed abnormal vessels in the right temporal lobe suspicious of an intracranial vascular malformation. He underwent DSA

which revealed a Borden type 3 DAVF supplied by bilateral occipital arteries, bilateral middle meningeal arteries, and the falcine branch of the right ophthalmic artery. Venous drainage was into the cortical veins including the right vein of Trolard, the right Sylvian veins, and the right vein of Labbe (figure 1A, B).

TREATMENT

Successful Onyx-18 and Onyx-34 embolization of the DAVF was performed via the distal left occipital artery using an ev3 Apollo detachable tip microcatheter, resulting in obliteration of the bilateral

Figure 1 (A) Anteroposterior and (B) lateral DSA showing a Borden type 3 dural arteriovenous fistula on left occipital artery injection.

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occipital artery supplies to the DAVF. There was still residual DAVF supplied by the bilateral middle meningeal arteries and the right falcine artery (figure 2A, B). Due to incomplete obliteration via endovascular embolization, the patient underwent surgical obliteration of the DAVF 3 days later (figure 3A, B).

OUTCOME AND FOLLOW-UP

Postoperatively the patient remained neurologically intact. There was no abnormal staining on the scalp. His incision site remained clean, dry, and intact. He was discharged home. Three months later during a routine postoperative clinic visit, the patient produced a plastic bag containing multiple small pieces of the Onyx metallic cast which he kept that had extruded out from his scalp through small spontaneous holes (figure 4) about 5 weeks after the procedure. Along with the Onyx casts the detached tip of the Apollo microcatheter had also extruded (figure 5). These areas of skin erosion were about an inch away

from the surgical incision site and did not result in wound complications. The surgical incision site was completely healed at the time of the clinic visit.

DISCUSSION

Spontaneous intermittent Onyx extrusion through the scalp has not previously been reported to the best of our knowledge. In this case, a few weeks after the embolization, our patient presented with spontaneous intermittent extrusion of Onyx through small holes in the scalp. There was no blackening of the surrounding skin.

In July 2005, the US Food and Drug Administration approved the use of Onyx for endovascular embolization of brain arteriovenous malformations. Onyx-18 is composed of 6% ethylene vinyl alcohol and 94% DMSO, with a resultant viscosity of 18 cps at 40°C.³ Histopathological study showed that Onyx evoked a mild degree of intra and perivascular inflammation in the subacute (18 days) and chronic (1–6 months) phases after embolization. Granulomatous inflammatory response, including many elongated epithelioid cells as well as scattered foreign body

Figure 2 (A) Anteroposterior and (B) lateral DSA after Onyx embolization of the dural arteriovenous fistula via the distal left occipital artery. Residual dural arteriovenous fistula is seen supplied by the middle meningeal artery branches.

Figure 3 (A) Anteroposterior and (B) lateral intraoperative DSA after surgical resection of the dural arteriovenous fistula.

Figure 4 Small spontaneous holes of skin erosion through which Onyx extruded along with the Apollo microcatheter detachable tip.

giant cells, was seen in this study. No inflammation was seen in the acute phase.¹ Similar findings were reported in another study.² DMSO, however, can cause severe inflammation, vasospasm, and endothelial necrosis following intra-arterial injection if injected at a rapid rate and/or high volume, primarily in the acute setting.¹ We believe that in our patient the spontaneous extrusion of Onyx was secondary to the inflammation from Onyx causing erosion of the vessel wall and subsequently erosion of the skin of the scalp. The timing of the onset of Onyx extrusion is more consistent with chronic inflammation associated with Onyx use. Ischemic necrosis is less likely the cause as there was no blackening of the skin around the holes in the scalp.

Figure 5 Onyx metallic casts along with the detached tip of the Apollo microcatheter.

An Apollo microcatheter was used in this patient during Onyx embolization. The detached tip of this microcatheter also extruded along with the Onyx metallic cast which could be expected to occur in the setting of inflammation. The Apollo and SONIC (Balt, Montmorency, France) detachable tip microcatheters are novel catheters designed to address the issue of catheter entrapment during Onyx embolization for vascular malformations.^{4,5} No such incidence of catheter tip extrusion as seen in our patient has been reported in the literature with the use of detachable tip microcatheters.

The present case report adds to the list of complications which can potentially happen after Onyx embolization for a DAVF. This complication can be alarming to the patient not expecting it; however, prior knowledge and discussion can lessen the anxiety of both the treating physician and the patient dealing with such a situation.

Learning points

- ▶ Spontaneous extrusion of Onyx after embolization for a dural arteriovenous fistula can be alarming to the patient not expecting it; however, prior knowledge and discussion can lessen the anxiety of both the treating physician and the patient dealing with such a situation.
- ▶ We believe that in our patient the spontaneous extrusion of Onyx was secondary to chronic inflammation associated with Onyx use.
- ▶ Antibiotic treatment is not required for the management of spontaneous extrusion of Onyx in such cases.

Contributors All authors have made significant contributions to the study, and have read and approved the final version of the manuscript.

Competing interests None declared.

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