

# Onyx® Use in Extracranial Pathologies –A Retrospective Case Review

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## Purpose

- To demonstrate the safety and efficacy of ethylene vinyl alcohol (EVOH) copolymer (Onyx®; Medtronic, Inc, Minneapolis, MN) in non-CNS vascular pathologies.

## BACKGROUND

- Onyx is an FDA-approved non-adhesive permanent liquid embolic for pre-operative embolization of cerebral arteriovenous malformations (AVMs)<sup>1</sup>.
- Off-label use has gained recognition to treat a variety of peripheral pathologies most commonly: type II endoleaks<sup>2</sup> and peripheral AVMs<sup>3</sup>.
- Onyx is composed of an EVOH copolymer, DMSO, and micronized tantalum powder.
- DMSO diffuses upon contact with blood allowing precipitation of EVOH. The copolymer solidifies from surface to center maintaining a liquid core.

## Methods

- Performed a retrospective review of all cases that used Onyx between October 2010 and October 2017 at a single tertiary care academic university urban hospital.
- Choice of embolic agents was based on the operator's decision for definitive treatment, preoperative embolization, or palliation.
- Institutional review board approval was appropriately obtained. Data was collected via EMR and PACS. Head and neck cases were excluded.
- Analyzed demographic data, technical success, clinical success, complications, adjunct embolic agents used, and anatomic location.

## References

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## Fluoroscopic Images



Fig. 1



Fig. 2

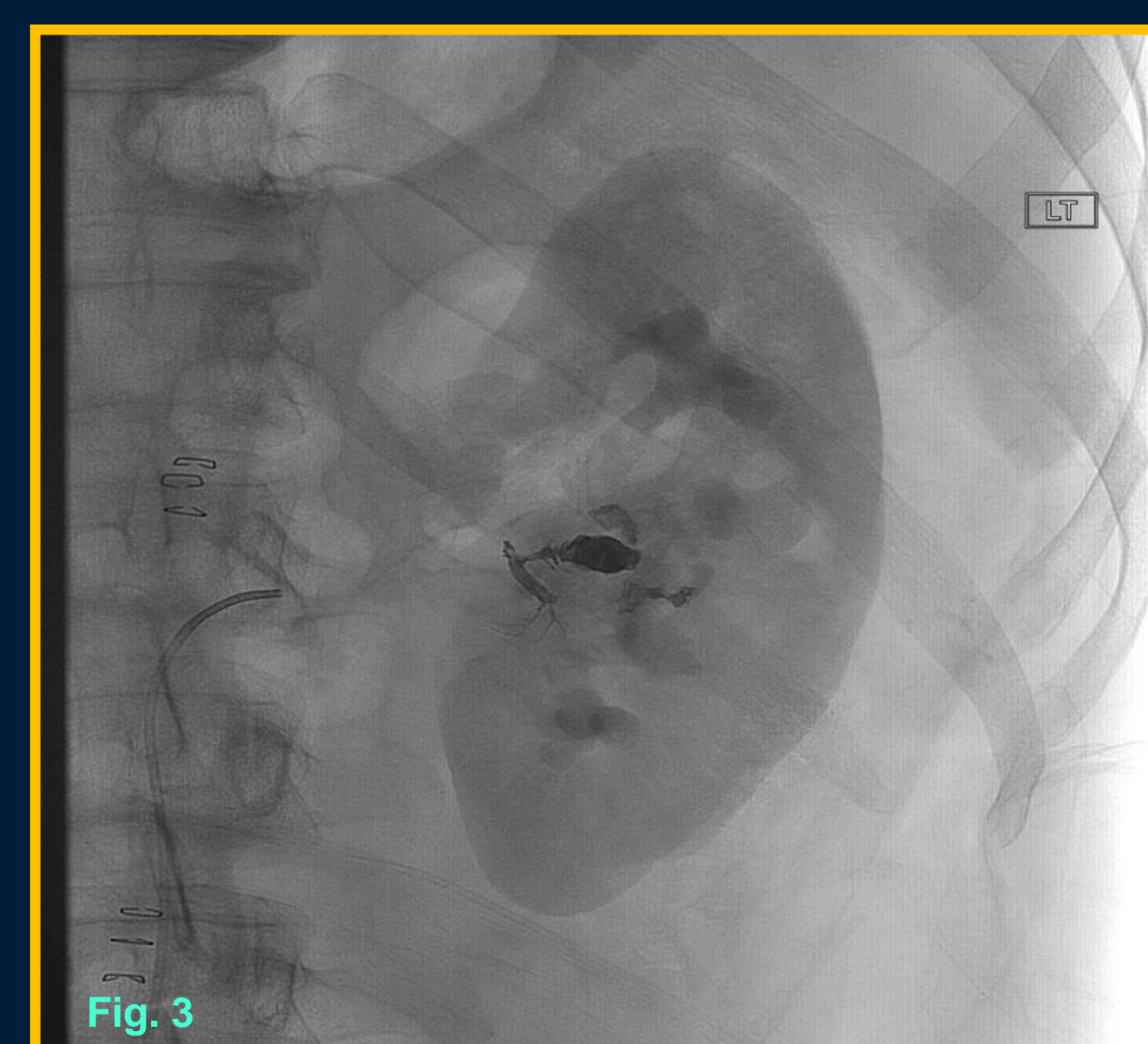


Fig. 3

**Fig. 1.** 57 year-old male presented with hematemesis, melena, and persistent extravasation into the proximal duodenum after embolization with 4 interlock detachable coils. Fluoroscopic image reveals catheterization of the GDA with complete cessation of extravasation after embolization with Onyx 34.

**Fig. 2.** 61 year-old male with congenital venous malformation of the right shoulder, axilla, and pectoralis muscle presents with swelling of the affected areas. Fluoroscopic image shows Onyx 18 and 34 and Truefill glue embolization of a large superficial lateral chest wall AVM. Subsequent surgical excision performed with <7ml of blood loss.

**Fig. 3.** 53 year-old male s/p left partial nephrectomy presenting with hematuria. Image shows selective embolization with Onyx 34 of left renal artery third order branch pseudoaneurysm.



Fig. 4A

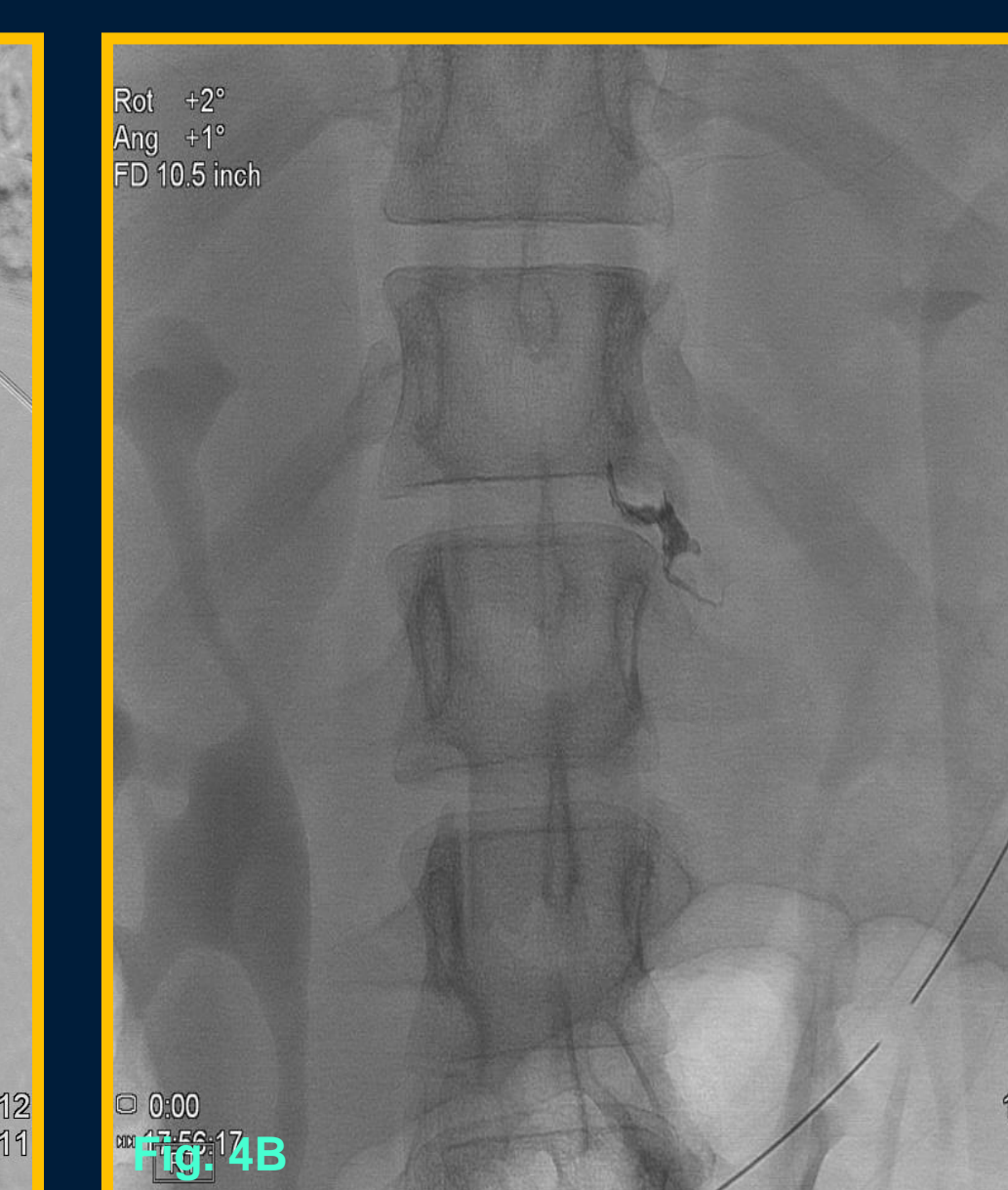


Fig. 4B



Fig. 5

**Fig. 4.** 28 year-old male presenting with RUQ abdominal pain. Selective angiogram reveals presence of a distal left hepatic arterial branch pseudoaneurysm (A) with subsequent Onyx 18 embolization (B).

**Fig. 5.** 75 year-old male with enlarging infrarenal AAA sac s/p endovascular repair. Fluoroscopic image demonstrates embolization with Onyx 34 of a third order L4 lumbar artery causing the Type II endoleak. Of note, coil deployment was initially attempted to embolize this leak but proved to be technically challenging.

Table 1. Characteristics of Onyx embolization cases.

Indications for treatment, n = 54 (%)	Onyx concentration used, n = 54 (%)	
Primary treatment	42 (78)	13 (24)
Pre-surgical devascularization	6 (11)	35 (65)
Palliative or symptomatic relief	6 (11)	Both 6 (11)
Major anatomic region, n = 54	Adjunct embolic agent used, n = 54 (%)	
Endoleak repair	18	None (Onyx only) 33 (61)
Upper and lower extremity arteries	11	Coils 13 (24)
Pelvic arterial system	9	NBCA 4 (7)
Gastrointestinal arterial system	7	Sotradecol foam 2 (4)
Renal artery branches	4	Embospheres 1 (2)
Venous malformation	4	Coils & Gel foam 1 (2)
Pulmonary artery	1	

## Results

- 49 patients were identified who underwent embolization with Onyx for extracranial pathologies.
- A total of 64 instances met our criteria. The incongruent number of cases compared to patients was secondary to multiple sessions for some patients.
- Such cases included: venous malformation, arteriovenous malformations, and type II endoleaks.
- Technical success was achieved in 100% of cases. The clinical success rate was 98%.
- Among all 64 cases, only one complication had occurred with nontarget embolization of a renal pseudoaneurysm status post nephrectomy.

## Conclusion

- This study demonstrates that Onyx is a safe and effective embolic agent to treat a variety of extracranial vascular pathologies.

ADVANTAGES	LIMITATIONS
✓ "Lava-like" consistency for precise embolization of tortuous, complex vessels	❖ Cost prohibitive
✓ Varying EVOH concentrations and viscosities for distal targets or different flow rates <sup>4</sup>	❖ Nontarget embolization
✓ Non-absorbable and cohesive properties	❖ DMSO-compatible microcatheters
✓ Longer injection time, better operator control	❖ DMSO side effects (foul breath, vasospasm, respiratory distress) <sup>5</sup>
✓ Strong fluoroscopic visibility	
✓ Independent of coagulation cascade	

## Discussion

- May be expanded to nonvascular uses, e.g. closure fistulae refractory to surgery or in high risk patients, and to situations refractory to other agents.
- Despite larger sample size, the data is retrospective. Future studies require randomized controlled setting or a noninferiority analysis comparing different embolic therapies.