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) 1.
- Off-label use has gained recognition to treat a variety of peripheral pathologies most commonly: type II endoleaks 2 and peripheral AVMs 3.
- 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 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.

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

Table 1. Characteristics of Onyx embolization cases.

<table>
<thead>
<tr>
<th>Indications for treatment, n = 54 (%)</th>
<th>Onyx concentration used, n = 54 (%)</th>
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</thead>
<tbody>
<tr>
<td>Primary treatment</td>
<td>42 (19)</td>
</tr>
<tr>
<td>Pre-surgical devascularization</td>
<td>6 (11)</td>
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<tr>
<td>Palliative or symptomatic relief</td>
<td>6 (11)</td>
</tr>
<tr>
<td>Major anatomic region, n = 24</td>
<td></td>
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<tr>
<td>Endoleak repair</td>
<td>18</td>
</tr>
<tr>
<td>Upper and lower extremity arteries</td>
<td>11</td>
</tr>
<tr>
<td>Pelvic arterial system</td>
<td>9</td>
</tr>
<tr>
<td>Gastrointestinal arterial system</td>
<td>7</td>
</tr>
<tr>
<td>Renal artery branches</td>
<td>4</td>
</tr>
<tr>
<td>Venous malformation</td>
<td>4</td>
</tr>
<tr>
<td>Pulmonary artery</td>
<td>1</td>
</tr>
</tbody>
</table>

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

- "Lava-like" consistency for precise embolization of tortuous, complex vessels
- Varying EVOH concentrations and viscosities for distal targets or different flow rates
- Non-absorbable and cohesive properties
- Longer injection time, better operator control
- DMSO side effects (foul breath, vassospasm, respiratory distress)
- Strong fluoroscopic visibility
- Independent of coagulation cascade

LIMITATIONS

- Cost prohibitive
- Nontarget embolization
- DMSO-compatible microcatheters

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 settings or a noninferiority analysis comparing different embolic therapies.