

Liquid Embolization with Onyx in a Technically Challenging Case of Acute Upper GI Bleeding

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Abstract Conventional embolization such as coiling of acute upper gastrointestinal bleeding may be rendered impossible or unsuitable due to anatomical and technical factors. Liquid (Onyx) embolization in such situations may prove valuable and life saving, though literature on the subject, particularly of acute upper gastrointestinal bleeding due to duodenal ulcer, is sparse. We present a technically challenging case of acutely rebleeding duodenal ulcer embolized successfully using ethylene polyvinyl alcohol polymer (Onyx).

Keywords Upper GI bleeding · Duodenal ulcer · Angiography · Embolization · Onyx

Introduction

Endovascular embolization is an accepted treatment modality for acute nonvariceal upper gastrointestinal (GI) bleeding not amenable to endoscopic management [1]. Various embolizing materials (such as coils, gelatin sponge, PVA particles, microspheres, etc.) and embolization techniques have been employed to achieve sufficient hemostasis, though the most widely used technique for achieving hemostasis is endovascular coiling [2, 3]. However, use of the liquid embolizing material Onyx for bleeding peptic ulcer has not found widespread application, and literature on the topic has been sparse.

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Case Report

A 61-year-old man was admitted in our hospital with acute severely rebleeding duodenal ulcer. He had a previous episode of upper GI bleeding 2 weeks before the current event and was then treated by empiric embolotherapy with coiling of gastroduodenal artery (GDA) and superior pancreaticoduodenal artery (SPDA) following unsuccessful endoscopic treatment. Endoscopic treatment of the current episode failed to arrest bleeding. Angiography from the common hepatic artery showed a well-occluded GDA from previous coiling. An angiogram from the superior mesenteric artery (SMA) revealed active bleeding from a very small and gracile peripheral branch of the SPDA (branch of the GDA) filled up retrogradely by a feeder from the inferior pancreaticoduodenal artery (a branch of the SMA) beyond a point where coils from previous embolization were lying. Several attempts were made to manipulate various microcatheters and guide wires into that bleeding peripheral branch, but it was impossible to negotiate the same due to slender vessel caliber, acute and sharp distal angulation, tortuosity, and proximal catheter instability. Therefore, coiling could not be undertaken. Bead Blocks (Biocompatibles UK Limited, Farnham, UK) were then tried, but they ran directly into the duodenum through the actively bleeding artery. Gelatin sponge was avoided, as it causes only temporary embolization. It was then decided to use the liquid embolizing material Onyx (EV3 Neurovascular, Irvine, CA, USA) because of its easy controllability during injection, nonadhesive nature, lava-like casting, and no necessity of crossing the bleeding point [3]. A microcatheter was primed with dimethyl sulfoxide (DMSO), and then, Onyx 18 (6 % ethylene vinyl alcohol [EVOH]) was injected at a very slow pace. Onyx could be seen spreading towards the target vessel smoothly. No significant nontarget embolization was noticed. Injection was stopped after Onyx reached the target vessel, and a review angiogram showed well-accomplished embolization with no sign of active extravasation from the

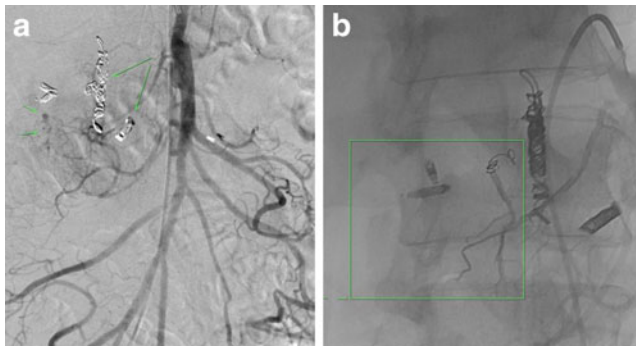


Fig. 1 **a** Pre-embolization angiography from SMA shows an active bleeding point (*short arrows*) near endoscopically placed clips. Coils from previous embolization can also be seen (*long arrows*). **b** Post-Onyx embolization angiogram shows complete hemostasis at the bleeding site (*square box*)

target vessel or anywhere else. No extra embolizing material such as coils was used, and complete hemostasis was achieved with Onyx alone. The patient has been doing well 6 months post-Onyx embolization. No hematemesis or melena has been reported (Fig. 1).

Discussion

Peptic ulcer disease is the most common cause of upper GI bleeding and accounts for about 50 % of all such cases [4]. The primary diagnostic and therapeutic modality for acute nonvariceal upper GI bleeding is early endoscopy [1]. However, percutaneous transcatheter embolization is an effective method, has emerged as a first-line therapy for upper GI bleeding refractory to endoscopic hemostasis, and therefore should be considered an alternative to surgery for patients for whom therapeutic endoscopy has failed [1, 5, 6]. In our case, endoscopic treatment was tried without success. A successful endovascular embolization is greatly aided by identification and localization of the bleeding site demonstrated by contrast extravasation [1, 2]. A definitive angiographic bleeding source was seen in our case. Coiling could not be performed because of difficult anatomy and technical factors as previously cited. Bead blocks extravasated directly through the bleeding vessels. Gelatin sponge particles alone were beyond therapeutic purview, as permanent occlusion was intended. Onyx was therefore selected as the uniquely suitable material in this situation for reasons mentioned before. Onyx is a nonadhesive liquid embolic agent composed of EVOH copolymer available in concentrations of 6 % (Onyx 18), 6.5 % (Onyx 20), and 8 % (Onyx 34) dissolved in DMSO with the additive of micronized tantalum powder for visibility. The copolymer precipitates when coming in contact with blood due to rapid dissipation of DMSO [7]. Onyx has shown great potential in treatment of brain and spinal arteriovenous malformations as well as

peripheral arteriovenous malformations [8–10]. It has also found increasing use in peripheral interventions such as bleeding due to iatrogenic vessel injury/pseudoaneurysm, aneurysm, malignancy/inflammation, trauma, etc. [11, 12]. However, the use of Onyx as embolizing agent for bleeding from peptic ulcer has not found widespread use, and literature on this topic has been sparse at best. Lenhart et al. [3] mentioned two cases of peptic ulcer bleeding (one gastric ulcer and one duodenal ulcer) treated with Onyx, showing good result in long-term follow-up (about 2 years). In our case too, we have obtained satisfactory result after Onyx embolization of a difficult-to-approach lesion of bleeding duodenal ulcer. In conclusion, EVOH copolymer (Onyx) can be successfully used as a liquid embolic material for technically challenging acute upper GI bleeding due to peptic ulcer disease.

References

1. Millward SF (2008) ACR appropriateness criteria on treatment of acute nonvariceal gastrointestinal tract bleeding. *J Am Coll Radiol* 5:550–554
2. Brian F (2006) On-call treatment of acute gastrointestinal hemorrhage. *Semin Intervent Radiol* 23(3):215–222, PMID: PMC3036383
3. Lenhart M, Paetzel C, Sackmann M et al (2010) Superselective arterial embolization with a liquid polyvinyl alcohol copolymer in patients with acute gastrointestinal hemorrhage. *Eur Radiol* 20(8):1994–1999
4. Laine L, Peterson WL (1994) Bleeding peptic ulcer. *N Engl J Med* 331(11):717–727
5. Loffroy RF, Abualsad BA, Lin MD et al (2001) Recent advances in endovascular techniques for management of acute nonvariceal upper gastrointestinal bleeding. *World J Gastrointest Surg* 3(7):89–100, PMID: PMC 3158888
6. Barkun AN, Bardou M, Kuipers EJ, Sung J, Hunt RH, Martel M et al (2010) International consensus recommendations on the management of patients with non-variceal upper gastrointestinal bleeding. *Ann Intern Med* 152(2):101–113
7. Covidien (2012) EV3 user manual on Onyx (EV3 Neurovascular, Irvine, CA, USA), 2012 Covidien.
8. Jahan R, Murayama Y, Gobin YP et al (2001) Embolization of AVMs with Onyx: clinicopathological experience in 23 patients. *Neurosurgery* 48(5):984–997
9. Molyneux AJ, Coley SC (2000) Embolization of spinal cord AVMs with EVOH copolymer dissolved in DMSO (Onyx liquid embolic system). *J Neurosurg* 93(2 Suppl):304–308
10. Castanada F, Goodwin SC, Swischuk JL et al (2002) Treatment of pelvic AVMs with EVOH copolymer (Onyx). *J Vasc Interv Radiol* 13(5):513–516
11. Muller-Wille R, Herold T, Jung EM et al (2009) Onyx (ethylene-vinyl-alcohol-copolymer)—a novel approach to the endovascular treatment of acute bleeding. *Fortschritte auf dem Gebiete der Rontgenstrahlen und der Nuklearmedizin (Rofo)* 181(8):767–773, Epub 2009 Jul (PMID: 19575344)
12. Vanninen RL, Manninen I (2007) Onyx, a new liquid embolic arterial for peripheral interventions: preliminary experience in aneurysm, pseudoaneurysm and pulmonary arteriovenous malformation embolization. *Cardiovasc Intervent Radiol* 30(2):196–200