

Upper Gastrointestinal Bleed Embolization with Onyx®: The “Tattoo Effect”

Driss Raissi, Qian Yu, S. Houssam Mardini¹

Division of Vascular and Interventional Radiology, University of Kentucky College of Medicine, Lexington, Kentucky, USA,
¹Division of Gastroenterology and Hepatology, University of Kentucky, College of Medicine, Lexington, Kentucky, USA



Received : 13-08-2018
Accepted : 30-09-2018
Published : 15-11-2018

ABSTRACT

Endoscopic intervention is well validated for the control of upper gastrointestinal bleeding (UGIB). In cases of refractory bleeding, transarterial embolization is a safe and effective alternative. Ethylene vinyl alcohol (EVOH) commonly known as Onyx® is an inherently black liquid embolic approved for use in cerebrovascular arteriovenous malformations and is increasingly used as an embolic agent in multiple peripheral and visceral territories. Onyx® has a uniquely undesirable property of causing black color discoloration when used in peripheral applications adjacent to the skin akin to a “tattoo effect.” Knowledge of the agents used by the interventional radiologist, clinical correlation, and close follow-up can be of paramount importance to avoid unnecessary surgical intervention. Here, we report a case demonstrating this “tattoo effect” on the gastric mucosa following UGIB embolization.

KEYWORDS: Embolization, ethylene vinyl alcohol, Onyx, right gastric artery, tattoo, upper gastrointestinal bleeding

INTRODUCTION

Endoscopic intervention is well validated for the control of upper gastrointestinal bleeding (UGIB). In cases of refractory bleeding, transarterial embolization (TAE) is a safe and effective alternative. Ethylene vinyl alcohol (EVOH) also known as Onyx® (Covidien/ev3, Irvine, CA, USA) is an inherently black liquid embolic approved for use in cerebrovascular arteriovenous malformations and is increasingly used as an embolic agent in multiple peripheral and visceral territories including the gastrointestinal (GI) tract. It is less adhesive than other liquid embolics such as N-butyl cyanoacrylate and polymerizes slowly, which provides better control for the interventionalist performing the procedure. However, Onyx® has a uniquely undesirable property of causing black color discoloration when used in peripheral applications adjacent to the skin.^[1] This side effect can be described as a skin “tattoo effect” and should be discussed with the patient beforehand. This “tattoo effect” can be easily confused with gastric mucosal necrosis by the endoscopist during any follow-up endoscopy after UGIB embolization as the “tattoo effect” may be permanent based on described

skin findings in the literature.^[1] Knowledge of the agents used by the interventional radiologist, clinical correlation, and close follow-up can be of paramount importance to avoid unnecessary surgical intervention.

CASE REPORT

A 43-year-old male was referred to interventional radiology after being admitted for decompensated cirrhosis and persistent UGIB following endoscopic therapy. The patient had a history of alcoholic cirrhosis, portal hypertensive gastropathy, and gastric antral vascular ectasia. He was admitted 1 year prior for UGIB and underwent gastroduodenal artery (GDA) coil embolization and supraduodenal artery pseudoaneurysm N-butyl cyanoacrylate embolization [Figure 1]. During the current admission, the patient was hypotensive,

Address for correspondence:

Dr. Qian Yu,
University of Kentucky College of Medicine, Lexington,
Kentucky, USA.
E-mail: qyu227@uky.edu

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: reprints@medknow.com

How to cite this article: Raissi D, Yu Q, Mardini SH. Upper Gastrointestinal Bleed Embolization with Onyx®: The “Tattoo Effect”. J Clin Imaging Sci 2018;8:46.
Available FREE in open access from: <http://www.clinicalimagingscience.org/text.asp?2018/8/1/46/245532>

Access this article online

Quick Response Code:



Website:
www.clinicalimagingscience.org

DOI: 10.4103/jcis.JCIS_64_18

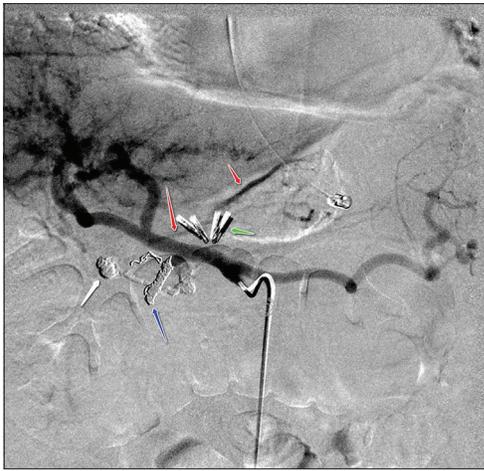


Figure 1: A 43-year-old male with a history of alcoholic cirrhosis, portal hypertensive gastropathy, and gastric antral vascular ectasia was admitted 1 year ago for upper gastrointestinal bleeding. Digital subtracted angiography of the celiac artery demonstrates previously coil-embolized GDA (blue arrow) and N-butyl-cyanoacrylate embolized supraduodenal artery pseudoaneurysm (white arrow). Hemoclips from prior endoscopic intervention were also visualized (green arrow). The RGA could be visualized supplying the site of bleeding along the lesser curvature of the stomach (red arrow).

and laboratory values were significant for low hemoglobin and hematocrit level. Upper GI endoscopy was performed showing large amount of blood in the stomach with arterial bleeding after clot removal at the prepyloric region just proximal to the pyloric sphincter [Figure 2]. Endoscopy report suggested underlying Dieulafoy lesion which was treated with endoscopic hemoclips and epinephrine injection, however, this failed to control the bleeding, which was identified around the prepyloric region. Angiography localized the bleeding to the right gastric artery (RGA) territory with subsequent embolization of the RGA branches using Onyx® (Covidien/ev3, Irvine, CA, USA) liquid embolic system [Figure 3]. The patient underwent a follow-up endoscopy 24 h later which showed mucosal changes in the expected anatomical distribution of the embolized area consisting of black discoloration but with no ulceration or bleeding. The endoscopist impression was “ischemia with possible gastric necrosis.” The patient remained hemodynamically stable with no further evidence of bleeding, he had a benign abdominal examination, and there was no clinical evidence of gastric necrosis/ischemia or infection. The case was discussed in a multidisciplinary conference that included surgery, gastroenterology, and interventional radiology. It was concluded that the mucosal changes were due to staining of the mucosa with the agent used for embolization Onyx® rather than gastric necrosis and no further interventions were needed given the lack of any concerning clinical signs in the patient.

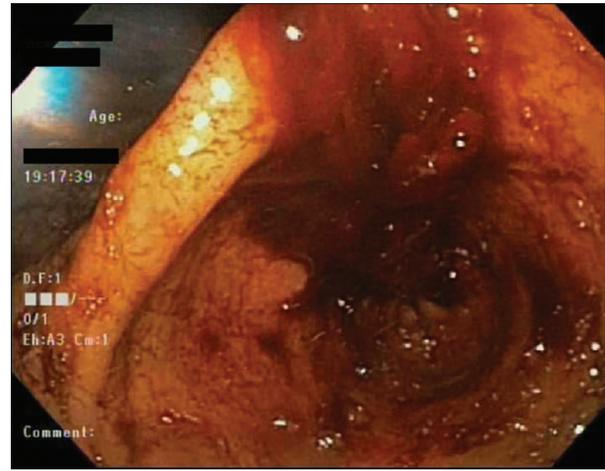


Figure 2: A 43-year-old-male with a history of alcoholic cirrhosis, portal hypertensive gastropathy, and gastric antral vascular ectasia was admitted for recurrent upper gastrointestinal bleeding. Upper endoscopy shows ongoing hemorrhage emanating from the prepyloric region toward the pylorus.

DISCUSSION

Endoscopic hemostasis is the best first-line treatment in acute UGIB due to its ability to directly visualize and characterize the site of bleeding.^[2] In a situation where endoscopy fails to control the bleeding, TAE is considered a safer alternative to surgery, especially in high-risk patients with hemodynamic instability or multiple comorbidities. TAE has a high technical and clinical success rate based on several studies.^[3-5] In our case, the patient experienced refractory bleeding despite endoscopic interventions with hemoclips and epinephrine injection. The patient’s hypotension and multiple medical comorbidities made him a poor surgical candidate, making TAE his best alternative.

While the left gastric and gastroduodenal arteries are the most common culprits of UGIB,^[4] less common arterial branches must be considered, especially in the setting of postsurgical or postembolization anatomy such as patients after a Whipple’s procedure, prior gastric surgery or a previous GDA embolization such as in our case. Given that the GDA is either ligated or embolized, these patients often rely on the RGA or the left gastroepiploic artery to supply the distal portion of their stomach. Thus, these vessels must be interrogated during angiography in the aforementioned settings.

In our case, angiography of the RGA, which typically supplies the distal third of the lesser gastric curvature, demonstrated ongoing hemorrhage. Arterial embolization of the RGA resulted in effective control of the patient’s UGIB. Potential embolic agents that may be used for the control of UGIB include both permanent materials such as metallic coils and polyvinyl alcohol particles as well as temporary ones like gelatin sponge particles.

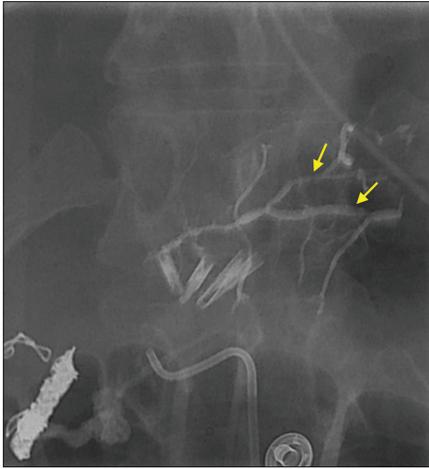


Figure 3: A 43-year-old-male with a history of alcoholic cirrhosis, portal hypertensive gastropathy, and gastric antral vascular ectasia was admitted for recurrent upper gastrointestinal bleeding. Embolization of the right gastric artery branches with Onyx®. Postembolization fluoroscopic image demonstrates Onyx® cast material within the embolized right gastric branches (yellow arrows).

However, these agents may not be an option due to anatomical and technical challenges.^[6] In our case, the bleeding arose from the distal branches of the RGA with a suggested Dieulafoy/vascular lesion on angiography, so Onyx® was selected as the embolic agent for its ability to provide deep occlusion of distal branches and obliterate anomalous vessels.^[7]

Onyx® (Covidien/ev3, Irvine, CA, USA) is a nonadhesive embolic agent comprised of EVOH copolymer dissolved in dimethyl sulfoxide and suspended in micronized tantalum powder to provide radiographic contrast for visualization under fluoroscopy. The FDA approved its use for brain arteriovenous malformations in July 2005. Onyx is available in two product formulations: Onyx® 18 (Covidien/ev3, Irvine, CA, USA) and Onyx® 34 (Covidien/ev3, Irvine, CA, USA). Onyx 18 may offer the advantage of deeper penetration into the nidus due to its lower viscosity compared to Onyx 34. Final solidification occurs within 5 min for both product formulations making its delivery much more predictable than other liquid embolics such as N-butyl cyanoacrylate. Direct endoscopic delivery of Onyx in the GI tract has also been reported in one single case report.^[8]

Although long-term follow-up is limited, this agent appears to offer several advantages over the other available embolic agents for the endovascular management of arteriovenous malformations and other vascular lesions. Onyx has shown positive outcomes in controlling acute v bleeding in selected patients with good results in long-term follow-up.^[7] Onyx is intrinsically black, and it is known to cause staining of the overlying skin when used in peripheral

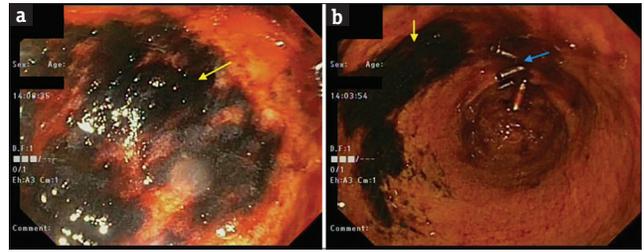


Figure 4: A 43-year-old male with a history of alcoholic cirrhosis, portal hypertensive gastropathy, and gastric antral vascular ectasia was admitted for recurrent upper gastrointestinal bleeding. Embolization of the right gastric artery branches with Onyx®. Figure a and b – Upper endoscopy demonstrating black staining/dyscoloration of the mucosa in the prepyloric region with relatively normal surrounding gastric mucosa (yellow) next to hemoclips (blue arrows).

applications.^[7,9] A similar “tattoo effect” finding was incidentally observed in our patient’s gastric mucosa during follow-up endoscopy the next day [Figure 4]. This black color “tattoo effect” on the gastric mucosa should not be confused with gastric necrosis when performing endoscopy, especially in patients with a history of arterial embolization with Onyx. Gastric necrosis manifests itself with ominous clinical signs leading to an acute abdomen with significant clinical deterioration associated with the diagnosis.^[10,11] While esophageal necrosis also known as the “black esophagus” is a well-known entity,^[12] endoscopic findings of gastric mucosal necrosis have been mainly described in case reports. Necrotic gastric mucosa typically demonstrates thickened folds, exudative mucosa with or without ulcerations in the setting of a clinically decompensating patient and black mucosal discoloration may or may not be part of the constellation of findings.^[13-15] In addition and based on Onyx’s reported skin effects, the changes attributed to this embolic material may be permanent in the GI tract as well^[7,9] and may prompt unnecessary work-up if not considered by the endoscopist at any point in time during future endoscopies. To the best of our knowledge, this is the first report to describe gastric mucosa “tattoo effect” resulting from mucosal staining after UGIB embolization with Onyx liquid embolic system.

CONCLUSION

Endoscopy is the first-line treatment for acute UGIB. As a second line of treatment, TAE offers a safe and effective option to control UGIB. Knowledge of the embolic agents used by the interventional radiologist, clinical correlation, and close follow-up can be of paramount importance to avoid unnecessary surgical intervention. This finding on endoscopy supports the need for the endoscopist to recognize mucosal changes resulting from the use of specific embolic agents and to have close communication with the interventional

radiologist while working in a multidisciplinary fashion. Furthermore, this gastric mucosa “tattoo effect” secondary to embolization with Onyx maybe permanent and unfamiliarity with this agent may prompt unnecessary sampling and/or imaging studies if these patients undergo any future upper endoscopy.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- Guimaraes M, Wooster M. Onyx (Ethylene-vinyl alcohol copolymer) in peripheral applications. *Semin Intervent Radiol* 2011;28:350-6.
- Cherian MP, Mehta P, Kalyanpur TM, Hedgire SS, Narsinghpura KS. Arterial interventions in gastrointestinal bleeding. *Semin Intervent Radiol* 2009;26:184-96.
- Shin JH. Refractory gastrointestinal bleeding: Role of angiographic intervention. *Clin Endosc* 2013;46:486-91.
- Loffroy R, Favelier S, Pottecher P, Estivalet L, Genson PY, Gehin S, et al. Transcatheter arterial embolization for acute nonvariceal upper gastrointestinal bleeding: Indications, techniques and outcomes. *Diagn Interv Imaging* 2015;96:731-44.
- Loffroy R, Rao P, Ota S, De Lin M, Kwak BK, Geschwind JF, et al. Embolization of acute nonvariceal upper gastrointestinal hemorrhage resistant to endoscopic treatment: Results and predictors of recurrent bleeding. *Cardiovasc Intervent Radiol* 2010;33:1088-100.
- Vaidya S, Tozer KR, Chen J. An overview of embolic agents. *Semin Intervent Radiol* 2008;25:204-15.
- Bharadwaz A, Madhab G. Liquid embolization with onyx in a technically challenging case of acute upper GI bleeding. *Indian J Surg* 2013;75:495-6.
- Herman B, Bublik M, Ruiz J, Younis R. Endoscopic embolization with onyx prior to resection of JNA: A new approach. *Int J Pediatr Otorhinolaryngol* 2011;75:53-6.
- Saeed Kilani M, Izaaryene J, Cohen F, Varoquaux A, Gaubert JY, Louis G, et al. Ethylene vinyl alcohol copolymer (Onyx®) in peripheral interventional radiology: Indications, advantages and limitations. *Diagn Interv Imaging* 2015;96:319-26.
- Fragkouli K, Mitselou A, Vougiouklakis T. Death-related gastric necrosis after laparoscopic adjustable gastric banding in the early post-operative period. *Diagn Pathol* 2010;5:68.
- Huang G, Jin Y. Total gastric necrosis: A case report and literature review. *Niger J Clin Pract* 2017;20:645-6.
- Gurvits GE. Black esophagus: Acute esophageal necrosis syndrome. *World J Gastroenterol* 2010;16:3219-25.
- Kurdi M, Shkrum M. Acute Necrotizing Pancreatitis with Gastric Necrosis in a Female with Cerebral Palsy. *J Case Rep Stud* 4;402. ISSN: 2348-9820.
- Scheppach W, Teschner M, Kirchner T, Schindler C, Franke S, Bodendörfer G, et al. Acute pancreatitis and stomach wall necrosis caused by cholesterol embolisms. *Dtsch Med Wochenschr* 1993;118:13-8.
- Salinas J, Georgiev T, González-Sánchez JA, López-Ruiz E, Rodríguez-Montes JA. Gastric necrosis: A late complication of nissen fundoplication. *World J Gastrointest Surg* 2014;6:183-6.