

Life-threatening gastrointestinal bleeding from splenic artery pseudoaneurysm due to gastric ulcer penetration treated by surgical hemostasis with resuscitative endovascular balloon occlusion of the aorta: a case report

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Abstract

We report the case of a patient for whom surgical hemostasis of gastrointestinal bleeding from a splenic artery pseudoaneurysm that developed due to gastric ulcer penetration was achieved with resuscitative endovascular balloon occlusion of the aorta.

Introduction

Splenic artery pseudoaneurysms (SAPs) are rare causes of upper gastrointestinal bleeding (UGIB), with less than 250 reported cases in the literature.¹ Among these reported cases, SAPs are most often caused by pancreatitis (52%) or trauma (29%),² and rarely by peptic ulcer disease. To the best of our knowledge, only nine cases of SAPs caused by peptic ulcers have been previously reported.²⁻¹⁰ UGIB caused by a ruptured SAP presents a significant risk for patient survival, since a mortality rate of up to 90% has been reported for untreated cases¹ and the treatment strategies used can determine whether a patient lives or dies. The use of resuscitative endovascular balloon occlusion of the aorta (REBOA) to control non-traumatic bleeding has increased¹¹⁻¹³; however, REBOA has not been used in any case report of UGIB from a SAP that was caused by a peptic ulcer. Herein, we report the case of a patient with UGIB from a SAP caused by a peptic ulcer, who survived as the result of surgery using REBOA.

Case report

A 72-year-old female with a history of consumption of nonsteroidal anti-inflammatory drugs for back pain was presented to our hospital for melena and shock by the helicopter emergency medical service. The patient had a history of atrial fibrillation and hypertension, for which she was receiving rivaroxaban (10 mg/day) and carvedilol (10 mg/day). During the emergency medical flight, the patient's blood pressure was 49/30 mmHg and her heart rate was 50 beats per minute (bpm). The patient received an intravenous transfusion of crystalloid fluid and tracheal intubation in transit to the hospital. Upon arrival at our emergency department, the patient's vital signs and laboratory results included: heart rate, 60 bpm; blood pressure, 95/44 mmHg; and hemoglobin, 4.0 g/dL. The patient received a transfusion of red blood cells and fresh-frozen plasma for the treatment of anemia. Subsequent changes in her vital signs and laboratory results, and the transfusion volume administered, are shown in Figure 1. The patient underwent upper gastrointestinal endoscopy; however, a lesion was not identified with this technique due to profuse hemorrhage from the posterior wall of the stomach. Consequently, contrast-enhanced computed tomography (CT) was performed and showed the presence of free air in the abdominal cavity and a large amount of extravasated fluid in the gastric lumen

(Figure 2); thus, we decided to perform surgery to achieve hemostasis. Following CT, the patient developed shock. We inserted a 7-French sheath into the right femoral artery using the Seldinger technique. Then, a REBOA catheter (RESCUE balloon catheter; Tokai Medical Products, Aichi, Japan) was advanced to the distal thoracic aorta. Although the patient's blood pressure had decreased immediately prior to surgery, we were able to control her blood pressure and the intragastric hemorrhage by completely occluding the aorta with balloon inflation using the REBOA technique. During the surgery, a circular transmural ulcer with a diameter of 30 mm was found in the posterior wall of the stomach, and a pyloric gastrectomy was performed (Figure 3). Active hemorrhage from the splenic artery resumed after the endovascular balloon was deflated; therefore, the ulcer was closed with sutures to achieve hemostasis. The patient was admitted to the intensive care unit (ICU) due to the development of coagulopathy and required open abdominal management to evaluate blood flow in the gastric remnant. Subsequently, the patient's vital signs stabilized. A Roux-en-Y reconstruction procedure was performed on the second day of hospitalization. The patient was discharged from the ICU on the third day of hospitalization and was discharged from the hospital on the 29th day of hospitalization without organ dysfunction.

Discussion

SAP is uncommon. In a large case series from the Mayo Clinic, 10 SAPs were found during an 18-year period.² Among previously reported cases, SAPs are most often caused by pancreatitis (52%) or trauma (29%)² and are rarely caused by peptic ulcer disease. To the best of our knowledge, there are only nine reported cases of SAPs caused by peptic ulcers.²⁻¹⁰ Thus, for a patient with UGIB after pancreatitis or trauma, a ruptured SAP should be considered as a differential diagnosis. However, the diagnosis of SAP due to a peptic ulcer poses a significant challenge for a clinician. In contrast to true aneurysms, which involve all three layers (intima, media, and adventitia) of an arterial wall, pseudoaneurysms typically involve only the intima and media. Unlike true aneurysms, SAPs carry a much higher risk of rupture.³ Control of UGIB caused by ruptured SAPs is critical to the survival of patients since the mortality rate for this condition can reach 90% in untreated cases¹ and the treatment strategies selected can determine whether patients live or die. Recently, retrospective studies and case reports involving multiple patients have discussed the use of REBOA for the treatment of non-traumatic hemorrhagic shock.¹¹⁻¹³

In cases of traumatic shock and cardiopulmonary arrest, aortic occlusion with resuscitative thoracotomy (RT) is a method of temporizing distal hemorrhage while augmenting cerebral and coronary perfusion.¹⁴ REBOA is also widely performed in cases of traumatic shock and is minimally invasive compared with RT.^{14,15} Among patients in traumatic shock who did not require cardiopulmonary resuscitation before REBOA or RT, those who underwent REBOA had a significantly higher survival rate.¹⁴ There are two types of REBOA balloon management strategies: intermittent and partial. Intermittent REBOA occludes the aorta completely, occlusion time is limited to 35–40 min in the distal thoracic aorta,¹⁵ and the occlusion process involves repeated inflation and deflation of the balloon. In contrast, partial REBOA occludes the aorta partially to minimize ischemic injury caudal to the balloon, while maintaining cerebral and coronary perfusion. Although the retrospective studies included cases of hemostasis with REBOA, little consideration was given to the influence of balloon management in these cases. In our patient's case, management by intermittent REBOA was useful, not only for maintaining cerebral and coronary artery perfusion, but also for securing the surgical field and identifying the source of the hemorrhage. Moreover, the durations of the complete occlusion times were 20 min and 5 min, respectively. Thus, the patient recovered without organ dysfunction. Since there are no conclusive indications as to whether partial or intermittent REBOA is better for balloon management, we propose that the choice of REBOA for balloon management should be based on the hemodynamics and bleeding characteristics of lesions. Future studies must aim to clarify the adaptation of REBOA for non-traumatic hemorrhage and to consider the type of REBOA balloon management used.

Conclusion

This case report showed that REBOA can be used to control UGIB and blood pressure during surgery for a ruptured SAP.

Authorship list

TN wrote the first draft of the manuscript. YO, KK, and SK reviewed and revised the manuscript. YO, KU, TN, and SK performed the surgery and contributed to patient care. All authors read and approved the final manuscript.

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Figure legends

Figure 1. Time course of blood pressure, heart rate, and laboratory data trends in a 72-year-old woman with melena. RBC, red blood cell; FFP, fresh-frozen plasma; CT, computed tomography; REBOA, resuscitative endovascular balloon occlusion of the aorta; ED, emergency department; Lac, lactate; Hb, hemoglobin; BE, base excess; Plt, platelet; Fib, fibrinogen

Figure 2. Contrast-enhanced computed tomography findings for a 72-year-old woman with melena. Free air is observed in the abdominal cavity (A). The red arrows indicate a large amount of extravasated fluid in the gastric lumen (B, C)

Figure 3. Abdominal surgery findings for a 72-year-old woman with melena. A defect with a diameter of 30 mm is seen on the posterior wall of the stomach. The white arrows indicate the perforated ulcer within the posterior wall of the stomach (A, B). The yellow arrow indicates the suture site of the splenic artery aneurysm (B)



