

A Case Report of Partial Resuscitative Endovascular Balloon Occlusion of the Aorta (REBOA) for Non-Traumatic Gastrointestinal Hemorrhage

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Background: Resuscitative endovascular balloon occlusion of the aorta (REBOA) is a tool used in the management of hemorrhagic shock in trauma patients. REBOA has also been proposed as an option for non-traumatic hemorrhage, such as gastrointestinal (GI) hemorrhage. In this case report, the use of a partial REBOA (p-REBOA) for a patient with an acute upper GI hemorrhage is presented as a management strategy to temporize bleeding.

Methods: Case information was obtained from the electronic medical record at the University Medical Center in New Orleans.

Results: A 46-year-old woman presented to the Emergency Department with concern for an upper GI bleed. The patient was tachycardic on presentation and then quickly became unresponsive. Massive transfusion protocol was initiated and a p-REBOA catheter was placed in Zone 1. After the REBOA was inflated 20 mL in 2 mL increments, the patient's blood pressure improved, while maintaining distal perfusion. An exploratory laparotomy, with an angiogram once the patient had been stabilized, was planned. Despite resuscitative efforts for more than 2 hours, the patient progressed to cardiac arrest and did not have return of spontaneous circulation.

Conclusions: This case report describes the use of p-REBOA in Zone 1 to control hemorrhage in a patient with a suspected upper GI bleed. This strategy could be utilized in patients with suspected non-traumatic hemorrhage in order to control bleeding temporarily and allow for ongoing resuscitation and stabilization of a patient prior to definitive treatment.

Keywords: REBOA; GI Bleed; Hemorrhage; Massive Transfusion; Bleeding Control

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INTRODUCTION

Hemorrhagic shock is estimated to be the cause of more than 1.9 million deaths per year, worldwide, and more than 60,000 deaths per year in the United States [1]. Non-traumatic causes of bleeding are often overshadowed by traumatic etiologies. Gastrointestinal (GI)

bleeding, more specifically peptic ulcer disease, encompasses a large proportion of those deaths. GI bleeds are responsible for more than 1,800 deaths per year in the United States and more than 140,000 worldwide [1].

During the Korean War, occlusion of the aorta to temporize major bleeding was first described in the 1950s for the management of hemorrhage, and is now gaining favor as an alternative to resuscitative thoracotomy in the setting of refractory hemorrhagic shock [2,3]. Resuscitative endovascular balloon occlusion of the aorta (REBOA) was initially designed to control traumatic intra-abdominal or pelvic hemorrhage [4]. However, more experience with the use of REBOA for the management of non-traumatic hemorrhagic shock has emerged [1,2]. A newer generation of REBOA, the partial REBOA (p-REBOA), has been studied more recently with the goal of decreasing the risk of ischemia-reperfusion injury to distal organs, as it allows a small amount of blood to flow past the balloon while inflated [5].

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REBOA deployment can act as a stabilizing measure until definitive control of bleeding can be achieved. However, REBOA use remains infrequent – one postulation to its limited use is due to less familiarity with deploying REBOA [2]. One of the most common indications for REBOA deployment in the setting of non-traumatic hemorrhage is GI bleeding. However, use in non-traumatic settings has not been well established, with limited case numbers and even more limited studies performed [2,3]. The objective of this study is to present a case report on the use of p-REBOA to temporize a suspected non-traumatic upper GI bleeding in a hemodynamically unstable patient, and improve the management of hemorrhagic shock.

CASE REPORT

A 46-year-old woman with no significant past medical history presented to the Emergency Department of a Level 1 Trauma Center with altered mental status. The patient was tachycardic and normoglycemic on initial evaluation, but quickly became unresponsive. Advanced Cardiac Life Support Protocol was initiated, the patient was intubated, and an orogastric tube was placed with return of approximately 1 L of bright red blood. Trauma Surgery was emergently consulted given the concern for GI bleeding.

Massive transfusion protocol was initiated and a p-REBOA was placed in an attempt to temporize the patient's ongoing hemorrhage. The existing femoral arterial line was exchanged for a 7.5 French arterial sheath and the p-REBOA catheter was inserted to Zone 1. The balloon was inflated to a maximum volume of 20 mL in 2 mL increments. Pressures were intermittently detected distal to the balloon following inflation. The p-REBOA remained inflated throughout resuscitation efforts. In order to obtain definitive control of the suspected GI hemorrhage, an exploratory laparotomy and angiogram were planned in the hybrid operating room. Interventional Radiology was also consulted for the angiogram. Despite more than 2 hours of maximum resuscitation efforts, the patient progressed into pulseless electrical activity before any definitive intervention could be performed. Further resuscitative efforts were terminated.

Ethical Approval and Informed Consent

Ethical approval was not required. Informed consent was not possible given the retrospective nature of the report, and any personal information has been anonymized.

DISCUSSION

The causes of hemorrhage are many, including but not limited to trauma, postpartum hemorrhage, GI hemorrhage,

perioperative hemorrhage, and aneurysmal rupture; they are major causes of death worldwide annually [1]. Improving mortality secondary to hemorrhage requires a multi-faceted approach including prevention of hemorrhage, early control of hemorrhage, and reduction of time to definitive hemostasis [1]. One such advancement on the front of early hemorrhage control has been REBOA and p-REBOA.

REBOA has been used for over 70 years, primarily in the setting of acute traumatic hemorrhage. It has gained favor in settings of refractory hemorrhage in which the alternative would be resuscitative thoracotomy [3]. With advancements in endovascular technology, REBOA has been used in a wider range of patients in the emergency setting of acute, non-traumatic hemorrhage [2,6]. More recently, p-REBOA has been studied to reduce the risks of ischemia-reperfusion complications to tissue distal to the balloon [5]. While the mortality rate in this patient population is high, there have been low incidences of access site-related complications [6].

Future research would be beneficial in determining appropriate patient selection for REBOA deployment. Furthermore, in scenarios such as the one presented in this case report, in which REBOA/p-REBOA is used as a temporizing measure, an important variable to account for would be time to deployment of REBOA. Studies focused on efficacy of REBOA/p-REBOA should be directed at scrutinizing outcome measures other than mortality directly related to deployment, to determine better potential scenarios in which REBOA/p-REBOA would be most helpful. Given its potential as a temporizing measure in the setting of acute hemorrhage, REBOA/p-REBOA could be a powerful tool in the arsenal of the surgeon during resuscitation efforts.

Ethics Statement

- (1) All the authors mentioned in the manuscript have agreed to authorship, read and approved the manuscript, and given consent for submission and subsequent publication of the manuscript.
- (2) The authors declare that they have read and abided by the JEVTM statement of ethical standards including rules of informed consent and ethical committee approval as stated in the article.

Conflicts of Interest

Alison A Smith, MD, PhD is a paid consultant for Aroa Biologics and on the advisory board for Prytime Medical.

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