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Practical Strategies Related to the Application of Balloon Tamponade Therapy in Acute Variceal Bleeding

IMPORTANCE: Acute gastrointestinal variceal hemorrhage is a major cause of morbidity and mortality in cirrhotic liver disease. Approximately one-third of cirrhotic patients will have variceal hemorrhage, and each bleeding episode is associated with up to 20% mortality. Balloon tamponade devices are used to achieve temporary hemostasis of bleeding esophagogastric varices and as a bridge to definitive therapy. Rapid and proper placement is crucial in a life-threatening bleed both to improve patient's chances of survival and minimize procedural complications. Passage of the tube can be complicated by coiling in the oropharynx or mid-esophagus particularly if an endotracheal tube is in place or the patient has large variceal burden. Endoscopic placement can be a useful adjunct but may not be readily accessible depending on resources and availability of specialists. Here, we describe a technique of balloon tamponade placement using a stiffening guidewire to overcome this challenge.

OBJECTIVES: The objectives were to: 1) describe the guidewire method for balloon tamponade tube placement and 2) highlight proof of concept through clinical application.

DESIGN: We conducted a retrospective case series of patients treated with balloon tamponade using the guidewire method.

SETTING AND PARTICIPANTS: This study was done at a single-center quaternary-care facility. Patients admitted to the surgical ICU and treated with a balloon tamponade device for acute variceal hemorrhage were included.

MAIN OUTCOMES AND MEASURES: Patient characteristics were assessed including age, sex, model for end stage liver disease score, etiology of cirrhosis, and definitive treatment received.

RESULTS: Nine patients were included in the final analysis. Mean age was 50 ± 19 , and mean model for end stage liver disease was 39 ± 8 . Alcohol cirrhosis was the most common cause of cirrhosis in this sample ($n = 5$). Six patients were able to be bridged to definitive treatment.

CONCLUSIONS AND RELEVANCE: Guidewire-assisted balloon tamponade placement is practical, is effective, and can be performed by acute care providers.

KEY WORDS: balloon tamponade; Blakemore; cirrhosis; hemorrhage; varices

Variceal bleeding is a life-threatening complication of portal hypertension and a major cause of morbidity and mortality in patients with cirrhosis. The prevalence of variceal bleeding varies from 30% in compensated to 60% in decompensated cirrhosis. Six-week mortality ranges from 10 to 20% even with treatment (1–3).

Acute variceal bleeding (AVB) is defined as hospital admission to day 5 based on the Baveno V consensus workshop (4). Initial management of AVB includes hemodynamic resuscitation, correction of coagulopathy, airway protection,

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and antibiotic prophylaxis (5, 6). Pharmacotherapy with a somatostatin analog such as octreotide is the first step in controlling the source of the bleed (2, 7). Following initial resuscitation endoscopic variceal ligation or sclerotherapy is performed within 12 hours of presentation (8). A subset of patients with AVB will have treatment failure or early rebleeding requiring additional intervention such transjugular intrahepatic portosystemic shunt (TIPS) (9).

In the unstable AVB patient, balloon tamponade can be an effective way to achieve temporary hemostasis and serve as a bridge to definitive treatment (10, 11). Success rate, defined as initial hemostasis, has been reported to be between 75% and 90% (12). Thirty-day mortality following balloon tamponade placement is reported to be as high as 40% (13, 14). Rapid and proper placement is crucial in a life-threatening bleed both to improve patient's chances of survival and minimize procedural complications (15). Aspiration, airway obstruction and esophageal perforation are some of the most serious complications for which misplacement is a contributing factor (12–14). Passage of the tube can be complicated by coiling in the oropharynx or mid-esophagus particularly if an endotracheal tube is in place or the patient has large variceal burden (16). Endoscopic placement can be a useful adjunct but may not be readily accessible depending on resources and availability of specialists. Here, we describe a technique of balloon tamponade placement using a stiffening guidewire to overcome this challenge. Although this technique has been reported in gastrointestinal literature, it has not

been described for the critical care audience (17–19). In our institution's surgical and liver transplant ICU, guidewire-assisted balloon tamponade placement has become standard practice. Here, we present a retrospective case series of patients with AVB treated with guidewire-assisted balloon tamponade placement. Our aim is to show that this method is practical and effective, with no increased risk of complication, and can be performed by critical care and emergency medicine providers.

MATERIALS AND METHODS

Technique

This method can be employed using any of the commercially available balloon tamponade devices. Our institution uses the Blakemore style 16-Fr Suction Tube Bard (McKesson, Irving, TX). A stiffening guidewire is inserted through the gastric aspiration port until it reaches the blind end. The stiffest available guidewire should be used to maintain rigidity of the tube (**Fig. 1**). We use the Amplatz Super Stiff wire (Boston Scientific,



Figure 1. Stiffening guidewire shown inserted into gastric port of a Minnesota Tube.

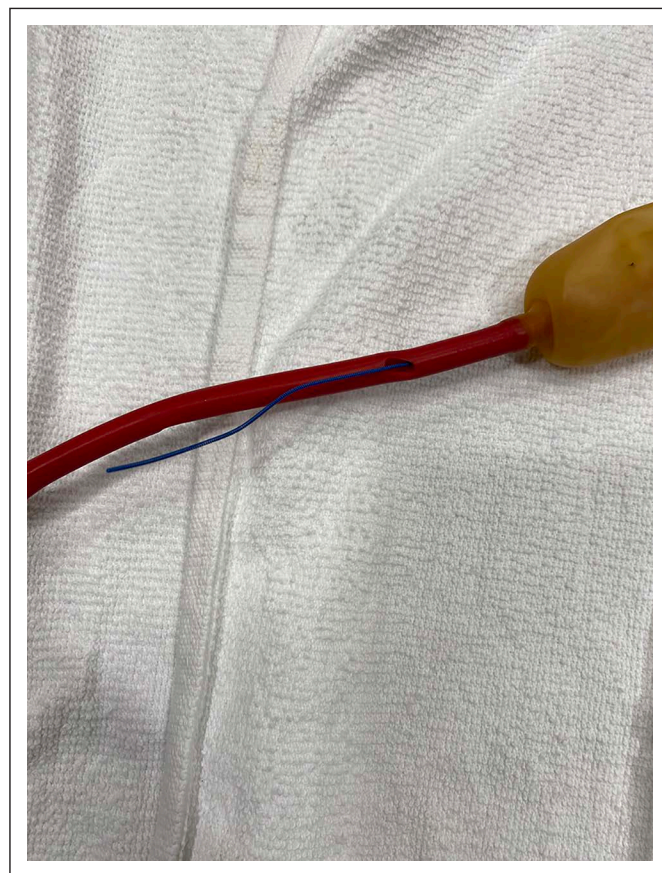


Figure 2. Guidewire shown coming out of side port.

Marlborough, MA). Other alternatives include the Rosen and Lunderquist Extra-Stiff wire (Cook Medical, Bloomington, IN). These are often stocked by interventional radiology. The guidewire from a standard central line insertion kit could potentially be used but variability exists in terms of stiffness and potential for kinking. Care is taken to avoid the guidewire from coming out of the side holes (**Fig. 2**). The other ports are clamped or have 3-way stopcock placed. The tube is then placed like a standard orogastric tube. Once inserted to measured depth, confirmatory upper abdominal radiograph can be obtained to determine if tip of the wire is in the appropriate position. Typical teaching is to instill 50 mL of air in the gastric balloon prior to obtaining radiograph; however, this is not necessary given the wire is radiopaque. Once position is confirmed, the guidewire can be removed, and the gastric and esophageal balloons can be inflated as needed. We secure the tube by pulling tension and attaching it to a second tube clamp on the patient's endotracheal tube holder (**Fig. 3**).



Figure 3. Tube secured using additional tube clamp attached to ETT holder. ETT = endotracheal tube.

Patient Selection

Patient data were abstracted from the electronic medical record using a keywords search for Blakemore. The time frame for which samples were obtained ranged from 2017 to 2021. Patients treated in our institution's surgical/liver transplant intensive care with upper gastrointestinal variceal bleeding requiring balloon tamponade were included. Patients who had balloon tamponade placed at an outside hospital were excluded. All balloon tamponade placement at our institution is done with stiffening guidewire assistance. Placement was performed by the intensivist or the consulting hepatologist.

This study qualified for expedited review under 45 Code of Federal Regulations. 46.110 and/or 21 Code of Federal Regulations 56.110. A complete waiver of HIPAA authorization and informed consent has been granted by the Emory Institutional Review Board (IRB). Procedures were followed in accordance with the ethical standards of the Emory IRB on human experimentation and with the Helsinki Declaration of 1975 (Practical Strategies Related to the Application of Balloon Tamponade Therapy in Acute Variceal Bleeding; IRB ID: STUDY00004182, approval date: April 15, 2022).

RESULTS

Eighteen patients were abstracted from the electronic medical record. Four were excluded for having Blakemore placed at an outside hospital. Five patients had no documentation of balloon tamponade device placement. The final sample size was nine patients. Mean age was 50 with 55% being male (**Table 1**). Most patients had alcoholic cirrhosis as the underlying etiology of their variceal bleed (56%). Other etiologies included hepatitis B and C, primary graft failure after orthotopic liver transplant, and cryptogenic cirrhosis. The mean model for end stage liver disease score was 39 ranging from 18 to 47. Definitive treatment included band ligation, TIPS, and Balloon-Occluded Retrograde Transvenous Obliteration. Three patients were able to receive a liver transplant. Three patients were unable to undergo definitive treatment due to instability and subsequently died. The cause of death was hemorrhagic shock and multisystem organ failure.

TABLE 1.
Demographics of Patients Treated With
Blakemore Tube

Upper Gastrointestinal Variceal Bleed, <i>n</i> = 9	
Age (yr)	
Mean \pm SD	50 \pm 19
Range	29–89
Sex	
Male	5
Female	4
Mean model for end stage liver disease score \pm SD	39 \pm 8
Etiology of bleed (no. of patients)	
ETOH cirrhosis	5
Hep B cirrhosis	1
Hep C cirrhosis	1
Primary graft failure	1
Cryptogenic cirrhosis	1
Definitive treatment ^a	
Band ligation	2
Transjugular intrahepatic portosystemic shunt	4
Balloon-Occluded Retrograde Transvenous Obliteration	1
Bridged to OLT	3
Deceased before definitive intervention	3

ETOH = alcoholic, MELD = model for end stage liver disease, OLT = orthotopic liver transplant.

^aSome patients received multiple treatments.

DISCUSSION

Balloon tamponade placement is often performed under high-stress, time critical situations. For this reason, it is imperative to achieve first-pass success. In our practice, adopting the guidewire method has been a valuable adjunct. The primary benefit is for overcoming the resistance encountered in the oropharynx and mid-esophagus, which frequently leads to coiling of the tube. All nine patients had successful placement on first attempt with the use of a guidewire. In one patient, Blakemore tube placement was attempted without the use of a guide wire but was unsuccessful due to kinking of the tube. Subsequent use of a guidewire allowed for advancement of the tube to a proper position. There were no instances of misplacement, associated aspiration events, or esophageal perforation. Although larger randomized controlled trials would be needed to determine superiority of this method compared with conventional approach, we can extrapolate from data on feeding tube placement. Guidewire assistance has been shown to lead to higher first-pass success and reduced rate of complications such as improper positioning (20).

Often, balloon tamponade placement is performed in resource-limited settings without access to specialists and treatment modalities such as endoscopy and interventional radiology. The procedure can provide valuable time to get patients to a higher level of care where they can receive definitive treatment. Either an emergency medicine or intensive care provider is the proceduralist in this setting, and the guidewire is a low-cost and readily available adjunct that can optimize chances of successful placement.

With regard to securement, we strongly recommend using an additional tube clamp on the existing endotracheal tube holder. This simplifies the apparatus and eliminates the need for a traction system using saline bags or helmets. It can also make transportation less cumbersome.

CONCLUSIONS

Balloon tamponade is a time-critical temporizing procedure for life-threatening esophagogastric variceal hemorrhage. Using a stiffening guidewire is practical and can be a useful adjunct for guiding proper placement. This can be valuable for emergency medicine and critical care providers as access to specialized equipment such as endoscopy and fluoroscopy is not needed. Further studies will need to be done to determine first-pass success and complication rates compared with conventional placement.

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