Chapter 18
Conservative Treatment: Balloon Tamponade

Masayuki Ohta, Masafumi Inomata, and Seigo Kitano

Abstract Balloon tamponade treatment for bleeding from esophagogastric varices with the Sengstaken-Blakemore (S-B) tube or Linton-Nachlas (L-N) tube was established in the 1950s. Now, after emergency endoscopy, the S-B tube is generally used for bleeding esophageal varices and the L-N tube is used for bleeding gastric varices. Because balloon tamponade with the S-B-tube is significantly inferior to endoscopic injection sclerotherapy (EIS) in the control of bleeding esophageal varices, the current indication for balloon tamponade is uncontrollable hemorrhage from esophagogastric varices caused by endoscopic treatments such as EIS. The contraindication is an anatomical abnormality in the esophagus such as esophageal stenosis, and careful use is required in patients with previous endoscopic treatments such as EIS. Balloon tamponade achieves primary hemostasis of variceal bleeding in 90% of the episodes and remains a clinically important modality even now.

Keywords Balloon tamponade · Bleeding esophagogastric varices · Sengstaken-Blakemore tube · Linton-Nachlas tube · Endoscopic injection sclerotherapy

18.1 Introduction

The concept of stopping hemorrhage at the site of ruptured esophageal varices by tamponade is not new; Westphal first reported a successful attempt at controlling esophageal hemorrhage by balloon tamponade in 1930 [1]. Afterward, many devices were developed, and Sengstaken et al. reported a new triple-lumen double-balloon tube, the so-called Sengstaken-Blakemore tube (S-B tube), in 1950 [2]. Linton reported the efficacy of balloon tamponade with a single-balloon tube in 1953 [3], and Nachlas also developed a new triple-lumen single-balloon tube, the so-called

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Linton-Nachlas tube (L-N tube), in 1955 [4]. In Japan, Idezuki et al. developed a modified S-B tube that was transparent and had a lumen for observing the esophagus using a bronchoscope to check on hemostasis of the varices and the mucosal injury [5]. Although balloon tamponade by S-B tube is inferior to endoscopic injection sclerotherapy (EIS) in patients with bleeding from esophageal varices [6, 7], it still plays an important role in the clinical management of treatment for esophagogastric variceal bleeding [8]. Here, the technique and its results are demonstrated.

18.2 Current Devices and Indications/Contraindications of Balloon Tamponade Tubes

Presently, in Japan, three companies (Sumitomo Bakelite Co., Ltd., Tokyo; Top Co., Ltd., Tokyo; and Create Medic Co., Ltd., Yokohama) are selling balloon tamponade tubes for hemostasis of bleeding from esophagogastric varices. Figure 18.1 shows the current types of balloon tubes produced by Sumitomo Bakelite Co., Ltd. The S-B tube (TSB tube, A type) has four lumens that are combined into one lumen for draining the esophagus to prevent aspiration pneumonia and is known as a type of "Minnesota tube" [9] (Fig. 18.1a). The maximum capacity of the gastric balloon is 300 mL, and it is generally used for bleeding from esophageal varices. In contrast, the balloon tube of the L-N tube (TSB tube, single-balloon type) has three lumens and is similar to the original design (Fig. 18.1b). The maximum capacity of gastric balloon is 700 mL, and it is used for bleeding the gastric varices. Both types of tubes are made from silicon and incorporate X-ray markers.

The indication for balloon tamponade is uncontrollable hemorrhage from esophagogastric varices by endoscopic treatments such as EIS and endoscopic variceal ligation. Therefore, this treatment is only used as a temporary bridge to other strategies, and additional therapy should be performed after temporary hemostasis is

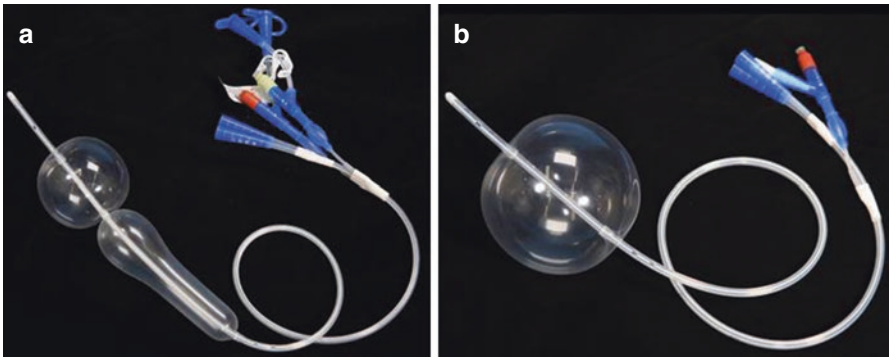

Fig. 18.1 Current models of balloon tamponade tubes (Sumitomo Bakelite Co., Ltd., Tokyo). (**a**) TSB tube, A type (S-B tube). (**b**) TSB tube, single-balloon type (L-N tube)

achieved. However, the contraindication of the balloon tamponade is an anatomical abnormality in the esophagus such as esophageal stenosis. Therefore, its use should be considered more carefully when a patient has undergone previous endoscopic treatments such as EIS.

18.3 Methods of Balloon Tube Placement

Before passage of the tube, the channels of the tube are tested for patency, and the balloons are checked for leaks. Because most of the patients have active bleeding from esophagogastric varices, tube passage has to be performed with the patient in the right lateral position if possible. The tube is lubricated with lidocaine jelly and passed through the nose into the stomach (up to more than 50 cm in length). Air is then injected into the stomach through the channel, and a stethoscope is used to detect the sound of air bubbles, which confirms that the tip of the tube is positioned within the stomach. However, it is more accurate to confirm the positions of the tip and the balloon by X-ray fluoroscopy. After confirmation of positioning, the gastric balloons are inflated with either 250–300 mL of air (A type, S-B tube) or 700 mL (single-balloon type, L-N tube). Although some of the literatures recommend that water be injected into the gastric balloon instead of air [10], we think that water should not be used instead of air to maintain the correct position of and prevent damage to the balloon. Then, the tube is slowly withdrawn until firm resistance is encountered at the esophagogastric junction (Fig. 18.2). After the tube is further retracted to apply pressure equal to 300–500 g of external traction, it is fixed with a sponge and tape. To prevent necrosis, the tube should not be retracted over the tip of the nose (Fig. 18.3). Afterward, the esophageal balloon of the S-B tube is inflated to a pressure of 30–40 mmHg as measured by manometry. The position of the tube and balloons is then checked using X-ray. Every hour, the esophageal and gastric contents are aspirated, and the traction of the gastric balloon is checked. To maintain the position of balloons and stop the bleeding from esophagogastric varices, it is of prime importance that the correct traction is applied. Gastric and esophageal balloons generally remain inflated for 12–48 h, but we recommend inflation for 12 h to prevent necrosis and/or injury of the esophagogastric junction. Therefore, the balloons should be deflated every 12 h.

Inadequate use of the S-B tube is illustrated in Fig. 18.4. A cirrhotic patient with bleeding esophageal varices was transferred from another hospital, and an S-B tube was placed. However, computed tomography revealed that balloons had slipped into the stomach because of inadequate traction and fixation of the balloon tube. Another cirrhotic patient with bleeding gastric varices who was also transferred had active bleeding from the varices in spite of S-B tube placement. When the balloon was deflated, 200 mL water was aspirated. This indicated that the balloon had not been maintained in an adequate position due to the weight of the water in the gastric balloon, and thus, the variceal bleeding could not be stopped.

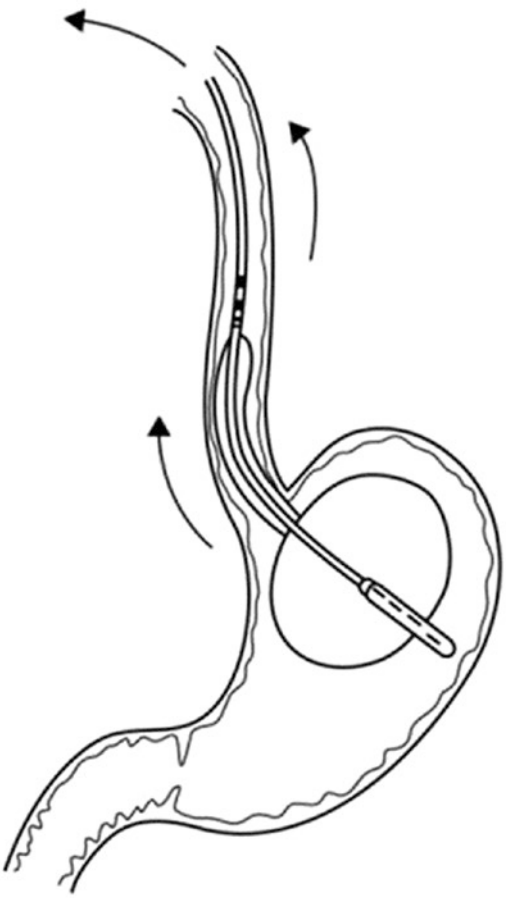

Fig. 18.2 Schematic of gentle withdrawal of the balloon tube after inflation of the gastric balloon with air

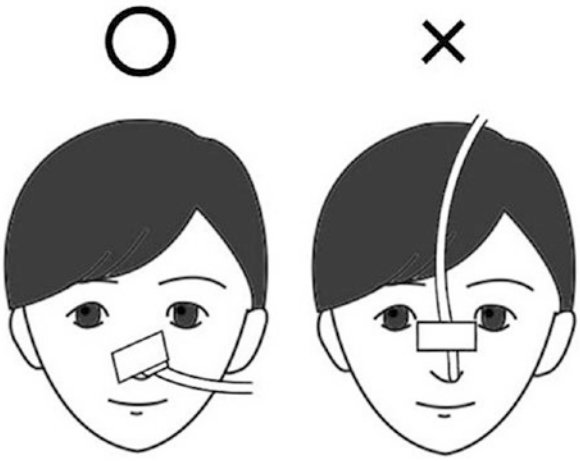

Fig. 18.3 Fixation method of the balloon tube at the nose. To prevent necrosis, the tube should not be retracted over the tip of the nose

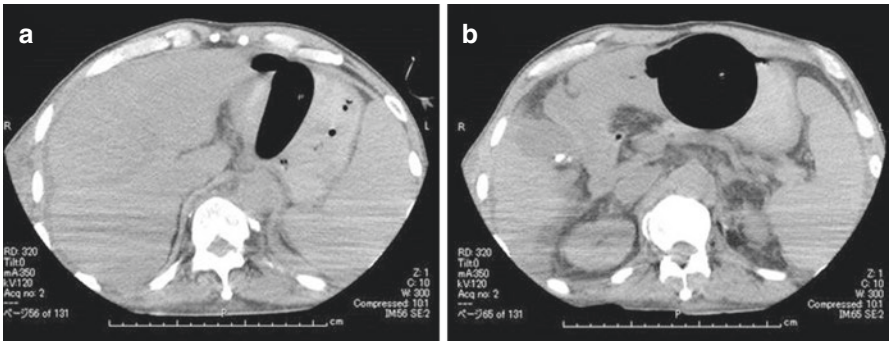

Fig. 18.4 Inadequate use of an S-B tube. Computed tomography revealed that the balloons had slipped into the stomach because of inadequate traction and fixation of the balloon tube. (**a**) The esophageal balloon is within the stomach. (**b**) The gastric balloon is far from esophagogastric junction

18.4 Results and Complications of Balloon Tamponade

Haddock et al. reported the results of the use of a modified S-B tube for acute variceal hemorrhage [10]. It stopped the bleeding in 98% of 126 episodes, but 36% of the patients with hemostasis experienced rebleeding. Complications included chest infection and esophageal tears. Panes et al. used an S-B tube in patients with bleeding esophageal varices and an L-N tube in those with gastric varices after endoscopy [11]. The S-B tube achieved primary hemostasis in 92% of 118 episodes and permanent hemostasis in 50%, and the L-N tube also achieved primary hemostasis in 88% of the 33 episodes and permanent hemostasis in 39%. Aspiration pneumonia occurred in 10% of the patients with the S-B tube and in 9% of those with the L-N tube. This complication appeared more frequently in patients with hepatic encephalopathy. Other complications included chest pain (17%), alae nasi necrosis (2%), and transient airway occlusion (1%).

Teres et al. performed a randomized controlled trial (RCT) to compare the S-B tube to the L-N tube in patients with active bleeding from esophagogastric varices [12]. Both tubes achieved primary hemostasis in over 90% of the patients with bleeding esophageal varices, but permanent hemostasis occurred more frequently with S-B tube (52%) than L-N tube (30%) use. The S-B tube failed in all three patients with bleeding gastric varices, but primary hemostasis was obtained with the L-N tube in 50% of such patients. With regard to complications, aspiration pneumonia occurred more frequently in patients with the S-B tube (29%) than in those with the L-N tube (10%). This study also reported that external traction on the S-B tube could cause adverse effects of complications and permanent hemostasis.

18.5 Comparison Between Balloon Tamponade and Other Treatments

Two RCTs have compared balloon tamponade to EIS in patients with bleeding esophageal varices [6, 7]. Paquet et al. demonstrated that the definite control of bleeding esophageal varices was significantly better in the EIS group (90%) than in the S-B tube group (55%) [6]. There was a significant difference in the number of the patients who died within 30 days between those treated with the S-B tube (27%) and those treated with EIS (10%). Moretó also found that primary hemostasis of bleeding esophageal varices was significantly better in the EIS group (100%) than in the S-B tube group (80%) [7]. At 7 days, only 56% of the patients with the S-B tube were free of hemorrhagic relapse, but 83% of the patients with EIS were relapse-free, and the difference was significant. Lo et al. performed another RCT to compare immediate EIS to EIS preceded by S-B tube use [13]. Rates of primary hemostasis and rebleeding were comparable in the two groups, but blood transfusion requirements and the incidence of complications were significantly lower in the immediate EIS group.

There have been two RCTs to compare balloon tamponade to drug therapies in patients with variceal bleeding [14, 15]. Teres et al. performed a RCT to compare vasopressin/nitroglycerin to balloon tamponade by S-B tube for bleeding esophageal varices and by L-N tube for bleeding gastric varices [14]. This trial found that hemostatic efficacy was significantly better in the balloon group (87%) than in the drug group (66%). No significant differences were recognized in rates of rebleeding, complications, and mortality. Avgerinos et al. compared three groups treated with somatostatin, balloon tamponade by S-B tube, or combined treatment [15]. Control of bleeding and mortality were comparable in the three groups, but the somatostatin alone group had significantly fewer complications than the other two groups.

18.6 Conclusion

Balloon tamponade achieved with S-B tube or L-N tube has been very effective in stopping hemorrhage from esophagogastric varices, but it is inferior to endoscopic treatments such as EIS and causes frequent complications such as aspiration pneumonia. Therefore, this treatment should be used only in patients with uncontrollable bleeding from esophagogastric varices as a temporary means of treatment.

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