The Use of the Sengstaken-Blakemore Tube for Immediate Control of Bleeding Esophageal Varices

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PORTOSYSTEMIC VENOUS SHUNTING is accepted as the best method for the definitive control of hemorrhage from esophageal varices. Most studies indicate that the operative mortality is substantially reduced if the procedure is performed electively after massive hemorrhage is controlled and blood volume has been replaced. This interval also allows for assessment and correction of liver function, fluid and electrolyte balance and coagulation mechanisms. Considerable attention has therefore been given to methods for the immediate control of bleeding to permit an appropriate interval between the patient's emergency admission to the hospital and the definitive operation.

A variety of methods for the emergency control of variceal bleeding are in current use. These include tamponade, administration of pressors, transesophageal ligation of varices and emergency portosystem shunting. Although Sengstaken-Blakemore balloon tamponade remains the most popular technique for the initial control of variceal bleeding, several reports[2-4,6,9,10,12-14,16] have described high failure rates in the attempt to arrest hemorrhage and high morbidity and mortality directly resulting from this tube.

We present a group of patients in whom the Sengstaken-Blakemore tube (SBT) has been an effective method of emergency control of bleeding. We describe methods to minimize the associated complications.

Material

Between 1965 and 1972, 47 patients underwent 50 portosystemic shunt procedures at The Mount Sinai Hospital (one patient had three shunts and another had two). Of these, 25 patients entered the hospital bleeding actively from esophageal varices and esophageal tamponade was used as the sole or initial method of emergency control of hemorrhage. This group of 25 patients constitutes the series presently reported.

The group consisted of 13 men and 12 women. The mean age was 49.8 years (range 16–69). All patients had proven bleeding esophageal varices with portal hypertension and intrinsic liver disease. The SBT was used 35 times in these 25 patients.

Of the 47 patients who eventually underwent shunting, the SBT was not used in 22 patients or in 24 preshunting hemorrhagic episodes (one patient had three shunting procedures). In four patients, tamponade was not instituted because the patient was uncooperative or because prompt emergency shunt was elected. Four patients had proven variceal bleeding in the recent past but were not actively bleeding at the time of this admission. In seven patients, the bleeding was not sufficiently severe to warrant the use of the SBT and, in nine patients the bleeding ceased spontaneously or after ice water lavage.

Technique

For balloon tamponade, the Davol® S.B. tube is used (Fig. 1). Prior to passage, patency of all lumens and intactness of both balloons is confirmed. Before insertion of the S.B. tube, the stomach is copiously lavaged with iced saline and emptied with an Ewald tube. Tracheal suction apparatus is available. The tube is well-lubricated and gently passed via the nasal route. The pharynx is not anesthetized. Passage is more easily accomplished by

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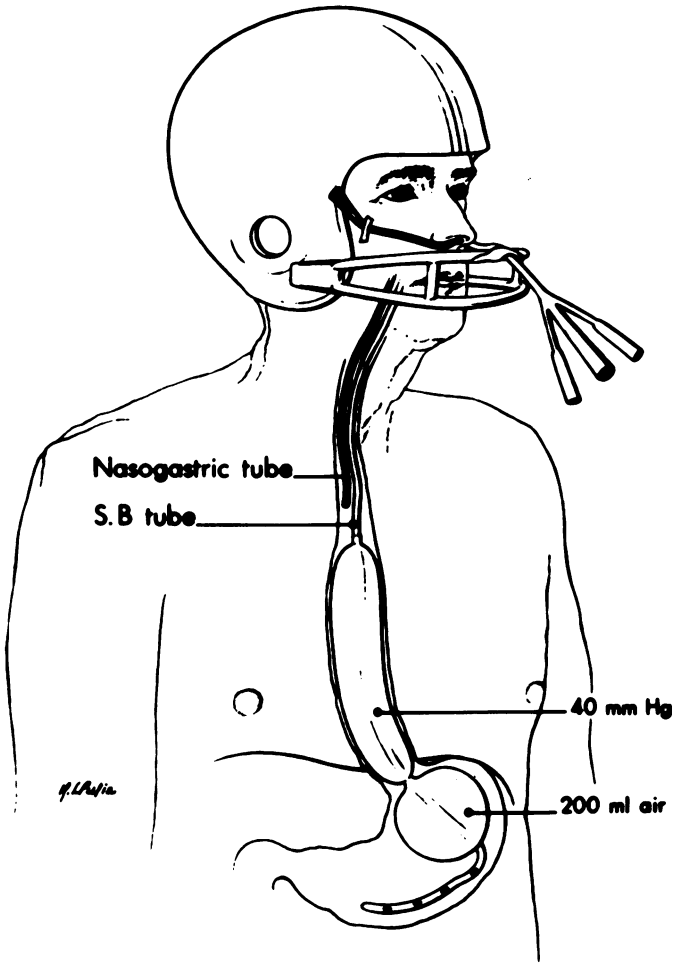

FIG. 1. The Sengstaken-Blakemore tube is in place with both balloons inflated. A nasogastric tube is placed through the contralateral external nares into a position just above the esophageal balloon.

having the patient slowly swallow some water. The tube is passed to 50 cm and the gastric balloon inflated with 200 ml of air and clamped. Very gentle traction is steadily applied until the gastric balloon is felt to be lodged at the gastroesophageal junction at which time the tube is taped to the face mask of a standard football helmet. The suction lumen is then irrigated and if bleeding has been controlled and the return from irrigation is clear, there is no need to inflate the esophageal balloon. If the bleeding is not controlled, the esophageal balloon is inflated to 40 mmHg. A small nasogastric tube is passed through the other external nares into the esophagus until it is felt to abut against the upper portion of the esophageal balloon. This is gently irrigated to check for bleeding and then attached to intermittent suction. If the bleeding is controlled, the patient is closely observed by the nursing and medical staff.

The tube, with both balloons inflated, is not disturbed for 24 hours, during which time adjunctive therapy and workup are instituted. Blood volume is restored, liver function, coagulation status and fluid and electrolyte status are assessed, and disorders corrected, if possible.

Because the residual blood in the gastrointestinal tract may provoke portosystemic encephalopathy, the colon is emptied by neomycin enemas, repeated until returns are clear. Cathartics are given via the tube. We prefer 30 ml doses of Fleets® phosphosoda. During this interval, intensive prophylactic respiratory therapy is instituted including nasothracheal suction, intermittent positive pressure breathing, and postural drainage.

If no further bleeding ensues during the first 24 hours, the esophageal balloon is deflated. The gastric balloon is deflated after another 24 hours and the tube is left in place on intermittent suction. If there is no further bleeding, the tube is removed after another 24 hours. If bleeding recurs at any time prior to removal of the tube, both balloons are quickly reinflated and consideration is given to prompt surgery.

Results

As shown in Fig. 2, the SBT was used to control hemorrhage in 25 patients. It successfully arrested the first hemorrhage in 21 of these patients. In the other four patients, emergency portosystemic shunts were performed. Of those in whom bleeding stopped, twelve did not rebleed after deflation of the baloons and had interval portosystemic shunts.

Nine patients rebled when the balloons were deflated. Of these, six were controlled by reinflation. In three patients, rebleeding was not controlled. These patients underwent emergency portosystemic shunt.

Of the six patients in whom rebleeding was controlled, five had complete control; one had partial control and underwent shunting several days later. One patient re-

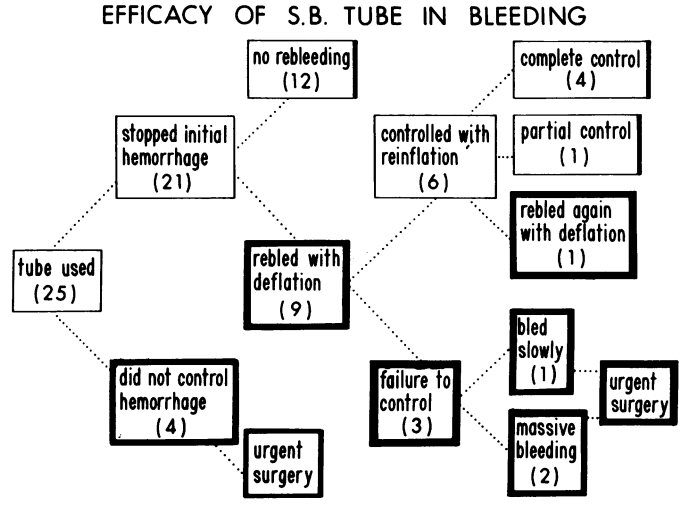

FIG. 2. Results of Sengstaken-Blakemore Tamponade in 25 patients.

bled again after a second attempt at deflation of the balloons and underwent emergency shunting.

Complications

Two deaths occurred:

In one patient, the gastric balloon ruptured during endotracheal intubation in the operating room. As a result, the tube slipped up the esophagus enabling the inflated esophageal balloon to occlude the airway causing transient hypoxia and then respiratory arrest. He was resuscitated and surgery was performed. However, he failed to regain consciousness after the operation and died two days postoperatively.

Case Report

One patient is briefly presented.

A 50-year-old male alcoholic with Laennec's cirrhosis and known esophageal varices presented with melena for one week and hematemesis for one day. The SBT was inserted and initially controlled bleeding, but the patient then developed a coagulopathy with a prothrombin time of 30/12 secs which could not be corrected in spite of administration of Vitamin K and fresh frozen plasma. An attempt was made to deflate the balloons several times, but each time the patient started to bleed moderately from the varices. After 5¼ days with the balloons inflated and in place, the gastric balloon was again deflated. The patient bled massively and reinflation of the balloons did not control the bleeding. The patient underwent emergency portocaval shunt while actively bleeding and with the prothrombin time only partially corrected (24/12 sec). The patient continued to bleed postoperatively and expired on the first postoperative day. Necropsy revealed a patent portocaval anastomosis. There was a deep erosion in the wall of the distal esophagus measuring 5 × 3 cm and containing fresh clot at the base. No other bleeding was identified. It is assumed that the erosion was a direct result of pressure necrosis caused by the prolonged (5¼ days) use of balloon tamponade.

In addition to two mortalities, there was one serious complication. A patient aspirated blood while the SB tube was being inserted. Endotracheal suction was rapidly instituted as was bronchial lavage but he still developed an aspiration pneumonia which responded to chest physiotherapy and antibiotics.

Discussion

The first reported case of control of variceal hemorrhage by tamponade was by Westphal[19] in 1930. In his report the varices were compressed by an esophageal sound. Since that time, several methods have been described. In 1950, Sengstaken and Blakemore[15] reported the technique of a double balloon tamponade, a method still widely used.

Early reports[3,6,9,14,16] described effective initial control of variceal hemorrhage in approximately 45–75% of the episodes. These observers also noted that if definitive operation was not undertaken following the initial control of bleeding, a large percentage of the patients rebled. Thus the definitive control of hemorrhage by balloon tamponade was only in the range of 24–50%.

Our results are similar to those previously reported. Twenty-eight of 35 (80%) bleeding episodes were controlled with Sengstaken-Blakemore tamponade. Twenty-one of 25 (84%) initial bleeding episodes were controlled by this method and of the nine patients who rebled after deflation of the balloons, six (67%) were controlled by reinflation.

It is our conviction that where possible, S.B. tamponade should be used to arrest hemorrhage and that definitive surgery should be performed after an interval; the results of elective portosystemic shunt have been shown by a majority of investigators to be better than those performed during active bleeding.

Some investigators[11,13] disagree with this approach, and propose that in selected patients, emergency portosystemic anastomosis provides the best chance of survival. They have found the relative effectiveness of the S.B. tube to be too low and the complications attributable to its use too high.

Thus there is general agreement that this method properly used, is an effective method to control bleeding; however, the complications that occur are often serious and may be fatal and because of this, many feel that its use should be limited.

The most common serious complications previously reported have been rupture or erosion of the esophagus[2–8,10,12,18,20] and occlusion of the airway by the balloon.[2–4,12,14,16] Conn[4] reported major complications in 35% of the patients in whom the tube was used, with nine deaths attributable to these complications (22%). Two deaths were a result of rupture of the esophagus. One death was caused by airway obstruction and six deaths were caused by regurgitation and aspiration of gastric contents. This author emphasized that because of the high complication rate, S.B. tamponade should be used only in "those critically ill patients in whom the higher risks attending its use are justified."[4]

In our group of twenty-five patients in whom S.B. tube was used 35 times, serious complications developed in three patients or 8.6% of the times the tube was used. In two (5.7%) of these instances, the complications proved fatal. One patient hemorrhaged from a deep distal esophageal erosion caused by the esophageal balloon. In the other who died, the gastric balloon ruptured during endotracheal intubation in the operating room enabling the esophageal balloon to slip up the esophagus and occlude the airway. The other serious complication was an aspiration pneumonia which responded to therapy. Our complication rate is similar to that of Hermann and Traub[8] who reported a series in which the SBT was used 109 times in 75 patients. The overall effectiveness of the SBT in arresting hemorrhage was 83.6%. Complications directly attributable to the tube occurred in 10 patients (9.2%) with 4 mortalities (3.7%). Three of the

patients had aspiration pneumonia with resultant cardiorespiratory failure and death. We feel that our complication and mortality rates, closely paralleling that of Hermann and Traub, are acceptable in light of the poor general condition of the patients, the urgency of the situation, and the high mortality consequent upon emergency surgery.

Our series may be favorably weighted because only those patients who were seen by the surgical service and eventually underwent portosystemic anastomosis were reviewed; those patients who died before shunts could be performed or who were rejected for shunting because of excessively high risk were not included in the series.

We feel that close adherence to the described technique of S.B. tube insertion is important in minimizing complications. There are several points to be emphasized. The lower incidence of complications reported here is primarily attributable to fewer instances of aspiration of gastric contents either during, or subsequent to insertion. Six of the nine deaths reported by Conn[4] were secondary to aspiration. We employ several safeguards to avoid this complication. The pharynx is not anesthetized so that the gag reflex is intact. Nasotracheal suction is available. After the balloons have been inflated, a small (#12 french) nasogastric tube is inserted through the contralateral nares. This enables the staff to determine whether or not there are bleeding varices above the level of the esophageal balloon. This has occurred in two instances and in both cases the patients underwent emergency portocaval shunts. In addition, esophageal and pharyngeal secretions can be continuously suctioned. There is a commercially available four lumen tube manufactured by Davol® (model #9222) which contains a lumen designed to aspirate the esophagus above the esophageal balloon. In our experience, we have found this lumen to be too small to be completely effective and we prefer the previously described method of inserting a separate nasogastric tube into the esophagus above the esophageal balloon. We believe that this maneuver has enabled us to avoid the potentially lethal sequelae of aspiration.

One of the lethal complications in our series of patients and one which continues to be reported, is erosion of the esophagus. The erosion is probably a result of ischemic necrosis of the esophageal mucosa and can therefore be caused by excessive traction on the tube or prolongation of the length of time that the balloons are inflated. In our reported patient, the balloon was inflated for a total of 5½ days. Attempts at deflation were made several times but the patient continued to ooze slowly. This was complicated by a coagulopathy. Whenever possible, the esophageal balloon, in particular, should be deflated within 24 hours. If bleeding recurs after deflation, the balloon should be reinflated and if bleeding is controlled, the patient be prepared for surgery within the next 36–48 hours.

Airway occlusion by the esophageal balloon causing asphyxia has been reported rather frequently[2–4,12,14,16] and was responsible for one of the two deaths in our series of patients. This is usually caused by either sudden rupture or inadvertent slow deflation of the gastric balloon which then makes it possible for the esophageal balloon to slip proximally up the esophagus until it obstructs the airway either in the oropharynx or larynx. Complications such as these can be minimized by always using a new SBT which has been carefully checked by inflating all balloons before insertion of the tube. It has been suggested that bandage scissors should be tied to the SBT so that the tube can be instantly divided. This would allow the esophageal balloon to immediately deflate promptly reducing the obstruction to the airway.

Acute perforation of the esophagus by the inflated gastric balloon can be prevented by passing the tube to 50 cm before inflation to be certain that gastric balloon is in the stomach and not the esophagus.

Once the tube has been satisfactorily positioned, we have found the technique described by Wallace[17] to be valuable, i.e. to fix the tube to a rigid face mask. We use the faceguard of a standard football helmet. This enables us to maintain the gastric balloon impacted at the esophagogastric junction by constant, sustained, gentle traction. This assures proper position of the inflated esophageal balloon in the lower part of the esophagus.

In an attempt to avoid all of the previously mentioned complications of balloon tamponade, several investigators have attempted alternate methods for controlling hemorrhage from varices. Baum *et al.*[1] described a technique of selective angiography of the celiac and superior mesenteric arterial systems to diagnose and acutely localize the site of upper gastrointestinal hemorrhage. As an extension of their diagnostic studies, they discovered that infusion of dilute pitressin into the superior mesenteric artery could arrest bleeding from esophageal varices. The mechanism is presumed to be vasoconstriction of the arterial splanchnic bed, resulting in a decreased arterial inflow and hence a decrease in splanchnic venous outflow with concomitant reduction in portal venous pressure. They reported a series of 13 pts. with effective arrest of hemorrhage in 12 cases.

Our own experience using this technique is limited to a few selected cases with encouraging results. We are concerned about the dangers of sustained arterial vasoconstriction to segments of the gastrointestinal tract especially the intestine and a diseased liver. We have also been reluctant to use vasoconstrictors in those patients with coexistent coronary artery disease although Baum[1] reported no coronary complications.

An additional limitation of the technique of angio-

graphic diagnosis and sustained vasopressor infusion is the need for an immediately available and skilled angiography team.

Nonetheless, we intend to expand our experience with this technique.

Summary

1. A series of 35 applications of the Sengstaken-Blakemore tube to control bleeding from esophageal varices in 25 patients is described.

2. The tube successfully arrested hemorrhage in 21 of 25 patients.

3. There were two fatalities directly attributable to the S.B. tube. One was caused by erosion of the distal esophagus and the other a result of airway obstruction by the balloon.

4. Only one major pulmonary complication occurred in this series of patients.

5. Techniques to minimize complications from the tube are described in detail. These include controlled placement of the S.B. tube without topical pharyngeal anesthesia, insufflation of the gastric balloon with 200 ml of air, and impaction of the gastric balloon at the cardioesophageal junction with sustained traction. In addition, a nasogastric tube is placed above the esophageal balloon for continuous aspiration of accumulated nasopharyngeal secretions.

6. It is emphasized that balloon tamponade should be used for a limited period of time, i.e. 48 hours.

With proper application of the Sengstaken-Blakemore tube, most acutely bleeding esophageal varices can be controlled. This permits subsequent portosystemic shunting to be performed under elective rather than emergency circumstances.

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