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Case Report Open Access

Bleeding Gastric Varices from Liver Cirrhosis Complicated by Hepatocellular Carcinoma Treated by Balloon Occluded Retrograde Transvenous Occlusion Obliteration using Sodium Tetradecyl Sulphate foam in an Emergent Setting

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Abstract

Balloon occluded retrograde transvenous occlusion of gastric varices is a well-described technique for treating gastric varices. However, the procedure is usually performed in an elective setting, with use of conscious sedation. We report of a case which we performed, using Sodium Tetradecyl Sulphate Foam, in a middle aged man presenting with acute upper gastrointestinal bleeding secondary to gastric varices from alcoholic liver cirrhosis, complicated by hepatocellular carcinoma, with portal vein thrombosis, in an emergent setting and without conscious sedation. There was good outcome, with successful arrest of the bleeding. We discuss the use of this technique, as well as review the literature.

Keywords Balloon occluded retrograde transvenous occlusion; Sodium tetradecyl sulphate foam; Gastric varices; Gastric varices; Liver cirrhosis; Hepatocellular carcinoma; Portal vein thrombosis

Case Report

A 55 years old Indian gentleman, presented to our institution with 5 episodes of coffee-ground vomiting within a day, associated with epigastric pain and malaena. He has Hepatitis C and alcoholic liver cirrhosis, diagnosed in 2010, which is complicated by hepatocellular carcinoma spanning the right lobe of the liver. This was also thrombosis of the main and right portal vein with cavernous transformation, as well as thrombosis of the splenic vein. The tumour was extensive; involving segments 5, 6 and 8. As such, he was deemed not a surgical candidate and chemotherapy was suggested as a treatment option. However, he defaulted follow-up and chemotherapy was not commenced.

During this admission, urgent oesophagogastroscope (OGD) was performed which demonstrated 6 columns of Grade 1 oesophageal varices and fresh blood within the stomach. However, the bleeding point could not be identified with certainty. Banding of the esophageal varices was performed and N-butyl-2-cyanoacrylate was injected into the cardia varix which extended into the fundus. Despite this, the patient continued to have haemetemesis. Hence a Sengstaken-Blakemore tube was inserted to temporally arrest the bleeding. He was subsequently referred to Interventional Radiology for further management for consideration of transjugular intrahepatic portosystemic shunt insertion.

However, the patient was deemed unsuitable for transjugular intrahepatic portosystemic shunting (TIPS) due to thrombosis of the portal and splenic veins. Decision was made to attempt balloon-occluded retrograde transvenous obliteration (BRTO) with sodium tetradecyl sulfate (STS) foam. A pre-procedure CT scan was performed to delineate the variceal anatomy. The CT scan confirmed the findings of a large right lobe liver tumour with portal vein thrombosis (Figure 1). It also showed that the endoscopic injected sclerosant to be in the gastric mucosa at the fundus (Figure 2). There were multiple oesophageal, perigastric, peripancreatic and perisplenic collaterals (Figures 1 and 2), in keeping with portal hypertension. There was a large gastro-renal varix demonstrated in the coronal CT image (Figure 1).

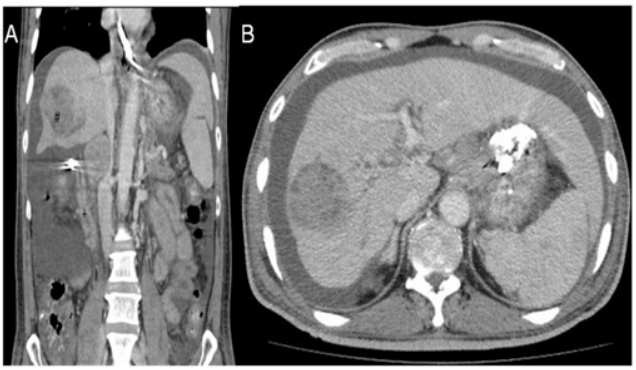

Figure 1: (A). Coronal Contrast Enhanced CT scan demonstrated a large right lobe tumour (#), complicated by portal vein thrombosis (+). There was a large gastro-renal shunt (*), in keeping with portal hypertension. (B). Axial Contrast Enhanced CT scan demonstrated portal vein thrombosis with cavernous transformation.

Immediately after the CT scan, the patient was sent to angiography suite. No sedation was administered, for fear of possible clinical detioration. Vascular access was secured through the right common femoral vein with a 9-Fr Brite Sheath catheter (Cordis Vascular, Miami

Lakes, Florida, USA). The left renal vein was selected with a 0.035 inch angled guidewire (Terumo, Tokyo, Japan) and a 5-Fr diagnostic catheter (Cobra, Somerset, New Jersey, USA).

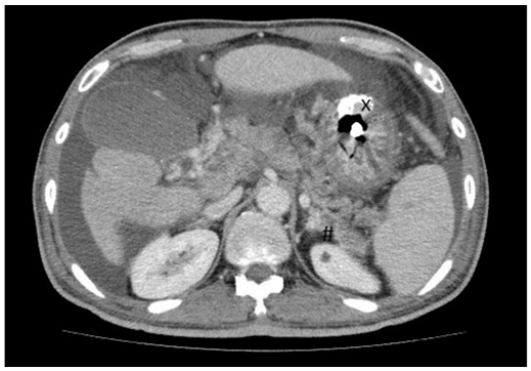

Figure 2: The endoscopically injected sclerosant was noted to be in the region of the fundus (x), not in the location of the gastrorenal shunt (#).

There was difficulty in identifying the varix in the initial runs. Initial small caliber veins were cannulated, which drained into the paraverterbal venous complex, in keeping with the ascending lumbar veins, rather than the varix (Figure 3). After deflation of the indwelling Sengstaken-Blakemore (SB) tube, the varix was identified, and was successfully cannulated with a 4-Fr diagnostic catheter (Cobra C2, Somerset, New Jersey, USA) (Figure 4). Initial diagnostic difficulties were attributed to probable compression of the varix by the Sengstaken-Blakemore tube. The diagnostic catheter was then exchanged for a 5.5-Fr Fogarty balloon catheter (Edwards Lifesciences, Irvine, California, USA). The balloon was inflated and a venogram performed, which demonstrated a Type B varix, with collateral draining veins, namely a left inferior phrenic vein, one diaphragmatic and one paraoesophageal vein.

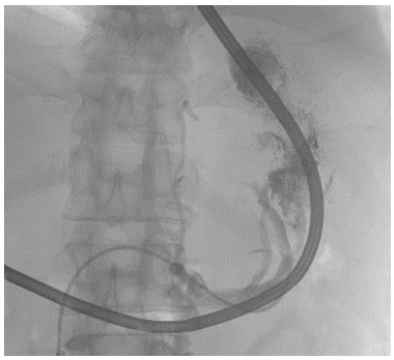

Figure 3: Extensive endoscopically injected sclerosant is noted in the region of the gastric fundus. The left renal vein was cannulated, and initial venograms failed to identity the varix with certainty. Small calibre veins were cannulated, which were deemed more to be lumbar veins than the varix.

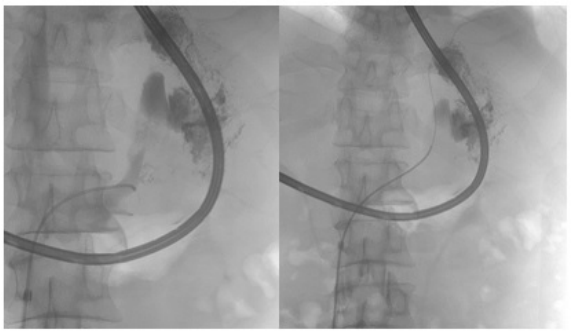

Figure 4: The Sengstaken-Blakemore tube was deflated. Immediately, the varix was evident. It was successfully cannulated. Initial cannulation difficulties were attributed to compression of the varix by the balloon, rendering it not well seen on angiography.

The left inferior phrenic and diaphragmatic draining vein were cannulated with a 2.2-Fr microcatheter (Progreat, Somerset, New Jersey, USA) and 0.016 inch hydrophilic guidewire (Terumo, Tokyo, Japan) (Figure 5). The left inferior phrenic collateral was embolised with one 4 mm and two 5 mm VortX-18 Diamond-shaped fibered platinum coils (Boston Scientific, Cork, Ireland) (Figure 6) whilst the other diaphragmatic collateral was embolised with two 5 mm VortX-18 Diamond-shaped fibered platinum coil and two 7 mm Complex Helical-18 fibered platinum coils (Boston Scientific, Cork, Ireland).

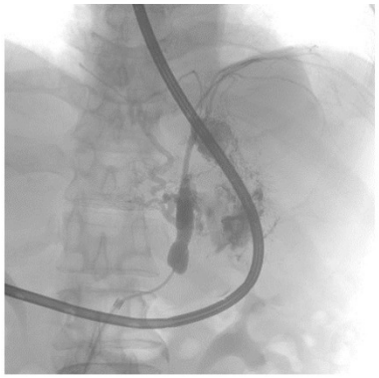

Figure 5: The Fogarty balloon was inflated and a venogram performed. There were small draining left inferior phrenic veins, one diaphragmatic and one paraoesophageal vein, in keeping with a type B varix.

A 3 ml of sclerosing foam was instilled (3:2:1 mixture of air: Sodium tetradecyl:lipodol). The end point was taken as stasis of contrast in the varix. Check venogram demonstrated satisfactory occlusion of the varix (Figure 7). The balloon catheter was left *in-situ* with the balloon inflated for 24 hours. The patient was sent to intensive care unit for observation and monitoring.

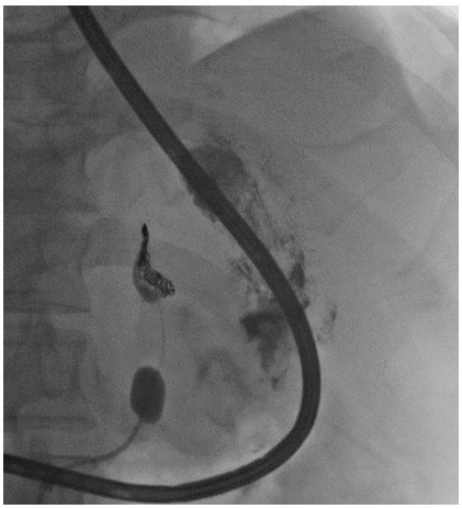

Figure 6: The 2 draining left phrenic veins were cannulated, and successfully embolized with coils.

After 24 hours, the patient was sent to angiography suite to review. A fluoroscopic image was performed which demonstrated good persistent lipoidal uptake in the varix. There was no reflux of the sclerosant material or migration of the embolisation coils. The Fogarty balloon was still inflated, in a good position in the proximal aspect of the varix (Figure 8).

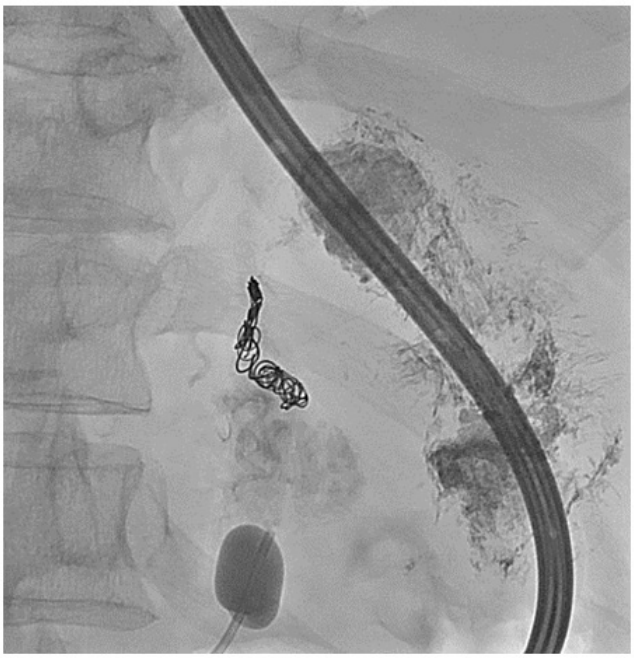

Figure 7: With the balloon inflated, a 3 ml of sclerosing foam was instilled (3:2:1 mixture of air: Sodium tetradecyl:lipodol), till stasis was achieved There was satisfactory filling of the varix with the mixture.

The Fogarty Bleeding Gastric varices from Liver Cirrhosis complicated by Hepatocellular Carcinoma Treated by Balloon Occluded Retrograde Transvenous Occlusion Obliteration using Sodium Tetradecyl Sulphate foam in an Emergent Setting. The Fogarty balloon was carefully deflated and removed under fluoroscopic guidance. A non-contrast enhanced CT was then performed which demonstrated good uptake of the sclerosant material/lipoidal within the varix (Figure 9). There was no CT evidence of migration of the sclerosant material, in particular to the pulmonary arteries.

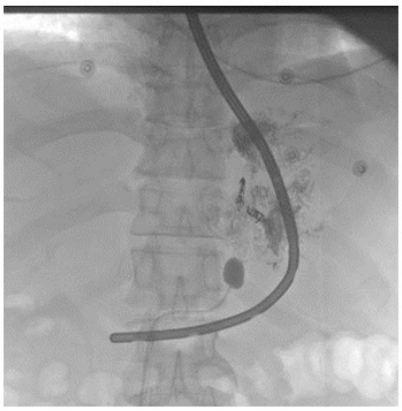

Figure 8: The balloon was kept inflated for 24 hours. He returned to Angiography the following day. The balloon was noted to be in a good position, with no evidence of rupture or migration. The sclerosants were also noted to be in the varix, with also no evidence of migration.

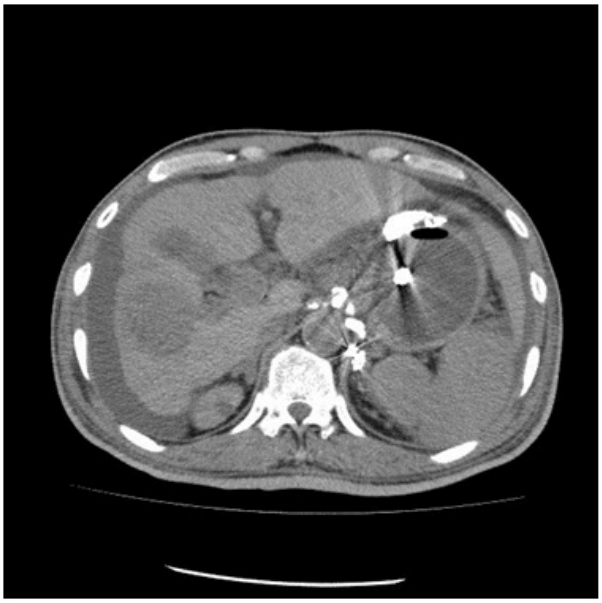

Figure 9: Post procedural CT scan demonstrated good filling of the varix with the mixture of lipoidal and sclerosant. Of note was that there was no migration of the sclerosant to the pulmonary arteries.

The patient was subsequently discharged with no further episodes of haemetemesis. There was no recurrent admission 1 month after discharge and follow-up ultrasound demonstrated mild ascites, reflecting no interval worsening of his hepatic function or portal hypertension

Discussion

Hepatic cirrhosis with portal hypertension is a common condition in South East Asia, given the high prevalence of hepatitis B and C among its population. A potentially life-threatening complication of portal hypertension is variceal bleeding. The prevalence of bleeding gastric varices in patients with portal hypertension has been reported as approximately 30%.(1) Whilst the prevalence and risk of bleeding from gastric varices are lower than that of oesophageal varices, bleeding gastric varices is associated with higher mortality rate, of approximately 25% to 55% [1,2].

Most gastric varices are formed by the left gastric or posterior gastric vein. Gastric varices from the left gastric vein are frequently located at the cardia and are associated with paraoesophageal varices. Those formed by the posterior gastric and short gastric veins are usually located at the fundus, and usually drain into the inferior phrenic vein. In 80% to 85% of cases, the left phrenic vein will join the renal vein, forming the gastrorenal shunt. 10% to 15% will drain into the inferior vena cava, forming the gastrocaval shunt.

Gastric varices can be classified according to the afferent veins (Type 1 to 3) or the draining veins (Type A to D) [3,4]. Type 1 gastric varices are typified by a single afferent gastric vein whilst Type 2, by multiple afferent gastric veins. Type 3 varices may have single or multiple afferent gastric veins; the presence of gastric veins that are contiguous with the shunt but not contributing to the varices is its defining characteristics. Type A gastric varices are drained by a single shunt; type B, by a single shunt and collateral veins whilst type C varices are drained by both gastrorenal and gastrocaval shunts. There is no catheterizable shunt in type D varices.

In BRTO, retrograde balloon occlusion of the outflow of variceal blood allows for stasis of the injected sclerosant within the varix, postulated to lead to obliteration. This overcomes the difficulty of achieving a satisfactory volume of sclerosant within the varix as compared to endoscopic N-butyl-2-cyanoacrylate injection (EBC). The technical difficulty and success of BRTO depends on the type of the varix. Type 1 and Type A gastric varices would be the ideal anatomy for BRTO [3]. Type 3 gastric varices are likely subject to low-success rates, as the injected sclerosant will be drained by the coexistent gastric veins despite occlusion of the draining veins. Type D gastric varices have been traditionally considered contraindicated for BRTO, although Araki et al. [5] recently demonstrated that BRTO was technically possible for Type D varices draining into the inferior phrenic vein. In type 2 varices, the success of BRTO is affected by the intraluminal pressure of all the afferent veins. If the intraluminal pressure of the gastric veins are not equal, the direction of flow in the veins with lower pressure will alter such that it matches the direction of flow in the portal vein. In most cases, this alteration of flow does not significantly affect the outcome of BRTO. However, in some cases, it may lead to insufficient filling of the varix or unwanted flow of the sclerosant into the portal system. In Type B varices, the outcome of BRTO depends on the number, size and ease by which the collateral draining veins can be occluded. [4] Yamagami et al. [6] recently showed that embolisation of collateral veins from gastric varices prior to BRTO is a safe and useful procedure, although they noted that gastric varices with collaterals sufficiently large to necessitate embolisation may require careful follow-up for recurrence. In cases where there are high-flow or large number of draining veins which cannot be occluded, the injected sclerosant will flow into the systemic veins, leading to reduced efficacy of BRTO. Type C varices are also subject to similar difficulty, unless both the gastrorenal and gastrocaval shunts are occluded.

Ethanolamine Oleate is the original agent used and remains the agent of choice in Japan. However, we opted to use Sodium Tetradecyl Sulphate (STS) foam due to its availability and experience of the primary interventionist with this agent. STS foam has been used for sclerotherapy of superficial lower extremity varicosities in Singapore. It has been reported that STS foam allows for a lower dose of sclerosant used, thus reducing systemic effects such as haemolysis and renal failure, whilst still achieving similar technical success and obliteration rates [3]. Air bubbles in the STS foam displaces the blood more effectively that liquid agents, and provides a larger surface area of the sclerosant for contact with the venous endothelium. Lipodol was used in the mixture to confer radio-opacity to the sclerosant, which would be important during the angiographic procedure and follow-up CT.

This method, which was introduced in the 1990's, has been widely adopted in Japan and Korea, and is increasingly garnering more interest in other countries. It has a reported technical success rate ranging from 84% to 100% [7-11]. Rebleeding rate is extremely low (15%) and complete obliteration rate ranges from 89% to 100% [7-11]. This appears to be more favourable than EBC [12]. For bleeding gastric varices, EBC has been reported to have a rebleeding rate as high as 40% [12], whilst the success of Transjagular intrahepatic portal systemic shunt (TIPS) has been reported as 50% to 63% [13]. These can be explained by the larger diameter of the gastric varices compared to oesophageal varices. In EBC, rapid flow of variceal blood hinders adequate sclerosant injection in EBC, whilst in TIPS, the lower portal pressure shunt gradient leads to reduced success rates. A recent study by Katoh et al. [14] demonstrated cumulative relapse-free rate of 90% at 5 years for BRTO. However, there is a higher risk of regrowth in partially thrombosed complex-type varices (defined as having more than three afferent veins), as demonstrated by Takaji et al. [15]. This emphasizes that complete occlusion of the gastric varix should be achieved for good outcome.

BRTO has several other advantages over EBC and TIPS. It can be performed with the patient awake, negating the risks associated with sedation and anaesthesia in these ill patients. It is also a minimally invasive procedure, in that it does not require hepatic puncture unlike TIPS, thus reducing the risk of hepatic bleeding in these coagulopathic patients. In our case report, the procedure was done in an emergent setting, in a conscious patient without sedation.

A major concern of BRTO is its effect on portal pressure and oesophageal varices. BRTO has been found to significantly increase portosystemic pressure gradient resulting in increased oesophageal variceal bleeding rates [16,17]. This may necessitate close follow-up and prophylactic treatment for oesophageal varices. Other reported complications of BRTO include those related to the sclerosant and those related to the procedure. EO, the original agent used, was associated with renal and pulmonary complications [18-20]. Some of these side-effects were found to be dose-related; the use of STS foam which potentially allows for lower doses may be advantageous. Procedure-related complications include balloon rupture, which was found to have a prevalence of 8.7% [21]. This may lead to rapid

dissemination of sclerosant material causing pulmonary embolism, as well as reduced success rates with increased recurrence.

Our patient is unique in several respects. This is the first reported case of treatment of bleeding varices with BRTO in Singapore. Also, this is the first reported case of BRTO performed in an emergent setting. The procedure was performed without sedation or anaesthesia, and an indwelling Sengstaken-Blakemore tube which posed some technical difficulty. A pitfall we encountered in this patient includes the inadvertent cannulation of the ascending lumbar continuant vein. This was further contributed by the presence of the SB tube, which led to alterations of variceal flow and rendering the varix less prominent. This is an important observation, as many of these patients who have failed conventional therapy would have an SB tube *in-situ*. The procedure should be performed with the SB tube deflated to ensure good visualization of the varix.

Given the high technical success, low rebleeding and high complete obliteration rates, we should consider employing BRTO with STS foam more frequently in our local population, particularly in patients who have failed EBS and are not suitable for TIPS. Early reports of better long-term outcomes compared to EBS and TIPS raises the possibility of BRTO as a potential first-line treatment for bleeding gastric varices.

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