

Case Report

Emergency treatment of esophageal varix incarceration in the endoscope and ligation device during endoscopic variceal rubber band ligation

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Received September 26, 2014; Accepted October 31, 2014; Epub November 15, 2014; Published November 30, 2014

Abstract: Sclerotherapy and endoscopic esophageal variceal ligation (EVL) are commonly used to treat and prevent variceal bleeding. As of today, there has been no report on an unexpected incarceration of a varix hooked on with the bands from the endoscopic EVL device. We recently experienced this emergency while using the 7-band ring endoscopic EVL device (Boston Scientific Corp., Boston, MA) for prophylaxis of variceal bleeding. In this case, the varix body itself was accidentally incarcerated in the crevice of the esophageal endoscope after highly negative pressure of absorption was applied on the endoscope. In this situation, using force to take out the gastroscope was not an option as it would tear the vein and cause massive hemorrhage. We were managed to ligate the varix with rubber bands while releasing the incarceration. We observed that ligation of the varix at the same position using all seven ligation bands resulted in disappearance of the targeted varix. The surrounding esophageal mucosa became smooth after the treatment.

Keywords: Esophageal variceal hemorrhage, endoscopic esophageal variceal ligation, emergency situation

Introduction

Esophageal variceal hemorrhage is one of the most common complications of portal hypertension in patients with hepatic cirrhosis [1]. Even with the best medical care currently available, mortality from variceal bleeding still reaches 20% [2, 3]. Sclerotherapy and endoscopic esophageal variceal ligation (EVL) are commonly used to prevent variceal bleeding [4, 5]. Esophageal varices with the “red-color sign” defined by the World Health Organization are indicative for prophylactic treatment due to increased risk of bleeding [5, 6]. Over the past 20 years since EVL's wide implementation, gastroenterologists have accumulated abundant experience in managing various intraoperative complications such as bleeding, esophageal mucosa and submucosal lesions, esophageal perforation, the inner sleeve detachment, loose ligation bands, and the rubber band accidentally slipping off. However, there have been no reports about the unexpected incarceration of

a varix hooked on with the bands from the endoscopic EVL device. We recently experienced this emergency while using the 7-band ring endoscopic EVL device (Boston Scientific Corp., Boston, MA) for variceal bleeding prophylaxis. In this case, the varix body itself was accidentally incarcerated in the crevice of the esophageal endoscope after highly negative pressure of absorption was applied on the endoscope. In this report, we describe how to manage this emergency situation.

Case report

A 56-year-old male patient was admitted for recurrent hematemesis and excreting tarry stool. He had been previously treated for the same problem with ELV ten years ago. The patient had a 20-year history of chronic hepatitis B (CHB) and received antiviral therapy with entecavir during the past 2 years. He had undergone cholecystectomy and splenectomy for gallstones and hypersplenism five years before. The family

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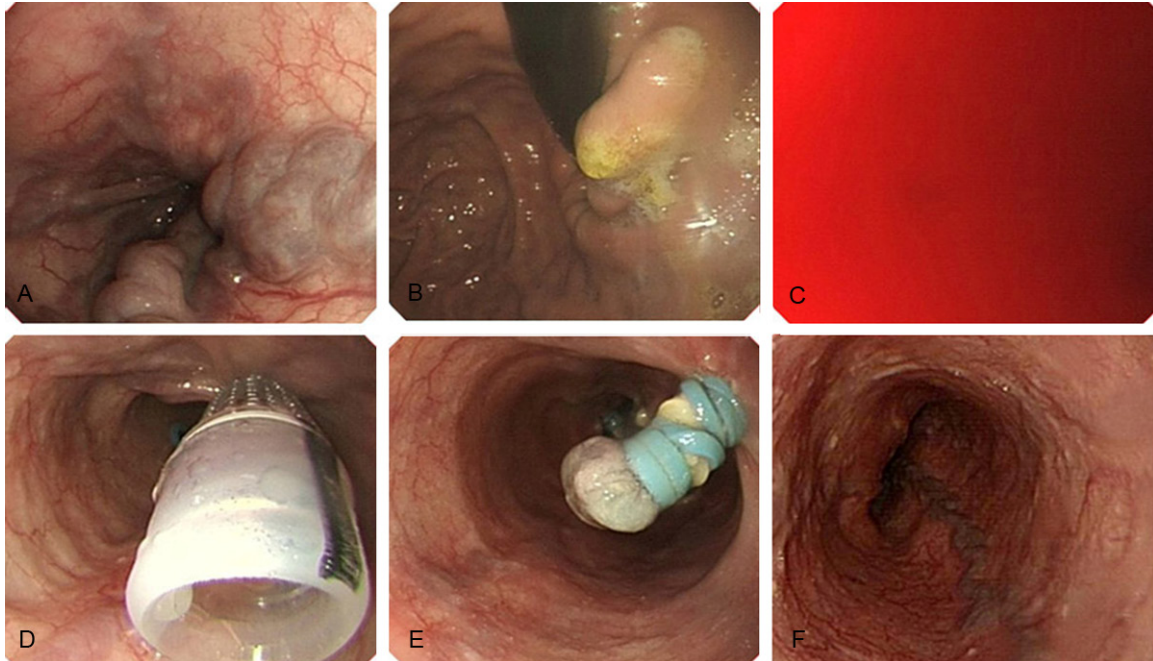


Figure 1. Endoscopic depiction of an esophageal varix incarcerated in the endoscope, ligation, and release. A. Severe esophageal varices before treatment. B. Gastric varix before the treatment. C. A varix was sucked into the crevice of the endoscope, causing hemorrhage and the view to become all red. D. All seven elastic bands were applied to ligate the varix by rotating the handles, but the ligated varix did not slip out of the gastroscopie nozzle. We rotated the handles again so that the steel wire was fetched away from the inner sleeve. We then pulled out the gastroscopie gently until the inner sleeve slipped out of the gastroscopie nozzle. E. On the third day after the EVL, the inner sleeve had fallen off by itself. The varix had been successfully ligated with seven elastic bands, including six blue bands and a white one. The shape was columnar. F. Seven months after EVL, the treated varices have completely disappeared, leaving only a residual blue vein.

history included the patient's father, sister, and older brother all suffering from CHB.

Physical examination and laboratory results

The patient came to hospital by himself. He looked normal, conscious, and had stable vital signs at admission. There were no significant abnormalities in the patient's circulatory and pulmonary parameters. His vital signs are: temperature 36.4°C, pulse rate 76 beats per minute, respiratory rate 19 times per minute, and blood pressure 115/75 mmHg. Laboratory findings at admission were as follows. (1) Complete blood counts: red blood cells $2.80 \times 10^{12}/L$, hemoglobin 85 g/L, leukocytes $3.57 \times 10^9/L$, neutrophils 39.20%, and lymphocytes 47.30%. (2) Clinical biochemistry: ammonia 244.00 umol/L, cholinesterase 3859 U/L, total bilirubin 23.20 umol/L, direct bilirubin 9.90 umol/L, total protein 57.50 g/L, albumin 26.40 g/L, total bile acid 70.40 umol/L, chloride 109 mmol/L, and glucose 10.18 mmol/L. (3) Im-

munological tests: HBsAg > 250.00 IU/ml, HBsAb 0.380 mIU/ml, HBeAg 0.552 S/CO, HBeAb 1.560 S/CO, HBcAb 9.70 S/CO, HBeAb IgM 0.070 S/CO, anti-HCV 0.08 S/CO, hyaluronic acid 1055.50 ng/ml, glycocholic acid 23.88 ug/ml, laminin 41.30 ng/ml, procollagen III 56.80 ng/ml, and collagen IV 54.52 ng/ml. (4) HBV DNA (PCR) < 500 IU/ml. (5) Peripheral blood mononuclear cells: CD3 cells 52%, with normal percentages of CD4, CD8, and CD45 cells. (6) Coagulation tests: prothrombin time 16.8 s, thrombin time 19.10 s, and fibrinogen 1.45 g/L.

The patient was treated with terlipressin, pantoprazole, reduced glutathione, furosemide, spironolactone, and underwent gastroscopy under general anesthesia. During the procedure, two varicose veins were identified in the middle and lower segment of the esophagus. The two varicose veins had a moniliform appearance and extended to the cardia, with obvious red-color sign in the lower seg-

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ment (**Figure 1A**). As we continued to insert the gastroscope, we found no bloody mucus lake or ulcers. However, there were gastric varices (**Figure 1B**). We used the standard gastric variceal “sandwich” injection method (i.e. hardener + tissue adhesive + hardener) to mitigate further bleeding. There was no observed bleeding within the five minutes after the operation. According to the standardized procedure, the next step was to slowly pull out the gastroscope and to ligate the significant esophageal varices at the position between the lower segment of the esophagus and cardia by applying rubber bands using a Boston device.

While we were pulling out the endoscope, the varix was sucked into the crevice of the endoscope, causing hemorrhage. The view from the endoscope became all red (**Figure 1C**). We tried to push in the first rubber band to stop the bleeding but it failed as indicated by the fact that the view from the endoscope was still red. We continued to push out all seven rubber bands in an attempt to stop the bleeding and loosen the varix body from the crevice. However, the varix body remained attached to the ligation device even after all seven rubber bands were applied. At this moment, forcing the gastroscope out was not an option, as it would tear the vein and cause massive hemorrhage.

The 7 band ligator made by Boston Science consists of ligation components, a handle, and a washing pipe. The outer cover is jointed at the end of the gastroscope and the inner ring is a ringlet that can glide through the outer cover and has a gap connecting to the steel wire. The O-band is installed in the inner ring and a wired cone is connected to the interior wiring. The pull line is a steel wire with a length of 140 cm, a diameter of 0.75 mm, and a winglet (1.8 mm) on both ends. The O-band is stretched and installed in the distal of the inner ring through the wired cone, leaving the winglet stuck in the gap so that it can be connected to the inner ring firmly. **Figure 2** shows the structure diagram of the device.

Our approach to pull out the endoscope in this circumstance is detailed below. We first turned off the negative pressure immediately. However, the varix ball ligated with the rubber bands did not slip out of the endoscopic nozzle by itself. Then, we turned around the handle several times until no tension was felt while gently pulling the wire. This implied that the rubber band

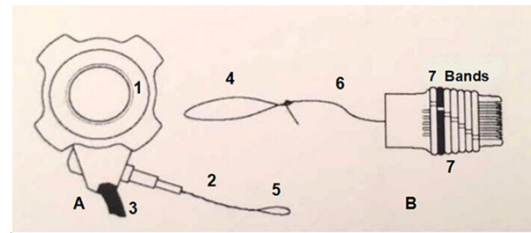


Figure 2. The structure diagram of the Multiple Band Ligator. (A) is the handle part which has a plastic reel (A-1), with a guide wire (A-2) circled on it and an endoscopic buckle (A-3). The plastic reel could only rotate clockwise. When it is rotated half circle (180°), there will be a clear clatter sound. An elastic belt will be sent out automatically. The endoscopic buckle is used to fix the handle to the endoscope. The flush valve is located in the side of the handle part. The valve is closed when the injection syringe or the washing pipe is fixed to its taper joint. (B) is the ligation component which is installed in the distal endoscope, with a cylindrical shape. There is an inner sleeve (see **Figure 1D**) located inside of it. The elastic belt is tensioned around the cylinder. The ring-belt (B-4) is adhered to the guide wire ring (B-5) of the handle part. (B-6) shows the steel wire, and (B-7) shows the seven bands.

had been separated from the inner sleeve of the ligation device. Next, we pulled the gastroscope gently and felt the wire cone separating from the outer thimble of the ligation device. Finally, we could see a column relapsing to the lumen of the esophagus with the trapped varix vein undamaged and no observed bleeding in and around the column (**Figure 1D**).

After the procedure, the patient was maintained on abrosia and given terlipressin for 24 hours. The next day, he received liquid food and omeprazole orally. On the third day after the operation, he underwent gastroscopy again. No obvious esophageal varices or bloodstain was found, and the inner sleeve had fallen off the varicose vein where the seven ligation bands had been applied (**Figure 1E**). **Figure 1E** shows that there were six blue and one white rubber bands ligated on the columnar varicose vein, but not in the manufacture-designed order (i.e. five blue, one white, one blue).

Discussion

This was an unexpected but successful procedure. We found that the seven ligation bands all applied to the same position caused the targeted varix disappear and turned the surrounding esophageal mucosa smooth. The patient

was re-examined seven months post-operation. His general condition, mental wellness, and appetite were all well. There was no indication of hematemesis. The gastroscopy examination found that all varices disappeared completely, leaving only a residual blue vein (**Figure 1F**). This suggests that ligation with multiple-bands can be highly effective in treating varices and the results may last for a longer time. Our observations are in agreement with those from other groups in which ligation with more than one band was also more successful in treating varices and had a more persisting effect [7]. We also tried to understand the reasons for this accidental incarceration. We found that the EVL device used for this patient was close to its manufacturer-set expiration date (3 months before its 2-year effective period). Using a newer device may reduce the incidence of similar accidents.

Acknowledgements

The study was supported by the Chinese 12th Five-Year Plan for a special study fund on hepatitis B and AIDS (2013ZX10004216-001-001) and the Biological Medicine Guide Fund of Shanghai Science and Technology Committee (124119a7801).

Disclosure of conflict of interest

None.

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