

## Case Report

# Endoscopic banding ligation can effectively remove the submucosal tumor

Fei-Zhen Xia\*, Zhe Shen\*, Hong-Tan Chen, Chao-Hui Yu, Wei-Xing Chen

Department of Gastroenterology, First Affiliated Hospital, College of Medicine, Zhejiang University, Hangzhou 310003, Zhejiang Province, China. \*Equal contributors.

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**Abstract:** Endoscopic band ligation for variceal bleeding in cirrhosis has been proved its safety and efficacy. We tried to treat submucosal tumors the gastrointestinal (GI) tract by endoscopic band ligation. The aim of this study was to evaluate the efficacy and safety of endoscopic band ligation in the treatment of submucosal tumors of the GI tract. There are 29 patients (15 men, 14 women, age range: 25-67 years old) with 30 submucosal lesions of the GI tract, including 15 lesions in the esophagus, 14 lesions in the of stomach and 1 lesion in the duodenal bulb. The average maximum diameter of the lesions was 7.78 mm (range: 2.4-23.6 mm). All submucosal lesions were successfully removed by band ligation. There is no bleeding and perforation in all patients. No recurrence was observed for the one month following-up. Endoscopic band ligation promises could be considered as a safe and effective for the treatment submucosal tumors of the GI tract, especially for the diameter of tumor < 25 mm.

**Keywords:** Endoscopic band ligation, submucosal tumors, gastrointestinal tract

## Introduction

Submucosal tumors (SMTs) occasionally are found in the esophagus and stomach by upper endoscopy, overall frequency 3% [1]. The management of submucosal tumors traditionally includes electrocautery snare polypectomy, nylon-rope ligation and surgical treatment. During the last decade, the important technical advances in endoscopic mucosal resection (EMR) and endoscopic submucosal dissection (ESD), have the potential to impact management of SMTs. However, complications (bleeding and perforation) are inevitable during the procedure of treatment.

Additionally, endoscopic band ligation for variceal bleeding in cirrhosis has been proved its safety and efficacy. In 1986, Van Stiegmann G *et al* firstly used this techniques in the treatment of esophageal varies [2]. Recently, advances in endoscopic band ligation techniques and devices have improved the safety in treatment of esophageal varies bleeding and become an important tool in the management of it. Furthermore, its application could be

spread to other areas of endoscopic therapy. There are some case reports of band ligation devices being applied to non-variceal bleeding [3-5]. Reports have purported safety in Dieulafoy's lesions [3], diverticula [4] and Barrett's Disease [5].

In our pilot studies, we used detachable snares to strangulate submucosal tumors and demonstrated that the gastrointestinal (GI) submucosal tumors could be removed. Our results implied that endoscopic band ligation could achieve the bloodless transection of GI submucosal tumors. The aim of this study was to evaluate the efficacy and safety of endoscopic band ligation in the treatment of submucosal tumors of the GI tract.

## Case reports

### Patients

A total of 29 patients (15 men, 14 women, age range: 25-67 years old) with 30 submucosal lesions of the GI tract (one patient has two lesions) were treated by endoscopic band ligation between March 2012 and January 2013.

## Endoscopic banding ligation

**Table 1.** Characteristics of SMTs including location, histological origin, size and histology

Patient No.	Location	Histologic origin	Size (mm)	Histology
1	Esophagus	Mucosa	3	Leiomyoma
2	Esophagus	Muscularis propria	9.3	Leiomyoma
3	Esophagus	Muscularis propria	10	Leiomyoma
4	Esophagus	Muscularis propria	4.1	Leiomyoma
5	Esophagus	Muscularis propria	3.9	Leiomyoma
6	Esophagus	Muscularis propria	5.3	Leiomyoma
7	Esophagus	Muscularis propria	5.3	Leiomyoma
8	Esophagus	Muscularis propria	3.4	Leiomyoma
9	Esophagus	Submucosa	4.7	Leiomyoma
10	Esophagus	Submucosa	8	Mesenchymoma
11	Esophagus	Submucosa	6	Inflammatory polyp
12	Stomach	Mucosa	7.4	Inflammatory polyp
13	Stomach	Mucosa	5	Inflammatory polyp
14	Stomach	Submucosa	13.6	Lipomyoma
15	Stomach	Mucosa	8.2	Inflammatory polyp
16	Stomach	Mucosa	6.3	Inflammatory polyp
17	Stomach	Submucosa	5	Heterotopic pancreas
18	Stomach	Submucosa	23	Heterotopic pancreas
19	Stomach	Submucosa	10.6	Mesenchymoma
20	Stomach	Muscularis propria	12	Mesenchymoma
21	Stomach	Muscularis propria	5	Leiomyoma
22	Stomach	Mucosa	8	Inflammatory polyp
23	Stomach	Muscularis propria	4.9	Mesenchymoma
24	Stomach	Muscularis propria	7	Mesenchymoma
25	Duodenum	Submucosa	23.6	Polyp
26	Esophagus	Not clear	5.2	Leiomyoma*
27	Esophagus	Not clear	12	Inflammatory polyp*
28	Esophagus	Not clear	5	Inflammatory polyp*
29	Esophagus	Not clear	6.8	Inflammatory polyp*
30	Stomach	Not clear	2	Inflammatory polyp*

\*These lesions were diagnosed only by general endoscopy, not by the EUS.

Endoscopic ultrasonography (EUS) was performed on 24 lesions to determine the lesion histological layer of origin and lesion size. The image of them was raised and have smooth surface, boundary clear. 6 of the submucosal lesions informed by general endoscopy have no precise histological origin. The submucosal lesions were selected if they were less than 30 mm in diameter. Patients did not take aspirin or another non-steroidal anti-inflammatory medication for at least 1 week before the procedure.

### Methods

The lesion was first identified with general endoscopy or endoscopic ultrasound was per-

formed to observe the lesion extent of submucosal involvement. Then transparent cap with a diameter of 1 cm attached to the endoscope, the lesion was aspirated into the cap and a trip wire was used to deploy the rubber band off the cap to ligate the lesion. As a result, the rubber band slipped off, thus ligating a lesion aspirated into the hood. If the lesion was not completely ligated, the band was removed and the lesion was ligated again. After the procedure, the patient was allowed to have a liquid or semi-liquid for a 24 hour period, and then a regular diet and was given the treatment for proton pump inhibitor.

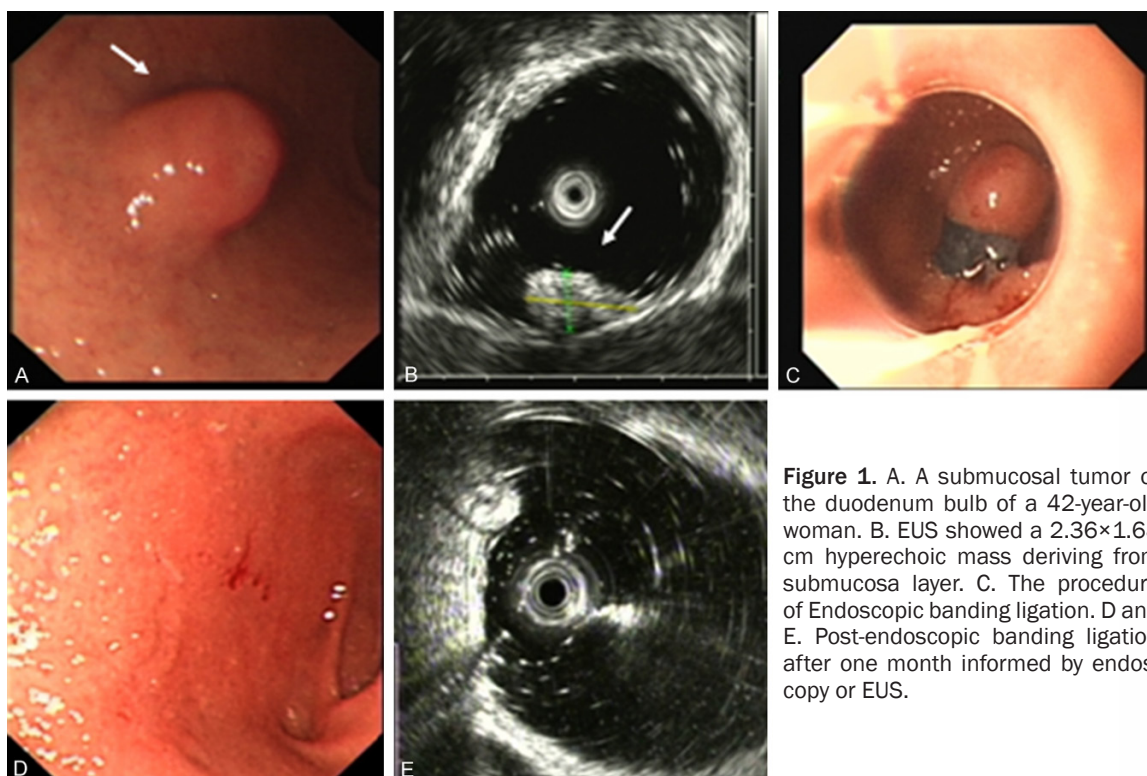
A follow-up endoscopy was performed one month after initial endoscopic ligation to assess the outcome of the strangulated lesion by general endoscopy and/or EUS.

### Results

29 patients were 15 men and 14 women, the age range was 25-67 years

old. The distribution of the 30 submucosal tumors was the following: 15 for esophagus, 14 for stomach, 1 for duodenum. The characteristics of SMTs including location, histological origin and size are shown in **Table 1**.

Of the patients with esophageal submucosal tumors, 3 lesions were in the upper esophagus, 3 lesions were in the middle esophagus, and 9 lesions were in the lower esophagus. The diameter of maximum tumor was 12 mm of a 63-year-old man in the middle esophagus. After one month he received endoscopic band ligation, he accepted the following-up, and the endoscopy showed the lesion had be removed. Of the patients with gastric submucosal tumors, 2 lesions were in the cardia, 3 lesions were in



**Figure 1.** A. A submucosal tumor of the duodenum bulb of a 42-year-old woman. B. EUS showed a 2.36×1.68 cm hyperechoic mass deriving from submucosa layer. C. The procedure of Endoscopic banding ligation. D and E. Post-endoscopic banding ligation after one month informed by endoscopy or EUS.

the fundus, 2 lesions were in the body, and 7 lesions were in the antrum. The diameter of maximum tumor was 23 mm for a 56-year-old man. After one month she received endoscopic band ligation, and the endoscopy showed the lesion had been removed in the follow-up. A case of a 42-year-old women who had upper abdominal pain was found a lesion in the duodenal bulb by endoscopy. The size of the lesion was 23.6×16.8 mm deriving from the submucosa. We used an air-driven ligation of diameter, the lesion was fully aspirated into the cap and the band was released. After one month, the endoscopic examination showed there was a superficial ulcer in the original position (**Figure 1**).

The average maximum diameter of the lesions was 7.68 mm (range 2.4-23.6 mm). Endoscopic band ligation was performed easily and safely in each case. The average time of the procedure is about 30 minutes. Endoscopic band ligation was successful in a total of 29 patients. There were no immediate postprocedure complications. The follow-up endoscopy and/or EUS about 13/29 patients (8 informed by general endoscopy, 5 informed by EUS) one month later revealed that the tumors had dropped off. In the follow-up, endoscopy showed the ligated tumors of 7 patients fell off and no recurrent or

residual tumor was found; there were superficial mucosal scars at the sites of the original lesions for 5 patients and the structural gastric walls were integrity. For other 14 patients, we had not received complaints phone about perforation or bleeding.

## Discussion

Endoscopic band ligation obliterates varices by causing mechanical strangulation with rubber bands, leading to thrombus and necrosis, then the mucosa sloughs off and eventual scars. After banding about 3 to 7 days, the strangulated varix sloughs off, leaving a superficial mucosal ulceration that typically heals in 14 days [6].

Endoscopic band ligation works by causing mechanical strangulation with rubber bands, did not result in deep ulceration, instead did result in superficial ulcer formation and inflammation confined to the submucosa [7]. Cyanotic change is an important predictor of the outcomes of the lesions following endoscopic ligation. Gastric polyps congest immediately following strangulation by rubber bands, and then develop cyanotic change within approximately 4 minutes [8]. Complications (bleeding and perforation) are common during the procedure of

treatment for SMTs. The bleeding rate after snare polypectomy appears to be high in the stomach, about 7.2% reported in a prospective multicentre studies [9]. The major complications associated with gastric EMR or ESD, the perforation and delayed bleeding rates have been reported to range from 1.2% to 5.2% and 0% to 15.6% [10]. Therefore, the risk of perforation can be reduced. Our results further demonstrated that the endoscopic band ligation allowed a lesion to be easily captured into the transparent hood, even in cases where it was situated in the lesser curvature side, posterior wall and cardia of the stomach, the duodenum where may be difficult in conventional snare polypectomy.

Furthermore, when suction and band ligation is performed with a cap fitted endoscope, all layers of the GI tract, together with the tumor, are ligated [11]. Employing suction equipment, endoscopic band ligation can easily capture tumor even it origins from the muscularis propria avoiding the bleeding and perforation by the further electrocautery. It implied that a strangulating technique alone can achieve the bloodless transection of gastrointestinal neoplasm. But Xing *et al.* had reported a case about perforation after band ligation of a gastric submucosal tumor [12]. The safety is reduced if all the layers of gastric wall including the serosa are ligated, and might result in acute perforation. It has been occurred in the two cases reported by Sun *et al* [11].

In conclusion, in our experience, endoscopic band ligation was an inexpensive, safe, effective and easily learned technique. It was applied to the tumor in gastric muscularis propria with the appropriate volume (< 25 mm). The sucking force should be soft and careful avoiding perforation. Our study showed that endoscopic band ligation could be applied in the management of GI submucosal tumor.

## Disclosure of conflict of interest

None.

**Address correspondence to:** Dr. Wei-Xing Chen, Department of Gastroenterology, First Affiliated Hospital, Medicine School, Zhejiang University, Hangzhou 310003, China. Tel: +86-571-87236861; Fax: +86-571-87236611; E-mail: zjucwx@163.com

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