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**Columns:** **CASE REPORT**

**Selective endoscopic ligation for treatment of upper** **gastrointestinal protuberant lesions**

**Wang L *et al*.** Endoscopic ligation in children

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**Abstract**

To explore the clinical value of endoscopic ligation for the treatment of upper gastrointestinal (GI) protuberant lesions in children. According to the appearance and size of lesions, we used different ligation technique for the treatment of upper gastrointestinal protuberant lesions. Endoscopic ultrasonography examination was used to provide preliminary identification of the property of lesions. One case diagnosed with Peutz-Jeghers syndrome was successfully treated by a detachable snare. Two cases with semi-pedunculated or broad-base lesions originating from submucosal layer of upper GI were treated with EVL technique. Endoscopic examination showed one of them was healed completely at 11 weeks after ligation. An ulcer scar was observed at the ligation site after 6 weeks in the other case. All lesions were successfully ligated at the first time. No significant complications occurred either during or after the procedure. Selective endoscopic ligation of upper GI lesions is an effective and safe treatment for upper GI protuberant lesions in children.

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**Key words:** Endoscopy; Ligation; Endoscopic ultrasonography; Protuberant lesion; Children

**Core tip:** Endoscopic ligation is an effective method in the management of protuberant lesions. It is less invasive and less cost than surgical interventions. However, there are few studies regarding this technique to treat upper gastrointestinal (GI) lesions in children. This paper reports selective endoscopic ligation for treatment of different upper GI protuberant lesions in children. And endoscopic ultrasonography examination was used to determine the depth of invasion and provides preliminary diagnose of the lesions.

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**INTRODUCTION**

Protuberant lesions in gastrointestinal (GI) tract may cause clinical symptoms (*e.g.*, abdominal pain, bleeding, intussusception, obstruction) and have malignant potential. In addition, the presence of the lesion is a source of psychological pressure. With the development of endoscopic techniques and devices, endoscopic treatment has been an effective method for protuberant lesions in gastrointestinal tract. It is less invasive than surgical interventions.

Endoscopic ligation has been widely used in the management of post polypectomy bleeding, bleeding esophageal and gastric varices, and angiodysplasias[1]. In 2004, Sun *et al*[2] first reported endoscopic band ligation without electrosurgery was an effective and safe treatment for resection of small upper GI leiomyoma. They found most of leiomyomas could slough spontaneously within 3.6 to 4.5 wk. Complications related to use of electrosurgery were avoided. There was a case report about colonoscopic polypectomy with a detachable snare to remove a large juvenile polyp in 1-year-old girl[3]. However, there are few published data regarding endoscopic ligation to treat upper GI protuberant lesions in children. Thus, we report three patients with upper GI protuberant lesions that has been received endoscopic treatment with ligation.

**CASE REPORT**

***Case 1***

A four-year-old girl presented with abdominal pain of half years. She was diagnosed with Peutz-Jeghers syndrome. Under general anesthesia, conventional upper GI endoscopic examination (GIF-XQ260, Olympus, Japan) revealed multiple polyps. A large, 25 mm × 15 mm, pedunculated polyp with a hyperemic and edematous surface was found in the descending part of duodenum (Figure 1). Another polyp with a thick stalk, 16 mm × 10 mm in size, also appeared in the opposite side of duodenal papilla. To remove the two large polyps safely, we performed endoscopic ligation with detachable snares (MAJ339, Olympus, Japan). The device was composed of an elliptically shaped nylon loop and a silicone-rubber stopper which can maintain the tightness of the loop. The nylon loop was placed at the base of the stalk, tightened around the stalk, and then the stopper was detached from the device. We observed the color change of target lesion to ensure proper tightening, proper ligated lesion changed to dark red due to congestion. A smaller lesion, 3 mm × 3 mm, was found in gastric body. It was removed by using the electrocoagulation technique. No complications occurred either during or after the procedure using the detachable snare.

***Case 2***

A ten-year-old boy with nausea and belching for two months underwent upper gastrointestinal endoscopy (GIF-XQ260, Olympus, Japan) in our hospital. The result revealed a protuberant lesion located in the gastric antrum. Endoscopic ultrasonography (EUS) was done using a radial echoendoscope at a frequency of 20 MHz catheter probe (UM-DP12-25R, Olympus, Japan), it showed a 6.5 mm × 5.0 mm hypoechoic, homogeneous lesion originating from the submucosal layer. And it didn’t involve the muscularis propria. Endoscopic ligation was performed by using an attached band ligator device –Endoscopic Vricel Ligation (EVL) device (6 Shooter Saeed Multiband Ligator, Wilson- Cook Medical, United States), the lesion was aspirated into the ligator cap, and then an elastic rubber band was released around the base of the lesion (Figure 2). The goal of ligation was to create a polypoid form with a pseudo stalk. For complete ligation, suction should be maintained for at least one minute before releasing the rubber band. There were no significant procedure-related complications. The lesion was completely healed eleven weeks after the ligation.

***Case 3***

A ten-year-old boy with an episode of recurrent abdominal pain was referred to our hospital for gastrointestinal endoscopy (GIF-XQ260, Olympus, Japan). Under general anesthesia, EUS examination showed a hypoechoic homogeneous mass, 13.6 mm × 9.2 mm in size, originating from the submucosal layer of the duodenal bulb (Figure 3). It was not extended to muscularis propria. The ligation of this lesion was carried out with EVL device. The lesion was sucked sufficiently into the ligator cap and the band was released to ligate the base of the tissue. After the ligation, an ulcer would be observed at the location of ligation. No complications were reported during the procedure. Four days later, a GI endoscopy showed sloughing of the elevated lesion and an ulcer could be observed. And a scar at ligation site was seen on a follow-up examination of 6 weeks later.

**DISCUSSION**

Endoscopic treatment has been remarkable progress in application by gastrointestinal diseases. The detachable snare for endoscopic use was first developed by Hachisu[4]. Large polyps or other elevated lesions were successfully removed by detachable snares. In a randomized trial, Iishi *et al*[5] used endoscopic ligation with a detachable snare of the stalk of a large pedunculated polyp and evaluated its safety and effectiveness in comparison with conventional endoscopic snare polypectomy. Results showed that no bleeding occurred in 47 patients assigned to colonoscopic polypectomy with a detachable snare. But bleeding occurred in 5 of 42 patients who received conventional colonoscopic polypectomy. Moreover, the use of a detachable snare reduced the duration of hospitalization after polypectomy. In 2005, Raju *et al*[6] first described a new technique for successful removal of a large pedunculated, 4cm in size, broad-based colonic lipoma with the application of endoloops and without the need for cautery. Lee *et al*[7] reported nine cases diagnosed with large pedunculated GI submucosal tumors were successfully treated by endoloop ligation in 2008, the tumors were removed within four weeks. Recently, a trial was published to evaluate the clinical impact of selective ligation using a detachable snare for small intestinal polyps in three adult patients with Peutz-Jeghers syndrome[8]. The technique of endoscopic ligation is safer than conventional snare polypectomy or endoscopic mucosal resection (EMR). It could reduce the risk of bleeding and injury of the deeper tissue layers. However, to our knowledge, the effect of endoscopic ligation for upper GI protuberant lesions in children has not been reported.

According to our experience, there are two aspects to be considered in endoscopic treatment. One is the appearance of elevated lesions. A study described some instances that the use of a detachable snare was ineffective for colonoscopic polypectomy of large polyps with thin stalks or those lesions that were semi-pedunculated[9]. For those semi-pedunculated or broad-base lesions, it is difficult to tighten the lesion sufficiently. The loop is more likely to slip off. And the target lesion positioned at the 5 o’clock to 7 o’clock position is easier to remove by endoloop[1]. Huang *et al*[10] reported the method for different lesions using EVL device or endoloop. Small GI stromal tumors (≤ 12 mm) were treated by endoscopic band ligation with EVL device. Large pedunculated tumors (> 12 mm) could be managed by endoscopic ligation with a detachable endoloop, while ligation of large sessile tumors was carried out with a large-sized transparent cap plus an endoloop. In our cases, we used a detachable snare for large pedunculated lesion. If the lesion was semi-pedunculated or sessile, endoscopic ligation was carried out with an attached band ligator device. One of the two cases using EVL device, the lesion in diameter was larger than 12 mm. For smaller lesion (3 mm × 3 mm), conventional electrocoagulation was performed. Thus, selective ligation is essential to avoid complications.

The second precaution is that endoscopic band ligation is associated with a risk of perforation. Pay more attention to avoid aspirating excessive tissue into the cap. Perforations were reported in two studies after endoscopic band ligation[11, 12], two were GI stromal tumors in gastric fundus, one was gastric submucosal tumor partly connecting with muscularis propria. The reason might be that all the layers of gastric wall were ligated. It seems that the risk of perforation is greater with deeper layer tumors. Appropriate origin of lesions and the force of suction are essential factors that should be considered.

 Endoscopic ligation allows the lesion to slough spontaneously. The main limitation of this technique is the difficulty in retrieving the tissue specimen. Histopathologic diagnoses could not be made. However, protuberant lesions in children are mostly considered as benign and to be with very low potential for malignant transformation. Sun *et al*[13, 14] studied EUS-assisted band ligation with systematic follow-up by EUS was an effective treatment for small upper GI stromal tumors. EUS was used to determine the histologic layer of origin and evaluate whether the mass was confined completely by the band. It has a significant value in diagnose of submucosal lesion. In the present study, EUS examination was used to identify the depth of invasion. It provides preliminary identification of the property of the lesion. And we recommend to our patients that they should have close follow-up in order to early detect the recurrence.

In conclusion, endoscopic ligation appears to be a feasible method for removal of upper GI lesions in children. According to the property and volume of lesions, selecting a correct application of ligation and controlling the sucking force can reduce the risk of related complications, such as hemorrhage and perforation. Moreover, combining with EUS examination may be a great technique for submucosal tumor in children. Pediatric experience with this endoscopic technique remains limited. Thus, studies involving more subjects and longer follow-up are needed to conduct for further defining the clinical role of endoscopic ligation in children.

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**Figure 1** **The image of case 1.** A: Endoscopic view of a large pedunculated polyp in the descending part of duodenum; B: Endoscopic ligation with a detachable snare; C: Endoscopic view of the ligated polyp, the endoloop was placed around the stalk.

**Figure 2** **The image of case 2**. A: Endoscopic ultrasonography image of a submucosal lesion; B: Endoscopic view of the lesion in gastric antrum; C: Endoscopic view showing ligated lesion; D: Endoscopic image at 11 wk after ligation, showing healing at ligation site.

**Figure 3** **The image of case 3.** A: Endoscopic view of a protuberant lesion in the duodenal bulb; B: Endoscopic ultrasonography image of the size of the lesion; C: Endoscope view of the ligated lesion with an Endoscopic Vricel Ligation-device; D: Endoscopic view of an ulcer scar at the ligation site after 6 wk.