Submucosal Ligation and Suck Endoscopic Separated-Resection a Technique for Excision of Small Gastric Stromal Tumors

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Abstract

Objective: To evaluate the method of Submucosal Ligation and Suck Endoscopic Separated-Resection (SLSER) in resecting small gastric stromal tumors.

Methods: In our hospital, we observed and analyzed 61 resections of small gastric stromal tumors from July 2008 to July 2011, which were performed by submucosal ligation and endoscopic separated-resection. The specimens were sent for histological examination. In order to observe tumor shedding and wound healing, the tumors were reviewed by endoscopy on Day 7, and at Months 1, 3, 6 and 12 post-operation.

Results: In the 61 cases, the 60 tumors were completely separated, with a complete resection rate of 98%. Only one tumor could not be totally separated, but it necrosed following the device falling off. No perforation, bleeding, other complications or recurrence were observed by endoscopic examination during follow up. We found this technique to be a safe and effective treatment for small gastric stromal tumors. SLSER is a simple operation, with few complications and allows complete resection.

Conclusion: SLSER is an ideal method for resecting small gastric stromal tumors.

Keywords: Small gastric stromal tumor; Endoscopic treatment; Submucosal ligation and suck endoscopic separated-resection (SLSER)

Introduction

Gastrointestinal Stromal Tumors (GISTs) account for less than 3% of all gastrointestinal tract tumors, and 5.7% of all sarcomas; indeed, the majority of sarcomas are gastric in origin. Patients commonly manifest with gastrointestinal bleeding or abdominal pain with 10% to 30% of patients expressing with symptoms of gastrointestinal obstruction. Endoscopic Mucosal Resection (EMR) can completely resect tumors from the gastrointestinal mucosa and the submucosal layer. It is used widely in the diagnosis and treatment of gastrointestinal mucosal lesions [1]. It is common sense that a Submucosal Tumor (SMT) is a contraindication for EMR, because of the location of SMT, and the fact that EMR is prone to perforation, bleeding and other serious complications. Domestic scholars mostly agree that SMT needs surgery or regular check-ups.

Tumors from the muscularis propria include stromal tumors, schwannomas and leiomyma. The long-term follow-up with these tumors, necessary because of the high tendency to malignancy, is a heavy burden to the patient.

In recent years, Endoscopic Submucosal Dissection (ESD), based on EMR by hook and IT knife, has gradually become a diagnosis and treatment technology, which is used to resect tumors of the muscularis propria. At present, ESD still leads to large risk of perforation and bleeding when excising muscularis propria tumors, especially for lesions that adhere closely to the muscularis propria, which require skilled operating techniques and take a long time. Few hospitals can carry out the operation, let alone the basic level hospitals [2]. Under these circumstances, we have created a new technique, a Submucosal Ligation and Suck Endoscopic separated-Resection (SLSER) method, combining such technological advantages as endoscopic rubber, Submucosal cutting and sucking. The method uses a leather collar to snare the tumor so that its basement becomes cucurbita moschata; a cut in the shape of “——” is then made on the top of the tumor, exposing the muscularis propria; the body of the tumor is then sucked outward until it is fully removed from the tissue. The whole process is safe, convenient and enables complete resection. Using this method, we have realized the potential of the muscularis propria for complete resection. This article reports on the feasibility and safety of the new technique for the treatment of small gastric stromal tumors.
Case Information and Methods

Case information

This study included 61 patients who were diagnosed with GISTs detected by histomorphology between July 2008 and July 2011. Among these cases, 32 were male and 29 were female. Age ranged from 38 years to 69 years, and the average age was 56.2 years. Patients with Submucosal tumors found by endoscopy and confirmed with endoscopic ultrasonography inspection and patients with muscularis propria of tumors less than 14 mm in diameter, confirmed by pathology and immunohistochemistry [3], underwent the SLSER operation. All patients were in the range of normal for blood cell analysis, coagulation function and platelet count, and were not given anticoagulant drugs. All patients signed the informed consent pre-operation, and the study was approved by the hospital's Ethics Committee at Juijiang University.

Equipment

The following equipment was used: Fujioun 4400 Gastroscope (Japan), PENTAX 3830UT Endoscopic ultrasonography system (Japan), COOK snaring ligator and transparent cap (United States), Olympus HOOK or IT knife (CITY, COUNTRY), snaring instrument (Japan), and the ERBE ICC-200 high frequency cutting device (Germany).

Procedure

The procedure is described here in six steps.

- The snaring instrument links and wraps the tumor in the vertical arrangement, or partially overlap so as to increase the friction.

- The top of the tumor is cut in the shape of “—”.

- After the ligation, the tumor turns ischemic and colours purple. Then, a hook knife (or IT knife) is used to cut the top of the tumor body in a straight line, about 1/2 to 2/3 of the diameter of the tumor. At this time the formation of the tumor would probably be very difficult to correct. We suck the tumor to the side of the transparent cap and cut it.

- The transparent cap attracts the stromal tumor so that it can be separated from the tissue. The transparent cap is directly attracted to the top of the mesenchymal tumor. The field of vision gradually fills with white hard tissue. We maintain the gravitational force and pull the endoscopy to about 10 cm. When the endoscopic tension can be obviously felt, we gently shake the endoscope so that the stromal tumor is gradually isolated from the muscularis propria, until the ligation ring on the outside of the mucosa gradually declines to the pseudo-roots. We then remove the attractive force and observe the basal ring; if not satisfied, the above operation is repeated once or several times, until the tumor is integrally separated and the substrate are completely ligated.

- The root of the tumor is separated by the snare's traction. The tumor is loosely trapped, and is gathered by moving the snare to the tumor basement by jiggling the ring under the endoscope; this tightens and confirms the full separation of the tumor and the muscularis propria.

- Tumor is resected. The snare is elevated 1cm to 2 cm from the substrate and is given electric resection.

- Specimen processing Neutral formaldehyde solution is used to fix the tumor tissue that is subsequently detected pathologically. Immunohistochemistry included CD117, CD34, S100 protein, SMA and Desmin.

Efficacy

If complete separation resection was achieved, the process was considered successful in terms of efficacy. The criteria for a complete resection included that the removed tumor was complete and without defect, that the ligation ring in the wound basement had shrunken to 5 mm or so, that the mucosa was coved above the healed wound, and that no residual tumor remained. The criteria for a part separation resection included that defects could be seen in the resection of the tumor, that the diameter of the ligation ring in the substrate was greater than 8 mm, and that there was residual tumor in the wound. The wound was reviewed by endoscopy on Day 7 and Months 1, 3, 6 and 12 post-operation and evaluated for local recurrence.

Statistical analysis

Data presented are mean ± Standard Deviation (SD). The statistical significance of the difference was assessed using t-test. P values <0.05 were considered significant.

Results

General condition

Tumors that were low echo lesions of the muscularis propria of the stomach were identified by ultrasound and endoscopic diagnosis, and were determined GISTs by pathological examination. There were 61 cases of GISTs with diameters of less than or equal to 14 mm. Patients volunteered to undergo EMBLSSR. Of the 61 tumors in total, 39 came from males and 22 from females; 40 out of 61 lesions were located in the stomach fundus, 12 in the gastric body and nine in the gastric antrum.

Surgical situation

All 61 patients underwent surgery, so the resection rate was 100%. Sixty out of 61 (98%) cases were completely separated and resected. Only one case was incompletely separated and resected. The residual tumors and ligation rings of 61 cases fell off synchronously by endoscopic review without recurrence after 3 months. Operation times ranged from 7 minutes to 29 minutes, and the median time was 18 minutes. The length of hospital stay ranged from 3 days to 5 days, and the average was 3.7 days. Artificial ulcers were seen at Day 7 of post-operative observation, without recurrence at Months 1, 3, 6 or 12 post-operation.

Pathological findings

All of the patients were diagnosed with GISTs prior to treatment, by dig deep biopsy for pathology. Chunk specimens were obtained and were pathologically examined. All the diagnosed cases were positive with CD117, and 92% were positive with CD34. Immunohistochemical results confirmed gastric stromal tumors, and the risk classification of stromal tumors in the stomach was extremely low.
Discussion

Gastrointestinal stromal tumors derive from cajal cells, and are the most common submucosal tumors in the digestive tract. Even when the tumor diameter is less than 3 cm, they can still be low-grade malignant. Because of this unique low-grade malignant tendency, medical intervention must be emphasized. Potential risks need long-term follow-up, so choice of resection is extremely important. Surgical approaches to GISTs are inconsistent because of the variation in size, location and degree of malignancy, and there is currently a lack of consensus opinion. GISTs of greater than 3 cm in diameter are often treated by surgical resection or laparoscopic resection. Sun et al. [4] suggested that GISTs of less than 12 mm be treated by mucosal ligation; however, remnants may be recurring, there is a lack of pathological diagnosis and tumors may fall off incompletely. It has previously been proposed that a high frequency electric trap be directly used to resect a tumor following endoscopic band ligation, although this procedure can be associated with serious complications, such as incomplete resection, no way to ligate due to the high tension of the wall of stomach, and possible acute perforation of the stomach if the tumor directly falls away. Complications increase significantly with exogenous tumors. Recently, endoscopy and laparoscopy were performed together in combination therapy; under anesthesia. Zhou et al. [5] was the first to propose the Endoscopic Submucosal Excavation technique (ESE) on the basis of Endoscopic Submucosal Dissection (ESD). This kind of operation allows more complete resection, but is associated with high technical requirement, complications (bleeding, perforation and peritonitis), long operation time (30 minutes to 80 minutes) and some extra demands, such as general anaesthesia and airway support. Meidong et al. [6] put forward the Submucosal Tunnel Endoscopic Resection (STER) method for resection of stromal tumors, which has gradually spread throughout China, and is associated with significantly less complications although it is a more demanding operation.

Based on the above, we proposed and designed a method of Submucosal Ligation and Suck Endoscopic separated-Resection (SLSER), with the aim of avoiding serious complications. Common removal or excavation operations require high technological capabilities, and high risk factors exist, such as bleeding [7-14]. Use of a substrate ligation ring can to avoid or reduce bleeding. Even so, acute perforation from ligation ring slippage may still occur because of high tension after resection. So we designed a polycyclic arrangement of the technical ligation to control the basal gastric wall tension. This study shows that our method did not result in such complications as bleeding and perforation.

Furthermore, in view of the hard texture of stromal tumors, which is easier to separate than the mucosa layer, we cut the top of the mucosa and Submucosal, and repeated, to provide the strength needed to attract and pull to separate the tumor completely from the muscularis propria. The most important thing is that the ligation ring located at the base or neck of the tumor can slide fully into the substrate and decrease the tension of the stomach wall as much as possible. The standard previously proposed by Siyu Sun was to perform mucosal ligation in tumors of less than 12 mm in diameter. We found that in stromal tumors of less than 14 mm in diameter, the ligation ring trapped the tumor neck successfully by attracting and pulling, so that the operation was successful. With the SLSER method, techniques for preventing perforation and bleeding complications were synchronized.

In order to further separate the tumor, the snare was used to loosen the trap, so as to separate the tumor gradually. The SLSER method differs from ESE and STER, separation is not achieved by water injection into the Submucosal layer or gradually by electric knife. With SLSER, the tumor was firstly limited, the basal layer was ligated, the tumor was cut and attracted to separate, so that the tumor falls out and the ligation ring shrinks inside for ligation. The technique was a simple operation, and its safety was improved significantly. After the tumor underwent the preliminary segregation, it was separated again by ligation ring until it was dragged outside and resected completely. We found that both endogenous and exogenous GISTs could be excised completely. The snare ring had not shifted after resection. Under the remaining mucosa tissue resistance, no supplementary haemostatic treatment, such as haemoclips, were required.

In summary, this method is simple and safe. Operational time is short and it is suitable for use in basic medical units. Although no relapse was found in our patients as determined by endoscopy, long-term follow up for patients undergoing this new procedure is required to observe the long-term effects. The SLSER technique can be used in primary health care units because it is a relatively simple, easy and safe technology.

References