

Laparoscopic resection of intestinal stromal tumors with transrectal extract specimen

A case report

Xuewei Wang, MMed, Peng Wang, MMed, Hao Su, MMed, Jianwei Liang, PhD, Haitao Zhou, PhD, Zhixiang Zhou, PhD*

Abstract

Rationale: Small intestine stromal tumors (SISTs) are a type of gastrointestinal stromal tumor (GIST) that has an insidious onset. Natural orifice specimen extraction (NOSE) surgery has been gradually developed for the treatment of colorectal, stomach, small intestine, hepatobiliary, and gynecological tumors because of its safety and feasibility. This case study explored the possibility of applying the NOSE method for the treatment of SIST.

Patient Concerns: A 59-year-old male patient was admitted to the hospital after having an irregular abdominal mass for >1 month that was detected by a medical examination. Thoracic and abdominopelvic enhanced computer tomography revealed irregular masses on the left side of the abdominal cavity.

Diagnosis: Sist.

Interventions: Nose (laparoscopic resection of intestinal stromal tumors with transrectal extract specimen and no abdominal auxiliary incision) surgery was performed.

Outcomes: The patient underwent operation successfully and recuperates well with no complications.

Lessons: Nose surgery is minimally invasive, results in patient recuperation with no complications, and is considered to be feasible for SIST treatment.

Abbreviations: GIST = gastrointestinal stromal tumor, NOSE = natural orifice specimen extraction, NOTES = natural orifice transluminal endoscopic surgery, SIST = small intestine stromal tumors, TEM = transanal endoscopic microsurgery.

Keywords: case report, intestinal stromal tumor, laparoscopic surgery, natural orifice specimen extraction surgery

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Patient Consent Statement: The patient has provided informed consent for publication of the case.

Patient Consent: The patient and his family members have understood the treatment method/surgical method/possible risks and complications of the disease, and have signed the informed consent for the operation.

Consent for Publication: Informed written consent was obtained from the patient for publication of this case report and accompanying images.

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Department of Colorectal Surgical Oncology, National Cancer Center/National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College, Beijing, P.R. China.

* Correspondence: Zhixiang Zhou, National Cancer Center/Cancer Hospital, Chaoyangqu, Panjiayuan, Nanli 17, Beijing, P.R. China (e-mail: zhouzx001@163.com).

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1. Introduction

The concept of a gastrointestinal stromal tumor (GIST) was first reported by Mazur and Clark in 1983.^[1] GISTs are found primarily in the gastrointestinal tract, with c-Kit protein (CD117) being expressed in the tumor. This is a type of mesenchymal tumor presented with spindle cells, epithelial-like cells, or even polymorphic cells, with an extremely low incidence of approximately 1/10 to 2/100,000.^[2] A small-intestine stromal tumor (SIST) is a type of GIST that has an insidious onset. In the early stages, the patients usually do not present with obvious symptoms and physical signs. Early detection and early surgical treatment is the only method by which to radically eliminate SISTs. Natural orifice specimen-extraction surgery (NOSE) has gradually been developed in the treatment of colorectal, stomach, small intestine, hepatobiliary, and gynecological tumors because of its safety and operability.^[3]

2. Case report

2.1. Materials and methods

A 59-year-old male patient was admitted to the hospital because of having an irregular abdominal mass for >1 month that was detected by medical examination. No hematochezia, changes in bowel habits, abdominal pain, abdominal distension, or other symptoms were evident. No positive sign was observed during an

abdominal examination. Thoracic and abdominopelvic enhanced computer tomography revealed irregular masses on the left side of abdominal cavity $\sim 3.7 \times 2.8$ cm in diameter with a lobulate edge and slightly uneven but with significant enhancement. Irregular calcification was observed inside the mass. The lesion was in close proximity to the wall of the small intestine, with a clear surrounding fat space. We considered that it could possibly be a stromal tumor. An abdominal ultrasound indicated a hypoechoic nodule in the upper abdomen 3.7×2.6 cm in diameter with a regular shape and clear boundary. A dot strong echo and rich blood flow were observed in the nodule, which moved with respiration. The mass was believed to have originated from the intestinal tract.

2.2. Surgical procedure

The patient's skin was disinfected with iodophor and covered with sterile towels, and a 12-mm Trocar was used as a viewing hole at the umbilicus. Pneumoperitoneum was established, 12-mm and 5-mm Trocars were placed as manipulation holes in the right lower abdomen and the right side of umbilicus, and a 5-mm Trocar was placed in the left lower abdomen as an auxiliary manipulation hole. There were no ascites in the abdominal cavity and no metastatic nodules were observed in the pelvis. No abnormalities were found in the hepatobiliary system, pancreas, or spleen. A dark-brown substantive spherical mass $\sim 5 \times 5$ cm in diameter with a smooth surface and intact capsule was observed in the small intestine.

The mesentery corresponding to the intestinal mass was separated both proximally and distally 5 cm from the lesion using an ultrasonically activated scalpel. The intestine was dissected with an Endo-GIA stapler and the cut ends were disinfected with alcohol gauze, after which the Endo-GIA stapler was used for side-to-side anastomosis. The site was sterilized again and a normal blood supply through the anastomosis site was ensured. The plasma muscle layer was strengthened.

The anus and rectum were disinfected and when anal opening was dilated using 4 fingers, an ~ 2 -cm transverse incision was made in the upper rectum ~ 5 cm above the peritoneal reflex using an ultrasonic knife; the incision was disinfected with alcohol gauze. A 20-cm protective bag was inserted through the main Trocar hole in the right lower abdomen. Lubricated with iodophor, one end of the protective bag was pulled through the anus, into which the removed specimen was placed. When the entire specimen was inside the protective bag, the ligation strap at the opening of the proximal protective bag was tightened and the protective bag was pulled out with the sample, paying attention to maintaining the integrity of the tumor and avoiding any rupture of the tumor capsule. The distal rectum stump was lifted using a clamp and the endoluminal incision was closed using the Endo-GIA stapler. When no bleeding was ensured, the abdominal pelvis was flushed with distilled water and saline. A drainage tube was placed through the left lower abdomen and left within the pelvic cavity. Pneumoperitoneum was stopped and the Trocar hole was closed.

3. Results

The total surgery time was 2 hours 20 minutes with ~ 50 mL blood lost during the procedure. The patient consciously passed gas by anus 48 hours postsurgery and was given a small amount of water. Three days after surgery, the abdominal drainage tube was

removed and a liquid diet was prescribed. The patient had smooth postoperative passage of anal gas and bowel movements. The abdominal incision healed well with no redness, swelling, or leakage. The postoperative hospital stay was 6 days.

3.1. Pathology results

The pathology report showed SISTs, with a maximum diameter of 4 cm, mitotic counts $< 5/50$ high-powered fields (HPF) (average $1\text{--}3/50$ HPF), and a classification of low risk. The tumor had invaded the lamina propria to the serosa. No tumors were observed at the incision margins of the small intestine. Immunohistochemical results were as follows: CD117 (3+), DOG1 (3+), SDHB (3+), CD3 4(+), desmin (-), Ki-67 ($< 5\%$), S-100 (-), and SMA (-).

4. Discussion

GIST is less common in primary tumors of the gastrointestinal tract, but it is the most common gastrointestinal stromal tumor. Originating from gastrointestinal interstitial astrocytes, GIST is characterized by multiple differentiation. C-Kit mutations and protein expressions were observed in the tumor cells.^[1] The tumor was located mainly in the muscular layer. Unlike gastrointestinal cancer, most of GISTs are exogenously inflated. Inward growth of the tumor can invade the mucous membranes, while outward growth can invade the serous membranes, mainly to the serosal surface. GIST has a low incidence, occurring mainly in middle-aged and elderly people, with unspecific clinical manifestations. The symptoms are related mainly to the location of the tumor, its size, its growth pattern, its degree of differentiation, and whether it is ulcerated and metastasized. The tumor often presents with changes in bowel habits; however, bloody stools have also been reported in some patients as being the most common initial symptoms,^[4] although these symptoms are nonspecific. Thus, patients often delay medical examinations and immediate treatment, which greatly affects any long-term prognosis. In this case, the tumor was found during a routine physical examination; the patient had no obvious symptoms or positive signs.

The main treatment methods for stromal tumors are surgery and targeted therapies, such as prescribed administration of imatinib. Less than 5% GIST patients respond well to traditional radiotherapy and chemotherapy^[5]; therefore, surgical resection is an effective treatment of stromal tumors,^[6] and most likely the only method by which to eliminate the disease. Whether the tumor can be completely removed by the first surgery is an important factor affecting the prognosis; therefore, enough normal marginal tissue must be removed at the same time.^[7] Although an R0 resection is the goal, the literature reports that an R1 resection is performed in $\sim 8.8\%$ of cases, which might be related to tumor size (> 10 cm), tumor location, or an intraoperative tumor rupture.^[8] There are many methods by which to remove stromal tumors, such as endoscopic surgery, laparotomy, laparoscopic surgery, and laparoscopic-endoscopic surgery. With the increasingly sophisticated surgical skills of surgeons and the continuous advancement of precision medical devices, minimally invasive treatment is being favored by more and more surgeons and patients over traditional treatments. The small intestine is located in the middle of the entire gastrointestinal tract, and endoscopic surgery through the mouth or anus has proved to be extremely difficult. The laparoscopic technique used

here is more suitable for SIST treatment because it has the advantages of a wide visual plane, high flexibility, simultaneous diagnosis and treatment, and fewer injuries. In recent years, with the development of laparoscopic surgery and the advent of three-dimensional laparoscopy, NOSE has become possible using total laparoscopy.

NOSE is defined as an intra-abdominal surgical procedure that involves laparoscopic instruments, transanal endoscopic microsurgery, or soft endoscopes. Specimens are taken through a natural orifice (rectum or vagina) without auxiliary incisions into the abdominal wall. NOSE technology skillfully combines the concept of natural orifice transluminal endoscopic surgery (NOTES) with the laparoscopic technique. The biggest difference between NOSE and conventional laparoscopic surgery is the method by which the specimens are removed. Without an auxiliary incision into the abdominal wall, only a few minor incisions remain after the procedure, which ensures that the surgery is minimally invasive and highly maneuverable^[3] and significantly reduces the patient's postoperative pain. Wolthuis et al^[10] have conducted a study comparing the short-term postoperative efficacy of NOSE with conventional laparoscopic surgery. Their results showed that postoperative pain is significantly higher in patients after conventional laparoscopic surgery than in those after NOSE. In addition, patients in the conventional laparoscopic surgery group are more dependent on postoperative analgesics because incision pain is severe and an important factor that affects postoperative recovery. NOSE reduces the chances of postoperative complications, such as incision infections and incision hernias,^[9] relieves the patient's mental anguish, and shortens the patient's hospital stay.

NOSE can be performed on colorectal, stomach, small intestine, hepatobiliary, and gynecologic tumors; however, there have been no reports applying the NOSE method on SISTs. Using this case study, the possibility of applying the NOSE method on SISTs is proposed. Expert Consensus of the Colorectal Cancer Surgery (2017 version) (Consensus) clearly pointed out that the indication of NOSE surgery must first meet the requirements of conventional laparoscopic surgery, and its application for SIST treatment is no exception. Second, Consensus recommended that the diameter of specimens in rectal NOSE should be <3 cm. The author believes that SIST is benign with an intact capsule. According to the actual situation with our case, including the degree of mesenteric hypertrophy and the anatomic characteristics of the natural tract, we considered that the tumor size could be appropriately broadened.

During the therapeutic process using the NOSE method on SISTs, the author believes that the most important outcome is complete removal of the tumor. DeMatteo et al^[10] have reported on 200 patients treated for GIST. In their report, the median 5-year survival was significantly longer in those in which the tumor was completely removed compared with those in which there was only a partial resection (66 months vs 22 months, respectively). Matthews et al^[11] have shown that the 5-year survival rates for GIST patients with complete and incomplete tumor removal were 42% and 8% to 9%, respectively, a statistically significant difference. Wan et al^[12] have conducted follow-up examinations on 153 GIST patients. Their results found that the median survival time of patients after complete tumor removal was 66.0 months, while those after only a partial resection was only 23.8 months. Thus, the postoperative prognosis of GIST patients after complete and partial tumor resection greatly differed. As mentioned, complete tumor resection is the basic principle of

GIST surgery that requires a sufficient surgical resection area as far from the tumor as possible to meet the negative-margin criteria, namely R0 resection (no residual tumor observed under a microscope). In addition, most SISTs, especially large tumors, are suspended atop the serosal surface of the small intestine or on the mesentery. The tumor can be easily ruptured because of an improper procedure; therefore, care must be taken during surgery to maintain the integrity of the tumor capsule. In principle, we do not explore the tumors during surgery to avoid various sharp and blunt traumas caused by instruments and hand operations, extensive dissemination of the tumor in the abdominal cavity, and planting metastasis. Most scholars generally believe that, based on complete resection of the tumor, it is not necessary to perform extensive lymph node dissection^[13] because the main GIST growth mode is exogenous expansion instead of diffuse infiltration, which is different from that of cancer and lymph node metastasis rarely occurs. The main metastasis pathway is hematogenous and intraperitoneal metastasis. Systematic lymph node dissection might be counterproductive by increasing the incidence of complications and affecting postoperative recovery.

In addition, intraoperative full anal dilatation and gentle manipulation should be performed to prevent injury to the anal sphincter during specimen removal. When the rectal stump is closed, rectal stenosis or closed-end bleeding should be strictly avoided. Moreover, it is necessary to disinfect the end of the intestine, use the specimen bag to pull out the specimen, and wash the abdominal pelvis after surgery, so as to meet the sterility criterion for the surgical procedure as much as possible.

There are several new studies and reports on NOSE, and a large number of these have shown that NOSE surgery has good minimally invasive results and is highly feasible; however, applying the NOSE method on patients with SIST and its long-term benefits must be further studied by conducting and collecting data on many more of these procedures.

Author contributions

Data curation: Xuewei Wang, Peng Wang.

Methodology: Jianwei Liang.

Resources: Haitao Zhou, Zhixiang Zhou.

Supervision: Zhixiang Zhou.

Writing – original draft: Xuewei Wang, Peng Wang, Hao Su.

Writing – review & editing: Haitao Zhou, Zhixiang Zhou.

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