

# World Journal of *Clinical Cases*

*World J Clin Cases* 2023 March 26; 11(9): 1888-2122



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- 1888 Endoscopic transluminal drainage and necrosectomy for infected necrotizing pancreatitis: Progress and challenges  
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- 1918 COVID-19 related liver injuries in pregnancy  
*Sekulovski M, Bogdanova-Petrova S, Peshevska-Sekulovska M, Velikova T, Georgiev T*
- 1930 Examined lymph node count for gastric cancer patients after curative surgery  
*Zeng Y, Chen LC, Ye ZS, Deng JY*
- 1939 Laparoscopic common bile duct exploration to treat choledocholithiasis in situs inversus patients: A technical review  
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- 1963 Clinicopathological features and expression of regulatory mechanism of the Wnt signaling pathway in colorectal sessile serrated adenomas/polyps with different syndrome types  
*Qiao D, Liu XY, Zheng L, Zhang YL, Que RY, Ge BJ, Cao HY, Dai YC*

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**RESPONSIBLE EDITORS FOR THIS ISSUE**

Production Editor: *Ying-Yi Yuan*; Production Department Director: *Xiang Li*; Editorial Office Director: *Jin-Lei Wang*.

**NAME OF JOURNAL**

*World Journal of Clinical Cases*

**ISSN**

ISSN 2307-8960 (online)

**LAUNCH DATE**

April 16, 2013

**FREQUENCY**

Thrice Monthly

**EDITORS-IN-CHIEF**

Bao-Gan Peng, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati, Ja Hyeon Ku

**EDITORIAL BOARD MEMBERS**

<https://www.wjgnet.com/2307-8960/editorialboard.htm>

**PUBLICATION DATE**

March 26, 2023

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**ARTICLE PROCESSING CHARGE**

<https://www.wjgnet.com/bpg/gerinfo/242>

**STEPS FOR SUBMITTING MANUSCRIPTS**

<https://www.wjgnet.com/bpg/GerInfo/239>

**ONLINE SUBMISSION**

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## Novel combined endoscopic and laparoscopic surgery for advanced T2 gastric cancer: Two case reports

Jian-Hua Dai, Feng Qian, Lei Chen, Sen-Lin Xu, Xiao-Feng Feng, Hong-Bo Wu, Yao Chen, Zhi-Hong Peng, Pei-Wu Yu, Gui-Yong Peng

**Specialty type:** Gastroenterology and hepatology

**Provenance and peer review:**

Unsolicited article; Externally peer reviewed.

**Peer-review model:** Single blind

**Peer-review report's scientific quality classification**

Grade A (Excellent): 0  
Grade B (Very good): B  
Grade C (Good): C  
Grade D (Fair): 0  
Grade E (Poor): 0

**P-Reviewer:** He YH, China;  
Murariu MS, Romania

**Received:** December 1, 2022

**Peer-review started:** December 1, 2022

**First decision:** January 2, 2023

**Revised:** January 14, 2023

**Accepted:** February 22, 2023

**Article in press:** February 22, 2023

**Published online:** March 26, 2023



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### Abstract

#### BACKGROUND

The standard treatment for advanced T2 gastric cancer (GC) is laparoscopic or surgical gastrectomy (either partial or total) and D2 lymphadenectomy. A novel combined endoscopic and laparoscopic surgery (NCELS) has recently been proposed as a better option for T2 GC. Here we describe two case studies demonstrating the efficacy and safety of NCELS.

#### CASE SUMMARY

Two T2 GC cases were both resected by endoscopic submucosal dissection and full-thickness resection and laparoscopic lymph nodes dissection. This method has the advantage of being more precise and minimally invasive compared to current methods. The treatment of these 2 patients was safe and effective with no complications. These cases were followed up for nearly 4 years without recurrence or metastasis.

#### CONCLUSION

This novel method provides a minimally invasive treatment option for T2 GC, and its potential indications, effectiveness and safety needs to be further evaluated in controlled studies.

**Key Words:** Novel combined endoscopic and laparoscopic surgery; T2 gastric cancer; Endoscopic submucosal dissection and full-thickness resection; Laparoscopic lymph nodes

dissection; Minimally invasive; Case report

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**Core Tip:** We propose a new method of combining endoscopic local lesion resection and laparoscopic lymph node dissection for 2 cases of advanced T2 gastric cancer (GC). This new method has the advantages of precision and being minimally invasive with similar outcomes as surgical resection. It is a novel method providing a minimally invasive treatment option for T2 GC.

**Citation:** Dai JH, Qian F, Chen L, Xu SL, Feng XF, Wu HB, Chen Y, Peng ZH, Yu PW, Peng GY. Novel combined endoscopic and laparoscopic surgery for advanced T2 gastric cancer: Two case reports. *World J Clin Cases* 2023; 11(9): 2029-2035

**URL:** <https://www.wjgnet.com/2307-8960/full/v11/i9/2029.htm>

**DOI:** <https://dx.doi.org/10.12998/wjcc.v11.i9.2029>

## INTRODUCTION

The standard treatment for advanced gastric cancer (GC) is laparoscopic or surgical gastrectomy (either partial or total) and D2 lymphadenectomy[1]. Here, we report 2 cases indicating that endoscopic local lesion resection combined with laparoscopic lymph node dissection may be an effective treatment for T2 GC. These cases included a 23-year-old male with a 2.0 cm × 2.0 cm T2 poorly differentiated gastric antrum adenocarcinoma and a 54-year-old female with a 2.0 cm × 2.5 cm T2 poorly differentiated gastric body adenocarcinoma. Both were resected by endoscopic submucosal dissection and full-thickness resection (ESDFTR) and laparoscopic lymph node dissection with good postoperative recovery. This method has the advantages of being more precise and minimally invasive compared to current methods. With this in mind, its potential indications, effectiveness and safety need to be further evaluated in controlled studies.

At present, partial or total gastrectomy is used in the minimally invasive treatment of advanced GC. However, this procedure has the drawback that it destroys the normal anatomical structure of the stomach seriously affecting its physiological function. It is often associated with substantial trauma, slower recovery, a higher complication rate and decreased postoperative quality of life. With advances in endoscopic resection technology, endoscopic submucosal dissection (ESD) or closed laparoscopic and endoscopic cooperative surgery is increasingly applied for T1 early cancer[2]. Endoscopic full-thickness resection technology can completely remove benign tumors of the muscularis propria[3]. For treatment of T2 GC, we reported a novel combined endoscopic and laparoscopic surgery (NCELS) to resect local lesions with ESDFTR (Figure 1) along with lymph node removal by laparoscope, which together achieved complete resection of the lesion and thorough clearing of the lymph nodes. This procedure also allowed preservation of the anatomical structure and physiological function of the stomach thereby enhancing the postoperative quality of life of the patients.

## CASE PRESENTATION

### Chief complaints

A 23-year-old male and a 54-year-old female were admitted to our hospital with poorly differentiated gastric adenocarcinoma.

### Personal and family history

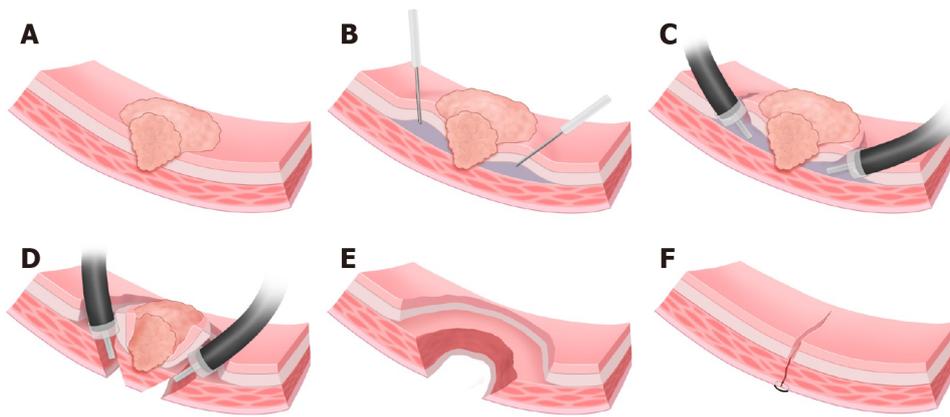
No specific medical history.

### Laboratory examinations

Carcinoembryonic antigen (CEA) test values were in the normal range.

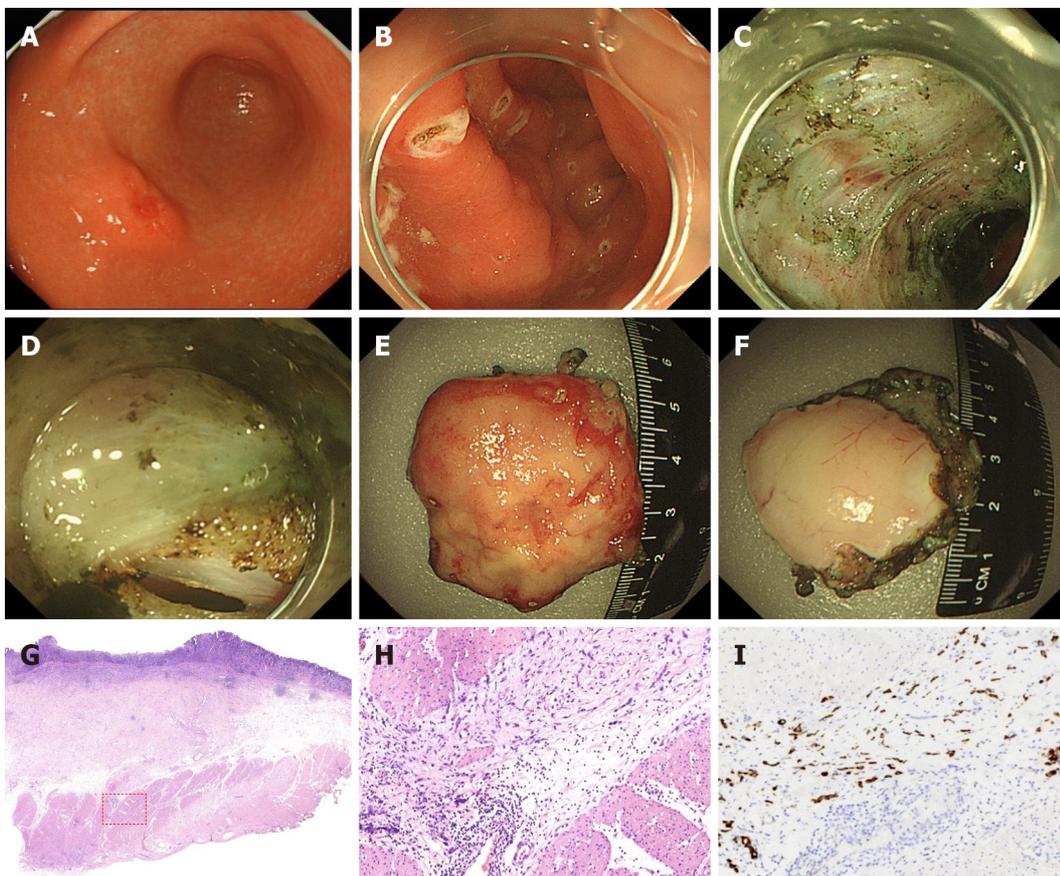
### Imaging examinations

Gastroscopy revealed a 2.0 cm × 2.0 cm protuberant lesion on the greater curvature of the anterior wall of the gastric antrum in the male patient (Figure 2) and a 2.0 cm × 2.5 cm 0-IIa + IIc type lesion on the greater curvature of the lower gastric body in the female patient (Figure 3). Pathological examination showed poorly differentiated adenocarcinoma. Contrast-enhanced computed tomography (CT) of the



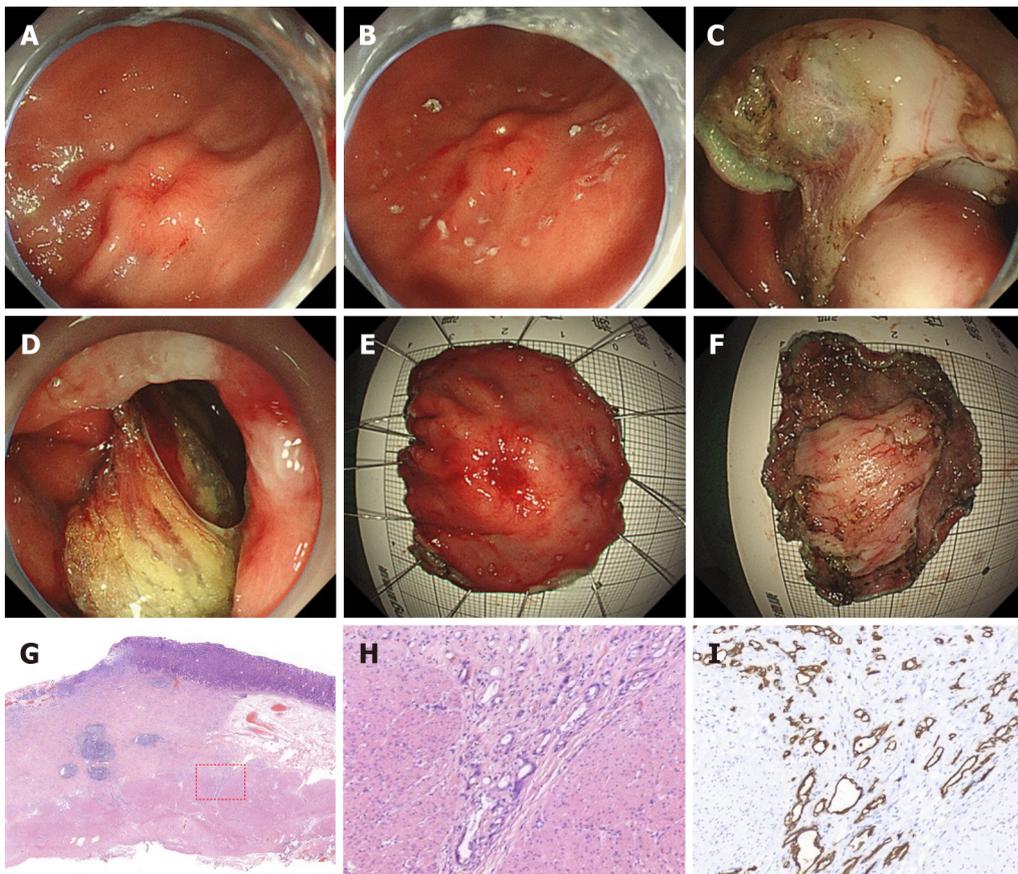
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**Figure 1 Endoscopic submucosal dissection and full-thickness resection.** A: T2 gastric cancer lesion; B: Submucosal injection on the lateral side of the lesion; C: Endoscopic submucosal dissection; D: The circumferential full-thickness resection is performed at 0.5-1.0 cm lateral to the deep infiltration, and the resected lesion is removed; E: Gastric wall wound after endoscopic submucosal dissection and full-thickness resection. The serosal defect is smaller than the mucosal defect; F: The gastric wall wound is sutured by endoscope or laparoscope.



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**Figure 2 Case 1, minimally invasive endoscopic resection of T2 gastric cancer (endoscopic submucosal dissection and full-thickness resection) and pathology.** A and B: Protuberant lesion on the greater curvature of the anterior wall of the gastric antrum, about 2.0 cm × 2.0 cm. The resection area was marked 1.5 cm outside the edge of the lesion, then endoscopic submucosal dissection (ESD) was performed along the outside of the marked point; C and D: ESD circumferentially peeled to the submucosa, which was thinned and unclear, indicating that the lesion was deeply infiltrated (SM3 or T2). At 0.5-1.0 cm outside the unclear portion of submucosa, the lesion was resected by ESD and full-thickness resection; E: Mucosal surface of resected lesion (3.2 cm × 3.5 cm); F: The serosa of the resected lesion revealed that the area of the resected mucosa (normal mucosa and the mucosa with shallow infiltration) was significantly larger than that of the serosa (location of deep infiltration); G and H: Poorly differentiated adenocarcinoma, infiltrating into the superficial layer of the muscularis propria (red box); scale bar, 500 μm; I: Immunohistochemical staining of cyokeratin expression at location of poorly differentiated adenocarcinoma.



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**Figure 3 Case 2, minimally invasive endoscopic resection of T2 gastric cancer (endoscopic submucosal dissection and full-thickness resection) and pathology.** A and B: Lesion on the greater curvature of the lower gastric body, central ulcer, marginal eminence, about 2.0 cm × 2.5 cm. The resection area was marked 1.5 cm outside the edge of the lesion, and endoscopic submucosal dissection (ESD) was performed along the outside of the marked point. ESD circumferentially peeled to the submucosa, which was thinned and unclear, indicating that the lesion was deeply infiltrated (SM3 or T2); C and D: At 0.5-1.0 cm outside the unclear portion of submucosa, the lesion was resected by ESD and full-thickness resection; E: Mucosal surface of resected lesion (3.8 cm × 4.0 cm); F: The serosa of the resected lesion showed that the area of the resected mucosa (normal mucosa and the mucosa with shallow infiltration) was significantly larger than that of the serosa (location with deep infiltration); G and H: Poorly differentiated adenocarcinoma, containing signet ring cells, infiltrating into the superficial layer of muscularis propria (red box); scale bar, 500 μm; I: Immunohistochemical staining of cyokeratin expression at location of poorly differentiated adenocarcinoma.

abdomen showed that areas of the antrum and gastric body were slightly thickened. No metastasis to the lymph nodes or other organs was observed on the chest and abdomen CT scans. Endoscopic ultrasonography revealed invasion of the muscularis propria.

## FINAL DIAGNOSIS

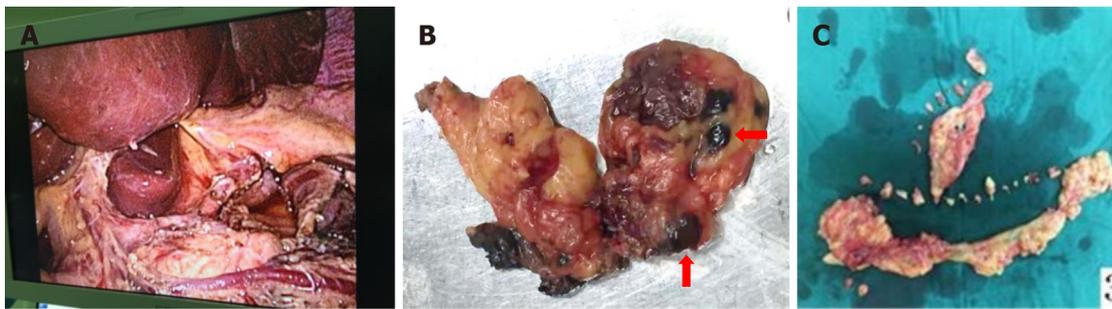
The clinical diagnosis in both cases was T2 GC without lymph node and other organ metastasis. Postoperative pathological diagnosis was T2 GC for both cases.

## TREATMENT

The patients were placed under general anesthesia with endotracheal intubation. The procedure included four steps as follows:

Step 1: Determine the demarcation line. Magnifying endoscopy with narrow band imaging was used to determine the demarcation line of the lesion. Marking was set to 1.5 cm outside the lesion.

Step 2: ESD/FTR. After submucosal injection, the lesion was dissected by circumferential ESD until the tumor infiltrated deeper (the submucosa was thin or unclear), then dental floss was used to traction the lesion. A whole layer incision was performed at 0.5-1.0 cm lateral to the deep infiltration, followed by circumferential full-thickness resection, and the resected lesion was removed.



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**Figure 4 Novel combined endoscopic and laparoscopic surgery.** A: Laparoscopic D2 lymphadenectomy can achieve skeletonization of common hepatic artery, proper hepatic artery and splenic artery; B and C: Dissection of lymph nodes (red arrow) and omentum.

Step 3: Gastric wound suture and lymph node dissection. The gastric wound was sutured with an endoscope or laparoscope. Then regional lymph nodes were radically dissected (Figure 4).

Step 4: Pathological examination. The resected gastric specimens and lymph nodes were pathologically examined to determine the depth of invasion and lymph node metastasis.

## OUTCOME AND FOLLOW-UP

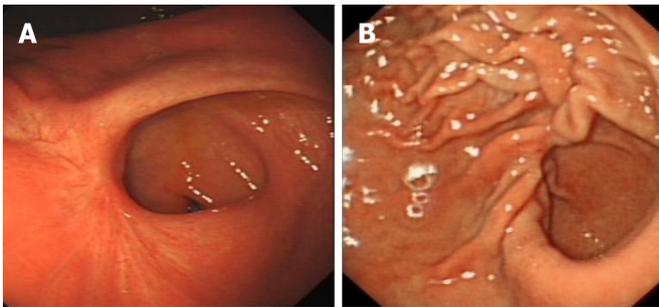
The 2 cases were characterized as poorly differentiated adenocarcinoma, infiltrating into the superficial layer of the muscularis propria. One case had negative lymph node metastasis, and the other case had nerve infiltration. Postoperative pathological diagnosis was T2 GC for both cases.

The patients were discharged 8 d and 10 d after operation. No local or metastatic recurrence of lymph nodes and organs were found in regular review of gastroscopy (Figure 5) and enhanced CT of the abdomen within 4 years for the male patient and 3 years for the female patient following the operation. CEA test values remained in the normal range. Their postoperative quality of life was good, with no significant gastrointestinal symptoms, and they retained a normal diet and weight.

## DISCUSSION

At present, there are two main techniques for minimally invasive treatment of GC: endoscopic resection and laparoscopic radical resection. Both endoscopic and laparoscopic therapies have their own advantages and limitations in the treatment of T2 GC. The advantages of endoscopic resection are that the lesion can be observed under direct vision, the resection range of the lesion can be accurately determined, the lesion can be completely removed, and the normal gastric anatomy and gastric physiological function can be preserved, thus ensuring postoperative quality of life of the patient. However, the limitations are that the lymph nodes cannot be cleared and the risk of lymph node metastasis cannot be eliminated[4]. The advantage of laparoscopic surgery is that it can completely remove the lesion and thoroughly clear the lymph nodes. However, because T2 cancers grow in the lumen, the extent of the lesion cannot be accurately determined outside the gastric wall. Therefore, laparoscopic surgery alone requires partial or total gastrectomy, which destroys the normal anatomical structure of the stomach and affects the physiological function of the stomach, thus seriously affecting postoperative quality of life of the patient, combined with a risk of local residue and recurrence[5,6].

T2 GC often has deep infiltration in the central part of the lesion, while the surrounding region is shallow, with mucosal or submucosal infiltration. Using ESD/FTR technology, submucosal dissection can be used to completely remove the mucosal and submucosal infiltrating lesion, followed by full-thickness resection to remove the lesion in the deep submucosa and muscularis propria, which can minimize the damage to the gastric anatomical structure providing a more precise and minimally invasive treatment option. In addition, laparoscopy is a more reliable procedure to seal the gastric wound. Furthermore, the lymph nodes can be thoroughly cleared of metastatic tumor tissue. Therefore, the NCELS can both provide a cure and be precise and minimally invasive. Compared with traditional surgery, NCELS for T2 GC achieved complete resection of the lesion, thorough clearing of the lymph nodes and preservation of the anatomical structure and physiological function of the stomach. It has the advantages of less trauma, fewer complications, lower cost and better postoperative quality of life.



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**Figure 5** Endoscopy images after endoscopic submucosal dissection and full-thickness resection. A: Case 1 endoscopy image after endoscopic submucosal dissection and full-thickness resection (ESDFTR); B: Case 2 endoscopy image after ESDFTR.

## CONCLUSION

The novel method described here provides a minimally invasive treatment option for T2 GC. However, the selection of standard indications, surgical methods, short-term and long-term complications, long-term recurrence rate and prognosis still need further evaluation.

## FOOTNOTES

**Author contributions:** Dai JH, Qian F and Chen L contributed equally to this work, and they were involved in the patient treatment and postoperative management; Xu SL provided pathological data and corresponding analysis; Feng XF, Wu HB, Chen Y, Peng ZH and Yu PW analyzed the cases and postoperative management; Peng GY designed the research study, performed endoscopic treatments on patients and wrote the manuscript; All authors have read and approved the final manuscript.

**Informed consent statement:** All study participants provided informed written consent prior to study enrollment.

**Conflict-of-interest statement:** The authors declare that they have no conflicts of interest to disclose.

**CARE Checklist (2016) statement:** The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised according to the CARE Checklist (2016).

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**S-Editor:** Zhang H

**L-Editor:** Filipodia

**P-Editor:** Zhang H

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