

Complete Closure of Gastric Defect with Improved Purse-String Suture Technique Using Single-Channel Endoscope

Min Lin¹, Qiang Wang¹, Feng-Dong Li¹, Rui Li², Jin Huang¹

¹Department of Gastroenterology, The Affiliated Changzhou No. 2 People's Hospital, Nanjing Medical University, Changzhou, Jiangsu 213000, China

²Department of Gastroenterology, The First Affiliated Hospital of Soochow University, Suzhou, Jiangsu 215006, China

To the Editor: Recently, with the development of endoscopic therapy technology, the incidence of iatrogenic perforation is also increasing. If the defect was not treated properly, subsequent gastrointestinal fistula and infection could lead to serious complications. This study evaluated a simple method for close gastric defect after endoscopic treatment, with endoloop and metallic clips using single-channel endoscope.

The study was approved by the Ethics Committee of The Affiliated Changzhou No. 2 People's Hospital (No. KY201601) and conducted in accordance with the *Declaration of Helsinki*, and written informed consent was obtained from each patient. A total of 48 patients from January 2016 to January 2018 at The Affiliated Changzhou No. 2 People's Hospital were retrospectively analyzed. Among these patients, 22 patients had early gastric cancer that underwent endoscopic submucosal dissection (ESD) treatment and combined muscularis propria (MP) defect or perforation, and 26 patients had subepithelial tumor (SET) originating from the MP that underwent endoscopic full-thickness resection (EFTR) treatment. The gastric defects were closed with improved purse-string suture technique.

Standard ESD and EFTR techniques were mentioned previously;^[1,2] endoscopic carbon dioxide insufflation was used during the procedure. The defect was closed immediately with endoloop (LeClamp™ Loop-20 and Loop-30; Leo, Changzhou, China) and metallic clips (Micro-Tech, China) using single-channel endoscope (GIF-Q260J; Olympus, Tokyo, Japan). First, the endoloop was placed into the gastric cavity by metallic clip through the endoscopic channel, and then the endoloop was anchored onto the defect's distal margin with the clip; second, the endoloop was symmetrically embedded onto the margin of the defect with several clips, and the clips could be repeatedly opened and closed if the clamping was not satisfactory; third, the delivery system was inserted and the removable hook was connected with the ring buckle of the endoloop; the endoloop was slowly tightened so that the defect was closed; finally, the delivery system was withdrawn [Figure 1]. Other clips were added if purse-string closure was not tight. During the procedure, a 10-ml syringe was used to relieve abdominal hypertension if the pneumoperitoneum

was obvious. A stomach tube was placed if full-thickness defect of gastric wall. Patients were asked to keep supine position and fast after operation. Other treatments included fluid replacement, proton pump inhibitors, antibiotics, and hemostasis. Abdominal sign and the body temperature should be observed closely. Surveillance endoscopy was performed at the 3rd and the 6th month after operation to observe wound healing.

The overall technical success rate (TSR), clinical success rate (CSR), complications, and procedure time of the 48 patients were evaluated. Technical success was defined as the complete closure of the gastric defect through the purse-string suture technique; clinical success was defined as nondelayed perforation during the postoperative and 6th month during follow-up.

The endoscopic operations in all patients were successful, and the rate of *en bloc* resection was 100%. The mean procedure time was 87 ± 21 min, the mean closure time was 18 ± 5 min, mean size of the lesion was 2.4 ± 0.4 cm, and TSR was 94%. In three cases, the endoloop was ruptured during suture because of tightening the endoloop too hard. Twice regarding the defect was narrower by purse-string suture, additional several metallic clips were deployed until the defect was entirely closed. Once a new endoloop was replaced, purse-string suture was carried out again. There were no serious complications, such as gastrointestinal fistula or intra-abdominal abscess. Patients felt slightly abdominal pain or discomfort after the operation, and some patients experienced fever with the body temperatures <38.0°C, recovering within 1–3 days. The mean postoperative hospital stay was 4.6 ± 0.7 days. Endoscopy and abdominal computed tomographic scan were performed in the 3rd month and 6th month after operation. Many of the clips and loops dropped, but some metallic clips and loops remained *in situ*. The mean follow-up period was 13 ± 6 months. No tumor

Address for correspondence: Dr. Jin Huang,

Department of Gastroenterology, The Affiliated Changzhou No. 2 People's Hospital, Nanjing Medical University, China
E-Mail: tianya-liulang@sohu.com

Access this article online

Quick Response Code:



Website:
www.cmj.org

DOI:
10.4103/0366-6999.241817

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

© 2018 Chinese Medical Journal | Produced by Wolters Kluwer - Medknow

Received: 05-06-2018 **Edited by:** Xin Chen

How to cite this article: Lin M, Wang Q, Li FD, Li R, Huang J. Complete Closure of Gastric Defect with Improved Purse-String Suture Technique Using Single-Channel Endoscope. Chin Med J 2018;131:2349-51.

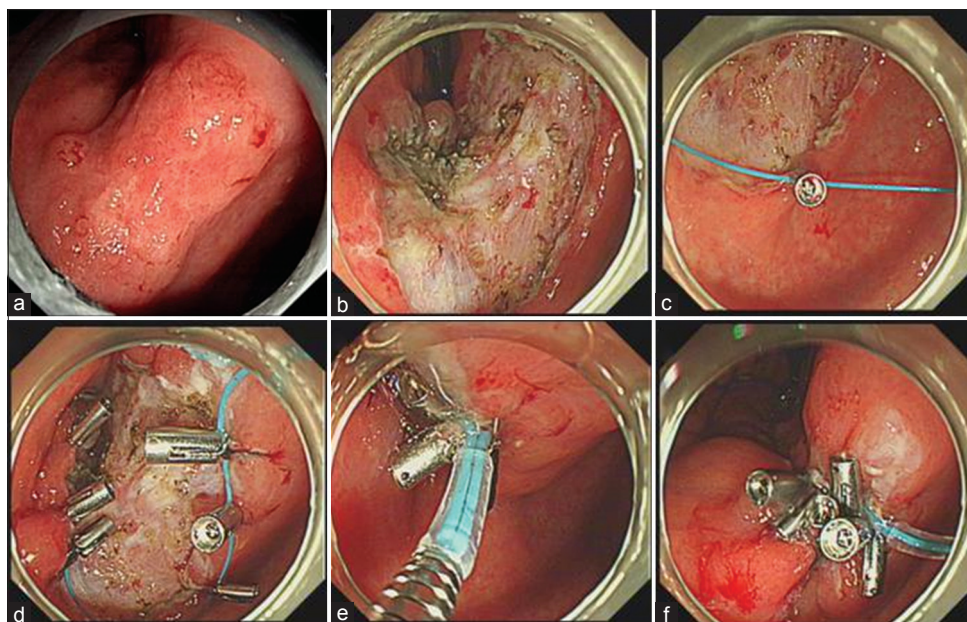


Figure 1: Procedure of the complete closure of gastric defect with improved purse-string suture technique using single-channel endoscope (a) The lesion was located in the gastric angle (IIa, high-grade intraepithelial neoplasia). (b) The area of wound after endoscopic submucosal dissection was large, combined part of muscularis propria defect. (c) The endoloop was anchored onto the defect's distal margin with the clip. (d) The endoloop was symmetrically embedded onto the margin of the defect with several clips. (e) The delivery system was inserted. (f) The defect was completely closed.

recurrence occurred during the follow-up period. All wounds were healed within 3 months after the procedure. CSR was 100% at the end of follow-up.

ESD and EFTR are mature endoscopic techniques. However, sometimes, destruction of MP or perforation is unavoidable during the procedure, so complete closure of gastric defect is critical. Therefore, it is great important to explore a convenient, simple, and effective method of closure for completing the endoscopic therapy successfully. At present, there are several available applications to manage gastric defects without surgery. Endoscopic clip is inserted through the biopsy channel, which has been widely used for closure of acute iatrogenic perforations. Endoscopic clip is effective in the management of iatrogenic perforations because of its usability, rotatability, and simplicity features. However, it is inconvenience for some larger defect because of limited opening width and closing strength.^[3] Suture technique, which combines clips and a removable snare, has recently been shown to be a good choice for closing gastrointestinal defects. There are two major disadvantages: First, the common ring buckle of snare is small, so it is hard to connect and remove the endoloop with the delivery system during the operation. Second, common clip lacks the function of repeated open and close, and it is difficult to adjust the clamping angle. Over-the-scope clip (OTSC) has a wider mouth and more strength and thus could be able to close a larger gastrointestinal defect. The main disadvantage of the OTSC is high cost and risk of iatrogenic perforation because of their bigger size.^[4] Fibrin glue (FG) is a kind of biologic sealant, composed of fibrinogen and thrombin. FG is injected into the gastric defect through a double-lumen catheter and then forms an acellular clot in the defect. In the current study, the effect of FG for sealing gastrointestinal defect is still plausible, which may only play the temporary sealing effect.^[5] The OverStitch Endoscopic Suturing System is a suturing device which can achieve full-thickness surgical suturing delivered through a double-channel endoscope. However, an animal study found that the average suture time was

1 h for seasoned experts, which indicated the technical difficulty of the OverStitch Endoscopic Suturing System.^[6]

In this study, we made two appropriate improvements in the suture technique. First, the novel clip was used, which had the characteristics of rotatable and repeated open and close, so the endoloop could be easily introduced with clip and directly anchored onto the defect's distal margin. Furthermore, because of clip's repeated open and close feature, the endoloop could be symmetrically and appropriately embedded onto the margin of defect. Second, the novel endoloop snare was used. The ring-pull at the tail of endoloop is larger than others, so it could be conveniently connected and removed the endoloop with the delivery system during the purse-string suture. This study reported that TSR and CSR, with the improved purse-string suture technique using single-channel endoscope, were 94% and 100%, respectively, the mean closure time was 18 ± 5 min, and all wounds were healed in 3 months after the procedure.

In this improved purse-string suture technique, the endoloop and metallic clips were cheap and did not require complicated or specialized equipment. More importantly, this technique was easy to operate and popularize. In addition, there were no surgical interventions or severe complications such as gastrointestinal fistula or abdominal abscess in this study. The above results suggested that this technique was safe and effective. However, this study was limited due to a retrospective design, small sample size, and a relatively short follow-up time. In the future, a prospective, randomized, controlled study with long-term follow-up is required to comprehensively investigate the safety and effectiveness of this technique.

Financial support and sponsorship

This study was supported by a grant from Changzhou Science and Technology Program (No. CJ20179034).

Conflicts of interest

There are no conflicts of interest.

REFERENCES

1. Gambitta P, Iannuzzi F, Ballerini A, D'Alessandro A, Vertemati M, Bareggi E, *et al.* Endoscopic submucosal dissection versus endoscopic mucosal resection for type 0-II superficial gastric lesions larger than 20 mm. *Ann Gastroenterol* 2018;31:338-43. doi: 10.20524/aoq.2018.0237.
2. Schmidt A, Bauder M, Riecken B, von Renteln D, Muehleisen H, Caca K, *et al.* Endoscopic full-thickness resection of gastric subepithelial tumors: A single-center series. *Endoscopy* 2015;47:154-8. doi: 10.1055/s-0034-1390786.
3. Yilmaz B, Unlu O, Roach EC, Can G, Efe C, Korkmaz U, *et al.* Endoscopic clips for the closure of acute iatrogenic perforations: Where do we stand? *Dig Endosc* 2015;27:641-8. doi: 10.1111/den.12482.
4. Kobara H, Mori H, Fujihara S, Nishiyama N, Chiyo T, Yamada T, *et al.* Outcomes of gastrointestinal defect closure with an over-the-scope clip system in a multicenter experience: An analysis of a successful suction method. *World J Gastroenterol* 2017;23:1645-56. doi: 10.3748/wjg.v23.i9.1645.
5. Nordentoft T, Pommergaard HC, Rosenberg J, Achiam MP. Fibrin glue does not improve healing of gastrointestinal anastomoses: A systematic review. *Eur Surg Res* 2015;54:1-3. doi: 10.1159/000366418.
6. Halvax P, Diana M, Nagao Y, Marescaux J, Swanström L. Experimental evaluation of the optimal suture pattern with a flexible endoscopic suturing system. *Surg Innov* 2017;24:201-4. doi: 10.1177/1553350617697184.