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*CASE REPORT*

# Novel magnetic compression technique for the treatment of postoperative anastomotic stenosis in rectal cancer: A case report

Miao-Miao Zhang, Huan-Chen Sha, Hai-Rong Xue, Yuan-Fa Qin, Xiao-Gang Song, Yun Li, Yu Li, Zheng-Wu Deng, Yu-Lin Gao, Fang-Fang Dong, Yi Lyu, Xiao-Peng Yan

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## Abstract

### *BACKGROUND*

The treatment of postoperative anastomotic stenosis after excision of rectal cancer is challenging. Endoscopic balloon dilation and radial incision are not effective in all patients. We present a new endoscopy-assisted magnetic compression technique (MCT) for the treatment of rectal anastomotic stenosis. We successfully applied this MCT to a patient who developed an anastomotic stricture after radical resection of rectal cancer.

### *CASE SUMMARY*

A 50-year-old man had undergone laparoscopic radical rectal cancer surgery at a local hospital 5 months ago. A colonoscopy performed 2 months ago indicated that the rectal anastomosis was narrow due to which ileostomy closure could not be performed. The patient came to the Magnetic Surgery Clinic of the First Affiliated Hospital of Xi'an Jiaotong University after learning that we had successfully treated patients with colorectal stenosis using MCT. We performed endoscopy-assisted magnetic compression surgery for rectal stenosis. The

magnets were removed 16 d later. A follow-up colonoscopy performed after 4 months showed good anastomotic patency, following which, ileostomy closure surgery was performed.

*CONCLUSION*
MCT is a simple, non-invasive technique for the treatment of anastomotic stricture after radical resection of rectal cancer. The technique can be widely used in clinical settings.

**Key Words:** Rectal cancer; Magnetic compression technique; Magnetosurgery; Anastomotic stricture; Magnetic surgery clinic; Case report



**Core Tip:** Endoscopic balloon dilation and radial incision are commonly used for the treatment of postoperative anastomotic stenosis after surgery for colorectal cancer, but the effect is limited. Magnetic compression technique (MCT) can be used for anastomosis of various parts of the digestive tract. Cases of postoperative anastomotic stricture after colorectal cancer surgery treated by MCT have been rarely reported. We report a patient with low rectal anastomosis who was successfully treated with the MCT. This case report enriches the treatment methods of postoperative anastomotic stenosis of colorectal cancer, which can bring important reference significance for peers.

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## INTRODUCTION

The incidence of postoperative anastomotic stenosis following colorectal cancer surgery is relatively low, however, it poses challenges in terms of treatment. Risk factors for anastomotic stenosis include anastomotic leakage, neoadjuvant chemoradiotherapy, gender, postoperative radiotherapy, and anastomotic ischemia[1-5]. The occurrence of anastomotic stenosis precludes the possibility of enterostomy reduction surgery, which adversely affects the quality of life of patients. Endoscopic balloon dilation and radial incision are effective in some patients[6-8], but some patients show poor outcomes. Therefore, the development of effective treatment for postoperative anastomotic stenosis after colorectal cancer surgery is imperative to improve the quality of life of patients. Magnetic compression technique (MCT) is a new surgical technique that can achieve suture-free anastomosis of the digestive tract by leveraging the magnetic force between magnets[9,10]. MCT in combination with endoscopic technique has been used for the treatment of biliary stricture[11-14], ureteral stricture[15,16], and esophageal stricture[17-20]. It has the advantages of simple operation, minimal trauma, and a good therapeutic effect. However, the application of MCT in postoperative anastomotic stenosis after colorectal cancer surgery has rarely been reported. This case report describes the successful use of MCT for the treatment of postoperative anastomotic stricture after radical surgery for rectal cancer.

## CASE PRESENTATION

### *Chief complaints*

A 50-year-old man presented with a narrow rectal anastomosis which was discovered 2 months ago during a follow-up colonoscopy following rectal cancer surgery.

### *History of present illness*

The patient had undergone laparoscopic radical resection for rectal cancer 5 months ago. A narrow rectal anastomosis was detected 2 months ago during colonoscopy.

### *History of past illness*

He was diagnosed with type 2 diabetes 5 months ago and his blood sugar has been effectively managed by oral hypoglycemic drugs.

### *Personal and family history*

His family history was unremarkable.

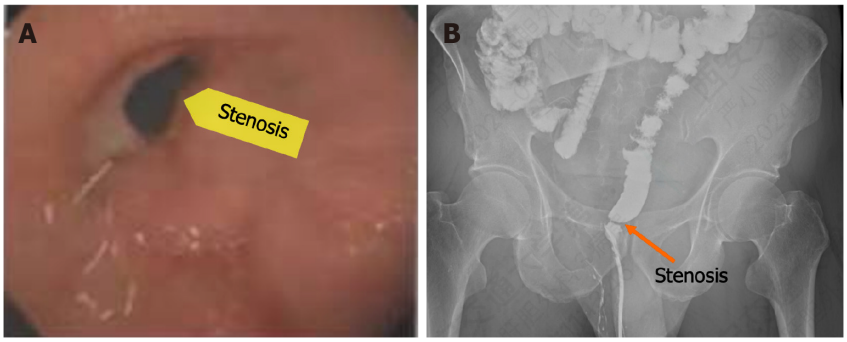


**Figure 1 Preoperative examination.** A: Colonoscopy image showing the stenosis; B: Colonography.

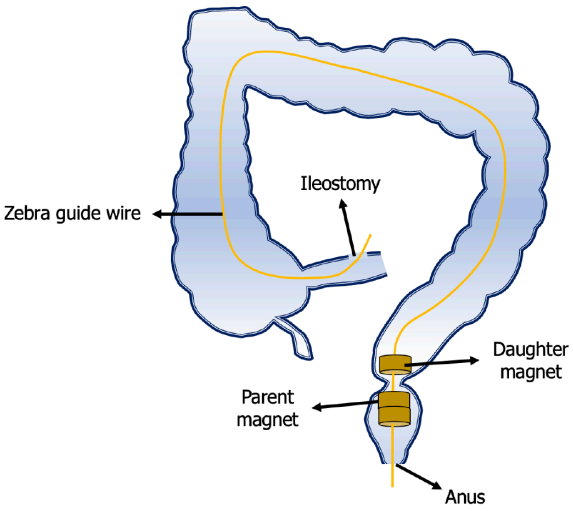


**Figure 2 Schematic illustration of the surgical plan.** Zebra guide wire was inserted through the ileostomy and pulled out through the anus with the assistance of colonoscopy. The daughter magnet and parent magnets were inserted into the two sides of the rectum stenosis along the zebra guide wire through the ileostomy and the anus, respectively.

### *Physical examination*

Initial physical examination revealed no cardiovascular or respiratory abnormalities. The abdomen was flat and non-tender. An ileostomy was seen on the right side of the abdomen.

### *Laboratory examinations upon admission*

The hematology results were normal.

### *Imaging examinations*

During colonoscopy, a narrow rectal anastomosis located 2 cm above the anus was observed, with a diameter of approximately 5 mm. Anastomotic staples were still present at the site, and the colonoscope could not pass through the narrow rectal anastomosis (Figure 1A). Subsequent, colonography confirmed a stenosis in the lower rectum (Figure 1B).

## FINAL DIAGNOSIS

Based on the colonoscopy and colonography, the diagnosis of rectal anastomosis stenosis was established.

## TREATMENT

The surgical plan developed by the Multi-disciplinary team of Magnetic Surgery at the First Affiliated Hospital of Xi'an Jiaotong University was shown in Figure 2. The patient and his family members provided written informed consent for the operation. The patient was positioned supine following intravenous anesthesia. Enteroscopy was conducted *via* the ileostomy, reaching the proximal end of the rectal anastomosis. A zebra guide wire was passed through biopsy hole of the colonoscope, and its tip was pulled out through the narrow section of the rectum *via* the anus. The zebra wire was left in

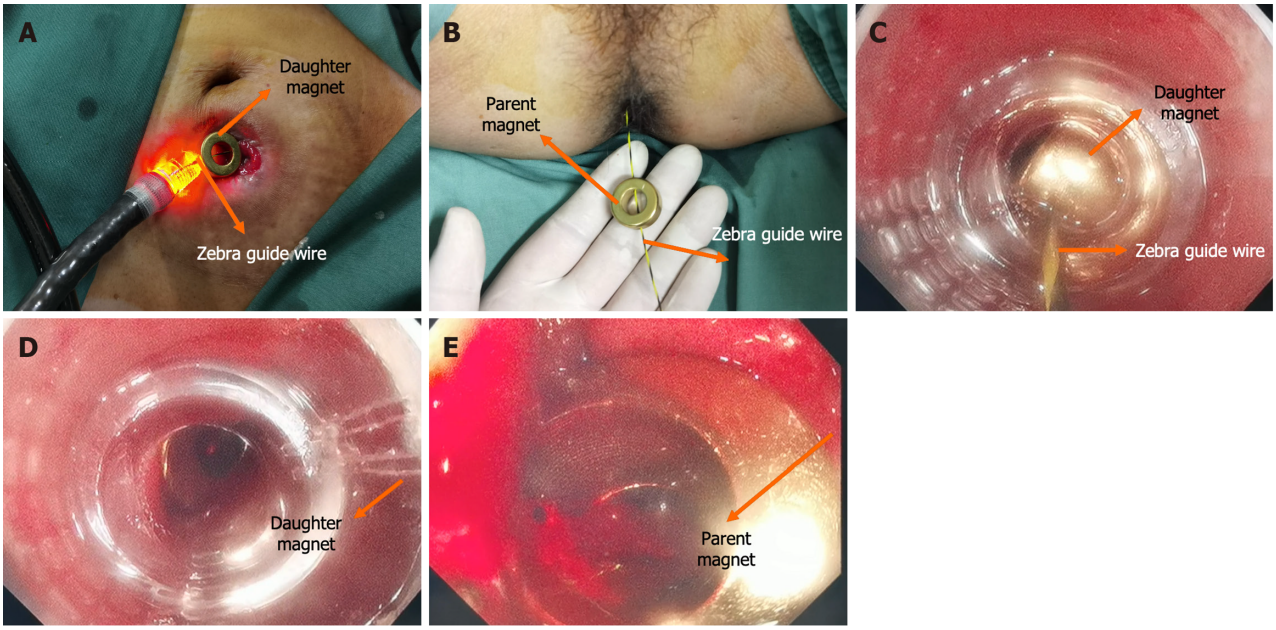


**Figure 3 Surgical procedure.** A: The daughter magnet was inserted along the zebra guide wire through the ileostomy; B: The parent magnet was inserted along the zebra guide wire through the anus; C: The push process of the daughter magnet; D: The state of the daughter magnet after attraction; E: The state of the parent magnet after attraction.

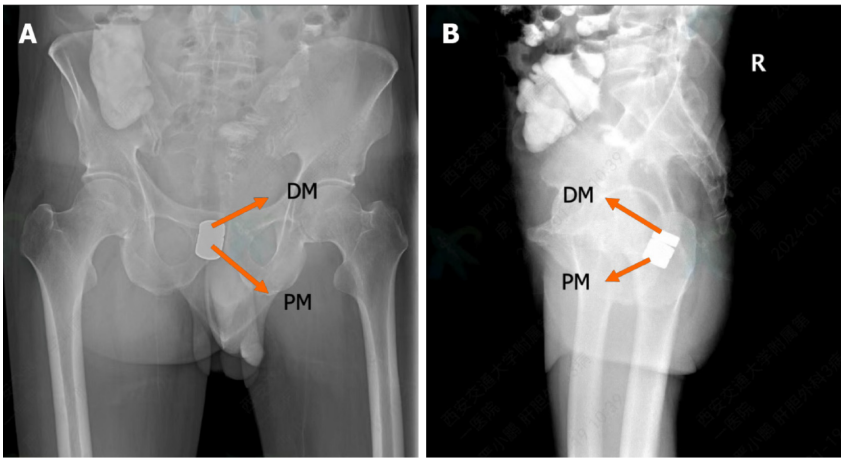


**Figure 4 Postoperative x-ray examination.** A: Pelvic anteroposterior radiograph showing the attraction state of the daughter and the parent magnets; B: Pelvic lateral radiograph showing the attraction state of the daughter and the parent magnets. DM: Daughter magnet; PM: Parent magnet.

place while the colonoscope was witdrawn. The zebra guide wire located on the side of the ileostomy was passed through the side hole of the daughter magnet and then retrogradely advanced through the biopsy hole of the colonoscope (Figure 3A). The zebra guide wire on the anal side was passed through the side hole of the parent magnet (Figure 3B). The colonoscope was advanced through the ileostomy and pushed the daughter magnet along the zebra guide wire to the proximal end of the rectal anastomosis (Figure 3C). The parent magnet along the zebra guide wire was pushed through the anus. The daughter magnet and the parent magnet were automatically attracted together, following which the zebra guide wire was exited. To increase the magnetic force between the daughter and the parent magnets, another magnet was introduced through the anus. Colonoscopy was performed again through ileostomy and anus to observe the status of daughter magnet and parent magnets (Figures 3D and E). The x-ray examination showed close apposition of the daughter and the parent magnets (Figures 4). Sixteen days after surgery, the daughter and the parent magnets were expelled through the anus (Figure 5A and B). Colonoscopy showed the new anastomosis, and the colonoscope passed smoothly (Figures 5C and D).

## OUTCOME AND FOLLOW-UP

Following discharge, the patient insisted on anal dilation treatment using a 20 mm diameter anal dilator. Four months

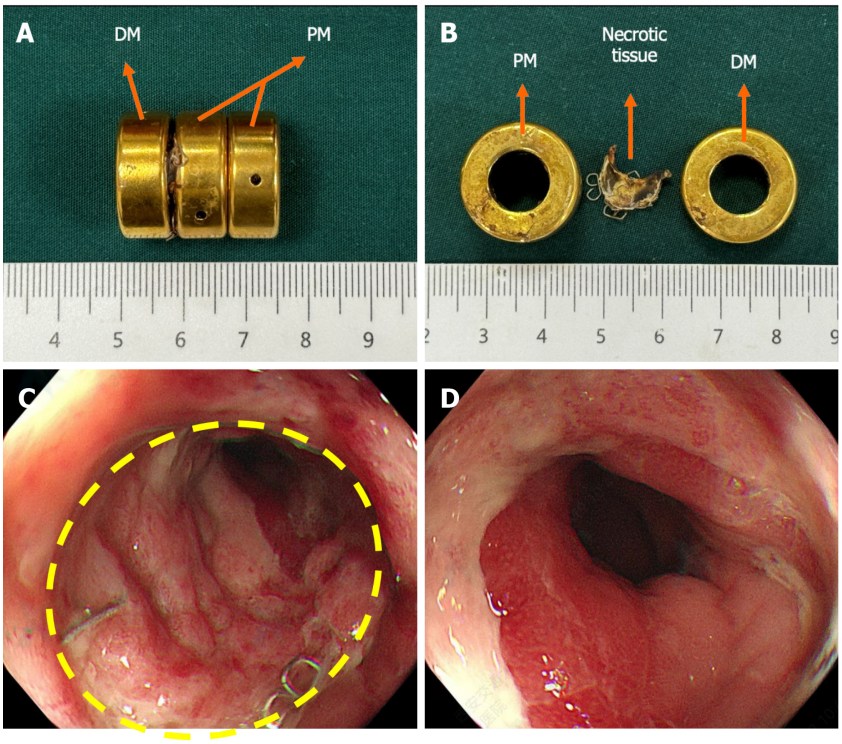


**Figure 5 Postoperative colonoscopy.** A: The daughter and parent magnets were discharged on the 16th day after surgery; B: The necrotic tissue between the daughter and the parent magnets; C and D: Colonoscopy image showing good patency of magnetic anastomosis. DM: Daughter magnet; PM: Parent magnet.

later, the rectal anastomosis remained good patent, and the ileostomy was successfully closed. The patient experienced normal bowel movements postoperatively.

## DISCUSSION

Hyperplasia of the scar tissue is the main pathological cause of anastomotic stenosis after colorectal cancer surgery. Endoscopic balloon dilation and radial incision cannot effectively remove hyperplastic scars, and may even aggravate scar formation. Therefore, there are limited options for the treatment of postoperative anastomotic stenosis of colorectal cancer[6]. The unique anastomotic principle of the MCT makes it effective in treating anastomotic stenosis after operation for colorectal cancer. Firstly, in the treatment of rectal anastomotic stenosis by MCT, the scar of anastomotic hyperplasia is located between the magnets. The continuous magnetic compression induces the pathological change sequence of ischemia-necrosis-shedding[21]. The primary distinction between MCT and other methods like balloon dilation and radial incision lies in the removal of scar tissue. Secondly, MCT does not involve inserting foreign objects into the intestinal wall during the establishment of the anastomosis, reducing the risk of complications such as fistula and infection, further reducing the formation of anastomotic scar. Third, by combining MCT with endoscopic techniques, minimally invasive anastomosis can be achieved, avoiding the trauma and complications associated with traditional surgical procedures.

The present case has some similarities with the previously reported cases where the MCT was used to treat postoperative anastomotic stenosis. However, there are some noteworthy novel aspects of this case. First, the patient had an ileostomy that provided access for the insertion of the daughter magnet. Second, zebra guides wire can pass through the narrow rectal anastomosis, and we chose magnets with holes on the side, which facilitated the placement of magnets. Third, to increase the magnetic force between the daughter magnet and the parent magnet, we inserted two magnets from the anus to act as the parent magnet. Fourth, unlike previous cases, the rectal anastomosis in this patient was near the anus, and there was a risk of anal damage during the magnetic compression process. However, the final results showed that the function of the anus was well maintained. This demonstrated that even if the anastomotic position is very low, the use of MCT does not affect anal function.

## CONCLUSION

MCT combined with endoscopic technology can be used for the treatment of postoperative anastomotic stenosis after colorectal cancer surgery. It has the advantages of simple operation, minimal trauma, and good anastomotic patency, making it worthy of widespread clinical application.

## FOOTNOTES

**Author contributions:** Zhang MM, Sha HC, Xue HR, Qin YF, Song XG, Li Y, Li Y, Deng ZW, Gao YL, and Yan XP performed the operation and drafted this manuscript; Dong FF assisted in perioperative care; Yan XP and Lyu Y designed the operation and revised the manuscript; all authors have read and approved the final manuscript.

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