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WJCC mainly publishes articles reporting research results and findings obtained in the field of clinical medicine and covering a wide range of topics, including case control studies, retrospective cohort studies, retrospective studies, clinical trials studies, observational studies, prospective studies, randomized controlled trials, randomized clinical trials, systematic reviews, meta-analysis, and case reports.

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RESPONSIBLE EDITORS FOR THIS ISSUE
Production Editor: Si Zhao; Production Department Director: Xue Guo; Cover Editor: Jin-Lai 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, Salim Surani, Jerzy Tadeusz Chudek, George Kontogeorgos, Maurizio Serati

EDITORIAL BOARD MEMBERS
https://www.wjgnet.com/2307-8960/editorialboard.htm

PUBLICATION DATE
June 6, 2024

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

STEPS FOR SUBMITTING MANUSCRIPTS
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ONLINE SUBMISSION
https://www.f6publishing.com
Computed tomography three-dimensional reconstruction in the diagnosis of bleeding small intestinal polyps: A case report

Shu-Hui Zhang, Ming-Wei Fan, Yan Chen, Ying-Bin Hu, Cheng-Xia Liu

BACKGROUND
Computed tomography (CT) small bowel three-dimensional (3D) reconstruction is a powerful tool for the diagnosis of small bowel disease and can clearly show the intestinal lumen and wall as well as the outside structure of the wall. The horizontal axis position can show the best adjacent intestinal tube and the lesion between the intestinal tubes, while the coronal position can show the overall view of the small bowel. The ileal end of the localization of the display of excellent, and easy to quantitative measurement of the affected intestinal segments, the sagittal position for the rectum and the pre-sacral lesions show the best, for the discovery of fistulae is also helpful. Sagittal view can show rectal and presacral lesions and is useful for fistula detection. It is suitable for the assessment of inflammatory bowel disease, such as assessment of disease severity and diagnosis and differential diagnosis of the small bowel and mesenteric space-occupying lesions as well as the judgment of small bowel obstruction points.

CASE SUMMARY
Bleeding caused by small intestinal polyps is often difficult to diagnose in clinical practice. This study reports a 29-year-old male patient who was admitted to the hospital with black stool and abdominal pain for 3 months. Using the combination of CT-3D reconstruction and capsule endoscopy, the condition was diagnosed correctly, and the polyps were removed using single-balloon enteroscopy-endoscopic retrograde cholangiopancreatography without postoperative complications.

CONCLUSION
The role of CT-3D in gastrointestinal diseases was confirmed. CT-3D can assist in...
the diagnosis and treatment of gastrointestinal diseases in combination with capsule endoscopy and small intestinal microscopy.

**Key Words:** Computed tomography three-dimensional reconstruction; Capsule endoscopy; Single-balloon enteroscopy; Gastrointestinal bleeding; Case report

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**Core Tip:** The computed tomography three-dimensional reconstruction can assist the capsule endoscopy-assisted single-balloon enteroscopy of the small bowel for the diagnosis and treatment of difficult-to-diagnose small bowel polyps.

**INTRODUCTION**

We report a 29-year-old male patient who was diagnosed giant polyp of small intestine through the computed tomography three-dimensional (CT-3D) reconstruction and capsule endoscopy and was treated through short-type single-balloon enteroscopy (SBE)-assisted endoscopic retrograde cholangiopancreatography. The CT-3D reconstruction can assist the capsule endoscopy-assisted SBE of the small bowel for the diagnosis and treatment of difficult-to-diagnose small bowel polyps.

**CASE PRESENTATION**

**Chief complaints**

The study presents the case of a 29-year-old male, who was admitted to Binzhou Medical University Hospital, Binzhou, Shandong, China with abdominal pain and black stools for 3 months. The abdominal pain was particularly concentrated around the umbilical cord and presented as paroxysmal colic. The pain could be slightly relieved after defecation; however, the patient also reported abdominal distension and fatigue.

**History of present illness**

The patient has a history of long-term smoking but no history of alcoholism, coffee or strong tea consumption, steroidal anti-inflammatory drug use, abdominal trauma or operation.

**History of past illness**

The patient had a history of recurrent diarrhea from the past 10 years ago but no history of infectious diseases, such as tuberculosis, viral hepatitis, or contact.

**Personal and family history**

The patient denied a family history of a similar disease. The patient had a history of long-term smoking but no history of alcoholism, coffee or strong tea consumption, steroidal anti-inflammatory drug use, abdominal trauma, or operation.

**Physical examination**

The patient received treatment at a local hospital three months ago. His blood routine results showed a red blood cell (RBC) level of 3.01 × 10¹²/L and an Hb level of 86 g/L. Using gastroscopy and colonoscopy procedures at the local hospital, only chronic non-atrophic gastritis and terminal ileitis were identified. However, these findings did not provide a clear explanation for the gastrointestinal bleeding. The patient was discharged following conservative treatment. However, after discharge, the patient continued to experience dark red stools, accompanied by abdominal pain, distension, fatigue, and even fainted once.

**Laboratory examinations**

Consequently, the patient sought treatment at the gastroenterology department of our hospital. The results of the patient's blood test showed RBC level of 4.6 × 10¹²/L, Hb level of 121 g/L, mean cell volume level of 80 fL, mean corpuscular hemoglobin level of 26 pg, mean cellular hemoglobin concentration level of 328 g/L, reticulocyte (RET) level of 0.026, and RET percentage of 0.6%. The patient lost approximately 3 kg weight within 3 months and appeared...
emaciated.

**Imaging examinations**

The location of the lesion was suspected to be in the small intestine, and the possible causes included small intestinal stromal tumors and congenital small intestinal vascular malformation. We recommend surgical exploration or enteroscopy for further diagnosis. However, the patient declined surgical exploration and enteroscopy due to concerns about the invasiveness of the procedures. Therefore, we initially conducted a CT angiography of the small intestine to assess the patient's condition. The 3D reconstruction of the small intestine revealed malformations, changes in the ileal wall and mesenteric vessels, formation of the space-occupying lesions, and a large polyp with significant blood vessels passing through the ileum (Figure 1). The patient's small intestine was examined using a magnetron capsule endoscope to observe the shape of the tumor and evaluate its location. The results indicated that the capsule endoscope was in the ileum for approximately 4 h and 51 min. A large protuberant lesion with hyperemia and swelling was observed (Figure 2). Based on the results of small intestinal CT-3D reconstruction and magnetron capsule endoscopy, it was concluded that the gastrointestinal bleeding was caused by a tumor located at the end of the ileum. The patient's condition was explained to him and his family, and he agreed to undergo enteroscopy and endoscopic treatment of the tumor. After careful consideration, transoral SBE was used to examine the jejunum and upper ileum, which showed no
A large protuberant lesion with hyperemia and swelling was observed. A and B: Capsule endoscopy revealed an obvious entanglement of the intestinal wall and a huge hemorrhagic protuberant lesion in the ileum.

Trans-anal single-balloon enteroscopy was used to identify a large, pedicled tumor measuring approximately 2 cm × 2 cm. A-D: Single-balloon enteroscopy revealed large polyps with large coarse pedicles (about 2 cm × 2 cm at the tip) and erosion and swelling at the tip; E-H: Two nylon rings were placed at the root of the polyp and the head of the polyp turned purple-blue.

obvious abnormalities. Subsequently, trans-anal SBE was used to identify a large, pedicled tumor measuring approximately 2 cm × 2 cm with erosion at the top (Figure 3A-D).

**FINAL DIAGNOSIS**

Based on the patient's symptoms, signs, and gastroenteroscopy results at the local hospital, we believe the patient is experiencing gastrointestinal bleeding.

**TREATMENT**

Combined with the CT results of the small intestine, the tumor might cause significant bleeding and perforation by
Figure 4 Histopathological examinations of the polyp, showing tubular adenoma with low-grade intraepithelial neoplasia, high chronic inflammatory cell infiltration, and local granulation tissue hyperplasia. A: Hematozlin and eosin stain, original magnification × 100; B: Hematozlin and eosin stain, original magnification × 200.

passing through the large blood vessels of ileal polyps and directly through the endoscopic mucosal exfoliation. Therefore, after careful consideration, we chose to perform nylon trap ligation. Once the tumor was completely exposed, two nylon rings were placed at the root of the tumor to make the head of the polyp purplish blue (Figure 3E-H). The tissue biopsy confirmed that the tumor was an adenomatous polyp with low-grade intraepithelial neoplasia, high-grade inflammatory cell infiltration, and local granulation tissue hyperplasia (Figure 4).

OUTCOME AND FOLLOW-UP

The patient did not experience hematochezia after the operation, and his abdominal pain was less severe as compared to that at the time of admission. A week later, the patient underwent a blood routine examination, which showed an Hb level of 143 g/L, indicating effective control of gastrointestinal bleeding. One year later, the patient was readmitted to the hospital for re-examination. The blood routine showed a hemoglobin level of 148 g/L. During the trans-anal enteroscopy, circular scar-like changes were found in the ileocecal valve at 30 cm. This suggested that small intestinal polyps might undergo necrosis and exfoliation after ligation with a nylon ring.

DISCUSSION

Small intestinal bleeding is a common cause of gastrointestinal bleeding; however, its diagnosis is difficult due to the special shape of the small intestine and the nature of the bleeding lesions[1]. Small bowel polyps are common types of intestinal lesions, which cause small bowel bleeding. The direct resection of the polyp using endoscopic submucosal dissection has been commonly used for the treatment of small intestinal polyps[2]. The traditional small bowel microscopy does not allow for the diagnosis of small bowel bleeding. However, the capsule endoscopy allows for a non-invasive and safe examination of the entire small bowel but requires imaging technology to assist in the examination[3]. The continuous advancements in CT-3D reconstruction technology have led to more accurate and efficient localization of gastrointestinal lesions and can better display the spatial morphology of the small intestine, thereby aiding in the diagnosis of small intestinal diseases[4]. The combination of CT-3D reconstruction with capsule endoscopy can better diagnose small intestinal lesions[5].

Small intestine diseases typically have an insidious onset, and the patients' clinical symptoms are often atypical. Due to the curvature of the small bowel, the intestinal tubes overlap each other, resulting in deep and irregular lesions that are easy to miss and misdiagnose. Therefore, diagnosing small intestine diseases can be challenging. Currently, gastroscopy and colonoscopy are unable to reach the gastrointestinal tract, and capsule endoscopy is uncontrolled and cannot repeatedly observe the lesions in multiple directions; moreover, small intestine microscopy is difficult to operate. Posting the operators' time and energy can be risky and has drawbacks[6]. CT-3D is a non-invasive imaging examination that is highly valuable for diagnosing intestinal tumors, gastrointestinal bleeding, recurrent diarrhea, and other conditions. It helps clinicians locate lesions and choose appropriate endoscopic treatment modalities, thereby reducing the need for multiple endoscopic examinations, alleviating patient pain, and lowering the risk and economic burden of operations.
CONCLUSION

In conclusion, this study presents a case of a giant terminal ileal polyp, which was diagnosed and treated using capsule endoscopy combined with CT-3D reconstruction and nylon snare ligation under enteroscopy due to bleeding. This study proved that the capsule endoscopy and CT-3D reconstruction of the small intestine might provide valuable clues for the diagnosis and treatment of small intestinal diseases.

FOOTNOTES

Author contributions: Hu YB performed the experiments; Liu CX and Chen Y discussed the data; Zhang SH and Fan MW drafted the manuscript and also took responsibility of the data analysis.

Informed consent statement: All study participants, or their legal guardian, provided informed written consent prior to study enrollment.

Conflict-of-interest statement: We declare that we do not have any commercial or associate interest in connection with the work submitted.

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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Country/Territory of origin: China

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S-Editor: Che XX

L-Editor: A

P-Editor: Zhao S

REFERENCES
