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CT-3D reconstruction in the diagnosis of bleeding small intestinal polyps

Applications of CT-3D

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Abstract

BACKGROUND

CT small bowel three-dimensional reconstruction is a powerful tool for the diagnosis of small bowel disease, can clearly show the intestinal lumen, wall and the structure outside the wall, the horizontal axis position shows the best adjacent intestinal tube and the lesion between the intestinal tubes, the coronal position can show the overall view of the small bowel, and the ileal end of the localisation 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 is best for rectal and presacral lesions and is useful for fistula detection. It is suitable for the assessment of inflammatory bowel disease and the severity of the disease, the diagnosis and differential diagnosis of small bowel and mesenteric space-occupying lesions, and the judgement of small bowel obstruction points.

CASE SUMMARY

Bleeding caused by small intestinal polyps is often difficult to diagnose in clinical practice. We report a 29-year-old male patient who was admitted to the hospital with black stool with abdominal pain for 3 months. Through the combination of CT-3D reconstruction and capsule endoscopy, we made a correct diagnosis and removed the polyps by SBE-ERCP without postoperative complications.

CONCLUSION

It proved the role of CT-3D in gastrointestinal diseases, which can assist in the diagnosis and treatment of gastrointestinal diseases together with capsule endoscopy and small intestinal microscopy.

Key Words: CT-3D reconstruction; Capsule endoscopy; Single-balloon enteroscopy; Gastrointestinal bleeding

Core Tip: The CT-3D 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 CT-3D reconstruction and capsule endoscopy and was treated through Short-type SBE-assisted ERCP. The CT-3D 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.

CASE PRESENTATION
Chief complaints
The study presents the case of a 29-year-old male, who came to Binzhou Medical University Hospital, Binzhou, Shandong, China with abdominal pain and black stools for 3 months. The 29-year-old male patient has been experiencing black stool for the past three months, accompanied by abdominal pain that is particularly concentrated around the umbilical cord and presents as paroxysmal colic. The pain can be slightly relieved after defecation, but the patient also reports 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 has a history of recurrent diarrhea from 10 years ago, but no history of infectious diseases such as tuberculosis, viral hepatitis, or contact.

**Personal and family history**
Patient denies family history of similar disease. 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.

**Physical examination**
Three months ago, he received treatment at a local hospital. His blood routine results showed RBC: 3.01×1012/L and Hb: 86g/L. Following the improvement of gastroscopy and colonoscopy procedures at the local hospital, only chronic non-atrophic gastritis and terminal ileitis were identified. However, these findings do 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**
As a result, the patient sought treatment at the gastroenterology department of our hospital. The results of the patient's blood test showed RBC: 4.6×1012/L, Hb: 121g/L, MCV: 80fl, MCH: 26pg, MCHC: 328g/L, RET#: 0.026, and RET%: 0.6%. The patient had lost approximately 3kg within 3 months and appeared emaciated.

**Imaging examinations**
The location of the lesion is suspected to be in the small intestine, and possible causes include small intestinal stromal tumor 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. Thus, we initially conducted CT angiography of the small intestine to assess the patient’s condition. The results of the 3D reconstruction of the small intestine revealed malformations, changes in the ileal wall and mesenteric vessels, the formation of 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 minutes. 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, we concluded that the gastrointestinal bleeding was caused by a tumor located at the end of the ileum. We explained the patient’s condition to him and his family, and he agreed to undergo enteroscopy and endoscopic treatment of the tumor. After careful consideration, we used transoral single-balloon enteroscopy (SBE) to examine the jejunum and upper ileum, which showed no obvious abnormalities. Subsequently, we used transanal single-balloon enteroscopy (SBE) to identify a large, pedicled tumor measuring approximately 2cm x 2cm with erosion at the top (Figure 3A-3D).

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 may cause significant bleeding and perforation by passing through the large blood vessels of ileal polyps and directly through the endoscopic mucosal exfoliation. Therefore, after careful consideration, we chose nylon trap ligation. Once the tumor was completely exposed, we placed two nylon rings at the root of the tumor to make the head of the polyp purplish-blue (Figure 3E-3H). 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 their abdominal pain was less severe than at admission. A week later, the patient underwent a blood routine examination, which showed a hemoglobin level of 143g/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 148g/L. During the transanal enteroscopy, circular scar-like changes were found in the ileocecal valve at a distance of 30cm. This suggests that small intestinal polyps may undergo necrosis and exfoliation after ligation with a nylon ring.

DISCUSSION
Small intestinal bleeding is a common cause of gastrointestinal bleeding, but 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 examination[3]. The continuous advancements in the CT-3D reconstruction technology have led to more accurate and efficient localization of the 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 insidious onset and 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, capsule endoscopy is uncontrolled and cannot repeatedly observe the lesions in multiple directions, and small intestine microscopy is difficult to operate. Posting the operators' time and energy can be risky and has drawbacks\textsuperscript{[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, 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.