5 cases of mirror man combined with colorectal cancer treated surgically and literature review

Xiao-Qiong Chen
Sixth Affiliated Hospital of Sun Yat-sen University

Wei Chen
Sixth Affiliated Hospital of Sun Yat-sen University

Lin-Qing Yang
Sixth Affiliated Hospital of Sun Yat-sen University

Gui-Ting Chen
Sixth Affiliated Hospital of Sun Yat-sen University

Xiao-Fang Wang
Sixth Affiliated Hospital of Sun Yat-sen University

Yao-Yi Huang
Sixth Affiliated Hospital of Sun Yat-sen University

Mei-Jin Huang
Sixth Affiliated Hospital of Sun Yat-sen University

Shu-Yun Tan  (✉tanshy3@mail.sysu.edu.cn)
Sixth Affiliated Hospital of Sun Yat-sen University

Research Article

Keywords: Colorectal cancer, Situs inversus totalis,

Posted Date: October 14th, 2022

DOI: https://doi.org/10.21203/rs.3.rs-2151581/v1

License: This work is licensed under a Creative Commons Attribution 4.0 International License. Read Full License
Abstract

Background

Situs inversus totalis (SIT) is a rare congenital malformation in which the viscera is positioned in the opposite direction of normal, like a mirror. The patients of SIT with colorectal cancer (CRC) requiring surgical treatment are even more rare.

Methods

From January 2013 to May 2022, the clinical data of 5 SIT patients with CRC diagnosed in the Sixth Affiliated Hospital of Sun Yat-sen University were reviewed.

Results

Five SIT patients with CRC were all female, aged 53-76 years. One patient died of complications after surgery due to poor cardiopulmonary function; One patient presented with a recurrent lesion of the side of the urethra after surgery and was readmitted for chemoradiotherapy. One patient died of tumor recurrence after surgery and chemotherapy. One patient with IIA was indicated by pathology after operation, and no recurrence was found. No tumor recurrence was found in one patient with early pathological indication. After reviewing 17 related literatures, together with 5 cases in our hospital, the most common primary sites of tumors were the sigmoid node and ascending colon, and the median survival of patients with combined chemotherapy was longer.

Conclusions

It is safe and feasible to perform surgery on the SIT patients with CRC after the preoperative examination and evaluation.

Background

Situs inversus totalis (SIT) refers to the complete inversion of unpaired tissues and organs in the thoracic and abdominal cavities, i.e., the heart, liver, spleen, gall and other organs are positioned opposite to normal, the heart and spleen are on the right and the liver is on the left. It is an extremely rare congenital disease with a prevalence of about 1/4000–8000 [1]. It is not known why the "Mirror Man" was born in the embryonic period. It is believed that the abnormal position caused by the abnormal development of viscera and torsion may be related to the mutation of a gene in parents. It has also been reported that two families married to close relatives, with multiple "introverts" in the same family, suggesting a genetic link.

Colorectal cancer (CRC) is the 3rd most common cancer worldwide, as well as the third leading cause of cancer-related death. In China, the number and proportion of cases of CRC have been increasing gradually[2]. According to the previous study, 5 per 34,723 SIT patients were discovered during colonoscopy [3]. Although laparoscopic colorectal surgery has recently become a routine treatment...
modality, there are few reports of laparoscopic surgery in SIT patients with colorectal cancer, which is extremely rare. To the best of our knowledge, we report the largest number of case. This article reports 5 cases of laparoscopic radical colorectal resection in our hospital.

**Case Presentation**

Case Report 1

In October 2014, a 76-year-old female was referred to our Gastrointestinal Surgical Department for a half-year history of constipation and one-week history of intermittent hematochezia. The patient had been diagnosed with diabetes five years and hypertension six years prior. She also had chronic obstructive pulmonary disease for more than 10 years, and had repeated bronchial infection in the past year, the latest attack was 3 weeks before admission. Colonoscopy showed a mass on the lower rectum, and mucosal carcinoma was confirmed by colonoscopic biopsy. Chest and abdominal Contrast-Enhanced computed tomography (CECT) scan showed: mass in the middle and lower rectum, abdominal situs inversus, nodular dysplasia of the spleen, extensive chronic inflammation of both lungs and bronchiectasis. (Fig. 1A, 1B).

The patient underwent laparoscopic radical resection of rectal cancer and terminal ileum stomy. Histopathology identified moderately differentiated rectal adenocarcinoma infiltrated the perirectal fat (pT3) with 1 lymph node metastasis(1/17, pN1a), categorized as stage B according to the eighth edition of the American Joint Committee on Cancer (AJCC) Staging System. Postoperatively, the patient was transferred to intensive care unit (ICU), and gave up treatment on postoperative day 4 due to severe pneumonia.

Case Report 2

In March 2016, a 59-year-old female was referred to other hospital for a two-year history of intermittent hematochezia. The patient was diagnosed with rectal cancer and underwent radical resection of rectal cancer. Histopathology identified moderately differentiated rectal adenocarcinoma infiltrated the perirectal fat (pT3) with 3 lymph node metastasis(3/4, pN1b), categorized as stage B according to AJCC Staging System. Thereafter, the patient received CAPOX regimen adjuvant chemotherapy for 6 times and postoperative regular re-examination.

In June 2017, she was again admitted to other hospital for a symptom of intermittent hematochezia, and upon uretoscop examination found that there was a longitudinal fissure about 1 cm long and bright red at her left lateral urethral 0.5cm near orifice. Biopsy indicated moderately differentiated adenocarcinoma, which was considered as metastasis of rectal cancer. In July 2017, she was admitted to the Urology Department of our hospital. Pelvic magnetic resonance imaging (MRI) showed a nodule on the left side of the urethra, enhanced scan showed ring enhancement and high signal on diffusion weighted imaging (Fig. 1C). She underwent resection of extra-urethral metastasis and cystoscopy. The operating time was 109 min, and the blood loss was 200 ml. The lesion was pathologically identified as metastatic
moderately differentiated adenocarcinoma. Combined with immunohistochemical results CK20 (+), CK7 (-), CDX2 (+), it supported alimentary tract sources. After an uneventful postoperative course, she was discharged on postoperative day 5. Postoperative concurrent radiotherapy 50Gy/25 times and 3 times of FOLFIRI regimen chemotherapy were performed. There was no recurrence at 6 months follow-up after the second operation, re-examination CT showed total visceral inversion (Fig. 1D), and then patient lost to follow-up.

Case Report 3

In December 2017, A 53-year-old female was referred to our Gastrointestinal Surgical Department for a one-week history of abdominal discomfort. Colonoscopy showed a circumferential mass of sigmoid colon, and pathological examination revealed moderately differentiated adenocarcinoma. Chest and abdominal CECT showed: Local thickening of the bowel at the junction of descending colon and sigmoid colon with scattered lymph nodes surrounding the mesangium, colon cancer was considered (CT stage T3, < 5mm), and the complete “mirror-images” of thoracic and abdominal organs (Fig. 1E). Laboratory investigation showed a carcino-embryonic antigen (CEA) level of 68.5 ng/ml, and a carbohydrate antigen-199 (CA199) level of 42.4 U/ml.

The patient underwent laparoscopic radical resection of sigmoid colon cancer. The operating time was 113 min, and the blood loss was 50 ml. During the operation, pelvic implant nodules were found, which were confirmed adenocarcinoma by intraoperative rapid freezing pathology. Peritoneal hyperthermic perfusion therapy (HIPEC) for sigmoid colon cancer was performed twice. After an uneventful postoperative course, she was discharged on postoperative day 10. Histopathologic results showed that moderately differentiated adenocarcinoma perforated visceral peritoneum (pT4a), 4 tumour deposits without regional lymph node metastasis (0/15, pN1c), pelvic moderately differentiated adenocarcinoma nodules (pM1c), categorized as stage C. Immunohistochemical results showed Ki-67 about 40% tumor cells (+), MLH1 (+), MSH2 (+), MSH6 (+), PMS2 (+), CDX2 (+), HER2 (-), CK7 (-), CK20 (+), Braf (-). Genetic test results showed KRAS mutation, NRAS, BRAF and PIK3CA wild type. The patient received FOLFOX regimen adjuvant chemotherapy for 8 times and died of recurrence in January 2020. This was a patient we reported on in 2020 [4].

Case Report 4

In June 2020, a 57-year-old female was referred to our Gastrointestinal Surgical Department for a 3-month history of intermittent stomachache. Colonoscopy showed a circumferential mass of the colon 65cm from the anal margin, and mucosal carcinoma was confirmed by colonoscopic biopsy. Chest and abdominal CECT showed: Situs inversus totalis, mirror colon flexure tumor (left), CT staging: T3 (> 5mm) Nx, EMVI (+) (Fig. 1F). Physical examination and routine laboratory studies were unremarkable.

The patient underwent laparoscopy-assisted right colon cancer radical resection and peritoneal chemotherapeutic drug lavage. The operating time was 239 min, and the blood loss was 50 ml. There were no postoperative complications and the patient was discharged on postoperative day 13.
Histopathologic results showed that moderately differentiated adenocarcinoma with about 20% mucinous adenocarcinoma infiltrated the pericolic fat (pT3), and without regional lymph node metastasis (0/40, pN0), categorized as stage A. Immunohistochemical results showed Ki-67 about 50% tumor cells (+), MLH1 (+), MSH2 (+), MSH6 (-), PMS2(+), CDX2(+), HER2 (-), CK7(-), CK20(+), Braf (-). Genetic test results showed KRAS mutation, NRAS, BRAF and PIK3CA wild type. The patient received CAPOX regimen adjuvant chemotherapy for 6 times, and follow-up showed good recovery without recurrence 11 months after operation.

Case report 5

In August 2020, a 59-year-old female was referred to our Gastrointestinal Surgical Department for a 20-day history of change in stool habits. Physical examination and routine laboratory studies were unremarkable. All the lesions were treated with endoscopic mucosal resection (EMR). Chest and abdomen CECT showed that: total viscera inversion, nodules in the upper rectum and sigmoid colon lumen, adenoma or polyp was considered, malignant transformation was not excluded partly, and the outer edge of the diseased bowel wall was smooth (Fig. 1G, 1H). Colonoscopy indicated multiple colorectal polyps, of which a 2.5cm×3.0cm wide base polyp was found in the rectum 9cm from the anal margin. All the lesions were treated with endoscopic mucosal resection (EMR). Pathologic results showed that the lesions of ascending colon, transverse colon and sigmoid colon were tubular adenoma, hyperplastic polyp and villus-tubular adenoma, respectively. No adenoma was observed at the basal resection margin. The rectal lesion was a well-differentiated adenocarcinoma infiltrating into the submucosa (pT1, depth >1mm), with carcinoma involvement at the basal cutting edge, and without vascular or fascicular infiltration.

The patient underwent laparoscopic radical resection of rectal cancer. The operating time was 183 min, and the blood loss was 20 ml. Pathologic results showed that the rectal wound had no tumor residue and with no lymph node metastasis (0/26, pN0), categorized as stage . The patient had rectal anastomotic bleeding on the first postoperative day and was treated with endoscopic hemostasis on the next day. After that, the patient recovered well and was discharged on postoperative day 7. The patient is doing well without recurrence 16 months after operation.

Literature review

PubMed-indexed for MEDLINE retrieval system was used to retrieve reports published between January 2000 and April 2022 on visceral translocation with CRC and situs inversus. The associated references were shown in Table 1 [5–21].

Discussion

In the literature, there are 17 cases-reports recognized about this issue, making a total of 19 cases, by adding this report. Enrolling all papers, CRC was more frequent in female SIT. The age ranged from 41-85 years. Adenocarcinoma was the histological type present in all cases. Regarding the location of the
tumor, there was a predominance of the sigmoid colon, followed by ascending colon. Combined with our reported cases, the Laparoscopic surgery was performed in most patients, and only 1 case of laparotomy was performed. In one of the cases we reported, there was a recurrence of the side of the urethra after surgery, which is rare and the cause is not clear. In addition, there is a case of postoperative complications and death. Therefore, for elderly patients with underlying diseases, we should strengthen perioperative management to ensure patient safety.

SIT is a rare congenital malformation. The incidence of SIT with CRC is very low, and the relevant literature is rare[4]. To date, there have been 19 cases of total visceral inversion with CRC (see Table 1). The literature emphasizes detailed preoperative examinations and well-developed surgical planning for patients with SIT. Compared with them, our hospital was the center with the most reported cases, and patients were followed up regularly.

Although the viscera of the "Mirror Man" are all dislocated, but only the position changes, physiological function has not changed, they can work and live like ordinary people. But, when this kind of person has the disease to need the surgery treatment, because its inborn organ anatomy unusual, will bring the difficulty to the diagnosis and treatment. Therefore, we should inquire the medical history and physical examination in detail, perfect various examinations and study the imaging data deeply, if necessary, reconstruct the blood vessels to make sure whether there is any obvious variation of blood vessels, try to know the anatomical position and variation of the sites involved in the operation as much as possible, and study repeatedly the operative approach and the problems that may arise during the operation, so as to work out the best treatment method.

The surgical team had to prepare carefully for the surgery, deciding the patient's position, the display and the location of the trocar depending on the location of the tumor. It has been reported that the incidence of complication of endoscopic surgery is higher than that of patients with normal anatomic position[22]. Therefore, surgeons should be more careful. The biggest difficulty in surgery is the need to distinguish the variation of blood vessels, the operator's right and left hand habits. Oms and Jobanputra found potential advantages for left-handed surgeons in laparoscopic surgery in SIT patients[23, 24]. But the right hand surgeon should not hesitate to perform the operation, which is consistent with our view, because after careful preoperative imaging analysis, the operation itself is not different from conventional surgery.

**Conclusions**

To sum up, although CRC with SIT is rarely seen clinically, it is not difficult to diagnose. When SIT is associated with an organ disease, its clinical symptoms and signs are completely wrong to the normal position, which is helpful for doctors to diagnose and differentiate chest and abdomen diseases.

**Abbreviations**

SIT
Situs inversus totalis
HIPEC
Hyperthermic introperitoneal Chemotherapy
CRC
Colorectal cancer

Declarations

Acknowledgements

None.

Authors' contributions

XQC, WC, LQY, GTC, XFW, YYH, MJH and SYT contributed to the study design, data collection, data analysis and interpretation, drafting of the manuscript, approval of the final manuscript, and supervision. All authors approved the final version of the manuscript.

Funding

This study was supported by the Guangdong Natural Science Foundation (2014A030310021) and National Key Clinical Discipline.

Availability of data and materials

The clinical data can be achieved in the electronic medical record system in our hospital.

Ethics approval and consent to participate

The manuscript was approved by the Ethics Committee on Scientific Research of the institutional Review Board of Sun Yat-Sen University.

Consent for publication

Written informed consent was obtained from the patient for the publication of this case report and any accompanying images.

Competing interests

The authors declare that they have no competing interests.

References


Table

Table 1 is not available with this version

Figures
Figure 1

Contrast-enhanced computed tomography or magnetic resonance imaging findings in CRC patients with SIT.

A) Chest and abdomen CT showed the position of abdominal organs of the patient was opposite to normal in Case Report 1;

B) Chest and abdomen CT showed the tumor in the rectum in Case Report 1 (arrowhead) (sagittal image);

C) MRI showed the recurrent nodule near the urethra orifice after CRC surgery in Case Report 2;

D) Chest and abdomen CT showed the position of internal organs of the patient was opposite to normal in Case Report 2;

E) Chest and abdomen CT showed the position of sigmoid colon cancer in Case Report 3;

F) Chest and abdomen CT showed the position of ascending colon cancer in Case Report 4;
G) Chest and abdomen CT showed the position of internal organs of the patient was opposite to normal in Case Report 5;

H) Chest and abdomen CT showed the position of rectal cancer in Case Report 5.