Rectal infarction caused by transcatheter arterial embolization of the superior rectal artery below the Sudeck's point: A case report

Rongdi Wang ( wangrongdi7@163.com )
Dalian Municipal Central Hospital

Yefeng Yin
National Cancer Center, National Clinical Research Center for Cancer/Cancer Hospital, Chinese Academy of Medical Sciences and Peking Union Medical College

Xu Guo
Dalian Municipal Central Hospital

Meng Xu
Dalian Municipal Central Hospital

Case Report

Keywords: transcatheter arterial embolization, rectal infarction, Sudeck's point, acute lower gastrointestinal bleeding

Posted Date: January 11th, 2023

DOI: https://doi.org/10.21203/rs.3.rs-2445210/v1

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

BACKGROUND

Transcatheter arterial embolization (TAE) is the first-line treatment for lower gastrointestinal bleeding. Previous reports have examined the safety and efficacy of TAE, but few studies have assessed its complications. Some studies have only statistically analyzed complication incidence, but it is relatively plain to discuss the causes. Here we emphasize the Sudeck's point as watershed areas for colonic blood supply. Especially for those rare cases which are lack of anastomosis between the sigmoid artery and the superior rectal artery, that should be taken into serious consideration by both surgeons and interventionists.

CASE SUMMARY

In this case, the patient was diagnosed with malignant rectal tumor bleeding. Because the tumor blocked the intestinal lumen, the endoscope could not reach the bleeding site. Therefore, Transcatheter arterial embolization was selected as a hemostatic measure. The superior rectal artery below the Sudeck's point was utilized as the embolization site. Spring coil and Gelfoam were used as embolization materials. However, laparoscopic exploration revealed ischemic necrosis of the upper rectum 25 h later. Due to the lack of blood transport, bowel anastomosis could not be completed after tumor resection, and a sigmoid colostomy was required.

CONCLUSION

When transcatheter arterial embolization serves as an adjunctive therapy, it aims to reduce arterial perfusion pressure rather than to completely occlude the blood vessel. The choice of embolization materials and location is extremely important.

Core Tip

Intestinal infarction is a serious complication of Transcatheter arterial embolization, whose cause is related to embolization location and material selection. To avoid this complication, special attention should be paid to the distribution of intestinal blood vessels during the treatment. The Sudeck's point is often ignored by interventionists because of its controversy. We here report a case of rectal infarction caused by embolization of the superior rectal artery below the Sudeck's point. We also provides valuable imaging data and investigates the effects of embolization location and materials on embolization outcomes. This case provides new insights into the occurrence of intestinal infarction after Transcatheter arterial embolization.

Introduction
Transcatheter arterial embolization (TAE) serves as the first-line treatment of lower gastrointestinal bleeding. However, one of the major complications of TAE is bowel infarction, especially in areas with weak blood flow. The Sudeck's point is a weak point at the rectosigmoid junction. Since the importance of the Sudeck's point is controversial, this area is ignored by most medical professionals. Here we present a case of bowel infarction after TAE of the superior rectal artery below the Sudeck's point performed to treat massive malignant rectal tumor hemorrhage. To the best of our knowledge, no other such cases have been reported in the literature. This report provides guidelines for interventional treatment in order to avoid intestinal infarction complications.

Case Presentation

A 42-year-old man presented at our center with rectal bleeding four months and was diagnosed with clinical Dukes’ stage C adenocarcinoma of the rectum (Fig. 1). Endoscopically, the mass was detected 10 cm from the anal verge and encompassed almost the whole circumference of the lumen. The patient's hemoglobin levels were 87 g/L due to long-term hematochezia. No obvious abnormalities were found in coagulation function and other laboratory tests. After definitive diagnosis and exclusion of surgical contraindications, laparoscopic radical rectal carcinoma was planned.

On May 31, 2021, the patient experienced an episode of hematochezia with a total volume of 500 mL after awakening at 7 AM. The patient appeared irritable and showed fatigue symptoms. His vital signs were as follows: blood pressure, 104/60 mmHg; pulse rate, 98 beats/min; respiration rate, 20 breaths/min; body temperature, 36.7°C. Blood count showed hemoglobin level decrease to 6.3 g/dL, and hematocrit level decrease to 27.8%. The patient was in a state of hemorrhagic shock (compensatory phase). Based on the patient’s clinical scenario, the rectal tumor was the suspected origin of the active bleeding. After supportive management, the patient maintained hemodynamic stability and was immediately sent to the interventional radiology suite for hemostatic treatment. Interventional radiologists chose the right common femoral artery as the access point for endovascular angiography. After selective catheter angiography of the inferior mesenteric artery (IMA) and superior rectal artery (SRA), active extravasation was demonstrated at the upper rectum (Fig. 2A). Then, a combination of Gelfoam slurry (560–710 µm) and two coils was used for SRA embolization (Fig. 2B). After embolization, angiography showed that the target vessel (SRA) was well embolized (Fig. 2C). The patient returned to the ward at 11 AM without abdominal pain, abdominal distention, or rebleeding.

After blood transfusion and fluid replacement treatment, the patient remained hemodynamically stable, and hemoglobin levels increased to 92 g/L. Then, the patient underwent a laparoscopic radical resection of the rectal tumor at 12 PM on June 1. During the intraoperative exploration, bowel infarction was found in the area between the sigmoid and the upper area of the rectum (Fig. 3). The bowel was pale in color, without peristalsis. The marginal arteries were not visible. The Hartmann's procedure was performed to avoid postoperative anastomotic complications. As a result, the patient had to undergo permanent sigmoid colostomy.
Discussion

Acute lower gastrointestinal bleeding (LGIB) is often an urgent and potentially life-threatening emergency that may lead to significant morbidity and mortality without appropriate management. Colorectal tumor bleeding makes up 4.9% of all LGIB cases, with an overall mortality rate as high as 2.4–3.9% \(^1\). The purpose of the treatment of massive LGIB caused by a tumor is to prevent life-threatening hemorrhagic shock and to transform an emergency operation into an elective one. The clinical success of TAE provides favorable conditions for tumor resection and digestive tract reconstruction.

TAE has been shown to be effective in controlling LGIB and is much safer than surgery in high-risk patients. It also has a low 30-day mortality rate. Angiography results are evaluated to identify an active bleeding rate of at least 0.5 mL/min \(^2\). The source of bleeding can then be rapidly accessed without a requirement for bowel preparation.

The risk of ischemia and/or infarction in TAE is related to both embolization position and the choice of embolic materials. First, most reports describe the vasa recta as the target embolization artery that is located proximally to the marginal or terminal artery and as close to the bleeding site as possible. Secondly, coils and Gelfoam are the most embolization materials used in combination. Coils can be detected under fluoroscopy and placed precisely at the target vascular site. They consist of a fibrous component that stimulates thrombosis and a metal component that serves as a physical block. They reduce blood flow while preserving enough collateral circulation to prevent bowel ischemia \(^3\). Gelfoam is a temporary agent that remains effective for weeks to months. A disadvantage of Gelfoam is a difficult control of its placement, resulting in a location further away than intended, which may increase the risk of intestinal ischemia \(^4\). Therefore, Gelfoam is not recommended as a single agent.

There are various weak points known as watershed areas for colonic blood supply, which include the Griffiths’ point at the splenic flexure and the Sudeck's point at the rectosigmoid junction \(^5\). The Sudeck's point (or Sudeck's critical point) refers to a specific location in the arterial supply of the rectosigmoid junction, namely the origin of the last sigmoid arterial branch from the IMA (Fig. 4). Because macroscopic anastomosis of SRA and the last sigmoid arterial branch are absent or insufficient in a minority of individuals (4.7%), most surgeons believe that the Sudeck's point is not critical. However, the present report describes a patient lacking macroscopic anastomosis who experienced rectal infarction. Therefore, the Sudeck's point should be considered a critical point during TAE and surgery in patients lacking arterial anastomosis.

According to the above theories, the reasons for the occurrence of intestinal necrosis in this case have two major aspects. First, the embolization location was incorrect. SRA was completely embolized below the Sudeck's point, and its distal end lacked anastomotic branches. Secondly, the choice of embolic material was inappropriate. After the spring coil was placed, the hemostatic effect should have been checked before deciding whether to inject the Gelfoam. As an adjunctive treatment, embolization aims to
control massive bleeding, buy time for the operation, and stabilize the patient's condition, rather than cause complications and unexpected difficulties for the operation.

In this case, the bleeding location was definitively diagnosed before angiography because the patient had rectal cancer. Although colonoscopy was recommended as the first intervention in a recent review article discussing the management of LGIB, the probe could not reach the bleeding site due to the occlusive primary tumor. Therefore, another treatment modality had to be considered. In the present case, the patient was considered hemodynamically unstable. Hemostasis and resuscitation represented overwhelming tasks then. Efficient and minimally invasive strategies should be considered regardless of treatment type. Surgery is the most traumatic option with high mortality rate and should be used as the last resort when TAE remains the only option. It is sobering that TAE is a part of a therapeutic scheme for cancer patients, which treats the symptom of the underlying disorder rather than the disease itself \[6\]. In this case, using TAE as a hemostatic measure was appropriate, but careful consideration of operation details and embolization location would have prevented the occurrence of rectal necrosis.

**Declarations**

**ACKNOWLEDGEMENTS**

None

**Author contributions:** Rongdi Wang and Yefeng Yin contributed to study conception and design. Rongdi Wang searched the literature and assessed the identified studies. Rongdi Wang and Yefeng Yin evaluated the study quality and wrote the manuscript. Xu Guo and Meng Xu provided critical feedback on the manuscript.

**Informed consent:** The patient provided consent to use his medical record for educational and publication purposes.

**Conflict of interest:** The authors have no conflicts of interest to declare.

**Funding:** This research received no external funding.

**CARE Checklist (2016) statement:** The authors have read the CARE Checklist (2016), and the manuscript was prepared and revised accordingly.

**References**


Figures
Figure 1

(A) Preoperative CT image of the patient. (B) Preoperative MRI image of the patient. The white arrows indicate the tumor.
Figure 2

(A) Pre-embolization arteriogram showed bleeding in the rectal area. (B) Two coils was placed in the superior rectal artery. (C) Postembolization arteriogram showing complete occlusion of the superior rectal artery.
Figure 3

Endoscopic imaging showed necrosis of the rectum. The black arrow indicates the ischemic line.
Figure 4

The Sudeck's point of the patient. Angiography showed a lack of anastomosis between the sigmoid artery and the superior rectal artery.