



Multiple interventional embolizations for hemostasis in hemorrhage following advanced colorectal cancer treatment: a case report

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Background: In recent years, the incidence of serious complications in patients with advanced colorectal cancer has been progressively increasing, and the fatality rate of secondary bleeding is the highest, while most patients cannot undergo surgical intervention due to physical weakness, while interventional embolization therapy has attracted more and more attention of clinicians because of its advantages of small trauma and quick effect. Among them, multiple cases of secondary hemorrhage of different arteries are very rare. In this case, the changes of vital signs of patients were significantly stabilized after each interventional embolization therapy. Interventional embolization therapy can be used as one of the first choices for secondary hemorrhage.

Case Description: Retrospectively analyzed the clinical data of a patient with advanced colorectal cancer who successively developed 7 times of secondary hemorrhage within 10 months. The two times of hemorrhage had different degrees of hemorrhagic shock, and five times showed unexplained progressive decrease in hemoglobin. The location of each hemorrhage and the arteries invaded by the tumor were different, and the embolization materials and treatment methods used each time were not the same. The effect of interventional embolization each time could effectively stop bleeding, and the patient greatly improved the quality of life with tumor survival. The patient prolonged the survival cycle for up to 16 months from the first secondary hemorrhage.

Conclusions: For patients with advanced colorectal cancer complicated with secondary hemorrhage, interventional embolization can be used to control the disease and prolong the life cycle, which is one of the preferred treatment methods in clinical application.

Keywords: Advanced colorectal cancer; hemorrhage; interventional; embolization; case report

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Introduction

Secondary hemorrhage of advanced colorectal cancer is one of the most common complications of this disease (1-3). Because most patients with advanced cancer are complicated with distant organ metastasis or weak constitution after multiple radiotherapy and chemotherapy cycles, they are unable to undergo further surgical intervention (4,5).

Moreover, as the hemostatic effect of internal medicine is not immediately apparent, interventional embolization hemostasis is the most effective method for the treatment of secondary bleeding of advanced colorectal cancer (6-8), which both prolongs survival and greatly improves patients' quality life (9,10). However, there are very few patients with advanced colorectal cancer who can prolong the life cycle of more than 6 months due to the low effective control

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Table 1 Comparison of 7 interventional embolization treatment regimens and hemoglobin values before and after each operation in patients

Number of interventions	Treatment time	Bleeding artery	Embolic material	Preoperative hemoglobin (g/L)	Postoperative hemoglobin (g/L)
First	2017-5-12	Left internal iliac artery bleeding	12 coils	68.2	80.4
Second	2017-5-16 AM	Suspected bleeding from left 5th lumbar artery	2 coils, several gelatin sponges	93.3	80.5
Third	2017-5-16 evening	Suspected hemorrhage of left inferior epigastric artery and right vesical artery and left external iliac artery	2 intravascular stents, 1 balloon, 1 coil, several gelatin sponges	71.1	81.7
Fourth	2017-7-20	Hemorrhage of two branches of superior mesenteric artery	3 coils	86.1	89.7
Fifth	2017-8-30	Local aneurysm formation in right common iliac artery	1 endovascular stent, 2 controllable coils	88.8	90.6
Sixth	2017-9-1	Right common iliac artery bleeding	4 controllable coils	86.8	97.6
Seventh	2018-2-4	Right 4th lumbar artery and superior mesenteric artery 2 branch artery hemorrhage	1 controllable coil, 5 coils, several gelatin sponge particles	89.9	92.2

rate of secondary bleeding. In this patient with advanced colorectal cancer, after receiving surgery, radiotherapy and chemotherapy and other related treatments, 7 times of secondary bleeding occurred successively within a period of 10 months, and the bleeding arteries were different each time. Such complex complications are very rare, and each interventional embolization therapy can effectively stop bleeding, and the patient's life cycle was prolonged for up to 16 months successively. The treatment experience is reported as follows. We present the following article in accordance with the CARE reporting checklist (available at <https://jgo.amegroups.com/article/view/10.21037/jgo-22-731/rc>).

Case presentation

A 46-year-old male patient underwent radical resection for rectal cancer in the Cancer Hospital of Chinese Academy of Sciences in 2011, which was followed by radiotherapy and chemotherapy. In 2016, radical resection for sigmoid colon cancer and colostomy were performed. On May 12, 2017, the patient received emergency treatment in our department for the first time due to a sudden large amount of hematochezia passing through the stoma, and, with further complications of hemorrhagic shock and blurred consciousness, was in critical condition. From May 2017 to February 2018, the patient received interventional

embolization treatment for secondary bleeding 7 times successively at our department, with different embolization sites and embolization methods being used and achieving satisfactory results (Table 1). Moreover, the patient did not show bleeding or other symptoms after the last treatment in February 2018, and the treatment as a whole extended the patient's life by 16 months.

In the first emergency episode on May 12, 2017, which included massive hematochezia combined with hemorrhagic shock, digital subtraction angiography showed left internal iliac artery contrast leakage entering the colon. Consequently, 12 spring rings were used for artery embolization, and the patient's vital signs became stable (Figure 1A,1B).

At the second admission to our department on May 16, 2017, the patient presented with an unexplained progressive decrease in hemoglobin. Angiography showed that the left fifth lumbar artery had slightly thickened, and hemorrhage was suspected. Gelatin sponge particles and 2 coils were used for embolization (Figure 1C,1D).

The patient's third admission to our department occurred on the night of May 16, and was due to the patient once again experiencing massive hematochezia and hemorrhagic shock. The angiography findings led us to suspect bleeding of the left inferior abdominal artery and the right bladder artery. A spring coil and gelatin sponge particles were used for pulse embolization. However, after the embolization,

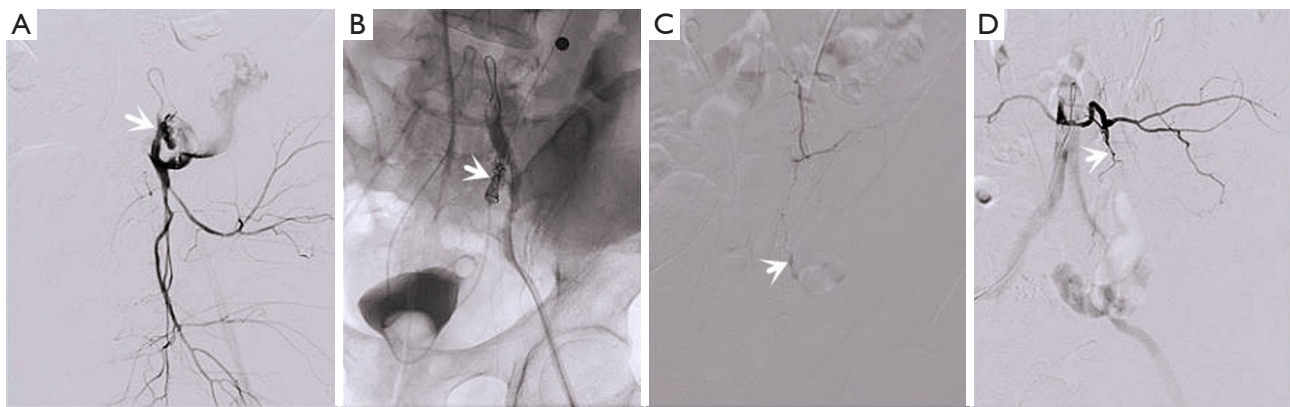


Figure 1 The first interventional embolization treatment process on May 12, 2017 and the second on May 16, 2017. (A) The left internal iliac artery rupture bleeding point (white arrow). (B) Twelve coils occluded and embolized left internal iliac artery (white arrow). (C) Suspicious bleeding in the left fifth lumbar artery. Hemostasis was performed by embolization (white arrow). In (D), repeat angiography shows the disappearance of thickened collaterals (white arrow).

the blood pressure, heart rate, and other vital signs still had not significantly improved. Further angiography revealed a large amount of contrast medium overflowing from the external iliac artery, which was consistent with the suspected bleeding. Consequently, 2 self-expanding stents were placed to cover the overflow of the contrast medium. After reexamination, the bleeding had significantly reduced, but there was still a small amount of overflow. After insertion of an 8 mm × 4 cm balloon through the guide wire, the common iliac artery was intermittently blocked for about 8 minutes each time, with an interval of 5 minutes. After 2 sessions of blocking, angiography was again applied, which revealed that the bleeding had stopped (*Figure 2A-2H*).

On his fourth visit on July 20, 2017, the patient showed a progressive decline in hemoglobin, with bleeding in 2 branches of the superior mesenteric artery and overflow into 2 branches of the superior mesenteric artery. Subsequently, 3 microcoil action pulse embolization was applied. Reangiography showed the proximal bleeding occlusion of the superior mesenteric artery, and the bleeding signs disappeared (*Figure 3A-3D*).

On his fifth visit on August 30, 2017, the patient once again had progressive decrease in hemoglobin. Angiography indicated an aneurysm in the lower segment of the right common iliac artery, with no obvious contrast agent spillage. A vascular stent and 2 coils were then placed to occlude the aneurysm (*Figure 4A,4B*).

As of his sixth visit on September 1, 2017, the patient's drop in hemoglobin had not improved significantly, and reangiography showed endoleak around the right common

iliac artery stent that was consistent with bleeding. The right common iliac artery endoleak space was selected, and 4 controllable coils were used for embolization. Follow-up angiography showed that the right common iliac artery endoleak space had been closed, and the signs of bleeding had disappeared (*Figure 4C,4D*).

On his seventh visit on February 4, 2018, the patient again presented with a progressive decrease in hemoglobin, and the angiogram showed suspicious bleeding in the right fourth lumbar artery and 2 branches of the superior mesenteric artery. One controlled spring coil and three microspring coils were used to embolize two branches of the superior mesenteric artery, and two gelatin sponge pellets and two microspring coils were used to embolize the right fourth lumbar artery. Review of the angiogram showed the evidence of tumor staining (*Figure 5A-5D*).

From May 2017 to February 2018, the patient suffered from massive bleeding in his stool passing through the stoma and 2 episodes of hemorrhagic shock. The situation was critical. Because the intraoperative embolization was accurate and the intraoperative vital signs had significantly improved, in the 5 cases of progressive decrease of hemoglobin, celiac arteriography was performed to determine the location and scope of bleeding, and the effect was satisfactory. Since the last treatment on February 2018, the patient has not experienced gastrointestinal bleeding or other symptoms. All the above interventional embolization treatments prolonged the life of the patient by a total of 16 months. The patient's family were very satisfied with the result of this treatment.

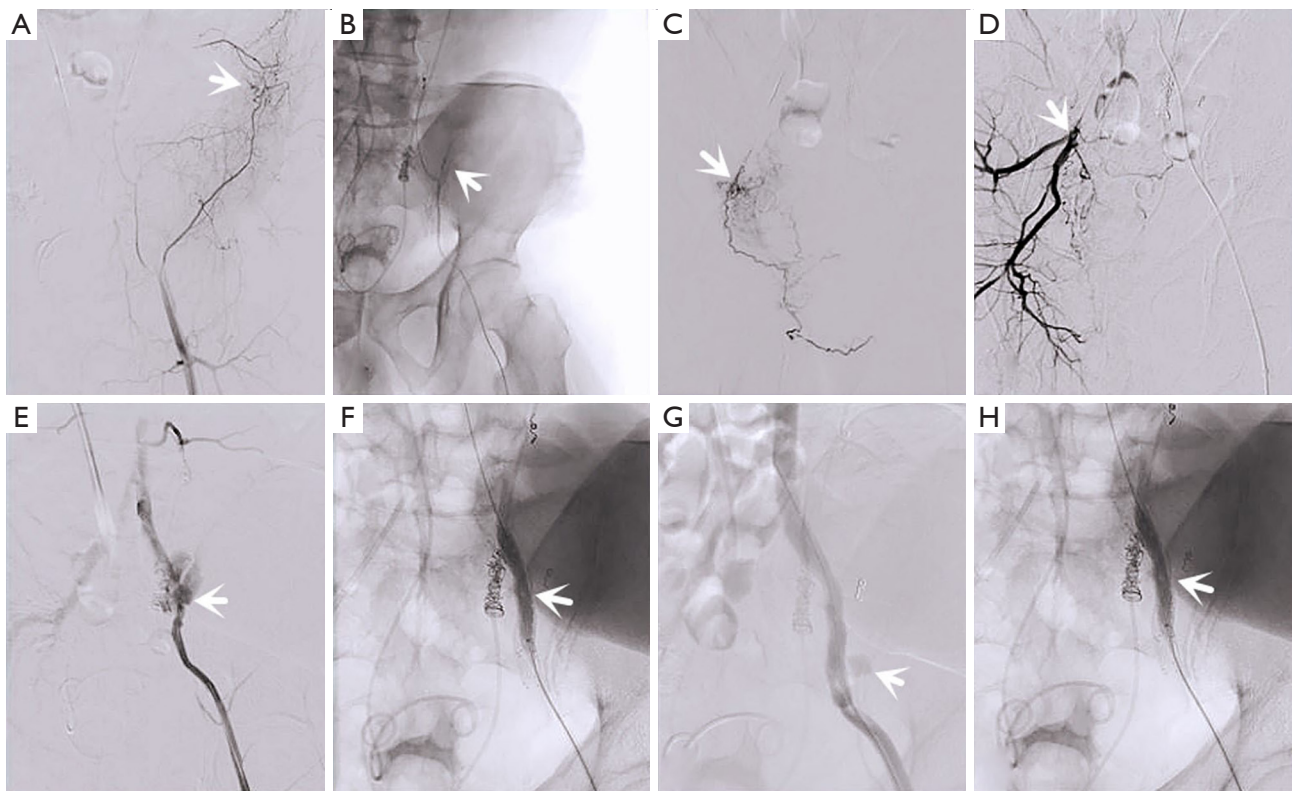


Figure 2 Third interventional therapy on 16 May, 2017 evening. (A) Suspicious hemorrhaging in the left inferior epigastric artery (white arrow). (B) The embolization with a spring coil (white arrow). (C) Suspicious hemorrhaging in the right bladder artery (white arrow). (D) The gelatine sponge particles being used for embolization (white arrow). In (E), reangiography confirms the conditions of the left external iliac artery to be consistent with hemorrhage (white arrow). (F) Two self-dilating stents placed in the left external iliac artery (white arrow). (G) The reexamination showing a small amount of contrast extravasation (white arrow). (H) The intermittent occlusion of the common iliac artery with a balloon (white arrow).



Figure 3 The fourth treatment process of interventional embolization for hemostasis on July 20, 2017. (A) Hemorrhage of a branch of the superior mesenteric artery (white arrow). (B) Hemostasis with 6 coils (white arrow). (C) Hemorrhage of a branch of the superior mesenteric artery (white arrow). (D) Reexamination after embolization with 3 microcoils had been applied: the signs of hemorrhage have disappeared (white arrow).

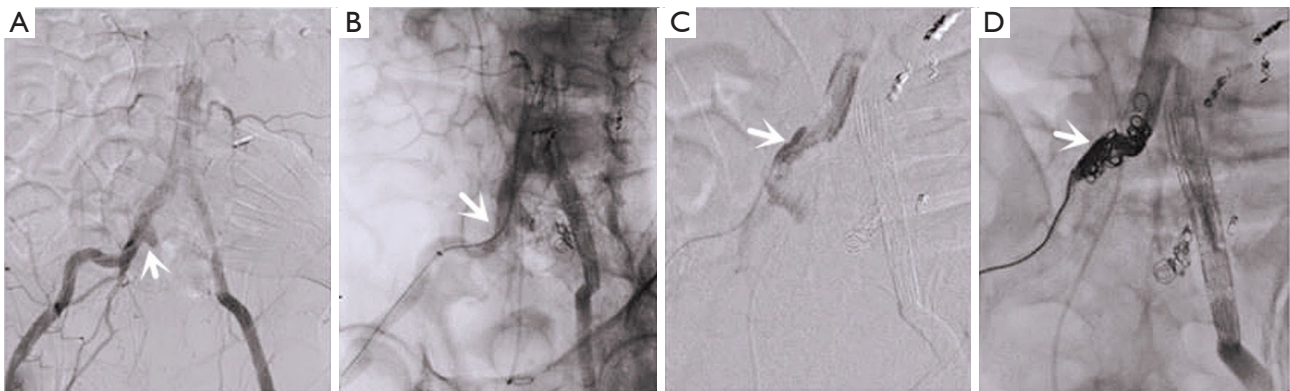


Figure 4 The treatment process of embolization hemostasis on August 30, 2017 for the fifth time and September 1, 2017 for the sixth time. (A) An aneurysm formation can be seen in the lower segment of the right common iliac artery (white arrow). (B) The placement of the 2 vascular stents (white arrow). (C) Hemorrhaging around the stent in the right common iliac artery (white arrow). (D) The embolization and closure treatment with 4 controllable spring coils (white arrow).

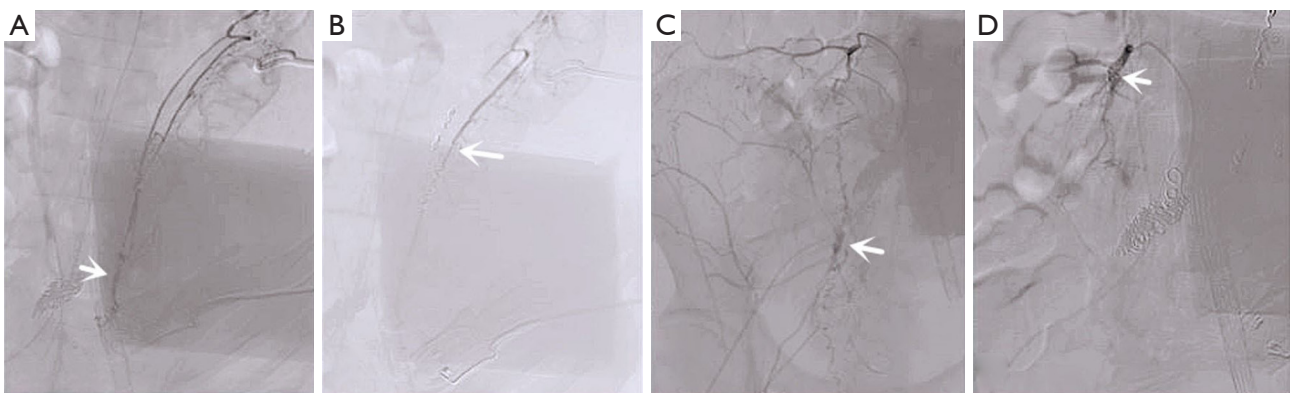


Figure 5 The seventh treatment process of embolization hemostasis on February 4, 2018. (A) Suspected bleeding in 2 branches of the superior mesenteric artery (white arrow). (B) Embolization of the bleeding artery with a coil (white arrow). (C) The right fourth lumbar artery (white arrow). (D) Embolization of right fourth lumbar artery with gelatin sponge particles and coil (white arrow).

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Declaration of Helsinki (as revised in 2013). Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the editorial office of this journal.

Discussion

Secondary hemorrhage is one of the most common complications of advanced colorectal cancer (11-13). If combined with hemorrhagic shock, it poses a

considerable threat to the lives of patients. Because of the difficulty in nutrition intake, weakness, and a multitude of complications, it is difficult for patients with advanced colorectal cancer to tolerate symptomatic surgical treatment (14,15). Similarly, patients undergoing long-term radiotherapy and chemotherapy often have reduced vascular capacity, and so it is difficult for conservative medical treatment to achieve a hemostatic effect (16,17). For patients who experience hemorrhagic shock, interventional embolization is the most direct and effective intervention, and not only causes less trauma to patients but can also facilitate a faster prognosis. For the progressive decrease of hemoglobin of unknown cause, the location and scope of bleeding can also be determined by

angiography, and embolization materials such as spring coils or gelatin sponges can be used to stop bleeding quickly under fluoroscopy. Moreover, this minimally invasive interventional treatment process can be repeated numerous times, with broad indications and relatively few contraindications (18-20). The hemostatic effect can be determined by checking routine blood test results 6 hours after the operation, which is convenient for the further development of the diagnosis and treatment plan.

In this case, the patient was 6 years postoperative for rectal cancer and 1 year postoperative for sigmoid colon cancer at the time of his initial visit, which occurred due to hemorrhagic shock caused by extensive metastasis of the mass directly invading the peripheral vessels. We stopped the bleeding by occluding the left internal iliac artery, and the patient's vital signs were stable intraoperatively. Four days later, the patient was reimaged due to a persistent drop in hemoglobin; we performed prophylactic blockage of the suspected left four lumbar arteries, the left inferior abdominal wall artery, and even the right bladder artery. However, the bleeding volume was large, and the signs did not match the actual situation. After applying angiography again, we found that the left external iliac artery was the key to rupture after pressure, and we blocked it with overlapping stents. Later on, the patient had several critical cases of a progressive decline of hemoglobin, and in addition to blocking multiple branches of the superior mesenteric artery forming the collateral circulation, we also blocked and embolized the hemangioma of the right internal iliac artery to ensure no further bleeding occurred. On the final visit, we performed detailed imaging of all the abdominal vessels and blocked several superior mesenteric arteries and lumbar arteries that might have been bleeding.

In interventional embolization, it is critical to quickly and precisely locate the bleeding site and range, with clinical performance and patients' vital signs being important criteria and auxiliary conditions for evaluating whether the vessels selected for embolization are correct. The effect of embolization can be evaluated according to the intraoperative changes of patients' vital signs in real time. For cases with extensive tumor invasion, the relevant vessels, especially the trunk and branches around the lesion, should be involved as comprehensively as possible when imaging occurs. For patients with multiple hemostasis, some less obvious vessels should also be repeatedly imaged. This is because multiple-blocking embolization can cause obvious opening of the collateral circulation of the target vessels in the lesion area, and many small vessels may easily

be missed and form obscure bleeding, which increases the risk of hemorrhagic shock. For obvious bleeding arteries, spring coils can be directly applied for embolization, while for important access vessels, peritoneal stents can be applied for blockage and supplemented with balloon dilation if necessary to increase the stenting effect. Meanwhile, for suspected bleeding arteries, gelatin sponges can be used for prophylactic intervention to avoid the ectopic embolization of functional vessels. Finally, proper postoperative clinical care of the patient is crucial in allowing the patient to obtain the maximum benefit from the interventional embolization treatment. This involves anticoagulation of the vascular stent and the appropriate prescription of daily hemostatic drugs.

In conclusion, cases of multiple interventional embolizations to stop hemorrhage are still relatively rare. In clinical work, these patients should be meticulously, comprehensively, and repeatedly examined with angiography; suitable embolization materials and stents should be selected according to the type and characteristics of vascular breakdown; the surgical plan should be adjusted according to the changes of the patient's vital signs during the operation; and postoperative review should be regularly performed to precisely determine the effect of embolization, which in turn will significantly prolong the patient's life.

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Footnote

Reporting Checklist: The authors have completed the CARE reporting checklist. Available at <https://jgo.amegroups.com/article/view/10.21037/jgo-22-731/rc>

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <https://jgo.amegroups.com/article/view/10.21037/jgo-22-731/coif>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved. All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee(s) and with the Declaration of Helsinki (as

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