IATROGENIC SMALL BOWEL HEMORRHAGE TREATED WITH TRANSCATHETER ARTERIAL EMBOLIZATION

[1*]Nguyen Vu Dang, [1]Bui Tien Si

[1]Department of Radiology, Can Tho University of Medicine and Pharmacy, Ho Chi Minh, Vietnam

***Corresponding author**:
Nguyen Vu Dang, Department of Radiology, Can Tho University of Medicine and Pharmacy, Ho Chi Minh, Vietnam.

Email: nvdang@ctump.edu.vn

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ABSTRACT:

Background:
Postsurgical iatrogenic gastrointestinal hemorrhage is an emergency which could carry high mortality rate and cause prolonging the hospitalization time. Endoscopic intervention plays a main role, although not always successful meanwhile reoperation is often difficult and dilematic. Endovascular intervention is minimally invasive and could be an effective management for this urgency.
Case Report:
A 74 years-old male patient with no significant pathology history had an abdominal pain at the right upper quadrant extending to the gastric areas. He was diagnosed with cholangitis and biliary obstruction due to pacreatic head tumor. Subsequently, he experienced a Whipple surgery for the pancreatic head tumor and D2 duodenal removal accompanied by a choledochojujenal anastomosis. Since the 9th day post-surgery, he has a suspicious gastrointestinal hemorrhage. On the day 11th after the surgery, he had a hypovolemic shock with a hemoperitoneum. The suspicion of the bleeding causes from the resected arteries of the sutured sites had been risen. An abdominal computed tomography angiography (CTA) was performed and the hemorrhagic pseudoaneurysmal artery was identified. After a discussion, he was immediately sent to the angio-suite for the interventional embolization. Check angiogram showed complete occlusion of the pseudoaneurysm without any complications.
Conclusion:
Transcatheter arterial embolization had shown its effectiveness in the treatment of the postoperative iatrogenic gastrointestinal bleeding. Its technical simplicity makes it more advantageous outweighing a repeat of a surgery especially in the high-risk patients with multiple comorbidities.
Keywords:
Iatrogenic gastrointestinal hemorrhage, Transcatheter arterial embolization, Therapeutic endoscopy, Pseudoaneurysm

INTRODUCTION:

Post-operative gastrointestinal bleeding is a complication that can lead to severe consequences. It could prolong hospital stay or increases the mortality risk. Some lethal cases even necessitate emergency rescue intervention. Generally, the cause of gastrointestinal bleeding originates from peptic ulcers. Less common causes include benign and malignant conditions such as gastrointestinal angiodysplasia, portal hypertension, trauma, and medical procedures. The incidence of post-operative gastrointestinal bleeding is relatively low, ranging from 0.4% to 16% depending on the different studies [1,2]. One of the rare causes is visceral artery pseudoaneurysm following abdominal surgeries [3,4]. The management for this entity needs prompt, accurate, and highly effective diagnostic and therapeutic measures. The first common treatment option for this complication is endoscopic hemostasis which is a preferred method in most patients if the patient's hemodynamics are stable. However, in many cases, endoscopy may be challenging due to the limited visualization and localization of the bleeding site due to a large amount of intraluminal blood. Some other cases manifest with intra-abdominal hemorrhage which is not controllable endoscopically. Under these certain circumstances, a repeated surgery is hard to obtain since it could dramatize the existing injuries and it is difficult to identify the bleeding vessels inside the previously operated structures due to post-operative anatomical distortion, inflammation, adhesion. whilst being given the unstable hemodynamics, a rapid hemostasis intervention is timely required to save the patient's life. In such situations, an endovascular embolization for hemostases is a highly recommended option.

CASE REPORT:

A 74-year-old male patient was admitted to the university hospital due to an abdominal pain. He has a medical history of hypertension and type 2 diabetes. After the examination, the patient was diagnosed with suspected cholecystitis due to distal common bile duct choledocholelithiasis. There was an associated suspicious pancreatic head tumor, adjacent to the second part of duodenum. The patient was scheduled for exploratory surgery and treatment. Upon the surgery, a tumor mass was found in the pancreatic head, with the characteristics corresponding to the computed tomography (CT) images. A Whipple surgery was performed accordingly. The patient tolerated quite well post-surgically. However, on the 9th postoperative day, the patient began to have minimal black blood-stained stools, indicating a gastrointestinal hemorrhage with suspicious bleeding from the operation sites. The patient was managed conservatively, being administered with fluids, receiving medicines, and being closely monitored. On the 11th postoperative day, the patient became lethargic and tachypneic with SpO2 fluctuating between 88 to 90%. He also had a hypotension with blood pressure of 80/50 mmHg and a hemoglobin drop to 10g/dl, indicating an acute blood loss with unknown causes. A multidisciplinary discussion was made by the surgery, the intensive care and the radiology teams leading to an initial diagnose which was hemorrhagic shock due to massive gastrointestinal bleeding and/or possible internal bleeding. The patient was resuscitated with intravenous fluid and blood transfusions to maintain the vital signs. He then was sent for urgent radiological screening, keeping in view an emergency intervention for urgent hemostasis. A contrast-enhanced abdominal CT angiography (CTA) had revealed the contrast extravasation adjacent to the lower part of the left liver, suspecting a bleeding site originating from the operated arteries in Figure 1. A swift discussion between the surgical and the interventional radiology teams lead to the unison decision for endovascular

intervention accordance to the relative consent. Subsequently, the patient was transferred immediately to the angio-suite for the urgent embolization. Diagnostic run was performed using a Yashiro catheter showing a pseudoaneurysm arising from a branch of the right hepatic artery. Selective catheterization and angiogram were done followed by coiling embolization of the bleeding artery as shown in Figure 2. Complete occlusion of the pseudoaneurysm as well as the the feeding artery was obtained which was demonstrated on the post embolisation images in Figure 3.

The day right after the embolization of the bleeding artery, the patient's clinical condition significantly improved in the post procedure room. His blood pressure returned to normal ranges, and it was stable at 100/60 mmHg. His SpO2 level was up to 96%. He was conscious and even being able to sit up. He was then transferred to the ward for close monitoring of the vital signs and further treatment. After a few days operatively, he was doing well and discharged subsequently without any recorded post-intervention complications.

DISCUSSION:

In the past decades, transcatheter arterial embolization (TAE) has developed and emerged as the first-line treatment for gastrointestinal bleeding when endoscopic therapy is ineffective. Interventional radiology offers rapid, safe, and minimally invasive hemostasis, also serving as a substitute for surgery. With various modern techniques and increasing experience of interventional physicians, it also has become a worthy consideration when facing the cases with recurrent bleeding after previous endoscopic or surgical interventions.

This TAE technique is suitable for the patients with coagulation disorders, with a shorter preparation time and being easier to identify the bleeding vessels compared to open surgery. Particularly, it can be repeated multiple times due to minimal invasiveness, which is a significant advantage over surgery. By far, the advanced embolization materials combining with the skills of interventional physicians, significantly reduces the complications of intestinal ischemia compared to earlier periods.

Its indications could include massive bleeding (requiring transfusion of at least 4 units of blood within 24 hours), unstable hemodynamics or hemorrhagic shock (hypotension with systolic blood pressure < 100 mmHg and heart rate > 100 beats per minute), acute status unmanageable conservatively, failure of endoscopic hemostasis on two occasions or high-risk patients, recurrent bleeding after surgery and those with associated intra-abdominal hemorrhage [2, 6].

This TAE procedures should be performed as early as possible right after the diagnostic suspicion of hemorrhagic emergency. The causative blood vessels can be accurately localized using CT or pre-procedure endoscopy. Other centers require the CTA to be performed routinely to identify the bleeding arteries [5]. However, in cases of profuse and massive bleeding, this step may be skipped, and the patient should be promptly transferred to the interventional centers. Computed tomography angiography is currently useful and has high sensitivity in detecting the bleeding vessels. [6, 8]

Regarding the technique, firstly the culprit blood vessel is often identified via endoscopy, the blood clotting clips or through a CTA. Therefore, performing the angiography allows a rapid access to the causative blood vessels. Visualization of contrast agent extravasation into the bowel lumen or the creation of pseudoaneurysms serves as indications for the culprit blood vessel. The interventional embolization may need to be performed simultaneously with supportive measures for blood clotting. The femoral artery approach is commonly used, utilizing a 5F or 6F sheath for femoral artery access. Various types of guiding catheters and microcatheters with small diameters are used for visceral artery

accesses. The commonly used ones include Cobra, Yashiro, and Sidewinder 4F catheters utilizing as the diagnostic as well as the guiding catheters. After safe access is properly achieved, background-subtracted angiography is performed to identify the hemorrhagic blood vessels. It is essential to use guiding catheters for small blood vessels and super-selective catheters to avoid artery constriction. After identifying the bleeding arteries, microcatheters are used to access and occlude it using microcoils or glue (N-butyl cyanoacrylate and lipiodol). Using coils ensures quick and safer occlusion for proximal arterial branches, preventing bowel infarction but still being relatively effective. Cyanoacrylate glue typically facilitates rapid and effective occlusion, being relatively safe provided the operating physician is well-trained and being experienced.

Regarding the effectiveness, the transcatheter arterial embolization (TAE) might have high clinical success rates which were reported in the majority of studies. They can achieve the effective hemostasis in up to 98% of gastrointestinal bleeding [1, 2, 7, 9]. In a meta-analysis conducted by Loffroy et al, the technical success rate reached 93% [7], meanwhile in another study by Chun-Gao Zhou et al with 26 patients undergoing intravascular embolization, the technical success rate was 95% and the clinical success rate was 82% [1].

The recurrent bleeding which range from 9 to 47% [10] which could cause another emerging dilemmatic situation. For that, a consideration of another intervention should be carefully discussed and selected. One more disadvantage was that, if the patient was agitated and not well-cooperative, the patient's breathing or movement could cause degradation of the image during diagnostic and embolization processes. For that, general anesthesia with intermittent pauses could reduce the image artefacts.

Complication of the TEA are not common, one of the most concern complications are bowel ischemia which is, however, reported with a minimal incidence [9, 11]. They are related to the usage of penetrating embolic materials including polyvinyl particles, liquid N-butyl cyanoacrylate. Using coils as oen of the embolic agents seem to be safer but some time the coils could not reach to the bleeding sites. However, they are quite effective in big hemorrhagic vessels with good control of this embolic material placement.

In the above illustrated clinical case, the patient had undergone a major surgery with Whipple procedure, rapidly progressed to the hemorrhagic shock. In this difficult situation, the decision for a repeat of an operation was difficult to be made due to high risks of unsuccessfulness, being unable to identify the bleeding sites, worsening the patient status by exerting another burden to the preexisting injury. Similarly, gastroenteroscopy also was not preferable because the hemorrhage may extent to the peritoneal cavity whereby the endoscopy machine could not approach. After all, the choice of intravascular embolization was made with good results, timely saving the patient without complication and avoiding prolong hospitalization time. This case gives another illustration of the endovascular benefit outweighing the other modalities in the management of the acute gastrointestinal hemorrhage. This is also sharing the common points with other reported studies in the advantages of the TAE for the management of emergent gastrointestinal hemorrhage especially in those who were unable to control surgically or endoscopically.

CONCLUSION:

Postoperative gastrointestinal bleeding poses challenges in the selection of treatment options due to multiple risk factors and technical difficulties. With the

recent advancement of medical gadgets and the interventional techniques, arterial embolization has become the preferred modality of choice in such emergency dilema, maximizing the outcome effectiveness, minimizing excessive cost and possible complications. Beside the interventional embolization, multidisciplinary collaboration between critical care, internal medicine management, surgery, and radiological specialties is essential to offer the most beneficial treatment for the patients. However, with the diferences of the current reported results in effectiveness, bleeding recurrences and complications, further improvement of embolic materials, protocols, technical gagets are still needed to be considered.

DATA AVAILABILITY:

Further information regarding the data used for this work can be obtained from the corresponding author upon reasonable request.

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CONFLICT OF INTEREST:

The authors have no conflicts of interest to declare and are in agreement with the contents of the manuscript.

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FIGURE LEGEND:

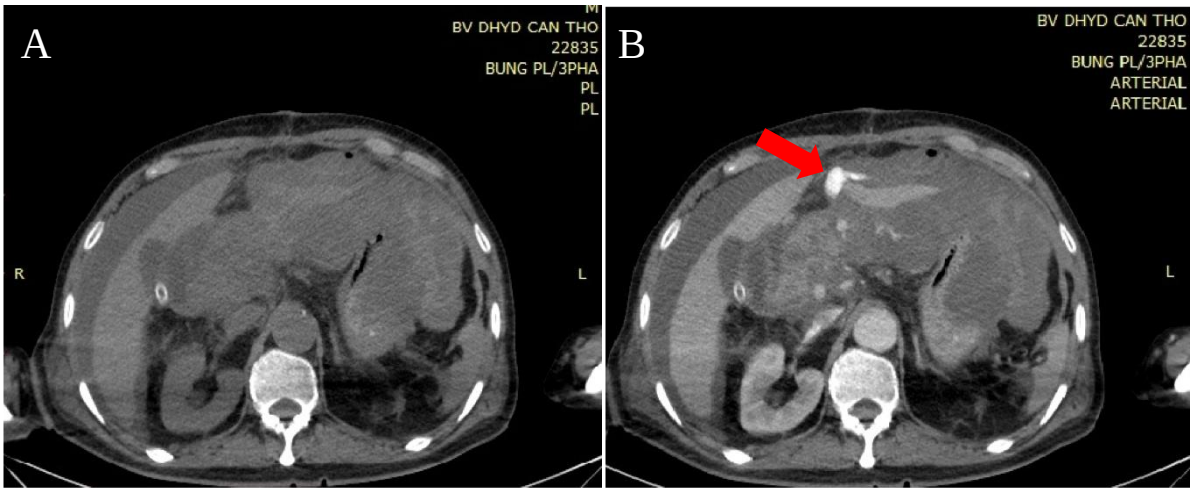

Figure 1: Plain abdominal CT image (A). CT angiography image, showing contrast extravasation, indicating active bleeding (Red arrow, B)

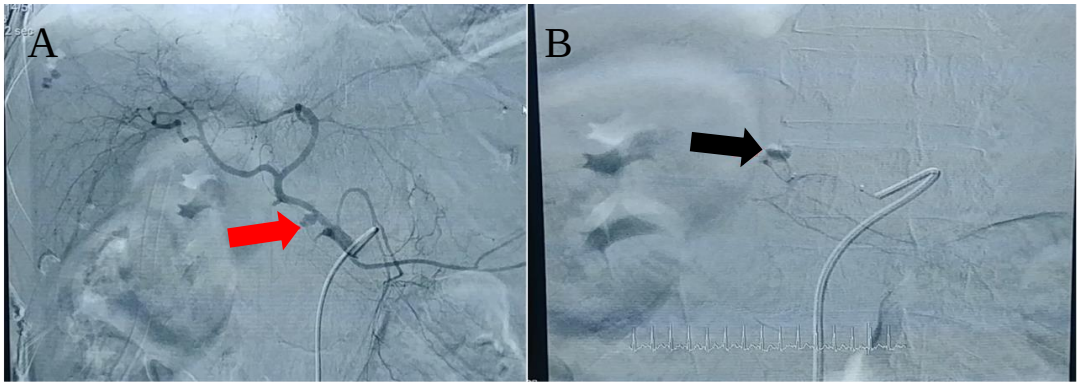

Figure 2: The digital subtraction angiography (DSA) revealed the presence of a pseudoaneurysm originating from a branch of the right hepatic artery (Red arrow, A). Selective angiogram of the bleeding artery with selective microcatheterization (Black arrow, B).

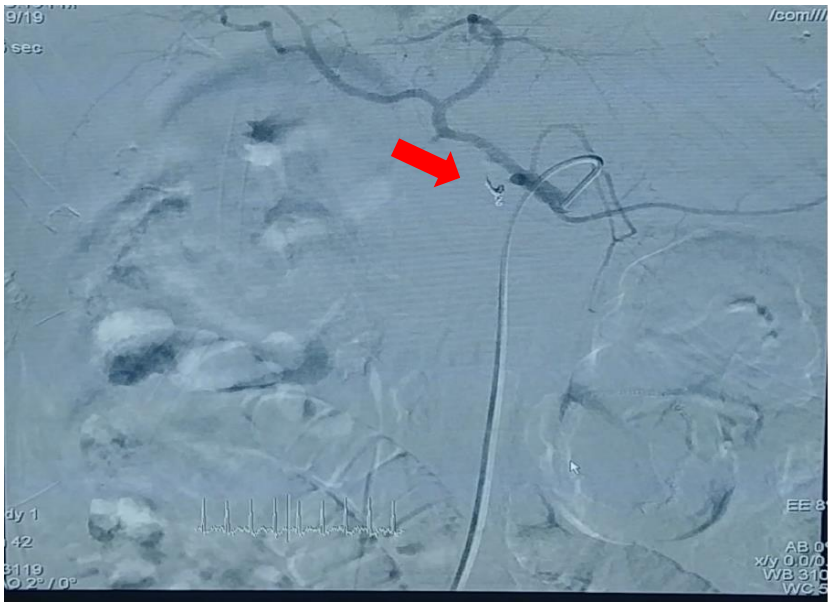

Figure 3: There was no contrast opacifying the pseudoaneurysm after coiling (Red arrow). The bleeding artery is completely occluded.