

# Transcatheter arterial embolization as an effective treatment for spontaneous inferior epigastric artery bleeding caused by anticoagulant therapy: Case reports

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**Abstract.** Spontaneous inferior epigastric artery hemorrhage (SIEAH) is a rare, yet potentially fatal condition. In some cases, the failure of hemostasis can result in hypovolemic shock or even death. Anticoagulant therapy is strongly associated with patient mortality. The present study describes two cases of SIEAH that were successfully dealt with using transcatheter arterial embolization (TAE). The standard use of anticoagulant or antiplatelet agents may induce episodes of severe bleeding, such as SIEAH. Although the condition is rare, it can potentially be life-threatening. The diagnosis mainly depends on computed tomography (CT) findings. With hemodynamic instability, surgical intervention is the most standard treatment. However, in patients with severe comorbidities, old age, or other associated injuries, several post-operative complications may occur. To date, data supporting that TAE is more suitable than the traditional open surgery are lacking. In some selected patients, compared with open surgery, TAE can be a relatively safe and effective modality for the termination of bleeding.

## Introduction

Spontaneous inferior epigastric artery hemorrhage (SIEAH) is a rare condition and can lead to rectus sheath hematoma (RSH), and may thus prove potentially fatal condition (1-5). Bleeding can lead to hematoma and tamponade; therefore, this episode may be self-limited (2,6-8). However, in some cases, hemorrhaging can result in hypovolemic shock or even death. Anticoagulant therapy has been reported to be a risk factor of mortality (1,3,4). Other risk factors of SIEAH include hypertension, pregnancy, atherosclerosis, obesity, the use of corticosteroids, thrombophilia and leukemia (1,5,8). Initially, conservative treatment, including blood transfusion, anticoagulation therapy and coagulation parameter correction, is the most commonly used treatment (1,2,4,9,10). However, in some patients with an unstable hemodynamic status, invasive intervention is indicated (2,4,9,10). In some selected cases, compared with open surgery, transcatheter arterial embolization (TAE) can be a relatively safe and effective modality for the termination of bleeding (2,9,10). The present study describes two cases that underwent anticoagulant therapy and developed spontaneous inferior epigastric artery (IEA) bleeding. Both cases were successfully dealt with using TAE.

## Case reports

*Case 1.* A 72-year-old male subject with hypertension and coronary artery disease was diagnosed with sigmoid colon cancer (clinical stage, cT3N1M0; stage IIIB), and sigmoid colectomy was subsequently performed. A few hours post-surgery, the patient was diagnosed with acute myocardial infarction. Considering the fasting status following colorectal surgery, a heparin pump was initially applied and this was then switched to oral antiplatelet agents (clopidogrel, 75 mg daily; aspirin, 100 mg daily).

On post-operative day 10, the patient suffered from bleeding from the operative wound with hypovolemic shock. The hemoglobin level decreased from 12.0 to 9.2 g/dl. Laboratory data revealed a normal prothrombin time (PT) and the international normalized ratio (INR) was 1.03 (range, 0.85-1.15).

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*Abbreviations:* SIEAH, spontaneous inferior epigastric artery hemorrhage; RSH, rectus sheath hematoma; TAE, transcatheter arterial embolization; IEA, inferior epigastric artery; PT, prothrombin time; INR, international normalized ratio; CT, computed tomography

*Key words:* spontaneous hemorrhage, inferior epigastric artery, anticoagulant therapy, transcatheter arterial embolization, superselective catheterization

Table I. Summary of the two cases of SIEAH.

Age (years)/sex	Underlying disease	Anticoagulant	Laboratory data	Bleeding point	Embolization
72/male	Acute myocardial infarction	Heparin, clopidogrel, aspirin	Normal	Left IEA	Gelfoam
58/female	Post MVR and TVR	Warfarin	Prolonged PT/INR	Right IEA	Gelfoam

Gelfoam SIEAH, spontaneous inferior epigastric artery hemorrhage; MVR, mitral valve replacement; TVR, tricuspid valve replacement.

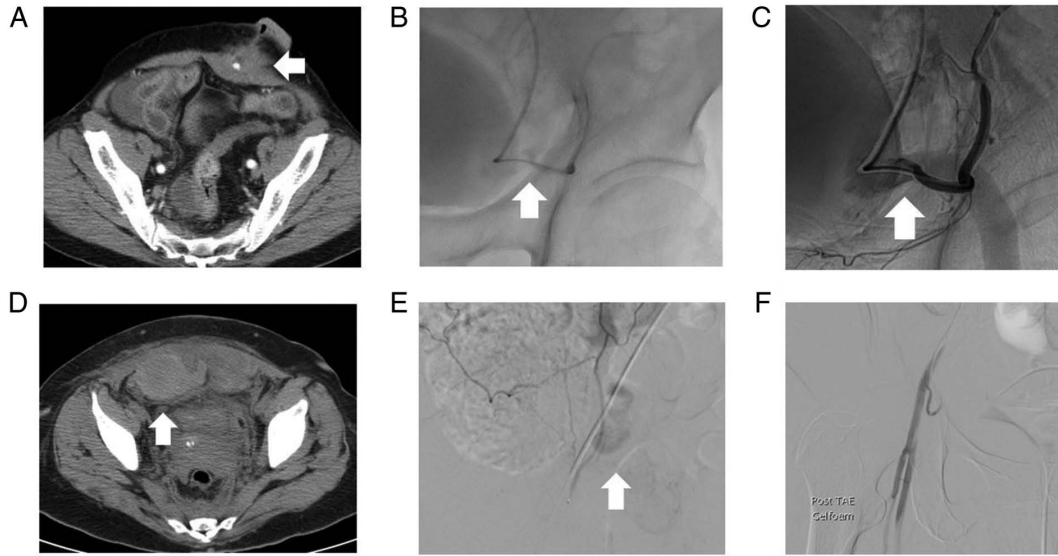


Figure 1. (A) Tissue swelling and hemorrhage from the incision wound with contrast extravasation observed (arrow). (B) Angiography confirmed active bleeding from the left inferior epigastric arterial branches (arrow). (C) No contrast extravasation following superselective embolization (arrow). (D) Enlargement of the enhanced densities over the bilateral lower abdominal wall and more prominent right-side rectus abdominis (arrow). (E) Angiography revealed active bleeding point from the right inferior epigastric artery (arrow). (F) Successful superselective embolization without contrast extravasation.

Computed tomography (CT) revealed contrast extravasation on the left lower abdominal wall (Fig. 1A). Subsequent angiography revealed active bleeding from the left IEA branches (Fig. 1B). To achieve hemostasis, superselective catheterization and conducted transarterial embolization we performed using Gelfoam (SURGIFOAM®, Ethicon). Bleeding was successfully terminated following the procedure (Fig. 1C). Owing to the state of shock of the patient, he was referred to the surgical intensive care unit. The patient was discharged on post-operative day 23. Written informed consent was provided by the patient.

**Case 2.** A 58-year-old female with a history of mitral and tricuspid valve replacement received anticoagulant therapy with warfarin (3 mg/day). She visited the Outpatient Department at Kaohsiung Medical University Chung-Ho Memorial Hospital and complained of a productive cough and abdominal pain. A physical examination revealed a tender mass on the lower abdominal area. Laboratory data revealed mildly prolonged PT/INR as 1.44 (range, 0.85-1.15). Initially, conservative treatment was applied with bed rest and ice pack application. However, the symptoms persisted, and the hemoglobin level decreased from 10.7 to 9.3 g/dl. CT findings revealed hematoma in the bilateral lower abdominal wall with persistent bleeding (Fig. 1D). Subsequent angiography revealed contrast

extravasation from the right IEA (Fig. 1E). Superselective embolization was performed with Gelfoam (SURGIFOAM®, Ethicon) pledgets (Fig. 1F). Post-operatively, the recovery course was uneventful. The patient was discharged on post-operative day 7. Written informed consent was provided by the patient. A summary of the 2 cases is presented in Table I.

## Discussion

RSH accounts for 1-2% of acute abdominal syndrome cases (2,5,8,11). Although its incidence is rare, certain studies have reported a high mortality rate of up to 25% with anticoagulant therapy (2,4,11,12). The etiology of RSH includes trauma, intensive muscle contractions, and iatrogenic and anticoagulant therapy (2,3,5,12,13). Anticoagulant therapy is one of the major risk factors of RSH (14). In a previous study, Cherry and Mueller reviewed 126 RSH cases and found that 25% of the patients received anticoagulant therapy (14). SIEAH is a relatively rare condition of RSH (2,5). The pathophysiology of SIEAH remains unclear. One hypothesis is unrecognized minor trauma, such as cough, sneezing, or passive joint motion (8,9,11). Patients with an advanced age are more susceptible to suffering from SIEAH. The cause may be rectus sheath weakness or small vessel atherosclerosis,

or both (8,9,12,13). Nevertheless, anticoagulant therapy is strongly associated with SIEAH (5,8,11,13).

IEA pseudoaneurysm rupture is also a rare etiology of RSH (15-17). The majority of cases of IEA pseudoaneurysm rupture are iatrogenic, such as the extraction of the retention suture, surgical trauma, drain tube insertion or removal, and therapeutic paracentesis (15,16). Color Doppler sonography can present 'to-and-fro' flow (16). CT and angiography can also reveal pseudoaneurysm and bleeding (15-17). In the present study, in case 1, the patient exhibited RSH on post-operative day 10. Moreover, the left para-midline incision wound was just beyond the extravasation point (Fig. 1A). Therefore, iatrogenic IEA pseudoaneurysm rupture can be a possible cause of RSH. However, angiography revealed no signs of pseudoaneurysm, only contrast extravasation. Thus, it was considered that the bleeding episode was SIEAH related to anticoagulant therapy.

The most common presentation of SIEAH is abdominal pain (2,8,11,12), which can become aggravated with the patient's movements (2,3,5,8). The typical finding during physical examination is an abdominal mass, which does not cross the middle abdomen (2,3,5,7,8). Peritoneal signs, such as muscle guarding or rebounding pain, may be positive; therefore, the presentation can mimic that of acute abdominal syndrome (3,7,8,11,12). Laboratory data may reveal normal coagulation function even with active bleeding (2,11). Bedside sonography can provide some information on differential diagnosis; however, CT is the most effective imaging modality (5,12). Both sensitivity and specificity can reach 100% (2,3,5,11,12).

Since hematoma caused by SIEAH is confined to the rectus sheath, bleeding can be self-limited. Thus, conservative treatment with compression, the use of ice packs and blood transfusion should be the appropriate initial treatments (2,3,5,12,13). Invasive management, such as surgical intervention with hematoma removal and ligation of the bleeding vessel, has been the most standard treatment, particularly for correcting hemodynamic instability (2,3,5,7,12). However, locating the bleeding point in hematoma and muscle fiber is difficult (9,10). Moreover, releasing the pressure of hematoma may aggravate bleeding (9). In patients with severe comorbidities, old age, or other associated injuries, the surgical intervention may result in several complications. Hence, in some selected cases, a minimally invasive procedure, such as TAE, may be the choice of treatment for SIEAH (3,7,8,11). Some studies have suggested that the shock status, such as hypotension and tachycardia, is not a contraindication of TAE (3,10). If the diagnosis of SIEAH is definite, embolization can be performed to achieve hemostasis (3,8,10,11).

In patients with SIEAH with unstable hemodynamic status, to date, data suggesting that TAE is more suitable than traditional open surgery are lacking (10,12). However, it is suggested that with the improvement of the imaging system and equipment, for selected patients with anticoagulant therapy, TAE may be the optimal treatment, as with Case 1 in the present study, for example. In a patient with old age and acute myocardial infarction, TAE may be superior to open surgery as the initial treatment.

In conclusion, the standard use of anticoagulant or antiplatelet agents may induce severe bleeding episodes, such as SIEAH. Although the condition is rare, it can be potentially life-threatening. The diagnosis is mainly dependent on CT findings. Surgery is a feasible treatment; however, it has some limitations. In some selected patients receiving anticoagulant

therapy, TAE, as a minimally invasive procedure, may be the preferred treatment for SIEAH.

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### Availability of data and materials

Data sharing is not applicable to this article, as no datasets were generated or analyzed during the current study.

### Authors' contributions

YCC was involved in the management of the cases and the preparation of the manuscript. CLH was involved in the management of the cases. MCS perform the transcatheter arterial embolization. JYW was involved in the management of the cases and the critical appraisal and review of the manuscript. All authors have read and approved the final manuscript.

### Ethics approval and consent to participate

Written informed consent was provided by the patients.

### Patient consent for publication

The patients provided written informed consent for the patient information to be published.

### Competing interests

The authors declare that they have no competing interests.

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