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Case Report

Endovascular management of rectus abdominis hematoma: A report of two cases ☆

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ABSTRACT

Nontraumatic spontaneous hematoma of the rectus abdominis is frequently related to anticoagulation therapy. In most cases, this condition is spontaneously self-limited or can be controlled with conservative therapy. Nevertheless, in some patients, despite early and adequate medical therapy, continuous development of the condition requires rapid and complete hemostasis. Currently, endovascular management by selective transarterial embolization of the bleeding vessel is the most common treatment option. We report 2 cases of endovascular management of rectus abdominis hematoma using a mixture of n-butylcyanoacrylate and lipiodol to embolize the bleeding point of the superior epigastric artery. Clinical symptoms improved without noticeable complications.

Background

Rectus abdominis hematoma is defined as blood accumulation in the sheath of the anterior rectus muscle, due to damage to the epigastric artery or the tearing of one or more muscle fibers, or both [1], usually beneath the umbilicus where blood vessels are not protected by external aponeurotic fascia. The most frequent cause of spontaneous rectus muscle hematoma is anticoagulation therapy [2]. The natural history of rectus muscle hematoma usually leads to a positive outcome and can be spontaneously self-limited solely by conservative therapy. Nevertheless, a large hematoma can be progressive and result in severe hypotension, requiring early and accurate diagnosis and adequate therapy, including liquid infusion, hemostasis, and endovascular embolization [3]. We report 2 cases of successful endovascular management of rectus abdominis hematoma and review the literature relating to this rare condition.

☆ Competing Interests: The authors have no conflicts of interest to declare.

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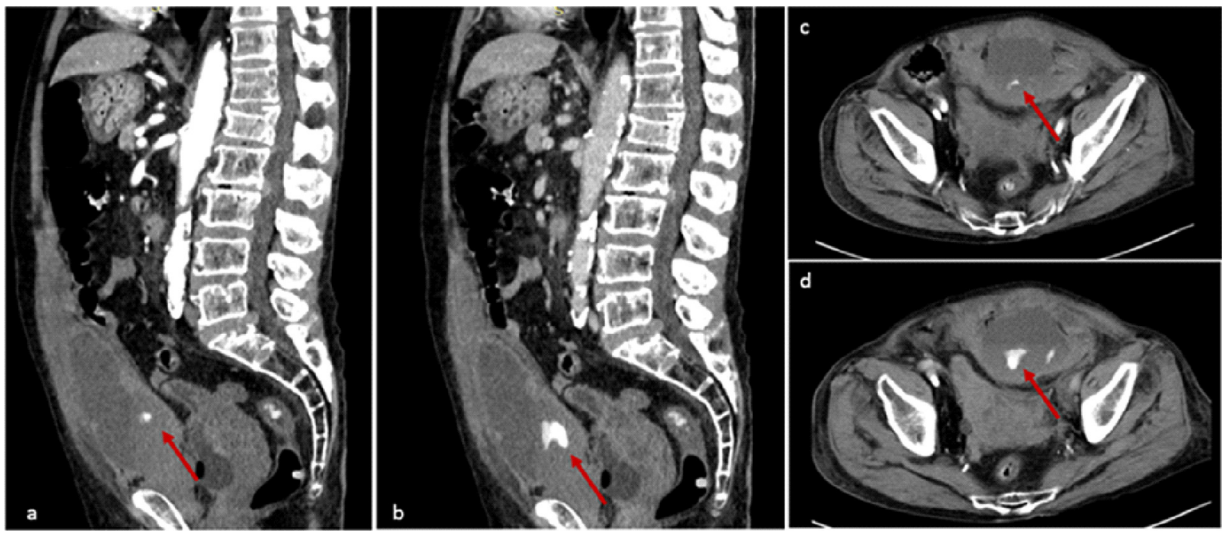

Fig. 1 – Axial and sagittal images in arterial phase (a, c) show a hyperattenuated spot in the left rectus abdominis hematoma (arrow). It then fades into an enlarged, enhanced collection in venous phase (b, d), which is a sign of active extravasation.

Case report

Case 1

A 70-year-old man presented with acute left-sided abdominal pain on day 5 after admission with diagnosis of acute exacerbations of chronic obstructive pulmonary disease (COPD), hypercoagulation status due to nephrotic syndrome, and acute kidney failure. He was using anticoagulation therapy at the time. During clinical examination, a palpable tender mass was noted in the left lower quadrant. The patient's blood pressure was 90/60 mmHg and hemoglobin level had decreased to 87 g/L from an initial 123 g/L. The patient underwent emergency multi-slice computed tomography (MSCT). A hematoma (15 × 6 cm) was discovered in the left rectus abdominis with signs of extravasation (Fig. 1). The patient underwent emergency endovascular embolization.

Procedure: Transfemoral diagnostic arteriography was performed after local anesthesia. The femoral artery was accessed through a 6Fr sheath. After overall study of the abdominal aorta and the external iliac artery, selective catheterization of the inferior epigastric artery was performed with a microcatheter (Headway Duo 1.6Fr), and a micro-guidewire (Transend 0.014″ 205 cm) was used to confirm extravasation, which corresponded to the left rectus abdominis in the MSCT image. We conducted super-selective embolization by injecting a mixture of n-butylcyanoacrylate (NCBA) and lipiodol at a ratio of 1:3. Postprocedural angiography confirmed complete embolization of the bleeding point (Fig. 2). The patient's clinical symptoms improved, including achievement of hemodynamic stability; the hemoglobin level at follow-up on day 3 was 93 g/L. No complications were recorded.

Case 2

A 57-year-old man with a history of COPD presented with cough, dyspnea, and signs of infection. He was diagnosed with acute exacerbation of COPD and pulmonary embolism. After using anticoagulation therapy for some time, the patient felt a pain in the left lower quadrant, accompanied by a palpable tender mass. The hemoglobin level gradually dropped from 113 g/L to 96 g/L. The patient underwent an abdominal MSCT scan. The images revealed a hematoma, 17 × 10 cm in size, located in the left rectus abdominis with active extravasation (Fig. 3). The patient underwent emergency endovascular embolization.

Procedure: Transfemoral diagnostic arteriography was performed after local anesthesia. The femoral artery was accessed through a 6Fr sheath. After overall study of the abdominal aorta and the external iliac artery, selective catheterization of the inferior epigastric artery was performed via a microcatheter (Headway 17) and a micro-guidewire (Chikai 0.010″ 200 cm) was used to confirm extravasation, which corresponded to the left rectus abdominis on the MSCT image. We conducted super-selective embolization by injecting a mixture of NCBA and lipiodol at a ratio of 1:3. Postprocedural angiography confirmed complete embolization (Fig. 4). After the operation, the patient's clinical symptoms improved and the patient achieved hemodynamic stability. The hemoglobin level at follow-up on day 3 was 97 g/L. No complications were recorded.

Discussion

Nontraumatic rectus abdominis hematoma accounts for 1%-2% of all causes of acute abdominal pain [4]. The major risk factor of this disorder is anticoagulation therapy. The incidence of hemorrhagic complication from anticoagulation drugs is about 8% [5]. According to Sheth [6], 70% of rectus abdominis hematoma is related to anticoagulation therapy. However, in 60% of patients, it is a comorbidity with advanced kidney failure. In our first case, rectus abdominis hematoma was a comorbidity with chronic kidney failure, while in the

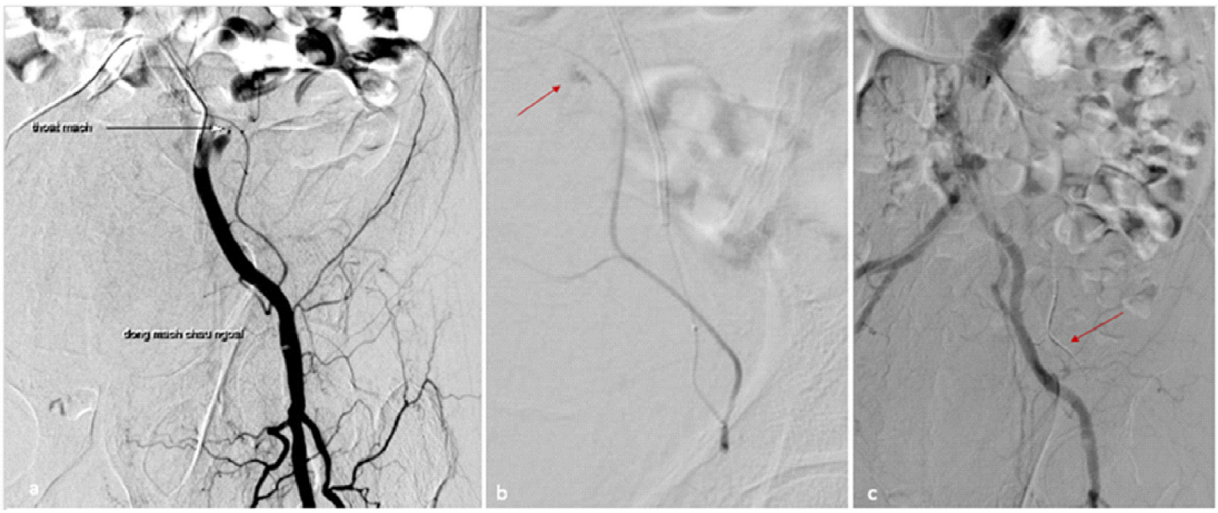

Fig. 2 – Digital subtraction angiography of the external iliac artery confirms extravasation (arrow) at the inferior epigastric artery (a). Following super-selective embolization, angiography shows no sign of extravasation (b, c).

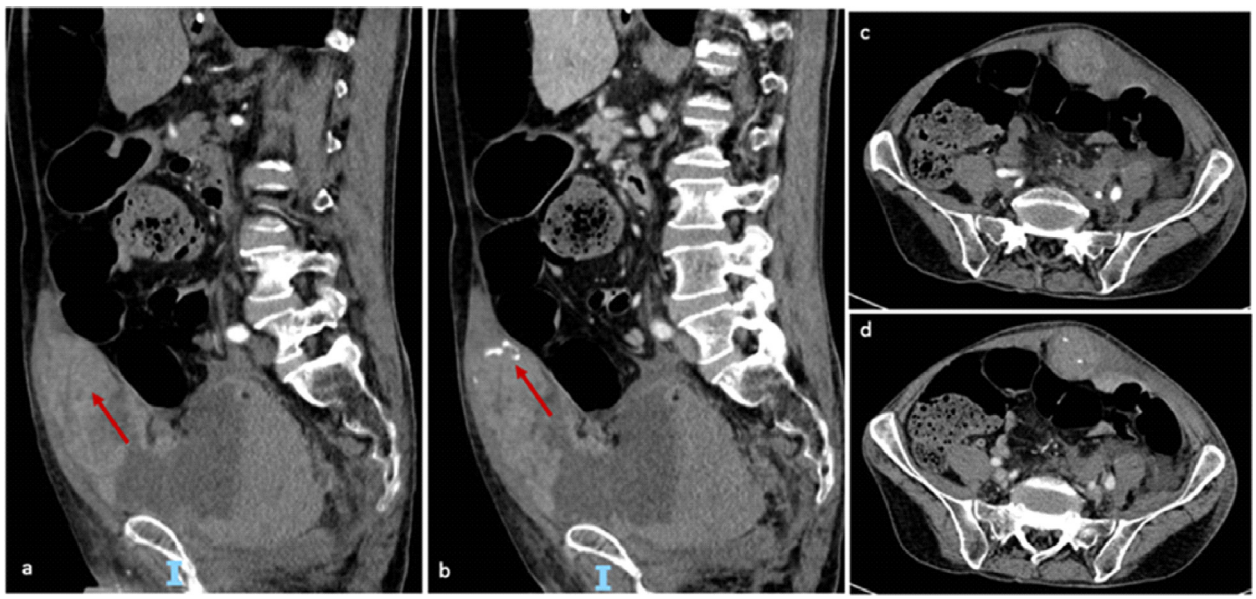

Fig. 3 – Axial and sagittal images in arterial and venous phase show a left rectus abdominis hematoma (arrow), with some high-density spots appearing within the hematoma (b). Angiography confirms extravasation.

second case, the patient was using anticoagulation drugs to manage pulmonary embolism. These are risk factors for rectus abdominis hematoma. Others risk factors include subcutaneous abdominal injections, blunt trauma, muscular exertion (cough, exercise, etc.), surgery, pregnancy, and medical comorbidities [6]. Coughing paroxysms can cause severe contraction of the abdominal muscles, resulting in injury to epigastric vessels or the rectus muscle itself. In the present cases, both patients experienced acute exacerbation of COPD, which can cause paroxysmal coughing and facilitate arterial injury. In Cherry et al.'s study of 126 patients, the most common signs and symptoms of rectus abdominis hematoma were abdominal pain (84%) and abdominal wall mass (63%) [7]; 55% of patients showed a decrease in the hemoglobin level of $\geq$ 0.4 g/dL from the baseline. Sometimes, the hematoma expanded posteriorly and could have perforated into the peritoneal cavity [7].

Rectus abdominis hematoma is caused by the rupture of one of the epigastric arteries or a tear in the muscle itself. The injury can be caused either by direct abdominal trauma or excessively forceful contraction of the rectus abdominis. As the muscle contracts, its length changes and the vessels must slide within it to avoid tearing. In addition, rupture of the superior epigastric artery usually results in small hematomas followed by their tamponade by the rectus sheath. In contrast, hematomas caused by rupture of the inferior epigastric artery

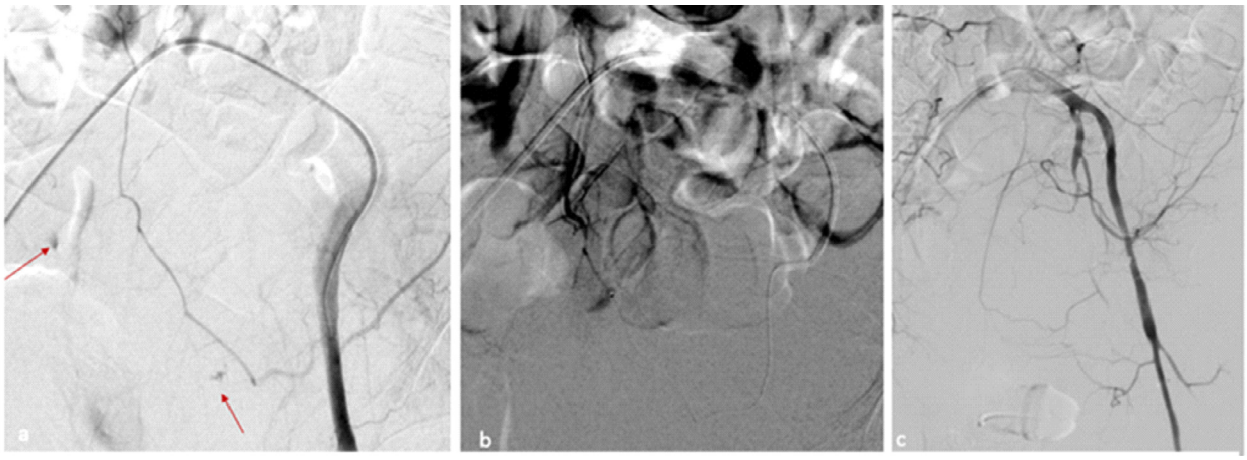

Fig. 4 – Digital subtraction angiography of the external iliac artery confirms extravasation (arrow) at the inferior epigastric artery (a). Following super-selective embolization, angiography shows no sign of extravasation (b, c).

are less restricted because of the absence of the posterior rectus sheath below the arcuate line and may even extend posteriorly and beyond the midline [8]. In our 2 cases, patients experienced inferior artery injury to a branch of the external iliac artery, resulting in a large hematoma.

Ultrasonography and computed tomography (CT) are currently the key procedures for diagnosis of acute abdominal pain. Ultrasonography is an inexpensive, safe, and easy-to-use diagnostic method as a first-line test for acute abdominal pain. However, it has a sensitivity of 80%-90% and depends on the physician's experience; therefore, it could result in misdiagnosis of a small number of patients, especially when attempting to accurately determine the origin of a detected mass, and lead to unnecessary laparotomy. CT scans are reported to be the perfect predictor of acute rectus sheath hematoma, with sensitivity and specificity reaching 100% [8]. It reveals accurate information about the size, location, origin, and extension of the hematoma and depicts the active bleeding. In their study of 13 patients, Berna et al. [9] proposed a method of classifying rectus sheath hematoma based on CT findings. This method differentiates hematomas into 3 types with implications for presentation, severity/prognosis, and therapy. Type I hematomas are intramuscular and unilateral, with minimal to no hemodynamic compromise. Type II hematomas are also intramuscular, but with blood between the rectus abdominis and the transversalis fascia, with a possible decrease in the hematocrit. Type III hematomas are the most severe, with blood extending to the peritoneum and the prevesical space. According to this definition, our second case was type III, which is a common occurrence in anticoagulation therapy.

The vast majority of patients with rectus abdominis hematoma can be treated conservatively because the hematomas are usually self-limiting. These patients are hemodynamically stable and have non-expanding hematomas. Conservative treatment consists of rest, analgesia, management of predisposing factors, compression of the hematoma, ice treatment, and, if needed, reversal of anticoagulation, fluid resuscitation, or blood transfusion [7]. Endovascular embolization should be used in cases of failure of conservative therapy and has a success rate reaching 90% [10]. In our second case, minimally invasive treatment was necessary because the patient was diagnosed with pulmonary embolism, and thus any delay in anticoagulation therapy could have resulted in deterioration of the patient's condition.

We used a microcatheter, which could super-selectively facilitate entry into targeted vessels. Embolic agents can be used, including coils and NCBA. When using coils, collateral circulation has to be calculated, as well as the anatomical structure of vessels. NCBA is preferred in cases of hemorrhage due to anticoagulation therapy because of its ability to provide absolute embolization compared to other procedures. Recently, Torcia et al. [11] reported successful embolization of rectus abdominis hematoma using Squid-18. Endovascular embolization, especially using NCBA, is a safe and effective procedure [11].

Conclusion

Rectus abdominis hematoma should be considered an emergency condition. If the presentation is ambiguous, it could result in late diagnosis and a catastrophic outcome. CT is considered the first-line method of detecting and evaluating crucial features of the condition, such as signs of extravasation. Endovascular embolization is necessary, safe, and effective in patients who are administered anticoagulation therapy and are resistant to conservative treatment.

Authors' contribution

Nguyen-Van Tien Bao and Nguyen Minh Duc contributed to write original draft. Nguyen-Van Tien Bao and Nguyen-Huynh Nhat Tuan contributed to undergo diagnostic procedure, collect, and interpret the imaging. Nguyen-Van Tien Bao, Le-Van Phuoc, Nguyen-Huynh Nhat Tuan, and Nguyen Minh Duc

made substantial contributions to collect patient data and clinical data analysis. All authors have read, revised, and approved the final published version of the manuscript. All authors were responsible for submission of our study for publication.

Statement of ethics

Ethical approval was not necessary for the preparation of this article.

Data availability statement

All data generated or analyzed during this study are included in this article and/or its online supplementary material files. Further enquiries can be directed to the corresponding author.

Patient consent

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

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