



Available online at www.sciencedirect.com

ScienceDirect

journal homepage: www.jfma-online.com



ORIGINAL ARTICLE

Management of patients with rectus sheath hematoma: Personal experience



Antonino Buffone ^{a,*}, Guido Basile ^b, Mario Costanzo ^a,
Massimiliano Veroux ^a, Lorenza Terranova ^a, Antonio Basile ^c,
Valeriya Okatyeva ^a, Maria Teresa Cannizzaro ^d

^a Section of Endocrine Surgery, University of Catania, Policlinico—Vittorio Emanuele Hospital, Catania, Italy

^b Section of Emergency and General Surgery, University of Catania, Policlinico—Vittorio Emanuele Hospital, Catania, Italy

^c Section of Radiology, Garibaldi Hospital, Catania, Italy

^d Section of Radiology, Delta-LagoSanto Hospital, Ferrara, Italy

Received 2 January 2013; received in revised form 28 March 2013; accepted 25 April 2013

KEYWORDS

abdominal pain;
hematoma;
rectus abdominal
muscle;
treatment

Background/Purpose: Rectus sheath hematoma (RSH) is a rare clinical entity. It can be mistaken for other intra-abdominal disorders, which can result in diagnostic and therapeutic difficulties. This study was undertaken to analyze the clinical presentation, diagnostic modalities, and management of patients affected with RSH.

Methods: Between January 2008 and June 2011, eight patients (5 men and 3 women with a mean age of 53 years) with RSH were evaluated according to demographic characteristics, clinical and radiological findings, and methods of treatment.

Results: Six patients developed RSH after anticoagulant therapy; one after local trauma, and one after laparoscopic intervention. Six patients were treated nonsurgically; one patient underwent embolization of the inferior epigastric artery and one underwent ligation of the bleeding vessel. The average hospital stay was 6 days. There were no mortality or thromboembolic complications.

Conclusion: RSH is a rare nonneoplastic entity that is usually associated with abdominal trauma and/or anticoagulant therapy. The gold standard for diagnosis is computed tomography, and ultrasonography can be used in follow-up. The treatment of choice is nonsurgical therapy because RSH is a self-limited condition. Surgical intervention should be reserved for cases with hemodynamic instability.

Copyright © 2013, Elsevier Taiwan LLC & Formosan Medical Association. All rights reserved.

Conflicts of interest: The authors have no conflicts of interest relevant to this article.

* Corresponding author. Section of Endocrine Surgery, University of Catania, Policlinico—Vittorio Emanuele Hospital, Via S. Sofia 78, 95124 Catania, Italy.

E-mail address: a.buffone@unict.it (A. Buffone).

Introduction

RSH is a rare pathology with increasing incidence and severity, especially in elderly patients, due to the frequent use of anticoagulants.^{1,2} The condition is defined as the accumulation of blood within the rectus muscle sheath secondary to a lesion of the epigastric vessels or direct rupture of the muscle fibers. Because RSH is characterized by acute abdominal pain, it can be mistaken for other intra-abdominal disorders and may pose not only a diagnostic but a therapeutic dilemma on clinical examination.³ Whether surgery should be immediate or delayed is the challenge faced by the treating physician. In this study we describe our experience with diagnostic modalities and treatment of patients with RSH.

Materials and methods

We observed eight patients with RSH admitted to the Emergency and General Surgery and Endocrine Surgery department (University of Catania, Policlinico—Vittorio Emanuele Hospital) from January 2008 to June 2011. There were 5 men (62.5%) and 3 women (37.5%) ranging in age from 34 years to 72 years, with a mean age of 53 years. Mode of presentation, presumed causes of hematoma, anticoagulant history, methods of diagnosis, laboratory data, and treatment were analyzed.

Results

In six patients (75%), the RSH was spontaneous due to anticoagulant therapy (high doses of low-molecular-weight heparin or acetylsalicylic acid); in one patient (12.5%), traumatic injury was the result of a kick from a horse; in another patient (12.5%), the RSH was iatrogenic secondary to injury to an epigastric vessel during the insertion of a 5-mm trocar in the left lower quadrant of the abdomen.

The patient with abdominal trauma was admitted for observation with acute abdominal pain, pale skin, and guarding tenderness; this patient was in a state of shock. Mean arterial pressure was 100/70 mmHg, pulse rate 92/min, and respiratory rate 26 breaths/min. Laboratory

analysis included the following results: hemoglobin 8.3 g/dL, hematocrit 28.5%, platelet count 268,000/UL, activated partial thromboplastin time (aPTT) 28 seconds, and international normalized ratio (INR) 1.1.

Immediate contrast-enhanced computed tomography (CT) revealed enlargement of the right rectus muscle secondary to hematoma (Fig. 1). This hematoma was a high-density mass measuring 32 × 53 mm and was strongly associated with the branch of the external iliac artery, which provided its blood supply. The patient was immediately transferred to the angiography department. Active bleeding from the inferior epigastric artery was identified. Embolization of the bleeding vessel with nine metal spiral coils was performed, with excellent morphologic and clinical results (Fig. 2).

The patient with an iatrogenic vascular lesion secondary to mini-invasive surgery for treatment of a right ovarian cyst was admitted to our department 5 hours after the intervention under the presumptive diagnosis of massive hemoperitoneum. Her hemoglobin level was 6.3 g/dL and hematocrit 22%. The mean arterial pressure was 85/50 mmHg, pulse rate 120/min, aPTT 36.1 seconds, and INR 1.4. Physical examination revealed abdominal tenderness, pale skin, guarding tenderness, and signs of compartment syndrome; in addition, the patient was in a state of shock. She was immediately transferred to the operating room and underwent a median laparotomy. During dissection of the anatomical planes, the anterior fascia of the rectus muscle was opened and approximately 1 L of fresh blood was aspirated. Surgical exploration of the left rectus muscle revealed the injured epigastric artery. The bleeding artery was ligated and a toilet of the newly formed cavity was exposed. Intraoperative abdominal ultrasonography revealed the absence of the hemoperitoneum.

The other six patients with spontaneous hematoma were in a state of shock and presented with acute abdominal pain associated with nausea and vomiting, tachypnea, hypotension, and tachycardia. An abdominal examination revealed a reduced ability of the abdominal wall to participate in the acts of breathing, guarding and rebound tenderness, and positive Rovsing and Blumberg signs. Deep palpation revealed a mass within the rectus muscle with positive Fothergill and Carnett signs. Neither ecchymosis nor hemarthrosis was observed. Mean blood pressure

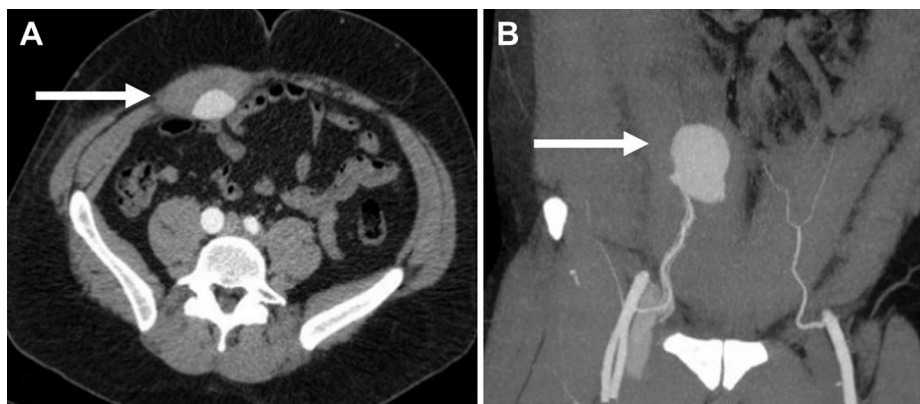


Figure 1 Computed tomography scan in the (A) axial and (B) coronal planes of the abdomen demonstrates the presence of the hematoma in the right rectus muscle (arrow).



Figure 2 Angiographic images. (A) Superselective catheterization of the right inferior epigastric artery with a minicatheter (arrow). (B) Embolization of the right inferior epigastric artery with microcoils.

ranged from 105/70 mmHg to 115/80 mmHg, pulse rate was 80–100/min. Blood chemistry tests, which were performed in all patients, revealed a reduction of hemoglobin (with values ranging between 8.5 g/dL and 10.3 g/dL) and hematocrit (ranging from 29% to 34%), a slight neutrophilic leukocytosis, and increased myoglobin and creatine kinase levels. aPTT ranged from 38–51 seconds, and the INR was 2.4–4.8. A blood transfusion was necessary in one case because the hemoglobin levels decreased up to 6.8 g/dL and the hematocrit was 25%. Classic native abdominal radiography was performed in all cases for suspected intestinal perforation. No signs of free gas in the abdominal cavity were documented. Abdominal ultrasonography was diagnostic in two cases (25%). In the other four cases (50%), contrast-enhanced CT showed extensive hematoma types II and III according to the classification of Bern (Figs. 3 and 4). All of these patients were treated nonsurgically, with complete bed rest, analgesic support, suspension of anticoagulant therapy, and administration of vitamin K. Complete resolution of hematoma was observed within 60–80 days.

The mean hospital stay was 6 days (range, 3–15 days). There were no mortality or thromboembolic complications. The elevated INR returned to normal within 4 days of cessation of anticoagulant therapy. The reintroduction of anticoagulant drugs was at doses below the initial levels. Follow-up studies did not reveal resumption of bleeding.

Discussion

RSH is an uncommon cause of abdominal pain. The incidence of RSH reported in the literature is 1.8%.⁴ It occurs most often in women (female-to-male ratio is

approximately 2:1) in the fifth and the seventh decades of life. The lower incidence in men seems related to the protection of the vessels offered by the greater development of muscle mass in men than in women. However, in many studies, and as in our experience, the incidence is higher in men because of the frequent use of anticoagulant and antiplatelet therapy for the increased incidence of cardiovascular and cerebral diseases in men.²

Several risk factors have been associated with the genesis of RSH, such as advanced age, anticoagulant therapy, hypertension, paroxysmal coughing, pregnancy, previous abdominal surgery (introduction of the trocar during laparoscopy), trauma, atherosclerosis, blood dyscrasias, severe



Figure 3 Computed tomography: hematoma of the right rectus muscle with a diameter of approximately 9 cm.



Figure 4 Computed tomography scan shows the hematoma limited in the right rectus abdominal muscle.

vomiting, violent physical activity, and leukemia.^{1,3–5} Hematoma occasionally may occur without direct abdominal trauma because of vigorous contraction of the rectus muscles or sudden change of position.^{6,7} However, among the predisposing factors, the most common cause is anticoagulant treatment, and paroxysmal cough is the most likely precipitating factor.⁸

The most frequent symptom at presentation is acute abdominal pain, which is observed in 84% of cases.⁹ This pain increases with movement and can be associated with an intra-abdominal mass that has indefinite margins.⁹ The origin of the abdominal pain may depend on the following mechanisms: (1) dilatation of the hematoma included between the anterior and posterior fascia of the rectus muscle; and (2) contraction of the muscle fibers.

RSH occurs more frequently in the lower quadrants of the abdomen and posterior to the rectus muscle because of anatomic characteristics of this region. Above the arcuate line (semicircular line of Douglas) the aponeuroses of the external oblique, internal oblique, and transversalis muscles join to form a strong and thick posterior sheath of the rectus abdominal muscle. This sheath protects the superior epigastric artery (terminal branch of the internal mammary artery) and the inferior epigastric artery (branch of the external iliac artery). Below this line, approximately 5 cm under the umbilicus, the posterior rectus sheath is absent. At this level the rectus abdominal muscle and the epigastric vessels are separated from the peritoneum only by the transversalis fascia.^{2,10} Therefore, an increase in abdominal pressure and/or violent muscle contraction can easily damage the epigastric vessels not protected by the effective sheath.^{6,11} The mass located between the anterior fascia of the rectus muscle and the transversalis fascia almost never crosses the midline of the abdomen (Romanzew sign).¹²

The acute presentation of RSH can imitate other intra-abdominal disorders such as peritonitis, incarcerated

hernia, ovarian pathology, ruptured abdominal aneurysm, diverticulitis, pancreatitis, periappendicular abscess, ectopic pregnancy, and Spigelian hernia.^{13,14}

The Fothergill and Carnett signs are positive in 40% of patients, and help to differentiate RSH from other intra-abdominal pathologies.¹⁵ To elicit either sign, the patient should be examined in the supine position with the head flexed on the neck (to facilitate the contraction of the rectus abdominal muscles). For the Carnett sign, the pain and tenderness persist and increase with palpation if the mass is within the abdominal wall, with a decrease in symptoms in the presence of intra-abdominal pathology. For the Fothergill sign, if a mass is produced by hematoma, it remains fixed and palpable when the patient lifts their head.^{11,12,15,16} Also, patients affected by RSH may present with hemodynamic instability or symptoms of peritoneal irritation.^{17,18}

The diagnosis can be clarified with ultrasonography, which has a sensitivity of 80–90%, but the gold standard for diagnosis is CT, which has approximately 98% sensitivity and specificity. According to the CT classification proposed by Berna et al⁸ there are three types of RSH. Type I hematoma is unilateral and occurs within the rectus muscle. Type II hematoma may be unilateral or bilateral, within the rectus muscle, or between the muscle and transversalis fascia. Type III hematoma extends into the peritoneum and the prevesical space. Type III hematoma, the most severe, usually occurring in patients receiving anticoagulant therapy, and frequently requires blood transfusions.⁸

Magnetic resonance imaging is used in selected cases when CT is not sufficient for the diagnosis, particularly in the differential diagnosis of hematomas of the rectus muscle and tumors of the abdominal wall.¹⁹ Because RSH is an uncommon cause of acute abdominal pain, the choice of nonsurgical treatment or surgery can be problematic for the surgeon. The choice of treatment is conditioned by the patient's hemodynamic stability and by the size of the hematoma.

In most cases RSH is a self-limited condition because of its position, which limits the extension of the hematoma and at the same time favors compression of the bleeding vessel and possible arrest of the hemorrhage.¹² For this reason, nonsurgical therapy is the most common treatment. It consists of bed rest, cryotherapy, compression, analgesia, suspension of the anticoagulants, monitoring of laboratory analysis, observation, blood transfusion when hemoglobin levels are diminished, and administration of antibiotics if there are signs of infection. Furthermore, nonsurgical therapy is preferable to unnecessary exploration because the opening of the anterior fascia can provoke new bleeding from the vessel that was previously compressed by the hematoma. A resolution of hematoma is usually within 2–3 months.¹² Surgery should be restricted to the cases with hemodynamic instability and when nonsurgical treatment fails.

In our study, five patients were treated nonsurgically; in two patients, one with hemodynamic instability underwent arterial embolization and the other patient underwent ligation of the bleeding vessel. In our opinion, the hemodynamic stability of the patient rather than the size of the hematoma determines the choice of treatment. Large-sized hematomas can be the source of compartment syndrome

due to the compression. This syndrome is diagnosed by measuring intra-abdominal pressure and treated by apposition of the CT-managed drainage.

The possible complications include hypovolemic shock, abdominal compartment syndrome, myonecrosis, acute renal failure, small bowel infarction, and myocardial infarction.^{8,9,19–22} Reintroduction of anticoagulant therapy can provoke the resumption of bleeding, which is observed in 1.6% of cases.^{2,4} In our study, no complications were observed. The overall mortality has been reported in the literature to be approximately 4%; for those receiving anticoagulant therapy it is 25%. Pregnant women and the developing fetus have a mortality rate of 13% and 50%, respectively.^{4,23,24}

In conclusion, RSH is usually associated with anticoagulant therapy and trauma of the abdomen. The initial clinical presentation is acute abdominal pain; therefore, hematoma of the rectus muscle can be mistaken for other acute intra-abdominal pathologies, presenting the surgeon with a diagnostic dilemma. CT is a study of choice that allows establishment of a correct diagnosis and helps differentiate the rectus hematoma from other intra-abdominal conditions. Nonsurgical treatment is favored because in most instances the hematoma is a self-limiting process. Surgery should be reserved for cases with hemodynamic instability. Appropriate preventive measures should be taken in patients treated with anticoagulants. When minimally invasive surgery is performed, the introduction of the trocars should be under direct vision to avoid the possible formation of a hematoma.

References

- Lambroza A, Tighe MK, DeCosse JJ, Dannenberg AJ. Disorders of the rectus abdominis muscle and sheath: a 22-year experience. *Am J Gastroenterol* 1995;**90**:1313–7.
- Fitzgerald JE, Fitzgerald LA, Anderson FE, Acheson AG. The changing nature of rectus haematoma: case series and literature review. *Int J Surg* 2009;**7**:150–4.
- Daily JM, Adams JT, Fantini GA, Fischer JE. Abdominal wall, omentum, mesentery and retroperitoneum. In: Schwartz SI, Shires GT, Spencer FC, Daly JM, Fischer JE, Galloway AC, editors. *Principles of surgery*. 7th ed. New York: McGraw-Hill; 1999. p. 1551–84.
- Klingler PJ, Wetscher G, Glaser K, Tschmelitsch J, Schmid T, Hinder RA. The use of ultrasound to differentiate rectus sheath hematoma from other acute abdominal disorders. *Surg Endosc* 1999;**13**:1129–34.
- Edlow JA, Juang P, Margulies S, Burstein J. Rectus sheath hematoma. *Ann Emerg Med* 1999;**34**:671–5.
- Choi Y, Lee D. A case of rectus sheath hematoma caused by yoga exercise. *Am J Emerg Med* 2009;**27**:899.
- Maharaj D, Ramdass M, Teelucksingh S, Perry A, Naraynsingh V. Rectus sheath haematoma: a new set of diagnostic features. *Postgrad Med J* 2002;**78**:755–6.
- Berna JD, Zuazu I, Madrigal M, Garcia-Medina V, Fernandez C, Guirado F. Conservative treatment of large rectus sheath hematoma in patients undergoing anticoagulant therapy. *Abdom Imaging* 2000;**25**:230–4.
- Cherry WB, Muller PS. Rectus sheath hematoma: review of 126 cases at a single institution. *Medicine (Baltimore)* 2006;**85**:105–10.
- De Martino C, Martino A, Giamattei RM, Viola G, Pisapia A, Fatigati G. Ematoma spontaneo del muscolo retto addominale: evenienza rara, diagnosi difficile e trattamento multidisciplinare. Presentazione di 5 casi clinici e revisione della letteratura. *Ann Ital Chir* 2011;**82**:399–404. (In Italian).
- Auten J, Schofer JM, Banks SL, Timothy B, Rooney TB. Exercise-induced bilateral rectus sheath hematomas presenting as acute abdominal pain with scrotal swelling and pressure: case report and review. *J Emerg Med* 2010;**38**:e9–12.
- Yi-Haoi L, Shing-Tze H, Hsing-Tse YU, Tzu-Hao W. Rectus sheath hematoma during pregnancy – a severe but easily overlooked condition: a case report. *Taiwanese J Obstet Gynecol* 2004;**43**:168–71.
- Gocke JE, MacCarty RL, Foulk WT. Rectus sheath hematoma: diagnosis by computed tomography scanning. *Mayo Clin Proc* 1981;**56**:757–61.
- Lohle PN, Puylaert JB, Coerkamp EG, Hermans ET. Non palpable rectus sheath hematoma clinically masquerading as appendicitis: US and CT diagnosis. *Abdom Imaging* 1995;**20**:152–4.
- Linhares MM, Lopes-Filho GJ, Bruna PC, Ricca AB, Sato NY, Sacalabrini M. Spontaneous hematoma of the rectus abdominis sheath: a review of 177 cases with report of 7 personal cases. *Int Surg* 1999;**84**:251–7.
- Zainea GG, Jordan F. Rectus sheath hematomas: their pathogenesis, diagnosis, and management. *Am Surg* 1988;**54**:630–3.
- Khan MI, Medhat O, Popescu O, Rastogi A, Thompson T. Rectus sheath haematoma presenting as acute abdomen. *ANZ J Surg* 2005;**75**:502–3.
- Salemis NS. Spontaneous rectus sheath hematoma presenting as acute surgical abdomen: an important differential in elderly coagulopathic patients. *Geriatr Gerontol Int* 2009;**9**:2002.
- Fukuda T, Sakamoto I, Kohzaki S, Uetani M, Mori M, Fujimoto T. Spontaneous rectus sheath hematomas: clinical and radiological features. *Abdom Imaging* 1996;**21**:58–61.
- O'Mara MS, Semins H, Hathaway D, Caushaj PF. Abdominal compartment syndrome as a consequence of rectus sheath hematoma. *Am Surg* 2003;**69**:975–7.
- Luhmann A, Williams EV. Rectus sheath hematoma: a series of unfortunate events. *World J Surg* 2006;**30**:2050–5.
- Rimola J, Perendreu J, Falco J, Fortuno JR, Massuet A, Branera J. Percutaneous arterial embolization in the management of rectus sheath hematoma. *AJR* 2007;**188**:497–502.
- Ducatman BS, Ludwig J, Hurt RD. Fatal rectus sheath hematoma. *JAMA* 1983;**249**:924–5.
- Chang WT, Knight WA, Wederhoff SG. Rectus sheath hematoma. www.emedicine.com/web [accessed 01.07.09].