Chapter

Rectus Sheath Hematoma

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Abstract

A hematoma is a collection of blood in an extravascular space and is named according to its location. Rectus sheath hematoma (RSH) was first described by Hippocrates and Galen about 25 centuries ago due to abdominal trauma, which is a rare cause of acute abdomen. It is uncommon, which may lead to delayed diagnosis in patients with acute abdomen. This condition arises due to trauma or hypertension in patients with bleeding disorders, using anticoagulants, doing heavy physical exercise, pregnant women, connective tissue diseases, and hematological diseases. The diagnosis can be made by detailed anamnesis, physical examination, ultrasonography, and contrast-enhanced abdominal tomography. For a accurate diagnosis, first of all, the medical history of these patients should be carefully questioned. CT and ultrasonography (USG) are used in the diagnosis of this condition. In many patients, conservative treatment by eliminating the predisposing factor is sufficient. In conclusion, with the increase in use of anticoagulation, the incidence of RSH is expected to increase. Every physician in the surgical field should keep rectus sheath hematoma at the top of the differential diagnosis list in patients presenting with acute abdominal pain and palpable abdominal mass.

Keywords: rectus, sheath, hematoma, trauma, therapy

1. Introduction

A hematoma is a collection of blood in an extravascular space and is named according to its location. Rectus sheath hematoma (RSH) was first described by Hippocrates and Galen about 25 centuries ago due to abdominal trauma. It was the first reported in the modern medical literature by Richardson in 1857 [1, 2].

RSH often has one or more of the risk factors, such as trauma, coagulopathy disorder, obesity, cough, or pregnancy. It may occur due to intense contraction of the rectus muscles during activities associated with the Valsalva maneuver. Patients are usually treated conservatively, but in some cases surgical intervention may be necessary. Cases causing abdominal compartment syndrome requiring surgical or endovascular intervention have been reported in the literature. Today, anticoagulation treatments are applied to more than 6 million patients in the United States for diseases such as atrial fibrillation, mechanical heart valve, or venous thromboembolism. This is a predisposing factor for RSH [3]. Most uncomplicated cases can be managed conservatively. The increasing incidence of RSH also increases the number of complications associated with them. Patients with coagulopathy typically have

one of the above-mentioned risk factors, but lack the natural ability to stop bleeding. This ability is also reduced in patients using anticoagulant drugs.

The rectus abdominis muscles originate from the fifth to seventh costal cartilages extend to the pubis, The rectus sheath surrounding the muscle consists of the aponeuroses of the lateral abdominal muscles. The epigastric arteries supply the rectus muscles. The superior epigastric artery is the terminal branch of the internal thoracic artery. The inferior epigastric artery is a branch of the external iliac artery. The inferior epigastric artery runs on the posterior surface of the rectus abdominis and enters the sheath at the arcuate line, passes upward, and anastomoses with the superior epigastric artery. The rectus muscles are separated in the midline by a band of connective tissue called the linea alba.

The rectus sheath is associated with the internal and external oblique muscles from anterior and the fascia of the transversus abdominis muscles from the posterior. Any infection or bleeding that develops in this area can progress through the cellular tissues and can go down to the pelvis. Patients can be taken to emergency operation mostly with the preliminary diagnosis of acute abdomen. Patients without acute abdomen are more stable.

2. Definition

RSH is a clinical condition caused by rupture of the rectus muscle or injury or spontaneous rupture of the epigastric vessels. It is a rare cause of acute abdomen. It is not very common, which may lead to delayed diagnosis in patients with acute abdomen. It can be seen due to trauma or hypertension in patients with bleeding disorders, using anticoagulants, doing heavy physical exercise, pregnant women, connective tissue diseases, and hematological diseases. It can also occur with a sudden sneezing, coughing, or sudden movement. In severe coughing cases, intrathoracic pressures may rise up to 300 mm Hg. With hemodynamic changes, systolic pressure rises up to 140 mmHg in the expiratory phase. These pressure and energy changes can also lead to undesirable results. Cough can cause complications in almost every system, from the cardiovascular system to the musculoskeletal system. RSH may also be one of these complications [4].

3. Clinical presentation

Rectus sheath hematoma has a sudden onset. It usually presents with a palpable mass under the umbilicus in the abdomen. It is more common in elderly patients and women with impaired rectus muscle structure. Pregnancy creates a trauma to the rectus muscle [5]. Ruptures of the superior epigastric artery usually result in small hematomas delimited by the rectus sheath. Hematomas caused by an inferior epigastric artery puncture are larger due to the absence of the posterior rectus sheath below the arcuate line and may grow beyond the midline and posteriorly [6].

Rectus sheath hematomas have abdominal pain in 84–97%, palpable abdominal wall mass in 63–92%, tenderness in 71%, defense in 49%, nausea in 23%, and vomiting and fever in 15%. Patients usually have sharp, severe, and persistent pain. The pain is constant where it does not spread. Pain generally increases with movement [7]. Large hematomas, although rare, can cause urinary tract obstruction and bladder irritability and even abdominal compartment syndrome. If it causes peritoneal irritation, gastrointestinal symptoms such as defense, rebound, tenderness,

anorexia, nausea, vomiting, or diarrhea may be present [8]. These findings may be accompanied by weakness, confusion, pallor, and sweating.

Abdominal bruising is a late sign. Bruising in the periumbilical region is a Cullen sign. Bruising in the flank areas is called Grey-Turner's sign. Both symptoms suggest an extraperitoneal extension of the intraperitoneal rupture. An interesting case of a patient with RSH is in the literature due to tetanus. The patient was hemodynamically unstable and was treated with percutaneous arterial embolization. The pathophysiology here is explained as damage to the epigastric arteries due to spasm of the rectus muscle [9].

4. Physical examination

Carnett's sign can help distinguish whether tenderness originates in the abdomen or the abdominal wall. If sensitivity increases or does not change when stretching the abdominal muscles, the test is positive and abdominal wall pathology is more likely. Conversely, in the case of intra-abdominal pathology, tenderness typically decreases when the abdominal muscles contract [10].

Fothergill's sign can help distinguish whether the mass originates in the abdominal wall or inside the abdomen. Fothergill stated that if the mass does not cross the midline and is palpated after contracting the rectus muscles, this is a rectus sheath hematoma [11].

It often occurs in the infraumbilical region and can easily be confused with intra-abdominal inflammation or mass lesions. It is more common in elderly and female patients.

Rectus hematoma has a characteristic appearance. You can easily diagnose it with inspection in the physical examination. For example, our patients photographs are shown in **Figures 1** and **2**.

Figure 1.
Photograph of our 77-year-old male patient. One week ago COVID 19 +. He's been hospitalized. He is receiving anticoagulant therapy for coronary artery disease.

Figure 2.
Photograph of our 86-year-old male patient. He was hospitalized two weeks ago due to COVID 19. At the end of the first week, he was taken to the intensive care unit. He did not use anticoagulants in his anamnesis. He has been receiving subcutaneous low-molecular weight heparin since hospitalization.

5. Diagnosis

The average age of occurrence is 50–60 years [12]. The female male ratio is 2–3/1. It is more common in women [13].

The diagnosis can be made by detailed anamnesis, physical examination, ultrasonography, and contrast-enhanced abdominal tomography. For a correct diagnosis, first of all, the medical history of these patients should be carefully questioned. Drug use should be detailed. CT and ultrasonography (USG) are used in the diagnosis of rectus sheath hematoma. Although USG is used as the first option because it is fast, easy, and quick to reach and can provide information about the location of the mass, CT gives more meaningful results. It should be noted that the sensitivity of ultrasound is 80–90%. Ultrasound may give different results depending on the experience of the attending physician [14]. Tomography can diagnose with sensitivity and specificity reaching 100%. It also allows us to have information about the size, location, origin, spread, and nature of the hematoma. It helps to exclude other abdominal pathologies [15].

In most patients, the hematoma is self-limiting. Complete blood count and bleeding parameters are important in laboratory examinations. They are used for diagnosis and monitoring of treatment. The overall mortality rate in rectus hematoma is 4%. This rate rises to 25% in patients receiving anticoagulation therapy [16].

Treatment of rectus sheath hematoma is evaluated according to its type [17]. Rectus sheath hematomas that develop due to bleeding disorder and do not require intervention are usually limited to close follow-up, rest, and correction of bleeding disorder.

6. Types and treatment approach

It would be beneficial to start the treatment of RSH by first investigating the predisposing factors. After a good anamnesis, most of the predisposing factors are controlled. The drugs used should be carefully examined. Additional diseases of the patient should be evaluated in detail.

Predisposing factors in rectus sheath hematoma are as follows:

1. Trauma.
2. Patients undergoing anticoagulation therapy.
3. Coagulopathy disorder.
4. Cough.
5. Trauma during surgery (iatrogenic).
6. Vascular injury.
7. Severe gagging.
8. Severe vomiting.
9. Severe straining.
10. Obesity.
11. Pregnancy.
12. Tetanus.
13. Heavy physical activity.
14. Sudden sneezing.
15. Hematological diseases.
16. Hypertension.
17. Connective tissue diseases.
18. After sudden movements.

Preventing the predisposing factors mentioned above may be an option in treatment.

RSH is accompanied by many predisposing factors. More than one factor can be present at the same time.

The presence of comorbid diseases, especially in elderly patients, affects the treatment process.

It compels the physician to determine the treatment.

For example, if a patient with heart failure requires transfusion, neither incomplete nor excessive resuscitation should be performed. A balanced policy should be followed.

Or, for example, in a pregnant patient, the treatment protocol should consider the health of the mother and baby.

Rectus sheath hematomas are divided into three types according to their size and localization.

Type I hematoma is within the rectus muscle and only increases the size of the muscle. The hematoma is unilateral and does not spread to the fascia plane. Patients can be followed on an outpatient basis. It can be followed up with bed rest and pain relief. It makes up the majority of patients. It is a limited situation. Close follow-up is important. The course may suddenly worsen, especially in elderly patients.

Type II hematoma can be unilateral or bilateral. Intramuscular hematoma mimics type I, but there is bleeding between the muscle and the transverse fascia. It requires close follow-up due to the possibility of hematoma enlargement. Hospitalization should be given. In this type, rest and analgesics are used. Caution should be exercised in elderly patients. Predisposing factors should be determined and treatment should be planned for it. Frequently hemodynamic monitoring should be performed in the hospital. If necessary, transfusion should be applied. Patients can be discharged within a few days. Hematoma often regresses in 2–4 months (**Figure 3**).

Type III hematoma, bleeding occurs between the muscle and the transverse fascia, in the peritoneum and also to the prevesical area. Patients are hospitalized and treated under close follow-up. Fluid resuscitation and transfusion of blood and blood products may be required in necessary cases. Uncontrolled and progressive hematomas may require surgical intervention.

In such cases, a quick decision must be made. Treatment should be started immediately. Close hemodynamic monitoring is important. In case of teamwork, decisions must be made and implemented quickly. Time is precious and it works fast.

These patients can be discharged after 1 week of follow-up and the hematoma usually resolves in more than 3 months. Rectus sheath hematomas usually do not recur and do not leave sequelae in the long term. The morbidity and mortality rates are higher in receiving anticoagulant therapy, large hematomas, and elderly patients with serious comorbidities [18, 19]. Rapid treatment a bleeding disorder quickly and blood transfusion are the cornerstones of treatment in those receiving anticoagulant therapy.

In many patients, conservative treatment with the elimination of the predisposing factor is sufficient. Correction of coagulation disorders with vitamin K, fresh-frozen plasma, and protamine sulfate and blood replacement are recommended, especially in cases leading to severe anemia. Vascular embolization with catheter, evacuation of hematoma with drainage with USG, or vascular ligation with laparotomy are among the surgical options that can be applied. USG-guided hematoma drainage should always be considered as a minimally invasive option in these patients, as serious complications such as renal failure due to intra-abdominal compartment syndrome and small bowel ischemia may occur due to advanced hematomas (**Table 1**).

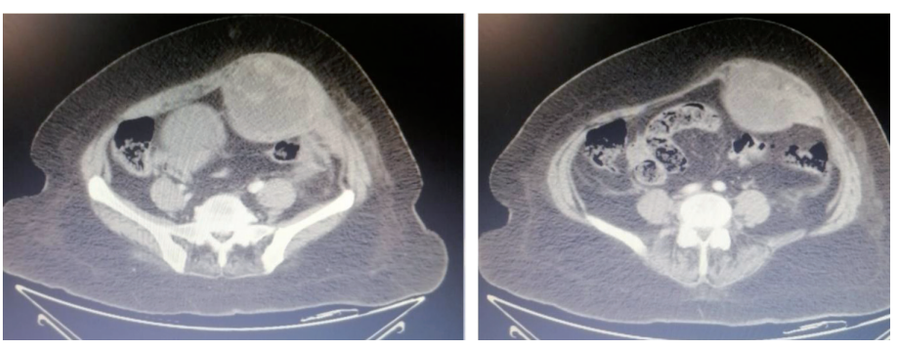

Figure 3.
Rectus sheath hematoma Type II (From Associate Professor Burhan Hakan Kanat's own private archive).

Type	Anatomical extension	Findings	Management
I	Intramuscular, unilateral, no spread to the fascia	No decrease in hemoglobin value	Conservative, outpatient follow-up.
II	Unilateral or bilateral, there is spread to the fascia plane, there is no spread to the prevesical area	Hemoglobin value may decrease	Short-term hospitalization and transfusion may be required
III	There is bilateral spread to the fascia-peritoneum prevesical area	Serious decrease in hemoglobin value and hemodynamic deterioration may be occur	Long-term hospitalization, transfusion with blood and blood products, and surgical intervention may be required

Table 1.
Types of rectus sheath hematomas and principles of clinical approach.

7. Rectus sheat hematoma treatment algorithm

First step Patient → Stabil → Necesseray imaginig analyzes

Unstabil → Fast and effective ressusitation

Second Step → Predisposing factors (+) → etiological treatment, eliminating the predisposing factor

Predisposing factors (-) → Plan treatment according to the patient condition

Third Step → Classify rectus sheath hematoma as Type I, Type II or Type III

Type I → No decrease in hemoglobin value → Conservative, outpatient follow-up.

Type II → Hemoglobin value may decrease → Short-term hospitalization and transfusion may be required.

Type III → Serious decrease in hemoglobin value and hemodynamic deterioration may be occur → Long-term hospitalization, transfusion with blood and blood products, and surgical intervention may be required

8. Results

In conclusion, with the increasing use of anticoagulation, the incidence of rectus sheath hematoma is expected to increase. Trauma, patients undergoing anticoagulation therapy, coagulopathy disorder, cough, trauma during surgery (iatrogenic),

vascular injury, severe gagging, severe vomiting, severe straining, obesity, and many kind of this predisposing factors cause RSH. An effective and fast way of treatment should be followed.

General practitioners, family physicians, emergency physicians, and every physician in the surgical field should keep rectus sheath hematoma at the top of the differential diagnosis list in patients presenting with acute abdominal pain and palpable abdominal mass, especially if there are predisposing factors. Fluid resuscitation or reversal of anticoagulation therapy is of paramount importance. The treatment plan should be decided according to the hemodynamic status of the patient and the characteristics of the hematoma. In the last year, the number of patients using anticoagulants due to COVID-19 has increased and the number of patients diagnosed with rectus sheath hematoma has increased.

Conflict of interest

There is no conflict of interest.

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