

# Rectus sheath hematoma as a revisited and rare cause of abdominal pain?



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## Rectus sheath hematoma as a revisited and rare cause of abdominal pain?

**OBJECTIVES:** Rectus sheath hematoma is the accumulation of blood within rectus abdominis muscle. The aim of this study was to investigate the clinical presentation, diagnostic methods, treatment strategy, and outcomes of patients diagnosed with rectus sheath hematoma.

**METHODS:** Patients diagnosed and treated for spontaneous rectus sheath hematoma between January 2014 and December 2019 were included in the study.

**RESULTS:** A total of 11 patients were diagnosed as spontaneous rectus sheath hematoma, with a median age of  $63.5 \pm$  IQR (55.5-73.25). 8 patients were treated by transfusion and medical therapy, while two patients underwent surgery and drainage. One patient was treated with arterial embolization. No mortality was encountered.

**CONCLUSION:** Anticoagulant therapy was a major risk factor. Treatment is mostly based on supportive care to maintain hemodynamic stability.

**KEY WORDS:** Abdominal pain, Hematoma, Interventional radiology, Rectus sheath

## Introduction

Rectus sheath hematoma is the accumulation of blood within the rectus abdominis muscle sheath because of the seference of epigastric vessels in the rectus muscle or the muscle itself <sup>1</sup>. This medical situation can be confused with acute abdomen since the hematoma below the linea semicircularis may lead to an indirect irritation on the peritoneum as a result of the weak posterior rectus sheath in this region <sup>1,2</sup>. Rectus sheath hematoma (RSH) has become relatively a more common problem, because of the increasing use of anticoagulation for medical conditions with increased life expentancy of progressively increased number of elderly patients in all populations <sup>3</sup>.

As an uncommon cause of acute abdominal pain, rectus sheath hematoma may be caused by direct trauma or may occur spontaneously, or as a result of twisting of vessels or abrupt changes in position <sup>4</sup>. It is responsible for 1.8%

of cases with acute abdominal pain and many times the disease may create a diagnostic challenge <sup>5</sup>.

In addition to the anticoagulation therapy, some contributing factors have been defined such as obesity, corticosteroid therapy, arterial hypertension, pregnancy, previous abdominal surgeries, and bleeding disorders <sup>6</sup>. Rectus sheath hematomas mostly occur with an acute abdominal pain and a palpable abdominal mass. Fever, chills, nausea, vomiting, abdominal tenderness, and abdominal guarding may accompany the cardinal symptoms <sup>7</sup>. Both ultrasound examination (US) and computed tomography (CT) are diagnostic modalities with great accuracy <sup>8</sup>.

Our aim was to investigate the outcomes of patients who were hospitalized because of rectus hematomas with regards to treatment and complications. Secondary outcomes are the demographics and predisposing factors of the patients.

## Materials and Methods

### SUBJECTS AND STUDY PROTOCOL

In this retrospective cohort study we reviewed the medical files of 11 patients who were diagnosed with the

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## ABBREVIATIONS

Ht: Hypertension,  
 DM: Diabetes Mellitus,  
 COPD: Chronic obstructive pulmonary disease,  
 DVT: Deep Vein thrombosis,  
 MVR: Mitral valve replacement,  
 CAD: Coronary artery disease,  
 MI: Myocardial infarction,  
 ASA: Acetyl salicylate,  
 RLQ: Right lower quadrant,  
 LLQ: Left lower quadrant,  
 RULQ: Right upper and lower quadrant,  
 LLUQ: left lower and upper quadrant,  
 MM: millimeters,  
 CONS: Conservative

rectus sheath hematoma and treated accordingly at the General Surgery Department of University of Health Sciences Istanbul Haseki Training and Research Hospital between January 2014 and December 2019.

The medical files, radiologic screening tests, surgical notes were reviewed. The demographic characteristics, the history of symptoms and complaints, comorbid diseases, physical examination findings, laboratory test results, hematoma measurements, previous anticoagulant and/or antiaggregant therapies, the durations of hospital stay and early in-hospital complications were recorded. The history of the patients were investigated about a possible predisposing event that precipitated the hematoma formation.

## STATISTICAL ANALYSIS

Descriptive data analysis was conducted using JASP statistical software (Version 0.11.1, JASP Team 2019, University of Amsterdam). Baseline variables were sum-

marized using percentages for categorical variables and means or medians for continuous variables.

## Results

Of the 11 patients diagnosed with spontaneous rectus sheath hematoma (SRS), 8 were females and 3 males. The ages of the patients ranged between 26 and 79 with a median age of  $63.5 \pm \text{IQR}$  (55.5-73.25) years. Regarding causes leading to straining of the rectus muscle; two (18.2%) patients had excessive cough due to chronic obstructive pulmonary disease (COPD) attacks, 2 (18.2%) patients had excessive cough due to flu, 1 (9.1%) patient experienced excessive exercising, and 2 (18.2%) patients had chronic constipation. The other patients revealed nothing specific to cause straining on the rectus muscle. One patient was in the preoperative period while using enoxaparin waiting for hernia surgery (Table I).

The mainly comorbid diseases included hypertension (HT) in 7 (63.6%), diabetes mellitus (DM) in 5 (45.43%), COPD in 2 (18.2%), coronary artery disease in 4 (36.4%), chronic constipation and dyspepsia in 2 (18.2%), and atrial fibrillation (AF) in 2 (18.2%) patients. The main initial symptoms included sudden abdominal pain in 9 (81.8%), hypotension in 2 (18.2%), vomiting in 2 (18.2%), and ecchymosis in abdominal wall in 2 (18.2%) patients.

In their physical examinations, all patients had abdominal tenderness in varying degrees. When evaluated elaborately; 8 (73%) of them had voluntary guarding, 7 (50%) had a right lower quadrant mass, and 3 (21.4%) had bilateral upper and lower quadrant masses.

All patients underwent an abdominal ultrasound (US) or CT scans, and hypoechoic masses compatible with hematoma were detected within the right and/or left rectus sheaths. The sizes of hematomas ranged between 20 mm and 170 mm in diameter. The largest hematoma was 170x100 mm. Two patients underwent surgery with drainage of hematoma and ligation of bleeding vessel and one patient underwent embolization by interven-

TABLE I

| Age | Sex | Co-morbidities        | Medication       | INR | Location | Size (mm) | Treatment                       |
|-----|-----|-----------------------|------------------|-----|----------|-----------|---------------------------------|
| 76  | f   | DM, COPD              | None             | 1.0 | RLQ      | 40 x 50   | Cons.                           |
| 69  | m   | DVT                   | Enoxaparin       | 0.9 | LULQ     | 80 x 50   | Surgery + ET                    |
| 59  | f   | Ht, AF, COPD          | warfarin         | 2.5 | RLQ      | 40 x 40   | Cons.                           |
| 79  | f   | Ht, cough             | None             | 1.0 | LLQ      | 52 x 50   | Cons.                           |
| 61  | f   | Ht, CAD, Constipation | ASA, clopidogrel | 1   | RLQ      | 30 x 60   | Cons.                           |
| 74  | f   | Ht, CAD, MVR          | warfarin         | 2.3 | RLQ      | 55 x 40   | cons.                           |
| 73  | m   | AF, Ht, Constipation  | rivaroxaban      | 1   | RUQ      | 100 x 50  | cons.                           |
| 79  | f   | CAD, arrhythmia       | ASA              | 1   | RULQ     | 170 x 100 | Cons (interventional radiology) |
| 26  | m   | Exercise              | None             | 0.9 | LRQ      | 20x24     | Cons.                           |
| 66  | f   | Ht, cough             | None             | 1.0 | LRQ      | 60 x 55   | Cons.                           |
| 56  | f   | Ht, CAD, MI           | ASA, clopidogrel | 1.0 | RULQ     | 130 x 100 | Surgery                         |

tional radiology department. Eight patients were treated conservatively by medical and supportive therapy with transfusion to maintain hemodynamic stability.

## Discussion

The pathophysiology of rectus sheath hematoma is explained by the unprotected anatomy of the superior and inferior epigastric arteries. The inferior epigastric artery which branches from the external iliac climbs upwards along the posterior surface of the rectus muscle without gaining any protection from the posterior sheath until the level of the arcuate line. The tension between the loose root of the inferior epigastric artery and its solid, fixed intramuscular perforating branches causes susceptibility to injury especially during the muscle contractions<sup>9</sup>. The average outer diameter of the deep inferior epigastric artery is larger than the superior epigastric artery (3.4 mm vs 1.6 mm), with the largest periumbilical perforators branching from the deep inferior epigastric artery<sup>10</sup>. Since the diameter and the wall tension are directly proportional according to the law of Laplace<sup>11</sup>, Karapolat et al inferred that rectus sheath hematomas develop in the lower abdomen more often because of this diameter difference and especially in the elderly women these vessels are more fragile due to muscle loss<sup>12</sup>. Costello et al reported that the blood supply of rectus abdominis muscle and relative infrastructural rigidity i.e., the firm adherence of inferior epigastric perforators to rectus abdominis take part in the formation of SRSBs<sup>13</sup>.

The physical examination generally reveals a large mass in the lower quadrants of the abdomen extending to upper abdomen or inguinal regions. The mass is generally tender by palpation without rebound tenderness and muscular rigidity, as Carnett and Fothergill tests are generally positive<sup>14</sup>. In our series sensitive palpable masses were encountered in (8/11) 73% of the patients on the first examination. All patients had radiological scanning. The ultrasound examination was able to diagnose a hematoma in 9 of 11 (82%) cases but the use of CT was necessary to rule out other reasons of differential diagnosis. CT scan is a perfect diagnostic tool for acute RSH which gives exact information about the size, location, extension and nature of the hematoma, in addition to its help in excluding other abdominal pathologies<sup>9</sup>.

Some studies reported that the clinical signs of hematoma, namely Fothergill's Grey Turner's, Cullen's, and dysuria/urinary symptoms were related to late presentation beyond 48 hours<sup>15</sup>. In 3 of 11 of the cases the color changes which may hint hematoma were present at the initial referral but this might have been underestimated since the diagnosis is mainly based on imaging studies.

SRSB is more commonly seen in women with advanced

age representing a female to male ratio as 2-3/1<sup>16</sup>. Age-related changes of arteriosclerosis, or hypertension that may make vessels more susceptible to injury and the decreased muscle mass compromising the protection by the rectus sheath could explain the underlying mechanism<sup>8</sup>. In a 2016 review by Sheth et al., evaluating a series of patients with rectus sheath hematoma, women were more likely than men to develop a rectus sheath hematoma, with a ratio of 1.7 to 1<sup>17</sup>. The mean age of patients in that study was 67 years. The mean age of 15 patients were 64.5 years in a study by Çarkman et al<sup>18</sup>. The relation to older age was also confirmed by our study.

Although generally the masses are observed at lower quadrants, they are sometimes located in the outer quadrants as well<sup>19,20</sup>. RSH is frequently localized below the umbilicus where the inferior epigastric artery (branch of the external iliac artery) penetrates the rectus muscles at the arcuate line and this vessel is relatively fixed, so branches are more prone to being injured<sup>21</sup>. In the study at hand, 2 of 11 cases were in the upper quadrant and in both upper and lower quadrants in one case. Rectus sheath hematoma is usually a benign self-limiting condition which responds to medical therapy, but invasive intervention is unavoidable when the rectus sheath hematoma enlarges enough to cause hemodynamic instability. It may represent with color changes in the periumbilical region and may expand to retroperitoneal spaces, as well<sup>22</sup>. In addition to that, the hematoma is usually reserved on one side of the abdomen but in rare cases the hematoma may enlarge enough to cross the midline. However, this growing in size may lead to extension into suprapubic region posterior to pubic symphysis and into prevesical region.

Compression effect of hematoma on bowel loops and bladder can also be seen<sup>23</sup>. This extension may even lead to bladder injury which occurs as a relatively late complication due to increased pressure caused by the growing hematoma. For an unstable patient, placing a Foley catheter into the bladder is advisable for both monitoring the hemodynamic stability and screening for a possible complication<sup>24</sup>.

In our series; such a male patient with hematoma extending down to the inguinal region was drained by surgery and ligation of the vessel. The CT showed a large heterogeneous fluid collection along the left rectus sheath which extended to the subperitoneal space. He was using enoxaparin in the preoperative period of hernia surgery as a part of coumadin stopping and bridging. He was started medical and supportive treatment but progressive enlargement of the hematoma in the follow up necessitated multiple transfusions in the first 24 hours. The patient underwent surgical drainage and arterial ligation after 48 hours because of the progressively enlarging hematoma.

The hematomas are graded according to CT findings. In Grade I, the hematoma is intramuscular, unilateral

and does not dissect the fascia. Grade II can be bilateral and dissects along the transversalis fascia while still confined within the rectus muscle. Grade III hematomas dissect along the fascia with extraperitoneal extension and may enlarge into the intraperitoneal and prevesical spaces that could lead to abdominal compartment syndrome<sup>25</sup>. Treatment of rectus sheath haematoma is usually done in a conservative way with analgesics, fluid resuscitation, blood transfusion and treatment of the underlying condition. For continued bleeding, radiological endovascular procedures are an option. For unstable patients, digital subtraction angiography (DSA) and selective embolization of the bleeding vessel is carried out with a high success rate and low recurrence risk, where available<sup>26,27</sup>. Surgery plays an increasingly restricted role in the management and it is generally the last option where the bleeding vessel is ligated either by an open technique or percutaneous suturing of the culprit vessel with an image guidance<sup>28</sup>. Surgical evacuation of the hematoma is not generally indicated in order not to reduce the tamponade effect of the hematoma mass onto bleeding vessels and is only necessary when the hematoma is large and abdominal compartment syndrome is feared<sup>29</sup>.

The SRSH may sometimes cause fatality especially when associated with co-morbidities<sup>30</sup>. The overall mortality rate of RSH is around 4% and rises up to 25% in anticoagulated patients due to increased volume of hemorrhage<sup>9</sup>. An early recognition of RSH may be associated with improved chances of survival<sup>31</sup>. The overall mortality rate associated with rectus sheath hematoma is less than 2% in the most recent publications<sup>17</sup>.

No fatality was encountered in our series. Even though in 3 cases, transfusion was necessary and one patient had prolonged stay in the intensive care unit.

Due to its clinical manifestation of acute abdominal pain with tenderness, it is often misdiagnosed and confused with other intra/extra abdominal problems, including abdominal wall abscess, abdominal wall tumors, hernias, and diverticular diseases, as well as gynecologic and urinary tract diseases, eventually leading to unnecessary laparotomy<sup>32</sup>.

## Conclusion

Rectus sheath hematoma is generally a benign condition which may be treated symptomatically and sometimes blood transfusion may be needed. On rare instances radiologic or surgical interventions are required. Especially patients under anticoagulant therapy are at risk for the development of hematoma. However, it may also be seen in otherwise healthy females of middle ages. Care must be taken in the first 24 hour for the possible enlargement of the hematoma. Increased life expectancy of progressively increased number of elderly patients in all populations gives the right of revisitation to RSH in the era of embolization.

## Riassunto

L'ematoma della guaina del retto è l'accumulo di sangue all'interno del muscolo retto dell'addome. Lo scopo di questo studio era di indagare la presentazione clinica, i metodi diagnostici, la strategia di trattamento e gli esiti dei pazienti con diagnosi di ematoma della guaina del retto. Sono stati inclusi nello studio i pazienti cui è stato diagnosticato e trattato un ematoma spontaneo della guaina del retto tra gennaio 2014 e dicembre 2019. Si tratta di un totale di 11 pazienti con diagnosi di ematoma spontaneo della guaina del retto, con un'età media di  $63,5 \pm \text{IQR} (55,5-73,25)$ . 8 pazienti sono stati trattati con trasfusione e terapia medica, mentre due pazienti sono stati sottoposti a intervento chirurgico e drenaggio. Un paziente è stato trattato con embolizzazione arteriosa. Non è stata riscontrata mortalità. È risultato importante fattore di rischio la terapia anti-coagulante. Il trattamento si basa principalmente su cure di supporto per mantenere la stabilità emodinamica.

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