ORIGINAL ARTICLE

Treatment of rectus sheath hematomas: Eight years of single-center experience with a review of literature

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ABSTRACT

BACKGROUND: Rectus sheath hematoma is a rare and frequently misdiagnosed cause of acute abdominal pain. In the management of the patients with rectus sheath hematoma, which are mostly with advanced age and comorbid diseases, positive results can be obtained by avoiding unnecessary surgical procedures with correct diagnosis and treatment approaches. The presented study aims to contribute to the lack of algorithms and optimal treatment strategies in the management of rectus sheath hematoma patients with the description of our experience in their management.

METHODS: Patients who underwent treatment with the diagnosis of rectus sheath hematoma between May 2010 and July 2018 were retrospectively analyzed. Demographic characteristics, medical histories, physical and laboratory findings and imaging methods, treatment processes, complications, morbidity, mortality, length of hospitalization and long-term follow-up results were searched. Data were analyzed from patient files, hospital computer registry system and radiology archives. Data analysis was performed using Microsoft Excel and IBM-SPSS-Statistics-24.

RESULTS: The mean age of the 31 patients was 63.03 years (24–85 years). The female/male ratio (21/10) was 2.1. The most common presenting sign or symptom was abdominal pain (100%), followed by abdominal wall mass in 25 patients (80.6%). Twenty-five patients (80.6%) were receiving some form of anticoagulation and antiplatelet therapy. Diagnosis was confirmed by Computed Tomography in 11 (45.4%), Ultrasonography in five (16.1%) and Computed Tomography with Ultrasonography in 15 (33.3%). Eight patients (25.8%) were evaluated as Type-1, 10 (32.2%) as Type-2 and 13 (41.9%) as Type-3. Mean International Normalized Ratio (INR) value of patients was 2.59. Bleeding was controlled by surgery in three cases (9.6%). The conservative approach was preferred in 28 cases (90.3%). 29 (93.5%) patients were discharged after an average hospital stay of 7.48 days (4–21). One patient died on the postoperative 5th day and other on the 14th day of conservative treatment (6.45% mortality). The mortality rate of conservatively and surgically treated patients was 3.5% and 33.3%, respectively.

CONCLUSION: Rectus sheath hematoma should be suspected in elderly patients using anticoagulants with acute abdominal pain, severe cough attacks and an umbilical palpable or radiologically supported mass. Computed Tomography and Ultrasonography should be performed in case of clinical suspicion. Early and correct diagnosis ensures successful conservative treatment and prevents unneces-sary surgical procedures. In the management of cases where clinician experience is at the forefront, we are hopeful that a new effective algorithm system and guidelines for the diagnosis will be identified after increasing the presentations of case series and experiences.

Keywords: Abdominal pain; abdominal wall disease; anticoagulant therapy; rectus sheath hematoma; treatment.

INTRODUCTION

Rectus sheath hematoma (RSH) is a rare clinical condition that may mimic acute abdomen, and it is often seen in elderly patients who are prone to bleeding.[1]

RSH occurs due to the rupture of epigastric vessels or the rectus muscle fibers in the anterior rectus abdominis sheath and the collection of blood within the rectus sheath.[2]

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Even if the most common cause of RSH is the use of anticoagulant therapy, it may occur due to many conditions, such as hematological diseases, trauma, strenuous exercises, continuous cough, sneezing, acute exacerbation of asthma or Chronic Obstructive Pulmonary Disease (COPD), pregnancy, hypertension, blunt or penetrating abdominal trauma, previous abdominal surgery, trocar procedures in laparoscopic surgery, abdominal wall injections and diagnostic paracentesis.[3]

Relatively little is known about the factors that precipitate RSH. Individual case reports, small case series, and a few reviews of individual case reports have been published regarding RSH.[4–6] However, in the literature, it is difficult to see medium and large case series with many clinical parameters like we have in our study. More presentation about the clinical experiences of RSH is important tofacilitate the early assessment of this diagnosis. As there is no clear and practiced clinical management yet, we are hopeful that a new and effective clinical management system will be identified following the increase of case series and experiences.

In this retrospective study, we aimed to investigate the risk factors that cause mortality in patients with RSH and present the results of our treatment experiences, clinical features and diagnostic methods in a large series of patients from a single centre with a review of the literature.

MATERIALS AND METHODS

Patients who had been admitted to the Emergency Department of Medical Faculty of Van Yuzuncu Yil University (Van, Turkey) between May 2010 and July 2018 with the complaint of abdominal pain and treated in the Department of General Surgery with the diagnosis of RSH were included in this study. Patients in the pediatric age group (0–16 years) and patients who were treated and diagnosed at external centers and then admitted to our center were not included in this study. Demographical data (gender, age), medical history, comorbidities (recent abdominal surgery, abdominal wall trauma, a history of anticoagulant therapy), physical examination findings, laboratory tests (blood counts, platelet counts, activated partial thromboplastin time (APTT), international normalized ratio (INR)), radiological examinations (ultrasonography (USG) and computed tomography (CT)), length of hospitalization, treatment methods (surgical approach, conservative approach, ultrasound-guided drainage or blood transfusions) and outcomes (death or recurrent RSH), complications, morbidity, mortality, and long-term follow-up results of the patients were retrospectively examined from the hospital computer system and imaging archives of patients' medical records. Medical and surgical treatment methods of the patients' were introduced, and their morbidity and mortality rates were evaluated.

Data analysis was performed using Microsoft Excel and IBM SPSS Statistics 24. Statistical significance was defined as $p \leq 0.05$.

The cases with a performed abdominal imaging data were staged according to Berná et al.'s[7] classification by the properties of the extension of the hematoma (Table 1).[8]

Type 2–3 patients with severe comorbidities, unstable clinical parameters and hemodynamic values were followed in the general surgical intensive care unit.

Ethics committee approval was received from Non-invasive Clinical Research Ethics Committee of Van Yuzuncu Yil University (2019/11-05).

RESULTS

Patient Characteristics

The mean age of 31 patients was 63.03 years (24–85 years), and the female/male ratio (21/10) was 2.1.

In this study, 25 patients (80.6%) were receiving some form of anticoagulant or antiplatelet therapy; 19 patients (61.2%) were on warfarin, four patients (12.9%) were on antiplatelet therapy, and two patients (6.45%) were on Low Molecular Weight Heparin (LMWH). The indications for anticoagulant and antiplatelet therapy were; mitral valve replacement (MVR) in eight patients (one with COPD) (25.8%), atrial fibrillation (AF) in eight patients (25.8%), hypertension (HT) and atherosclerotic heart disease (AHD) in four patients (12.9%), ischemic heart disease (IHD) in three patients (9.7%), aortic valve replacement (AVR) in one patient (3.2%), rheumatoid arthritis (RA) and its complications in one patient (3.2%).

There were two patients (6.4%) with a history of laparoscopic surgery for cholelithiasis and one patient (3.2%) with a history of diagnostics paracentesis for intraabdominal fluid of unknown origin.

There were 28 patients (90.3%) with comorbidities, such as cardiac pathologies, HT, RA, AHD, COPD, and Factor VIII deficiency. Clinical and demographic characteristics, diagnostic and treatment modalities and outcomes of the patients are given in Table 2.

Table 1. Diagnostic classification of rectus sheath hematoma

Type 1	Intramuscular, unilateral, and does not dissect along fascia adjacent to the rectus muscle
Type 2	Intramuscular, dissects along adjacent fascia, may involve bilateral rectus muscles but without extension into the prevesical space
Type 3	Dissects along the fascia and extends into the peritoneum and the prevesical space

Table 2. Clinical and demographic characteristics of the patients

No	Age	Sex	Medical history	Previous medication	Physical signs (tenderness)	INR	Radiological procedure	Treatment	Hospital Stay (day)	Outcome
1	71	F	AF	Warfarin	In left lower Q	2.52	CT	Conservative	6	Discharged
2	52	F	HT+AHD	Anti-Platelet Tx	In left upper Q	1.20	USG	Conservative	5	Discharged
3	63	M	MVR	Warfarin	In right lower Q	1.51	USG+CT	Conservative	6	Discharged
4	71	F	MVR	Warfarin	In left lower Q	3.38	USG	Conservative	8	Discharged
5	75	M	MVR	Warfarin	In left lower Q	1.91	USG+CT	Conservative	10	Discharged
6	73	M	AF	Warfarin	In both lower and upper Q	4.88	CT	Surgery (HI)	5	Exitus
7	74	M	HT+AHD	Anti-Platelet Tx	In left upper Q	2.54	USG+CT	Conservative	9	Discharged
8	68	F	AF	Warfarin	In right lower Q	1.41	CT	Conservative	6	Discharged
9	73	F	IHD	Warfarin	In both lower Q	3.55	USG	Conservative	4	Discharged
10	71	F	MVR	Warfarin	In left lower Q	2.90	CT	Conservative	4	Discharged
11	58	F	COPD	None	In left lower Q	1.31	USG	Conservative	9	Discharged
12	69	F	RA	LMWH	In right lower Q	2.10	USG+CT	Conservative	21	Discharged
13	73	F	MVR	Warfarin	In left lower Q	1.78	USG+CT	Conservative	11	Discharged
14	72	F	MVR	Warfarin	In left lower Q	3.10	CT	Conservative	9	Discharged
15	65	F	MVR	Warfarin	In both lower Q	3.74	USG+CT	Surgery	13	Discharged
16	69	M	AVR	Warfarin	In both lower Q	5.59	CT	Surgery	9	Discharged
17	85	F	AF	Warfarin	In right lower Q	2.55	CT	Conservative	7	Discharged
18	44	M	COPD	None	In left upper Q	0.93	USG+CT	Conservative	4	Discharged
19	70	M	IHD	Warfarin	In right lower Q	3.51	USG+CT	Conservative	4	Discharged
20	24	M	Factor VIII deficiency	None	In right upper Q	2.50	USG+CT	Conservative	6	Discharged
21	55	F	AF	Warfarin	In both lower Q	3.90	USG+CT	Conservative	9	Discharged
22	63	M	AF	LMWH	In right upper Q	1.95	USG	Conservative	6	Discharged
23	57	F	Laparoscopic surgery	None	In right lower Q	1.25	USG+CT	Conservative	3	Discharged
24	41	M	Paracentesis	None	In right lower Q	1.88	CT	Conservative	4	Discharged
25	28	F	Laparoscopic surgery	None	In right lower Q	1.23	CT	Conservative	5	Discharged
26	52	F	HT+AHD	Anti-Platelet Tx	In left lower Q	1.92	USG+CT	Conservative	4	Discharged
27	69	F	AF	Warfarin	In both lower Q	3.45	USG+CT	Conservative	11	Discharged
28	68	F	IHD	Warfarin	In left lower Q	2.96	CT	Conservative	8	Discharged
29	46	F	HT+AHD	Anti-Platelet Tx	In left lower Q	2.10	USG+CT	Conservative	4	Discharged
30	75	F	AF	Warfarin	In both lower Q	3.15	USG+CT	Conservative	8	Discharged
31	80	F	MVR+COPD	Warfarin	In both lower Q	3.70	CT	Conservative	14	Exitus

F: Female; M: Male; AF: Atrial fibrillation; HT: Hypertension; AHD: Atherosclerotic heart disease; IHD: Ischemic heart disease; MVR: Mitral valve replacement; AVR: Aortic valve replacement; RA: Rheumatoid arthritis; COPD: Chronic obstructive pulmonary disease; Tx: Treatment; LMWH: Low molecular weight heparin; Q: Quadrant; USG: Ultrasonography; CT: Computed tomography, HI: Hemodynamic instability.

Presenting Signs and Symptoms

The most common presenting sign or symptom was abdominal pain (100%), followed by an abdominal wall mass in 25 patients (80.6%). In 16 patients (51.6%), abdominal wall ecchymosis was observed on the abdominal skin (Fig. 1). Less common presenting signs and symptoms are detailed in Table 3.

There were nine patients (29%) who had severe coughing and fever before abdominal pain. When the localization of the hematoma was examined, the following findings were observed; the right lower quadrant in eight patients (25.8%), left lower quadrant in 10 patients (32.2%), both lower quadrants in seven patients (22.5%), both lower and upper quadrants in one

Table 3. Symptoms and signs of the patients

Symptom/Sign	n (%)
• Abdominal pain	n=31 (100)
• Abdominal wall mass	n=25 (80.6)
• Abdominal wall ecchymosis	n=16 (51.6)
• Decrease in hemoglobin >0.4 g/dL	n=13 (41.9)
• Severe coughing	n=9 (29)
• Peritoneal irritation	n=8 (25.8)
• Hemoglobin <8 g/dL	n=6 (19.3)
• Tachycardia	n=6 (19.3)
• Hypotension	n=6 (19.3)

patient (3.2%) and over the umbilicus in five patients (16.1%). According to the types of RSH, eight patients (25.8%) were evaluated as Type 1, 10 patients (32.2%) as Type 2, and 13 patients (41.9%) as Type 3.

Figure 1. Ecchymosis on the abdominal wall, A patient of 73 years-old, Male, Using warfarin for AF, Hematoma in both lower and upper quadrant. Type 3 RSH.

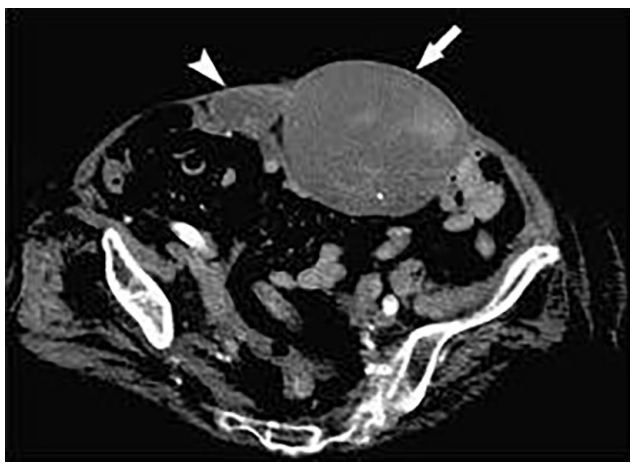

Figure 2. Abdominal computed tomography of a 65 years old woman with a history of mitral valve replacement of warfarin treatment at INR value of 3,74. Arrow shows the bilateral hematoma; the hematoma is bilateral that dissected between the transversalis fascia.

Diagnosis

Abdominal USG and/or intravenous contrast-enhanced CT were performed for diagnosis. While rectus hematoma could be detected in five (16.1%) patients by USG alone, 11 patients (45.4%) were diagnosed by CT only and 15 (33.3%) patients by USG and CT.

The diagnosis was made on the basis of history and physical examination and all diagnoses were confirmed with radiological imaging (USG, CT) (Fig. 2).

Treatment and Outcomes

After emergency department follow-up, Type 1 and Type 2 RSH patients were followed up with vital signs and hemogram analysis every 12 hours in the general surgery department. Type 3 and hemodynamically unstable patients with comorbid diseases were followed up in the surgical intensive care unit. Fresh frozen plasma (FFP) was administered intravenously until the patients with an INR of more than 3 had an INR lower than 2.5 to reduce their tendency to bleed. Patients with an INR above 3 (n=11) were treated with FFP (28 units) and Vitamin K. FFP was not administered to the patients with INR between 2.5 and 3 because of medical treatment and decreased INR values and clinical stability was defined after follow-up. At the same time, vital signs and strict laboratory follow-up were performed in the patients and comorbid patients were managed in a multidisciplinary way. Patients' characteristics, treatments and outcomes are shown in Table 4.

The mean INR value was 2.59 in all patients and the mean INR value was 2.97 in patients who used warfarin.

All the patients were treated with supportive care (intravenous fluids, pain management, bed rest and antibiotic therapy), with or without blood transfusion. Blood or blood products were administered to 17 patients (54.8%) in total. Twenty-eight units (mean 2.5 units) of FFP were administered to 11 patients (35.4%), and 14 units (mean 2.3 units) of red blood cells (RBC) were administered to six patients (19.3%).

Infection of the hematomas developed in two patients (6.4%) and was controlled by ultrasound-guided drainage and antibiotherapy. Acute renal failure was seen in three patients (9.7%), and resolved with multidisciplinary management with fluid replacement.

The mean duration of hospitalization was 7.48 days (4–21). Surgical procedures were performed in three patients (9.7%), while 28 patients (90.3%) were managed conservatively. There were two deceased patients with a mortality rate of 6.45%, and 29 patients were discharged. A patient with AF who underwent surgery died of heart failure on the fifth postoperative day, and a patient with the diagnoses of COPD and MVR was conservatively followed up and died of respiratory failure on the 14th day of hospitalization.

Table 4. Patients' characteristics, treatments and outcomes

Patient characteristics, treatment methods and outcomes	Value (mean) or n (%)
Gender	
Men	10 (32.3%)
Women	21 (67.7%)
Age (mean, year) (range)	63.03 (24–85)
Patients history	
Presence of comorbid diseases	28 (90.3%)
Anticoagulant therapy (Warfarin and LMWH)	21 (67.7%)
Antiplatelet therapy	4 (12.9%)
Previous abdominal surgery	2 (6.4%)
Low molecular weight heparin (LMWH)	2 (6.4%)
Non-surgical abdominal intervention(s) (paracentesis)	1 (3.2%)
Laboratory values (mean)	
Hemoglobin (g/dL)	11.3
Platelet count (x10^9/L)	237
Hematocrit (%)	34.3
International normalized ratio (INR)	2.59
Activated partial thromboplastin time (aPTT) (sec)	64.2
Treatments	
Conservative	28 (90.3%)
Surgery	3 (9.7%)
Complications	
Acute renal failure	3 (9.7%)
Recurrent rectus sheath hematoma	2 (6.4%)
Hematoma infection	2 (6.4%)
Myocardial infarction	1 (3.2%)
Hospital stay (mean, day) (range)	7.48 (4–21)
Mortality	2 (6.4%)

Warfarin was discontinued in accordance with the recommendation of cardiologists, and LMWH was started in these patients. LMWH was decided to be continued on discharge and be rearranged during outpatient follow-up. Two of the discharged patients (6.4%) were admitted again due to hematoma enlargement and discharged without any problem after a conservative approach. All the patients were followed-up for six months to one year, and their physical examinations were performed during their check-up. No additional morbidity and mortality were observed in the discharged patients.

DISCUSSION

RSH can often be overlooked while investigating the causes of acute abdominal pain in the emergency departments. Also, it may cause unnecessary surgical procedures. It accounts for 2% of unexplained abdominal pain cases. Clinical presentation, physical examination, medical history and drug use in these patients should be questioned carefully for a correct diagnosis.[9]

Although the patients with RSH usually show nonspecific symptoms during their first admission,[10,11] cases with large hematomas usually present with sudden onset abdominal pain and a palpable mass that does not often exceed the midline.[9–12] On physical examination, ecchymotic areas of the abdominal skin (Fig. 1) and palpable painful mass can be detected during inspection. By lifting the head or legs in the supine position, the mass becomes less movable, does not cross the midline and is more evident after the contraction of the muscular wall (Fothergill's sign).[13] At the same time, if there is an abdominal wall pathology, abdominal tenderness will increase or will remain unchanged by lifting the head or the shoulders in supine position (Carnett's sign).[14] It is more commonly seen in women due to births and in the elderly due to the impaired rectus muscle structure.[9]

If RSH is suspected, the diagnosis should be based on history, physical examination, USG and CT findings. Early diagnosis and conservative treatment can prevent surgical interven-

tion even in large hematomas. Surgical procedures may be necessary in cases where hemodynamic stability cannot be achieved or compression and compartment symptoms are seen. Given that these RSH patients are often comorbid patients with advanced age and hemodynamic imbalance with a high mortality rate (4–25%),[14,15] early diagnosis and appropriate clinical treatment will prevent mortality rates.[16]

RSH can be a relatively benign or life-threatening clinical condition depending on the size and location of the bleeding, the general health and the hemodynamic status of the patient.[17–19] It can also be confused with an intraabdominal inflammatory process that may lead to delayed diagnosis or unnecessary laparotomy before appropriate treatments begin.[20,21]

RSH is frequently seen during the fifth and sixth decades. The mean age in our study was similar to the literature.[22] This may be because elderly patients are more likely to receive anticoagulation and/or antiplatelet therapy as in our study. RSH has a 2–3/1 female/male ratio, which is similar to our study.[23] Although we could not reveal any additional risk factors for female patients with RSH, we think that women are more prone to spontaneous rectus sheath hematoma than men due to differences in muscle mass and changes associated with pregnancy. Larger muscle mass may provide protection against trauma.[2]

Spontaneous RSHs have also been reported in elderly patients because of reduced elasticity due to atherosclerotic wall changes of epigastric vessels.[24]

Hemorrhage is the main complication of anticoagulation therapy. With the exception of blunt abdominal trauma, RSH typically occurs in patients receiving anticoagulant or fibrinolytic therapy and in severe hypocoagulability, such as hemophilia, von Willebrand Disease and Factor VIII disease. The risk of bleeding is related to the characteristics of the underlying disease, the intensity of anticoagulation and the length of treatment. In our study, 28 cases (90.3%) had comorbidities. When analyzed according to anticoagulation status, some important differences were observed. Patients on anticoagulation therapy were older ($p<0.001$), and we detected that they had higher INR values. Like previous studies, we also believe that hematomas will be a growing clinical problem due to the limited confidence intervals of anticoagulant drugs, the need for strict monitoring of these drugs, the increase in the elderly population and the incidence of age-related diseases, such as thrombosis.[25]

The most common presenting signs and symptoms were abdominal pain and the presence of an abdominal mass, followed by abdominal wall ecchymosis and the decrease in hemoglobin by 0.4 g/dl or greater in 13 patients (41.9%). Peritoneal irritation, hemoglobin status, tachycardia and hypotension were less common presenting signs and symptoms (Table 3).

RSH is usually located under the umbilical level and more often in the right lower quadrant,[14] but may occur in the upper abdomen or maybe bilateral.[23] Infraumbilical localization of the hemotoma was also detected in our study. This can be explained by the anatomy of the rectus abdominis muscle below the arcuate line where the posterior rectus sheath passes anteriorly and allows a greater movement of the lower portion of the muscle but also predisposes to vessel rupture with the accumulation of large hematomas.[26,27]

Physical examination and medical history can only help correctly diagnose 17% of the patients with acute abdominal pain who underwent surgery without any diagnostic radiological imaging techniques. The possibility of surgery decreases when RSH is diagnosed by preoperative radiological imaging methods.[23] Therefore, both USG and CT should be used as diagnostic aids to distinguish RSH from any intraabdominal pathology. USG may be useful in the diagnosis of RSH, but the sensitivity is only 70% to 90%. CT is useful for differential diagnosis in other intraabdominal pathologies; it reveals hematoma size, location, and relation with peritoneum, so CT is the gold standard with close to 100% sensitivity and specificity.[23–28] Both CT and USG have been described as effective imaging methods to establish a diagnosis of RSH.[25–29] Also, in our study, we diagnosed RSH mostly with CT in 26 of the cases (78.7%). In cases where USG was used, differential diagnosis of intraabdominal pathologies and radiological experience were considered for the confirmation of the diagnosis.

In many patients, conservative treatment is sufficient with the elimination of predisposing factors. Conservative methods consist of bed rest, analgesia, intravenous fluid resuscitation, ice pack application, compression, blood transfusions, and correction of coagulopathy. After discontinuation of anticoagulant and antithrombotic therapies, it is recommended that coagulation disorders have to be corrected with vitamin K, FFP and protamine sulfate and also blood replacement is recommended for these patients.[8,9] In our study, blood transfusion (6 units of RBC) was performed in three patients (9.6%) who underwent surgery with hemodynamic instability and increased hematoma size. Totally 14 units (median 2.3 units) of RBC were administered to six patients (19.3%). While the median units of transfused RBC were 3.5 units in the previous studies,[30] our patients needed less RBC transfusion. This finding can be explained with the higher altitude of the study region (Van, Turkey altitude: 1725 meters)[31] where our patients live. INR levels were higher than normal, with a mean INR value of 2.59 but lower than previous studies.[30] This shows that the patient group using anticoagulants has been better followed in recent years.

The mean hemoglobin and hematocrit (%) values of the patients were 11.3 and 34.3 respectively, with a relative anemia due to the high altitude of our region. Hematoma patients should have a more significant anemia. Hemodynamic compromise was much less common and presumably appeared

only in patients with larger RSH. These results support previous case report findings regarding signs and symptoms at presentation.[32,33]

In our study, most of the RSH patients (n=28, 90.3%) were treated with a conservative approach, including intravascular hydration, FFP and vitamin K administration, bed rest, multidisciplinary approach for comorbidities, strict vital sign follow-up, laboratory follow-up and analgesic applications were performed. We applied 28 units of FFP (15 ml/kg) to 11 patients with an INR value above 3. In a hemophilia patient, we aimed to control bleeding risks with factor VIII replacement. We lost one of the patients who were followed conservatively, and our mortality rate was 3.5%.

Surgery should be considered in patients with persistent bleeding, in those who are hemodynamically unstable despite blood transfusion, and in those who have compression symptoms and abdominal compartment, as the decrease in the pressure in the hematoma may lead to more severe bleeding.[34] Also, in our study, surgical procedures (bleeding control by vascular ligation) were achieved in three patients (9.6%) who had hemodynamic instability and enlarged hematoma in size. Open surgery is not considered as the first-line treatment since it may cause a decrease in the pressure inside the hematoma that may lead to a worsening of the hemorrhage by diminishing the potential tamponade effect,[14] whereas we did not see these effects in patients who underwent surgery. Although ultrasound-guided drainage has been used successfully in stable patients with abdominal wall hematomas not subjected to anticoagulation therapy, its use has to be balanced against the potential risk of infection of the hematoma and persistent bleeding as it may also cause a decrease in the intraabdominal pressure.[13,14] We performed ultrasound-guided drainage for the infection of the hematoma in two patients (6.4%) without detecting the increase in hematoma size and bleeding again. Actually, the arteriography with selective embolization of the epigastric arteries is considered to be the first interventional therapeutic option,[35] and seven patients in our study were determined eligible for arteriography with selective embolization. Four of them did not accept the intervention and three of them were unsuitable because of the elevation of their serum creatine levels. Therefore, arteriography with selective embolization was not performed in our study.

The length of hospital stay ranged from four to ten days in previous studies.[36] In our study, the mean length of hospitalization was 7.48 days (4–21), which was in accordance with the literature. Long-term hospitalizations can be explained by that the patients with RSH have advanced ages and comorbid diseases as in our study (n=28; 90.3%). A statistically significant difference was found in our study given the lengths of hospitalization in terms of RSH types, same as the study conducted by Karapolat et al.[37] The patients with Type 3 RSH were observed to stay longer in the hospital than other types. We attributed this to the higher incidence of containing more blood inside that may cause hemodynamically unstable conditions in patients due to the greater area and peritoneal irritations of Type 3 hematomas.

RSH may lead to severe complications, including infection, recurrent hematoma, acute renal failure, myocardial infarction, hypovolemic shock, myonecrosis, small bowel infarction, and death.[7,33] In the study by Cherry et al.,[33] only 4.8% of the patients had a repeat episode of RSH after the anticoagulation therapy was restarted. Reinitiating anticoagulation was shown to be safe in high-risk patients for thromboembolic events. Two of our discharged patients (9.5%) had a repeat episode of RSH in our series after anticoagulation therapy was restarted. This ratio can be explained by the living conditions of our patients who reside in a rural area that has only one university hospital for 2.5 million people. Therefore, strict follow-up of discharged patients that are on anticoagulants and the access of these patients to the hospital are important features for treatment.

In this retrospective study, we investigated the factors affecting mortality in patients with RSH and reviewed the clinical features of RSH patients. Mortality rate of the largest case series that consisted of 126 patients at Mayo Clinic was 1.6%.[33] The mortality rate in RSH patients ranged from 0% to 14.7% in several studies;[7] for example, Carkman et al.[27] reported mortality rates of up to 20% of RSH in the elderly and in the patients who were receiving anticoagulant therapy. Our first patient who died was 73 years of age with a history of atrial fibrillation. He underwent emergency surgical exploration due to hemodynamic instability. Although bleeding was taken under control, he died because of myocardial infarction on the fifth postoperative day in the intensive care unit. Our second patient who died was 80 years of age with a history of COPD and MVR. She died on the 14th day of hospitalization due to respiratory failure with nosocomial pneumonia. The mortality rate of our study was 6.4%, which is consistent with the literature. The mortality rate was 3.57% (1/28) in patients treated conservatively and 33.3% (1/3) in patients treated with surgery. However, none of our patients died primarily from their RSH. Villa et al.[38] reported that the mortality rate was 17% in patients who had to undergo surgery due to hemodynamic instability. In our study, the mortality rate of the patients who were treated surgically was as high as 33.3% because only three patients were treated surgically and one of them died of non-surgical reasons. This suggests that surgical mortality may be quite high in the management of RSH. Inadequate diagnosis may causeunnecessary surgical interventions in the treatment of RSH and is the cause of increased mortality.[9]

Although our study is a retrospective study from a single institution and arteriography with selective embolization was not performed, our findings support and substantially add to previous observations regarding RSH and suggest possible

risk factors for this condition. Based on the findings of this study, we concluded that RSH is a rare but potentially severe problem that may arise with anticoagulant medications, especially in elderly female patients, and these patients should be followed-up closely with a multidisciplinary approach due to their comorbidities and hemodynamic instability. During the rapid evaluation of the physical and medical history of the patients, conservative treatment should be made with the help of diagnostic vigilance, clinical experience and rapid radiological imaging methods as much as possible. In addition, we concluded that in cases where hemodynamic stability could not be achieved and compression and abdominal compartment findings were detected, surgical intervention could be performed, but the results of this intervention could be mortal. We hope that reporting these large series of patients diagnosed with RSH who presented with many clinical parameters as in our study; will lead to an effective algorithm system and preparation of guidelines for the diagnosis and follow-up of RSH in the future.

Ethics Committee Approval: Approved by the Non-invasive Clinical Research Ethics Committee of Van Yuzuncu Yil University (2019/11-05).

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ORİJİNAL ÇALIŞMA - *ÖZET*

Rektus kılıf hematomlarının tedavisi: Literatür eşliğinde 8 yıllık tek merkez deneyimi

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AMAÇ: Rektus kılıf hematomu akut karın ağrısının nadir görülen ve sıklıkla gözden kaçan nedenlerinden birisidir. Çoğunlukla ileri yaş ve yandaş hastalıkların eşlik ettiği bu hastaların yönetiminde doğru tanı ve tedavi yaklaşımlarıyla, gereksiz cerrahi müdahalelerden kaçınarak olumlu sonuçlar alınabilmektedir. Bu çalışmanın amacı, rektus kılıf hematomu tanılı hastaların yönetimindeki algoritma ve optimal tedavi stratejileri eksikliğine olgu yönetim deneyimimizle katkıda bulunmaktır.

GEREÇ VE YÖNTEM: Çalışmamızda Mayıs 2010–Temmuz 2018 tarihleri arasında rektus kılıf hematomu tanısı ile tedavi uygulanan hastaların demografik özellikleri, özgeçmişleri, tanıya götüren fiziksel incelemeleri, laboratuvar ve görüntüleme yöntemlerindeki bulguları, tedavi süreç ve yöntemleri, komplikasyonları, morbidite ve mortalite oranları, yatış süresi ve uzun süreli takip sonuçları geriye dönük olarak hasta dosyaları, hastane bilgisayar kayıt sistemi ve görüntüleme arşivleri incelenerek elde edildi. Elde edilen verilerin analizi Microsoft Excel ve IBM SPSS Statistics 24 kullanılarak değerlendirildi.

BULGULAR: Çalışmaya dahil edilen 31 hastanın yaş ortalaması 63.03 yıl (24–85 yıl) olup; kadın/erkek oranı (21/10) 2.1 idi. En sık görülen semptom karın ağrısı (%100) olmakla beraber; 25 olguda (%80.6) karın duvarı kitlesi tespit edildi. Antikoagülan ve antiplatelet tedavisi alan 25 olgu (%80.6) vardı. Olgularda tanı; 11'inde (%45.4) yalnızca bilgisayarlı tomografi; beşinde (%16.1) yalnızca ultrasonografi ve 15'inde (%33.3) ise bilgisayarlı tomografi + ultrasonografi yardımıyla konuldu. Sekiz olgu (%25.8) Tip 1, 10 olgu (%32.2) Tip 2 ve 13 olgu (%41.9) Tip 3 rektus kılıf hematomu olarak değerlendirildi. Ortalama International Normalized Ratio (INR) değeri 2.59 olarak bulundu. Üç olguda (%9.6) kanama kontrolü cerrahi müdahale ile sağlanırken; 28 olguda (%90.3) ise konservatif tedavi uygulandı. Olgular ortalama 7.48 gün (4–21) takip edilmiş olup; 29 olgu (%93.5) taburcu edilirken; cerrahi yapılan bir olgu ameliyat sonrası beşinci günde, konservatif takip edilen bir olgu ise yatışının 14. gününde kaybedildi (%6.45 mortalite). Konservatif ve cerrahi yöntemle takip edilen olguların mortalite oranları sırasıyla %3.5 ve %33.3 idi.

TARTIŞMA: Akut karın ağrısı, göbek altı palpable veya görüntüsel yöntemlerle desteklenen kitlesi olup; antikoagülan tedavi alan, şiddetli öksürük atakları olan ileri yaşlı hastalarda rektus kılıf hematomundan şüphe edilmelidir. Klinik şüphe halinde ultrasonografi veya bilgisayarlı tomografi yapılmalıdır. Erken ve doğru tanı konservatif tedavinin başarılı olmasını ve gereksiz cerrahi girişimleri önler. Klinisyen tecrübesinin ön planda olduğu bu olgularda, olgu çalışmaları sunularının artmasıyla birlikte yeni bir etkili algoritma sisteminin ve tanı için kılavuzların tanımlanacağını umuyoruz.

Anahtar sözcükler: Antikoagülan tedavi; karın ağrısı; karın duvarı hastalığı; rektus kılıf hematomu; tedavi.

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