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The changing nature of rectus sheath haematoma: Case series and literature review

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ABSTRACT

Background: Rectus sheath haematoma (RSH) is classically described as a rare condition, following a relatively benign course. Notable in its' diagnostic difficulty, RSH may mimic a wide range of other more serious pathologies. With the advent of computed tomography (CT) scanning misdiagnosis is now less common. However, a number of recent case reports suggest the frequency and severity of cases is increasing. This case series examines our experience of RSH, and reviews the changing presentation and management of this condition.

Methods: Retrospective review of a prospectively maintained patient database, including all patients with discharge diagnosis of RSH over 30-month period. An additional two cases were noted prospectively. Clinical notes were reviewed and linked to radiological imaging.

Results: Seven patients were identified (3 female, 4 male; median age 76, range 27–89) during the review period. Two patients were haemodynamically compromised at presentation, with significant tachycardia in two others. One patient had an unknown bleeding diathesis, whilst the remainder were all prescribed anticoagulant medication. Three patients required fluid resuscitation and blood transfusion. The correct diagnosis was only made in two patients prior to imaging. All patients underwent confirmatory CT scanning.

Conclusion: This case series indicates the increasing prevalence and severity of rectus sheath haematoma, largely due to increased use of anticoagulant medication in an aging population. Our findings emphasise the changing nature of the condition, together with the variable clinical courses it may take. Clinicians must treat this condition expectantly and be aware of complications that may ensue.

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1. Introduction

Rectus sheath haematoma (RSH) occurs due to the accumulation of blood within the rectus abdominis sheath secondary to bleeding from damaged inferior or superior epigastric arteries, or through direct tears of the rectus abdominis muscle. Historically described as a rare presentation, it is one whose initial diagnosis frequently evades clinicians due to mimicry of other conditions.

With the exception of one recent case series¹ and older literature reviews^{2–4} our contemporary knowledge of this condition is based on numerous individual case reports. The classical presentation is typically described as acute onset abdominal pain with a palpable mass in elderly female patients; usually this is associated with a history of non-surgical trauma to the abdomen.¹ However,

variation in symptoms and signs associated with the infrequent nature of this condition may result in a wide range of misdiagnoses.

Appropriate investigation and early recognition is important to exclude a false acute abdomen. Failure to avoid unnecessary exploratory surgery may exacerbate RSH by relieving the natural tamponade provided by the rectus sheath, with subsequent uncontrolled haemorrhage.

The incidence has previously been estimated as 1.2–1.5 cases per year in patients referred for radiological investigation of acute abdominal pain,⁵ and is therefore seen considerably less frequently by the average clinician. The potential severity of RSH spans the full spectrum from benign, self-limiting disease to a fatal condition. However, simple measures including bed rest and pain control have long been the standard treatment with more problematic cases rarely described.

In recent years we have noted a changing spectrum of disease associated with RSH, both in the frequency of presentation and the

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increasingly aggressive nature of the management required. Similar concerns are reflected in two recent publications, describing a small number of complicated cases presenting within an unusually short period of time.^{6,7} In light of this, we review our recent experience in the presentation and management of an increasingly common condition.

2. Methods

Nottingham University Hospital is a large regional teaching hospital and tertiary referral centre. Clinical details for two patients were collected prospectively, which provided the basis for this study. Further adult general surgical patients with a final diagnosis of RSH were then identified through retrospective analysis of a prospectively maintained general surgery admissions database. A case of RSH was defined by positive clinical or radiological findings confirming the final diagnosis.

Clinical notes were reviewed for cases presenting within the previous 30 months (January 2006–July 2008). Data was abstracted by two authors into an electronic spreadsheet, and laboratory investigation results were obtained from the hospital information system (NotIS).

Clinical audit approval for this study was granted by Nottingham University Hospitals NHS Trust.

3. Results

We identified 7 patients (3 female, 4 male; median age 76, range 27–89) admitted to the department of general surgery with a final diagnosis of rectus sheath haematoma. Their cases are summarised in Table 1.

All patients presented with acute onset abdominal pain, which varied in location according to the position of the underlying haematoma. One patient (case 2) was later noted to have Grey-Turner's sign after diagnosis.

Two patients (cases 5 and 6) were haemodynamically compromised at the time of presentation, with hypotension and tachycardia. Three further patients were tachycardic (pulse range 97–100 bpm) without hypotension.

One patient had an underlying bleeding disorder of unknown aetiology and the remaining patients were all receiving prescribed anticoagulant therapy. Case 2 was an inpatient at the time of referral, with a heparin infusion to prevent progression of a Partial Anterior

Circulation Stroke (PACS). Case 6 was prescribed a range of anticoagulant therapy following admission for acute coronary syndrome and percutaneous coronary intervention nine days earlier.

In two patients (case 3 and 7) an abdominal wall haematoma was included in the differential diagnosis prior to definitive imaging. In case 6 a retroperitoneal bleed was suspected, and underlying abdominal malignancy was the primary diagnosis in the remainder.

All patients underwent computed tomography (CT) investigation. This confirmed the diagnosis of RSH in all cases. No ultrasound imaging was requested in this series. One haematoma was bilateral, two were located in the left and four were in the right abdominal wall.

Three patients required fluid resuscitation for haemodynamic instability during their admission, and the same three patients received blood transfusions of between 2 and 6 units. Active correction of coagulopathy was required in three cases with intravenous vitamin K, prothrombin complex concentrate and also recombinant factor IX in the final patient with an unknown bleeding diathesis. None of the patients required radiological or operative control of the bleeding.

Haemoglobin results from the four patients not requiring transfusion or fluid resuscitation showed a mean fall of 4 g/dl from pre-diagnosis to day 6 post-diagnosis. Pre-diagnosis represents the nearest full blood count result to their admission with RSH; this dated from up to two months beforehand and is intended to give a representative baseline point for comparison. These changes were accompanied by a sharp elevation in white cell count, rising from a mean pre-diagnosis level of $8 \times 10^9/L$ to $16 \times 10^9/L$; this peaked on day 1 post-diagnosis.

The median length of stay was 18 days, with wide variations related to the underlying condition (range 7–88 days). Case 1 subsequently developed an infected RSH with septic complications during this recovery period. This ultimately required incision and drainage, which was performed successfully under local anaesthesia. Unfortunately the patient later died of unrelated complications following a prolonged hospital stay.

4. Discussion

This case series illustrates the typical presentation, course and outcomes of an unusual condition that may no longer be described as a rarity. Although previous papers have commented on the

Table 1

Summary of case details.

Case	Sex	Age	Anticoagulation medication	Coagulation results		Co-morbidity	Radiological investigation	Treatment	Fluid resus	Blood transfusion	Units	LOS (days)	Outcome
				APTR	INR								
Case 1	F	81	Aspirin	1.27	1.2	Dementia	CT	Symptomatic	No	No	–	37	Died
Case 2	M	76	Heparin	0.99	1.1	PACS	CT	Heparin stopped	No	No	–	88	Discharged
Case 3	M	77	Warfarin	1.39	3.0	Nil	CT	Warfarin stopped	No	No	–	18	Discharged
Case 4	F	73	Warfarin	–	4.2	Mechanical mitral valve	CT	Vitamin K and PCC	No	No	–	7	Discharged
Case 5	F	89	Warfarin	–	7.8	Influenza, new antibiotic started	CT	Vitamin K and PCC	Yes	Yes	6	21	Discharged
Case 6	M	72	Clopidogrel, aspirin, low molecular weight heparin	1.12	1	ACS, PCI	CT	Stopped anticoagulants	Yes	Yes	2	11	Discharged
Case 7	M	27	None	0.88	1	Unknown bleeding disorder	CT	Recombinant Factor IX	Yes	Yes	4	13	Discharged

M = male, F = female; PCC = prothrombin complex concentrate; LOS = length of stay (days); PACS = Partial Anterior Circulation Stroke; ACS = Acute Coronary Syndrome; PCI = Percutaneous Coronary Intervention.

increasing frequency of RSH, none have reported as many cases in such a short time period.

Changes in population demographics, with rising numbers of elderly patients and enhanced use of therapeutic anticoagulation are likely to further increase the frequency with which RSH is encountered in clinical practice.

Whilst access to detailed CT imaging has in recent years reduced the risk of unnecessary surgery from misdiagnosis, the widespread use of anticoagulant therapy creates a new problem, with patients more frequently requiring active management and resuscitation.^{6,7}

4.1. Clinical anatomy of RSH

The diversity with which RSH can present is largely dependent on the anatomy of the anterior abdominal wall. Rectus abdominis consists of two vertically aligned muscles separated into superior and inferior portions by the arcuate line, 5 cm below the umbilicus. Transverse tendinous intersections also divide each muscle into shortened segments. Above the arcuate line, the muscle is enclosed within the strong aponeuroses of the external and internal oblique muscles and the transversalis muscle, which together comprise the rectus sheath. Below this, these aponeuroses continue to provide anterior protection, however little remains of the sheath posteriorly to separate the rectus muscle from the abdominal compartment: namely a weak transversalis fascia and peritoneum. Arterial supply to the muscle originates from the superior and inferior epigastric arteries, themselves branches of the internal thoracic and external iliac arteries respectively. Both run between the posterior aspect of the muscle and the rectus sheath, where they form rich anastomoses near to the umbilicus.

Haematomas are more frequently seen in the lower segment of the rectus sheath, directly posterior to the muscle.⁸ This lower section is the longest and consequently muscle shortening during contraction is greatest.⁵ In addition, the absence of a substantial posterior rectus sheath together with the firm attachment of blood vessels to the recti leaves vessels vulnerable to injury following violent muscle contraction or trauma.

4.2. Demographics and aetiology

Once a condition ascribed to 'men of active habits',⁹ RSH is now frequently seen in elderly women, with a female:male ratio of 1.8:1. This is likely due to differences in muscle mass between the sexes: an increased muscle mass in men confers greater protection against muscle and vessel injury.¹ Interestingly our small series does not reflect this, with a predominance of male patients. This may reflect the slight male predilection for conditions such as ischaemic stroke and myocardial infarction for which anticoagulant treatment is now commonly used, and both of which are represented in this series.

RSH typically occurs after apparently trivial trauma, including coughing, sneezing, twisting or lifting, and is frequently associated with exercise.^{1,8} In one case series, cough was the most common non-surgical mechanism of injury with a paroxysm of coughing associated with asthma, bronchitis or pneumonia identified as the causal factor in 56% of cases.³ Whilst spontaneous RSH has also been reported it is possible an underlying precipitant was not identified. Numerous rarer causes of RSH have been described in the literature including amniocentesis,¹⁰ paracentesis,¹¹ and acupuncture.¹²

In addition to these predisposing conditions (with or without anticoagulation), arterial hypertension and atherosclerosis have also been identified as risk factors.^{13,14} Patients on anticoagulation have larger haematomas which are more likely to cause haemodynamic upset, as well as require surgery.^{5,15} The risk of

haemorrhage is linked to the intensity of anticoagulation, although patient factors such as age and clinical condition may be confounding variables.

4.3. Clinical features

Whilst the classical history of acute onset abdominal pain exacerbated by movement is frequently seen, the presentation may vary widely. In one large retrospective series abdominal pain was present in 84% of cases.¹ The pain may be diffuse or localised, with diffuse pain commonly associated with haematomas >3–5 cm. Other less common presenting symptoms include fever, syncope, urinary retention, and nausea or vomiting.⁵

Physical examination may reveal a palpable non-pulsatile abdominal mass, potentially accompanied by tachycardia and hypotension if associated with haemodynamic compromise. Rarer signs include periumbilical or flank ecchymoses, consistent with Cullen's or Grey-Turner's signs respectively, and indicating considerable retroperitoneal haemorrhage. These typically develop over 3–4 days.

Given the variety of clinical features associated with RSH and the associated variation in anatomical location, the condition frequently mimics a range of other diagnoses. Examples of those previously reported in the literature are given in Table 2.

Historically, two classic eponymous physical examination signs have been used to distinguish intra-abdominal pathology from that arising within the abdominal wall. Fothergill first described a technique in 1926 for identifying whether an abdominal mass truly arose from within the abdomen.⁹ His 'sign' is elicited by locating the mass with the lying patient supine. The patient is then asked to sit half-way up, so tensing the anterior abdominal wall musculature and concealing a mass arising from within. If the mass arises from the abdominal wall it will remain palpable. Carnett described a similar 'test' to help differentiate causes of pain arising from within the abdominal wall.¹⁶ Combining the two may assist in making a clinical diagnosis of RSH.¹⁷ Both tests are sensitive for abdominal wall pathology but not necessarily specific.

4.4. Investigations

Previous analysis suggests half of all patients with RSH experience a drop in haemoglobin of >0.4 g/dL.¹ In this series the mean drop for those patients not requiring fluid resuscitation or blood transfusion was 4.3 g/dl, in keeping with our perception that patients with RSH are now experiencing a more severe clinical course related to the increasing frequency of anticoagulation. A mild leucocytosis can also be seen, which may further confuse the initial diagnosis. In this series the mean pre-diagnosis to peak rise in white cell count was $6.9 \times 10^9/L$ for those not receiving fluid resuscitation or blood transfusion. In a haemodynamically compromised patient with acute abdominal pain and a markedly raised white cell count, it is clear to see how easily an initial misdiagnosis might be made.

Table 2
Misdiagnoses of RSH published in the literature.

- Appendicitis²⁴
- Acute abdomen²⁵
- Enlarged urinary bladder²⁶
- Splenic enlargement²⁷
- Ovarian mass²⁸
- Sigmoid diverticulitis²⁹
- Abruptio placenta³⁰
- Septic shock³¹
- Myocardial infarction³²

Whilst RSH was traditionally a clinical diagnosis, advanced radiological imaging is now widely available. Previously failure rates in clinical diagnosis were reported to exceed 50%.^{2,3} Abdominal X-ray is of little use in the diagnosis of RSH.¹⁸ Although ultrasound is often the first choice of imaging, its sensitivity for RSH is only 71%.¹⁴ It is often used in conjunction with CT to evaluate the severity and size of RSH, and has been found to be of predictive value in determining the need for surgery. In a study of the ultrasonographic diagnosis of RSH, significantly more intra-abdominal fluid was detected in patients requiring surgical intervention.⁵ However, ultrasonography is non-specific and it may be difficult to distinguish RSH from abdominal wall tumours or inflammatory processes.⁸

CT has been repeatedly shown to diagnose RSH where ultrasound has failed, with a 100% success rate reported in the literature.¹⁴ This finding is supported in our series. CT may also be of use in excluding other underlying abdominal pathology and detecting the presence of active bleeding when used with intravenous contrast.⁶ The typical CT appearances of RSH are shown in Fig. 1.

Further classification of RSH based on CT findings has been proposed, which attempts to correlate these with optimal management.¹⁵ The classification is detailed in Table 3 and has been widely adopted in describing the severity of subsequent cases.

In longstanding cases, isodense material seen on CT may become increasingly difficult to interpret, and in such cases magnetic resonance imaging (MRI) may be helpful. Both T1- and T2-weighted images have been shown to identify subacute or chronic (>10 months duration) haematomas in contrast to the adjacent fatty material of the abdominal wall.⁸

4.5. Treatment

Treatment of RSH depends largely upon the clinical presentation of the patient, their coagulation status and the degree of haemodynamic compromise. In most cases, supportive treatment is employed, with analgesia, bed rest and discontinuation of anticoagulant therapy. Concurrent management of predisposing risk factors such as hypertension, reduces the likelihood of recurrence.

The decision to transfuse depends upon the haemodynamic status of the patient, as well as underlying comorbidities; severe anaemia or active coronary ischaemia may lower the threshold for transfusion in patients who are otherwise clinically stable.¹⁹ An average of 3.5 units of packed erythrocytes was required to normalise clinical parameters in one review.¹ In this series the average was 4 units.



Fig. 1. Spindle-shaped rectus sheath haematoma in the right anterior abdominal wall, as indicated by the white arrow.

Table 3

CT with associated clinical findings can be used to guide management [adapted from Berna et al¹⁵].

Type	CT and clinical findings	Management
Type I	Intramuscular unilateral haematoma; does not dissect along fascial planes.	Minor haematoma. Does not require hospitalisation.
Type II	Uni- or bilateral with blood between muscle and transversalis fascia. May be associated with a drop in haematocrit and moderate deterioration in clinical condition.	Moderate haematoma; requires hospitalisation for monitoring.
Type III	Blood is seen to track along fascial lines into the peritoneum and prevesical space. Associated with haemodynamic instability.	Severe haematoma. Transfusion and stabilisation required.

Depending on their indication, it may be appropriate to temporarily cease oral antiplatelet agents such as aspirin or clopidogrel. In patients who present with excessive anticoagulation, reversal may be achieved with fresh frozen plasma, vitamin K or protamine sulphate. Newer agents, such as prothrombin complex concentrate and recombinant factor IX may require expert haematological advice, as in this series.

Interventional measures may be required if there is evidence of continued bleeding. Several recent papers now describe successful percutaneous arterial embolisation under radiological guidance.^{20–22} Selective catheterisation combined with digital subtraction angiography allows visualisation of the bleeding vessel. Haemostasis may be achieved by either by coil embolisation or through the use of gelatine foam. These series all report successful haemostasis in the treatment of RSH, and it has been suggested this should now be the first-line therapy for continued bleeding, re-bleeding and persistent haemodynamic instability. However, access to appropriately trained interventional radiology staff and equipment may currently limit uptake.

Operative techniques may ultimately be required in patients who fail to respond to conservative measures, and in those who have continued active bleeding as determined by CT scan. Surgical evacuation of the haematoma is performed, with ligation of bleeding vessels and repair of the rectus sheath. Whilst surgery was once common, both CT and USS have reduced unnecessary laparotomy rates as a result of misdiagnosis.¹⁴

In this case series surgical intervention was discussed in cases 5 and 6, although ultimately avoided.

4.6. Complications of RSH

Whilst most cases of RSH have previously followed a benign course, there is evidence that the increasing frequency of coagulation is changing the severity of the condition. Complications of RSH may include infection of the haematoma, as occurred in this series. Rarer complications are becoming more frequently described, including abdominal compartment syndrome, hypovolaemic shock, myocardial infarction and death.^{6,7,23} Recurrence is also possible, with a reported rate of 1.6% typically associated with recommencing anticoagulation therapy.¹

5. Conclusion

Classically a benign rarity, rectus sheath haematoma is increasing in prevalence and severity largely due to increased use of anticoagulant medication in an aging population. Our case series emphasises the changing nature of this condition, together with the variable clinical courses it can take. Clinicians need to be aware of the diversity with which RSH can present, and be prepared to treat the

condition expectantly. CT is the investigation of choice and this, coupled with clinical signs, can be useful in guiding further management. Once diagnosed, it is important to keep alert to the complications that can ensue and be familiar with new radiological treatment modalities in addition to the traditional surgical approach.

Conflicts of interest

None declared.

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Ethical issue

None declared.

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