



## Arteriovenous malformation: An unusual cause of rectus sheath hematoma, following laparoscopic cholecystectomy

D. Dellaportas<sup>a,\*</sup>, P.G. Athanasopoulos<sup>a</sup>, P. Lykoudis<sup>a</sup>, A. Manta<sup>a</sup>, V. Koutoulidis<sup>b</sup>, A.N. Chatziioannou<sup>b</sup>, G. Polymeneas<sup>a</sup>, T. Theodosopoulos<sup>a</sup>

<sup>a</sup> 2<sup>nd</sup> Department of Surgery, University Hospital Aretaieion, Athens 115 76, Greece

<sup>b</sup> 1<sup>st</sup> Department of Radiology, University Hospital Aretaieion, Athens, Greece

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### ABSTRACT

Rectus sheath hematoma (RSH) is an accumulation of blood in the rectus abdominis muscle sheath, secondary to several conditions which may cause the epigastric vessel rupture or muscular tear, but mostly affecting patients undergoing anticoagulation therapy.

We present a rare case of a 67-year-old woman who underwent laparoscopic cholecystectomy and developed RSH on the 12th postoperative day. The patient was under anticoagulation therapy with acenocoumarole due to mitral valve replacement. The bleeding source was an arteriovenous malformation (AVM) rupture as indicated by the angiogram images and it was embolized successfully. The patient was discharged seven days later.

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### 1. Introduction

Rectus sheath hematoma (RSH) is an unusual cause of abdominal pain. It is the accumulation of blood in the rectus abdominis muscle sheath due to rupture of the epigastric vessels or muscular tear.<sup>1</sup> Causes of RSH reported in the literature include: blunt trauma, abdominal surgery, coughing, asthma, subcutaneous drug injections, physical exercise, pregnancy, trocar site injury after laparoscopic procedures, or even automatically, mostly affecting patients undergoing anticoagulation treatment.<sup>2–4</sup> A rare case of RSH, on the twelfth postoperative day after laparoscopic cholecystectomy (LC) in a 67-year-old woman is presented herein. The patient was undergoing anticoagulation treatment due to mitral valve replacement and the cause of the RSH was an arteriovenous malformation (AVM) rupture. It is important for surgeons to be aware of this condition because of the increasing use of anticoagulants for the management of various medical conditions. This report highlights the clinical features, diagnostic tools and treatment of this challenging medical case. To the best of our knowledge, the

mechanism which resulted to RSH in this patient has never been reported before.

### 2. Case presentation

A 67-year-old woman was admitted for symptomatic cholelithiasis. The past medical history included mitral valve replacement with a metallic one, four years ago, and atrial fibrillation, for which receiving anticoagulation treatment. The patient underwent an uneventful LC. Low molecular weight heparin (LMWH) was used preoperatively and postoperatively in order to replace her anticoagulation therapy with acenocoumarole, and the patient was discharged on the second postoperative day. The anticoagulation treatment with acenocoumarole was resumed on the eighth postoperative day and two days later the LMWH was discontinued. On the 12th postoperative day the patient was admitted suffering right upper quadrant (RUQ) abdominal pain. Her vital signs revealed a heart rate (HR) 110 beats/min, blood pressure (BP) 140/85 mmHg and her respiratory rate was 16/min. Physical examination revealed abdominal tenderness over the RUQ and a firm palpable mass 7 cm × 4 cm on this area. Fothergill (i.e., an abdominal mass that does not cross the midline and remains palpable when the rectus muscle is flexed) and Carnett (i.e. an increase in abdominal pain when the head and shoulders are lifted off the examination table) signs were found positive suggesting an abdominal wall mass. Her haemoglobin level was 13.5 mg/dL, platelet count was 240,000/mm<sup>3</sup>, international normalized ratio (INR) was 1.91 and activated partial thromboplastin time (aPTT) was 31 s. Abdominal ultrasonography (U/S) confirmed the diagnosis of RSH and

\* Corresponding author. Tel.: +30 6947718723; fax: +30 2107286128.

E-mail addresses: [dellapdio@gmail.com](mailto:dellapdio@gmail.com) (D. Dellaportas), [p.athanasopoulos@yahoo.com](mailto:p.athanasopoulos@yahoo.com) (P.G. Athanasopoulos), [panagis.lykoudis08@imperial.ac.uk](mailto:panagis.lykoudis08@imperial.ac.uk) (P. Lykoudis), [asiminamanta@yahoo.gr](mailto:asiminamanta@yahoo.gr) (A. Manta), [vkout1968@yahoo.gr](mailto:vkout1968@yahoo.gr) (V. Koutoulidis), [achatzi@med.uoa.gr](mailto:achatzi@med.uoa.gr) (A.N. Chatziioannou), [gpolym@cc.uoa.gr](mailto:gpolym@cc.uoa.gr) (G. Polymeneas), [ttheodosopoulos@yahoo.gr](mailto:ttheodosopoulos@yahoo.gr) (T. Theodosopoulos).

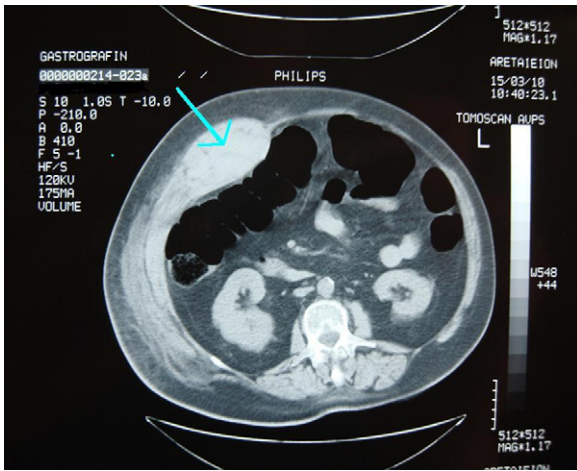


Fig. 1. Abdominal CT-scan: RSH before angiographic embolization (arrow).



Fig. 3. Angiogram post-embolization presenting the AVM.

conservative management using common analgesics was applied. Once again asenocoumarole was replaced by LMWH. The following day the patient was clinically deteriorating with increasing pain, her HR was 130 beats/min and BP 100/60 mmHg whereas the palpable mass became oversized extending below the umbilicus, and hemoglobin level dropped to 9 mg/dL. The administration of two units of packed red blood cells and further fluid resuscitation using crystalloid solutions re-established the patient's hemodynamic stability. A computed tomography (CT) scan revealed a rectus sheath hematoma covering the whole right rectus muscle sheath (Fig. 1). We decided to perform an angiography in order to work out the bleeding source and if possible, the embolization of the vessel responsible for the bleeding. The angiography of the right internal mammary artery and upper epigastric vessels revealed a ruptured AVM, which resulted to the hematoma and transarterial embolization using coils (MReye Embolization Coil, Cook) was employed (Figs. 2 and 3). The patient's clinical status was remarkably improved and she was discharged ten days later after a new CT-scan (Fig. 4) that revealed that the size of the hematoma was reduced.

3. Discussion

RSH is a rare, but sometimes life-threatening condition usually affecting patients, mostly women under anticoagulation therapy for various conditions.<sup>4</sup> Blunt trauma, abdominal surgery, coughing, asthma, physical exercise, laparoscopic trocar placement and pregnancy are reported as risk factors predisposing to RSH due to muscle fibers tearing or epigastric vessels rupturing.<sup>1-4</sup> Below the arcuate line there is only transversalis fascia between peritoneum and posterior rectus sheath, therefore an RSH can mimic acute abdomen. Presenting symptoms and signs consist of abdominal pain and cramping, tachycardia, fever, palpable abdominal mass, ecchymosis, nausea and vomiting. Positive Fothergill's and Carnett's signs help in differentiating RSH from other intra-abdominal pathological entities.<sup>5</sup> Also, Grey Turner's and Cullen signs (ecchymosis in the back and in the periumbilical region) were positive in our case.

Imaging modalities including abdominal U/S and CT-scan of the abdomen can be conducted to demonstrate and classify the lesion. Type I hematomas are mild, occurring within the muscle and causing an increase in its length. They do not require hospitalization, but conservative treatment with common analgesics is enough. Type II hematomas are moderate and develop within the muscle but bleeding occurs into the space between transversalis fascia and the muscle. Type III hematomas are severe and locate between transversalis fascia and the muscle, anterior to



Fig. 2. Angiogram pre-embolization presenting the AVM.

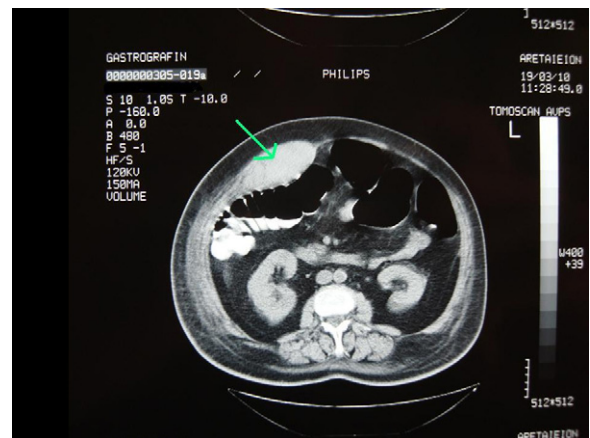


Fig. 4. Abdominal CT-scan: RSH after angiographic embolization (arrow).

the peritoneum and bladder. Type II and III hematomas require hospitalization.<sup>6</sup>

Hemodynamically stable patients with non-expanding RSHs are treated conservatively with analgesic medication, discontinuation of anticoagulants and fluid resuscitation as indicated. Surgical intervention is required for enlarged hematomas. In RSHs refractory to conservative measures, angiography and embolization using coils, Gelfoam or cyanoacrylate are an alternative option especially in high risk patients.<sup>7</sup> Surgical exploration and ligation of the bleeding vessel is rarely needed, yet fatal outcomes have been reported.<sup>8</sup>

In the rare case presented above, the hemorrhage which resulted to the RSH, originated from a ruptured AVM which in turn probably was caused by the sternotomy surgical trauma four years ago, during the mitral valve replacement surgery. The AVM was ruptured when anticoagulation treatment combining acenocoumarole and LMWH, resumed and continued until INR reached the desired therapeutic levels in order to discontinue LMWH. This mechanism, to the best of our knowledge, has never previously been reported.

#### 4. Conclusion

RSH is an uncommon entity, mimicking acute abdomen and accurate diagnosis should be made carefully using prompt but thorough history, physical examination and appropriate imaging studies. Abdominal CT-scan is considered the most helpful diagnostic tool. Management is usually conservative, while other options such as angiographic embolization or even surgical intervention can prove life-saving in clinically deteriorating patients.

#### Conflict of interest statement

No competing financial interests exist.

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#### Ethical approval statement

Written informed consent was obtained from the patient for publication of this case report and accompanying images. A copy of the written consent is available for review by the Editor-in-Chief of this journal on request.

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