

CASE REPORT

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# Fatal rectus sheath hematoma: a rare autopsy phenomenon

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## Abstract

**Background:** Rectus sheath hematoma is a condition where blood is accumulated within the sheath of the rectus abdominis muscle. It is caused by the rupture of either the superior or inferior epigastric artery or from a direct tear of the rectus muscle itself. This condition is usually self-limiting and most of the time, the hematoma is small, non-expanding and can be reabsorbed spontaneously over time. However, certain underlying pathology may lead to the expansion of the hematoma or even a recurrence, and without any medical treatment or intervention, this condition can even be fatal. Due to its rarity, only a few published cases of fatality associated with rectus sheath hematoma are reported worldwide.

**Case presentation:** We present a case of non-traumatic fatal rectus sheath hematoma in the presence of underlying lung infection. The deceased complained of abdominal pain 2 days prior to death with a history of prolonged cough. The autopsy revealed the presence of a hematoma within the rectus sheath of the left lower quadrant of the abdomen extending down into the left pelvis and a multitude of small yellow-tan firm lesions scattered throughout the parenchyma of the right lung, suggestive of a lung infection which was later confirmed histologically.

**Conclusions:** The case serves to increase awareness of fatal rectus sheath hematoma as a cause of death given its rarity in forensic medicine practice. The importance of a thorough post-mortem examination is the key to noticing the fatal hematoma since its enclosed location within the rectus sheath may be obscured to the eye of an inexperienced prosector.

**Keywords:** Autopsy, Rectus sheath hematoma, Abdominal wall hemorrhage, Forensic

## Background

Rectus sheath hematoma is a condition where blood is accumulated within the sheath of rectus abdominis muscle caused by the rupture of either the superior or inferior epigastric artery or from a direct tear of the rectus muscle itself (Kapan et al., 2008; Athanasios et al., 2014). This condition is uncommon with only a few published cases of fatality associated with rectus sheath hematoma reported worldwide (McCarthy & Bellam, 2010).

## Case presentation

A 50-year-old non-alcoholic Indonesian man with no known medical condition was found deceased on his bed by his wife early in the morning when she tried to wake him up for fajr prayer. He had left-sided abdominal pain for the past two days that did not associate with any diarrheal, constipation, or vomiting episodes. His wife was unable to describe the exact nature of the deceased's abdominal pain. There was no history of recent fall or trauma to the abdomen and he was not on any anticoagulation therapy. He had a history of prolonged coughing but did not seek any medical treatment. A post-mortem examination was requested by the police to determine the cause of death.

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**Fig. 1** Left rectus sheath hematoma

During the autopsy, an external examination showed the body was that of a medium-built adult male measuring 167 cm in length and was in the early state of decomposition, characterized by the passing off of rigor mortis involving smaller muscle groups of the upper part of the body. The post-mortem interval was estimated to be not less than 24 h. The external examination showed no obvious signs of trauma, with no prominent asymmetrical abdominal distension or ecchymosis. The internal examination revealed a hard diffuse mass, located underneath the parietal peritoneum of the left anterior abdominal wall. An incision into the area showed the presence of a hematoma within the rectus sheath of the left lower quadrant of the abdomen extending down into the left pelvis, 17 cm × 14 cm × 6 cm in size. The incision was extended from the left side of the abdomen to the proximal 1/3rd of the left thigh in which the left femoral artery was identified and then traced upwards until the left external iliac artery was found, where the



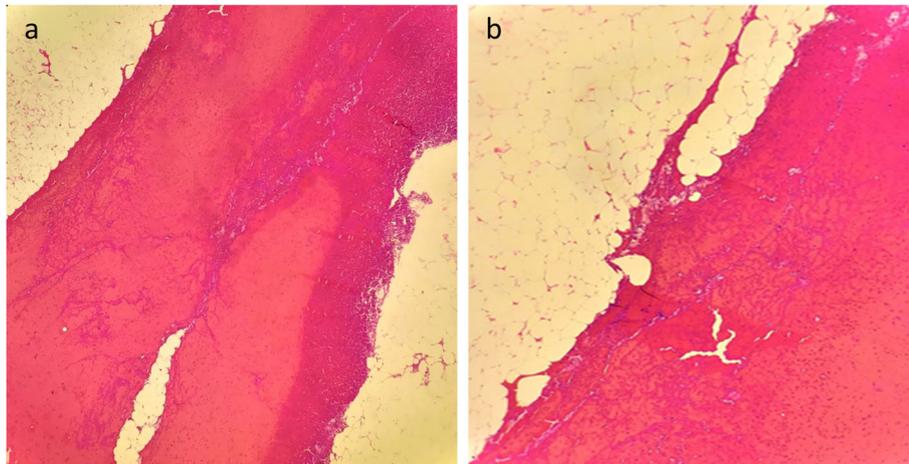
**Fig. 2** Closer view of the rectus sheath hematoma. Note that the hematoma is neatly encapsulated by the rectus sheath



**Fig. 3** Right lung. Note the scattered small yellow-tan firm lesions throughout the lung parenchyma. No cavitory lesion or caseating granuloma seen

vessel was seen to be intact with a grossly unremarkable vessel wall. Both kidneys were seen to be pale-looking but otherwise unremarkable. The liver (1670 g) showed a diffuse yellowish discoloration of the parenchyma, in keeping with fatty change. Examination of the thorax showed an intact ribcage with bilateral pulmonary congestion. The right lung (600 g), however, revealed a multitude of small yellow-tan firm lesions (more than 20 lesions in total and the size of each lesion being less than 0.5 cm) scattered throughout the parenchyma with the absence of any cavitory lesions or caseating granuloma. The left lung (460 g) was otherwise unremarkable. The heart weighed 350 g. The coronary arteries arose normally from the ostium and were all widely patent. The thickness of the left ventricular wall, interventricular septum, and right ventricle were measured at 12 mm, 13 mm, and 3 mm, respectively. All valves appeared healthy with no vegetation. No fibrosis or any gross sign of recent infarction could be seen over the myocardium. Along the intimal lining of the thoracoabdominal aorta, patchy atherosclerotic plaque was observed. The remaining internal organs of the body showed no remarkable pathology (Figs. 1, 2, 3, and 4).

Histopathological examination (HPE) of the right lung showed features in keeping with a lung infection in which scattered multifocal areas of intra-alveolar mixed inflammatory cell infiltrates; predominantly neutrophils were seen with the presence of focal necrosis. No evidence of granuloma or Langhans-type multinucleated giant cells were observed with the absence of acid-fast bacilli when using a Ziehl-Neelsen stain. The liver showed mixed macro- and microvesicular steatosis and increase inflammatory cells within some of the portal tracts, with a visible absence of peri-portal or bridging fibrosis. No evidence of steatohepatitis was seen.



**Fig. 4 a, b** Rectus sheath hematoma. Section shows hemorrhage partly sandwiched by fatty tissue. No evidence of inflammatory response and tissue repair seen (**a** hematoxylin and eosin, 4x; **b** hematoxylin and eosin, 10x)

The final cause of death given was complications of abdominal wall hemorrhage in a man with a lung infection.

### Discussion

The rectus sheath is a structure that is situated on either side of the linea alba of the abdomen. Its presence provides strength to the anterior abdominal wall. It has anterior and posterior walls, medial and lateral margins. The rectus sheath is formed at the merging point of the aponeurosis of the transversus abdominis, external and internal oblique abdominal muscles. It acts as an envelope to its contents which are the muscles (rectus abdominis and pyramidalis), blood vessels (superior and inferior epigastric arteries), and nerves (terminal parts of lower fifth intercostals and 12th thoracic nerves) (Athanasios et al., 2014; Karlin et al., 2021).

The commonly involved regions of a rectus sheath hematoma are in the lower quadrants of the abdominal wall (McCarthy & Bellam, 2010). Clinically, it can mimic the symptoms of acute abdomen due to an indirect irritation caused by the hematoma on the peritoneum below the arcuate line, making this condition easily misdiagnosed (Kapan et al., 2008; Athanasios et al., 2014; McCarthy & Bellam, 2010).

There are many underlying pathologies or causes that can lead to the development of rectus sheath hematoma, including abdominal trauma, previous abdominal surgery, coughing, physical exercise, iatrogenic causes for instance laparoscopic mishaps, hypertension, intraabdominal drug injections, hematological diseases, pregnancy, and anticoagulant therapy. On rare occasions, it can also occur spontaneously (Kapan et al., 2008; Athanasios et al., 2014; McCarthy & Bellam, 2010; Patel et al., 2016). Among all of the factors mentioned above,

direct blunt abdominal trauma and the use of anticoagulants are the most commonly reported risk factors (Alla et al., 2010; Elango et al., 2018; Donaldson et al., 2007; Cherry & Mueller, 2006).

Excessive vigorous contractions of the rectus muscle that occur during paroxysmal cough attacks or even during exercise are also frequently reported as independent contributing factors to the development of spontaneous rectus sheath hematoma. From the literature review, it is observed that the hematoma in such cases is frequently unilateral and may be found on either side of the abdominal wall. However, there are no documented explanation why bilateral cases are not more common or at least as common as the unilateral rectus sheath hematoma (Patel et al., 2016; Cherry & Mueller, 2006; Sogut et al., 2010; Ariyoshi et al., 2019; Jensen et al., 2013; Wong et al., 2018; Sharma et al., 2007).

There are few external and internal findings that may be found during an autopsy in cases of fatal rectus sheath hematoma. First is the presence of asymmetrical enlargement or distension of one side of the abdomen on external examination, or a large palpable mass that is usually present within one side of the abdomen. The mass can be felt either on the upper or lower abdominal quadrant. Second is the presence of ecchymosis over the abdomen. Ecchymosis may be prominently seen in certain cases and usually appears later in the course of the disease and is usually observed around the flanks or periumbilical region (Kapan et al., 2008; Athanasios et al., 2014; McCarthy & Bellam, 2010; Wong et al., 2018; Sharma et al., 2007).

Any condition that results in bleeding can progress into a life-threatening event, including bleeding into the rectus sheath which can result in hypovolemic shock when the loss of intravascular volume exceeds 20% or

one fifth of a person's total fluid volume. This significant loss will lead to hemodynamic instability due to a low cardiac output that will interfere with organ and tissue perfusion causing cellular hypoxia, leading up to organ damage and associated mortality (Athanasios et al., 2014; Kumar et al., 2012). Moreover, the deceased's underlying lung infection may have further reduced his resistance to any kind of systemic disruption, and because of this, a relatively lower volume of blood loss may already be sufficient to cause a significant circulatory compromise.

In this case, the only known precipitating factor to have led to the development of rectus sheath hematoma was the history of prolonged coughing. Coordinated contraction of the abdominal muscles including that of the rectus abdominis muscles along with the thoracic and pelvic muscles during vigorous coughing could have generated sufficient shearing force to tear the epigastric vessel that is deficient of protection by the posterior rectus sheath below the arcuate line (Donaldson et al., 2007; Jensen et al., 2013; Wong et al., 2018). If this condition is left undiagnosed and the bleeding continues, a sufficient volume of blood will be accumulated within the rectus sheath to cause severe hemodynamic compromise and associated fatal hypovolaemia (Patel et al., 2016; Cherry & Mueller, 2006; Romic et al., 2018).

The above mechanism is believed to be the underlying pathophysiology in the development of the fatal rectus sheath hematoma in this case. However, again, due to the massive size of the hematoma, the exact point of bleeding is indeterminate. The history of coughing is supported by gross pathological changes of the lung seen during the autopsy and histologically. Moreover, in theory, any bleeding conditions may be potentially exacerbated by the underlying coagulopathies associated with liver diseases (Kumar et al., 2012). However, current literature has failed to quantify this risk of morbidity and mortality especially in relation to the severity of the rectus sheath hematoma itself (Athanasios et al., 2014). Therefore, even though fatty liver is present, in which the features (historically and histologically) are in keeping with non-alcoholic fatty liver disease (NAFLD), its presence is unable to be directly or indirectly linked as a contributory factor to the size of this hematoma. Patchy uncomplicated atherosclerotic plaque along the intimal lining of the thoracoabdominal aorta may suggest underlying undiagnosed dyslipidemia. However, due to the unknown history of any other underlying medical illnesses or any existing metabolic disorders including dyslipidemia, the etiology of the fatty liver is unable to be clinically identified. Moreover, there were no recent external marks of trauma or injury noted over the skin and the underlying subcutaneous tissue during autopsy to imply

trauma to the abdomen as the underlying cause of this fatal condition.

## Conclusions

In a standard autopsy, the rectus sheath is not routinely examined. Given the location of the hematoma which is enclosed within the rectus sheath, this critical finding may be easily obscured especially to the eye of an inexperienced prosector, making the possibility of the condition being left undiscovered very likely and the actual cause of death might never be uncovered, just as it has been once said, that "The eyes cannot see what the mind does not know".

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## Authors' contributions

Medicolegal autopsy was conducted by Dr. ANF. This article was conceptualized and designed by Dr. ANF and Dr. SS. Relevant literature was searched by Dr. ANF and Dr. ANF drafted the manuscript which was further edited and reviewed by Dr. SS. The authors read and approved the final manuscript.

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## Declarations

## Ethics approval and consent to participate

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## Consent for publication

Written informed consent to publish this information was obtained from the next of kin under appropriate circumstances.

## Competing interests

The authors declare that they have no competing interests.

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