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# Cholecystitis causing rupture of the cystic artery and massive hemoperitoneum

Rowan Klein Nulend, Andrew Tse, Timothy Pollitt

## ABSTRACT

**Introduction:** Cholecystitis is a common surgical pathology; however, it is uncommonly associated with hemorrhage. Cases of hemoperitoneum secondary to cholecystitis are usually in the context of cystic artery pseudoaneurysms; however, no reports describe rupture of a non-aneurysmal cystic artery.

**Case Report:** We present a case of hemoperitoneum and hemorrhagic shock secondary to cholecystitis, with resultant rupture of a branch of the cystic artery, in the absence of a pseudoaneurysm. The patient was a middle-aged man who presented with severe right upper quadrant pain on a background of biliary colic. Imaging was consistent with cholecystitis, and significant volume free fluid in the right upper quadrant. The patient became shocked and was taken for laparoscopy, with conversion to laparotomy. 1.6 liters of hemoperitoneum was evacuated, and a cholecystectomy was performed. It appeared that a gallbladder perforation has caused rupture of a branch of the cystic artery, with resultant intraperitoneal hemorrhage. No pseudoaneurysm was identified. The patient made a complete recovery.

**Conclusion:** This was a previously unreported, yet life-threatening complication of cholecystitis. This report aims to present a novel case and promote awareness of this dangerous complication.

**Keywords:** Cholecystitis, Cystic artery rupture, Hemoperitoneum

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## INTRODUCTION

Despite cholecystitis being a common intra-abdominal pathology, hemorrhage secondary to cholecystitis is rare. The above case describes a case of cholecystitis complicated by massive hemoperitoneum secondary to cystic artery rupture, which is extremely rare. Cystic artery rupture most commonly occurs secondary to a cystic artery pseudoaneurysm (CAPA), which was not identified in this case.

## CASE REPORT

A middle-aged male presented to the emergency department with a 9-hour history of severe right sided abdominal pain and nausea. This was on a background of recurrent episodes of biliary colic. He had a previous medical history of bipolar disorder and 30 pack year history of smoking. Examination revealed a tender right upper quadrant with peritonism. Blood tests are seen in Table 1.

Table 1: Preoperative blood results

| | |
|---|---|
| Hemoglobin (g/L) | 167 |
| Bilirubin (umol/L) | 19 |
| ALP (U/L) | 67 |
| GGT (U/L) | 446 |
| ALT (U/L) | 169 |
| AST (U/L) | 126 |

*Abbreviations*: ALP: Alkaline phosphatase; GGT: Gamma-glutamyl transferase; ALT: Alanine transaminase; AST: Aspartate transaminase.

Bedside ultrasound showed a thickened gallbladder, with features suggestive of localized perforation. On computed tomography (CT) imaging (Figures 1 and 2) he was found to have extensive intraperitoneal free fluid, primarily surrounding the liver and subhepatic space. Hyperdense material was visualized within the gallbladder, which was consistent with hemocholecyst. Linear hyperdensity traversing the gallbladder and extending along the falciform ligament, and the liver surface implied active extravasation. There was no evidence of a cystic artery pseudoaneurysm on either imaging modality.

The patient was commenced on intravenous ceftriaxone and metronidazole. Shortly after CT, the patient became shocked with a blood pressure of 88/70 mmHg. He was urgently taken for laparoscopy, with conversion to laparotomy. Intraoperative findings were approximately 1.6 L of hemoperitoneum, and free gallstones in the right upper quadrant. The source of hemorrhage was at Hartmann's pouch, where a gallbladder perforation appeared to have ruptured a branch of the cystic artery. There was no evidence of a cystic artery pseudoaneurysm. The hemoperitoneum was evacuated, and a cholecystectomy was performed. Intraoperative cholangiography was not done at this stage. Gallbladder histopathology was consistent acute-on-chronic hemorrhagic cholecystitis.

The patient spent one night in intensive care unit (ICU) for postoperative monitoring before being transferred to the general surgical ward.

Subsequently, the patient improved clinically with normalizing biochemical and hematological markers. The patient was discharged on the fifth postoperative day. The patient was followed up and made an expectant full recovery.

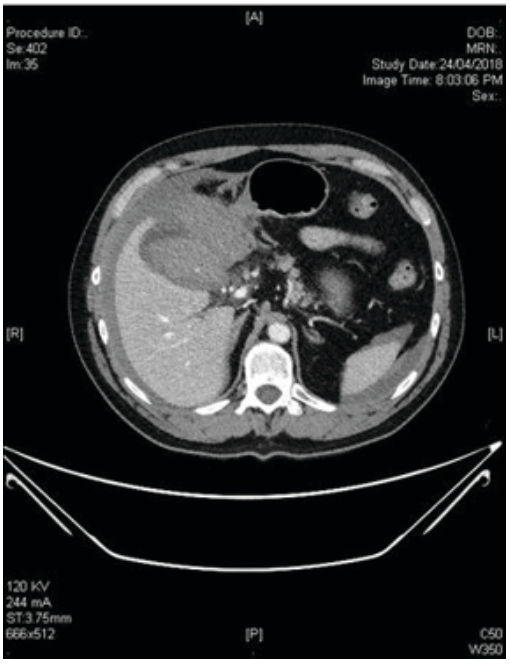

Figure 1: Axial preoperative CT abdomen.

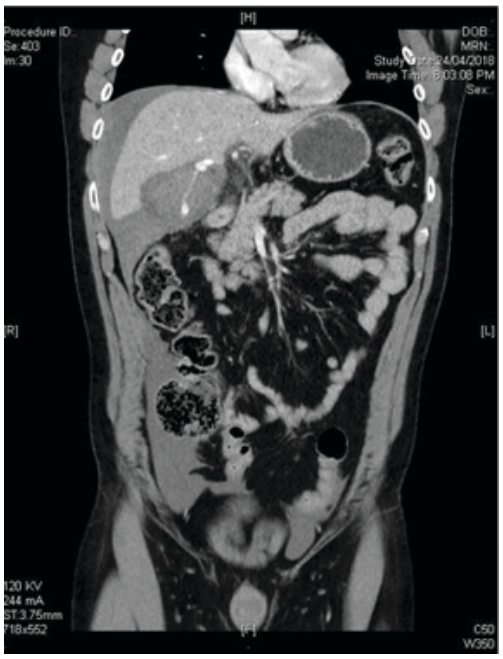

Figure 2: Coronal preoperative CT abdomen.

## DISCUSSION

Cystic artery pseudoaneurysms are extremely rare, most commonly occurring secondary to biliary instrumentation [1]. Although cholecystitis is a common surgical pathology, CAPAs have very rarely been described in cholecystitis. Clinical features of CAPA rupture remain unclear; however, it is hypothesized that in these instances, chronic cholecystitis can cause a CAPA, and that a superimposed acute inflammatory episode causes this pseudoaneurysm to rupture [2]. Cystic artery pseudoaneurysms have been associated with hemorrhagic cholecystitis resulting in hemobilia and upper gastrointestinal bleeds (UGIB), with some cases occurring with (supra)therapeutic antiplatelet/anticoagulation [3–14]. Four cases of gastrointestinal bleed secondary to CAPA have been described with concurrent cholecysto-intestinal fistulas [4, 15–17]. An even smaller number of CAPAs leading to hemoperitoneum have been described, again with some in the context of therapeutic antiplatelet/anticoagulation therapy [2, 18–21].

We found one previous case of massive hemoperitoneum secondary to cystic artery rupture in the absence of any aneurysm, secondary to acute cholecystitis in a patient with ulcerative colitis and primary sclerosing cholangitis [22]. This case was diagnosed through extravasation of contrast during a CT abdomen with contrast and was treated with angio-embolization followed by urgent laparotomy and cholecystectomy.

Two cases of cystic artery rupture and hemoperitoneum have been described without cholecystitis in patients with significant vascular risk factors. One case of hemoperitoneum due to spontaneous cystic artery rupture in the absence of cholecystitis or underlying arterial

pathology has been described in a patient with severe cardiopulmonary disease [23]. One case of spontaneous fatal cystic artery rupture has been described in a patient with vascular Ehlers–Danlos syndrome and multiple previous vascular anomalies [24].

Transhepatic gallbladder perforation has also been identified as a cause of hemoperitoneum secondary to acute cholecystitis, with subsequent hemorrhage from the liver bed [25–28]. Further cases of hemoperitoneum secondary to cholecystitis have been described with a range of related underlying pathologies, including coagulopathy (and therapeutic anticoagulation), cirrhosis, chronic primary sclerosing cholangitis, and rupture of a hemorrhagic cholecystitis [29, 30].

The case we present features a hemoperitoneum due to the rupture of a branch of the cystic artery secondary to acute perforated cholecystitis, in an otherwise healthy patient. We identified only one similar case, in a patient with complex autoimmune gastrointestinal/biliary pathology. Other cases of cystic artery hemorrhage are typically associated with bleeding from (pseudo) aneurysms. A clinical picture of acute cholecystitis and hypovolemic shock, alongside imaging findings consistent with hemoperitoneum were suggestive of such hemorrhage, which was confirmed intraoperatively. Due to appropriate investigations and timely intervention, the patient was able to make a complete recovery.

## CONCLUSION

A clinical picture of acute cholecystitis and hypovolemic shock, alongside imaging findings consistent with hemoperitoneum was suggestive of such hemorrhage, which was confirmed intraoperatively. Due to appropriate investigations and timely intervention, the patient was able to make a complete recovery.

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## Author Contributions

Rowan Klein Nulend – Conception of the work, Design of the work, Acquisition of data, Analysis of data, Interpretation of data, Drafting the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Andrew Tse – Design of the work, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

Timothy Pollitt – Conception of the work, Acquisition of data, Revising the work critically for important intellectual content, Final approval of the version to be published, Agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved

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The corresponding author is the guarantor of submission.

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## Consent Statement

Written informed consent was obtained from the patient for publication of this article.

## Conflict of Interest

Authors declare no conflict of interest.

## Data Availability

All relevant data are within the paper and its Supporting Information files.