The diagnostic dilemma of gallbladder volvulus: Report of a case

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Introduction

Gallbladder volvulus is a known but rare condition that often presents with acute abdomen in the elderly population. Less than 500 cases have been previously reported and the incidence is unknown. Only a few have reported a preoperative diagnosis of gallbladder volvulus, and imaging remains non-diagnostic. Patients are presumed to have acute cholecystitis in the setting of normal liver function testing. Gallbladder volvulus requires immediate operative intervention to avoid potential complications, while acute cholecystitis usually does not require immediate surgical attention. Though this is a rare condition, it is important to include gallbladder volvulus in the differential diagnosis when evaluating an elderly patient with acute onset of right upper quadrant pain.

Case report

A 90 year old female with no past surgical history presented with four days of abdominal pain, nausea, vomiting and anorexia. She reported no fevers or change in bowel habits. Physical examination revealed an afebrile hemodynamically stable patient. Her abdomen was soft, mildly distended but was extremely tender to palpation at the right upper quadrant region. The tenderness was associated with involuntary guarding. No mass was appreciated. The remainder of her physical exam was within normal limits. Laboratory evaluation revealed a white blood cell count of 14,800 and normal liver function test. CT scan of the abdomen and pelvis revealed a distended and likely necrotic gallbladder without cholelithiasis (Figure 1). This was associated with fat stranding and a significant amount of pericholecystic fluid. The patient was taken to the operating room for laparoscopic cholecystectomy. Upon diagnostic laparoscopy, the patient’s gallbladder was found to be distended, necrotic and volvulized on its mesentery, along the axis of the cystic duct and cystic artery (Figure 2 and 3). As the anatomy was unclear, the case was converted to an open procedure via a right subcostal incision. The gallbladder was detorsed and the cystic duct and artery were then clearly identified and ligated. The gallbladder was noted to be nonadherent to the liver and was easily resected. The patient’s postoperative course was uneventful and she was discharged to a skilled nursing facility on postoperative day four. Final pathology revealed acute cholecystitis with extensive hemorrhage, focal acute inflammation and loss of surface mucosa. No cholelithiasis was identified.

Discussion

Acute torsion of the gallbladder is a rare entity in the United States. Initially reported by Wendel in 1898 [1], this phenomenon has been described by several authors internationally and seems to have become more common in the past decade.
This condition often occurs in elderly, thin females, who present with acute abdomen and signs suggestive of acute cholecystitis, specifically right upper quadrant pain without jaundice. A spectrum of abdominal exam findings has been described. Findings have included mild right upper quadrant pain, palpation of a mass, frank peritonitis [2,3], or suspected acute appendicitis [4,5]. On laboratory evaluation, these patients do not exhibit signs of biliary obstruction or elevation of liver function tests. However, leukocytosis may be present, indicating an inflammatory response. Our patient presented with this clinical picture, including peritoneal signs on exam and no signs of biliary obstruction on laboratory evaluation.

Table 1 summarizes all of the reported cases in the English literature since the advent of laparoscopic cholecystectomy by Enrich Muhe [6]. As described above, most of these patients are elderly female patients who presented with RUQ pain without a palpable abdominal mass. In most cases, the initial diagnosis was acute or acalculous cholecystitis. However, seven out of 45 cases were diagnosed as gallbladder volvulus preoperatively. Interestingly, a majority of these cases were diagnosed on CT scan, which is not the traditional imaging modality for gallbladder pathology. In hind-sight, our patient’s torsion was visible on CT scan. Unlike our patient, most of the patients who presented with gallbladder volvulus did not have peritonitis or an acute abdomen. They therefore underwent further workup with hepatobiliary iminodiacetic acid (HIDA) scan, magnetic resonance imaging (MRI), or magnetic resonance cholangiopancreatography (MRCP), which revealed findings of a volvulized gallbladder.

From a clinical standpoint, gallbladder volvulus can show up on imaging as a distended, hydropic gallbladder with thickened wall and pericholecystic fluid. It has been previously suggested that ultrasound may be the instrumental for the diagnosis, with a triad of radiologic findings including: anterior localization of the gallbladder; increased volume of the gallbladder; and a severely thickened, multilayered gallbladder wall [14]. Our patient’s physical exam prompted evaluation in the emergency department with a CT scan. Chen et al. suggested that gallbladder volvulus can be identified on the CT scan using the “U to 9 to O” sign [34]; however, this sign was not evident on our patient’s imaging. Upon retrospective review of our patient’s CT scan, one can appreciate a twist of the gallbladder along the axis of the cystic duct (Figure 4). The use of MRCP to diagnose gallbladder volvulus has been reported [20,26]. However, the majority of these patients present with an acute abdomen, requiring prompt surgical intervention, thus negating any additional studies; a result, only 1% of reported cases of gallbladder volvulus were diagnosed preoperatively [41].

Conclusion

The exact cause of gall bladder volvulus remains unknown. Suggested mechanisms for torsion include: congenital deformities, a long peritoneal mesentery, generalized visceroptosis, forceful peristalsis of nearby organs, cholelithiasis, or atherosclerosis of the cystic artery [10,18]. The acute torsion initially results in venous congestion of the gall bladder, leading to engorgement of the organ, followed by acute internal hemorrhage as the mucosa becomes necrotic. This clinical entity has been described sporadically in the literature and remains a rare or under-reported phenomenon. While this diagnosis has been made radiographically, the use of imaging is difficult in cases where patients present with peritonitis requiring emergent operation.

The gallbladder in a gallbladder volvulus case can be resected laparoscopically; however, the triangle of Calot may be difficult to be identified due to torsion of the gallbladder along the cystic duct axis. Therefore, laparotomy may be necessary in order to safely evaluate the anatomy prior to its resection. To summarize, although rare, it is important to consider gallbladder volvulus as a differential diagnosis in the elderly patient with right upper quadrant pain and peritonitis, especially if the clinical situation does not permit time for additional radiographic studies.

Conflict of interest

Anuradha R. Bham, MD and other co-authors have no conflict of interest.
### Table 1. Gall bladder volvulus case reports since advent of laparoscopic cholecystectomy in 1986.

| Author, year | N | Age | Sex | Signs & Symptoms | Peritonitis | Attempted Methods of Diagnosis | Suspected preop diagnosis | Method of Diagnosis | Lap v Open | Outcome |
|--------------|---|-----|-----|------------------|------------|-------------------------------|--------------------------|---------------------|------------|---------|
| McHenrey [7] | 2 | 87  | F   | epigastric pain   | no         | AXR, US                        | AC exploration           | open                | uncomplicated |
|              | 80| F   | generalized abdominal pain | no         | AXR           | partial large bowel obstruction | exploration              | open                | uncomplicated |
| Van der Veken [8] | 1 | 83  | F   | RLQ pain         | no         | AXR                           | acute appendicitis       | exploration          | open                | uncomplicated |
| Alden [9]    | 2 | 78  | F   | RUQ pain         | no         | US                            | AC exploration           | open                | uncomplicated |
|              | 1 | 91  | F   | chest and abdominal pain | no         | US                            | AC exploration           | open                | uncomplicated |
| Macdonald [10] | 1 | 74  | M   | RUQ pain and abdominal mass | no         | none                          | AC exploration           | open                | uncomplicated |
| Gonzalez-Fisher [11] | 1 | 56  | F   | RUQ pain         | no         | US                            | AC exploration           | open                | uncomplicated |
| Nguyen [12]  | 1 | 91  | F   | crampy abdominal pain | no         | AXR, US, CT                  | AC exploration           | laparoscopy         | uncomplicated |
| Schroder [13] | 1 | 18  | F   | RUQ pain         | no         | AXR                           | exploration              | laparoscopy         |          |
| Hamdi [14]   | 1 | 90  | F   | RUQ pain         | no         | AXR, US                       | AC exploration           | open                | uncomplicated |
| McAlleese [15] | 1 | 85  | F   | RUQ pain         | no         | US                            | AC exploration           | laparoscopy         | postoperative bleeding diverticuli requiring readmission |
| Christoudias [16] | 1 | 82  | F   | left chest pain  | no         | US                            | AC exploration           | laparoscopy         | uncomplicated |
| Losken [17]  | 1 | 80  | F   | epigastric pain  | no         | AXR                           | bowel obstruction        | AC                  | open                | uncomplicated |
| Ikematsu [18] | 6 | 77-91 | F   | RUQ pain and abdominal mass | no         | US                            | AC exploration           | not commented       | uncomplicated |
| Khorzavani [19] | 1 | 86  | F   | RUQ pain and abdominal mass | no         | US                            | AC exploration           | open                | uncomplicated |
| Uusi [20]    | 1 | 78  | F   | epigastric pain  | no         | CT, US, MRI, MRCP             | GBV                      | MRCP                | open                |
| Rajagopal [21] | 1 | 70  | F   | RUQ pain and abdominal mass | no         | US, CT                        | AC exploration           | open                | uncomplicated |
| Kim [22]     | 1 | 73  | F   | RUQ pain         | no         | CT                            | AC exploration           | open                | uncomplicated |
| Ortiz-Gonzalez [23] | 1 | 90  | F   | RUQ pain         | yes        | AXR                           | acute appendicitis       | open                | uncomplicated |
| Cho [24]     | 1 | 94  | F   | RUQ pain and abdominal mass | no         | CT                            | GBV                      | CT                  | laparoscopy         | uncomplicated |
| Shaikh [25]  | 2 | 79  | M   | RUQ pain         | no         | US, CT                        | hydrops of GB            | exploration         | open                | uncomplicated |
| Matsuhashi [26] | 1 | 54  | F   | RUQ pain         | no         | US, CT, MRI, MRCP             | necrotic gall bladder    | exploration         | open                | uncomplicated |
| Tarhan [27]  | 1 | 70  | M   | RUQ pain         | no         | AXR, US                       | AC exploration           | open                | wound infection    |
| Faure [28]   | 1 | 84  | F   | RUQ pain and abdominal mass | no         | US, CT                        | GBV                      | CT                  | laparoscopy         | uncomplicated |
| Kimura [29]  | 1 | 11  | M   | RUQ pain         | no         | US, CT, MRI                  | GBV                      | MRI                 | laparoscopy         | uncomplicated |
| Malherbe [30] | 2 | 86  | F   | RUQ pain         | no         | US, CT, EUS                  | AC exploration           | open                | uncomplicated |
|               | 80| F   | diffuse abdominal pain w palpable mass | no         | CT                            | AC exploration           | laparoscopy           | postoperative pleural effusions |
| Caliskan [31] | 1 | 79  | F   | RUQ pain and abdominal mass | no         | US                            | acalculous cholecystitis | exploration         | open                | uncomplicated |
| Lavy [32]    | 1 | 85  | F   | RUQ pain         | yes        | CT                            | GBV                      | CT                  | not commented       | uncomplicated |
| Bagnato [33] | 1 | 85  | M   | RUQ pain         | yes        | AXR, US                       | acalculous cholecystitic | exploration         | open                | uncomplicated |
| Chen [34]    | 1 | 84  | F   | RUQ pain         | no         | AXR, CT, AC                  | AC exploration           | open                | uncomplicated |
| Chittal [35] | 1 | 71  | F   | cecal volvulus   |            |                               |                         | exploration         |                      |
| Inoue [36]   | 1 | 95  | M   | abdominal pain   | no         | CT, US, MRI, MRCP             | GBV                      | CT, MR              | laparoscopy         | uncomplicated |
| Mouawad [37] | 1 | 99  | F   | RUQ pain         | no         | CT, HIDA, ERCP               | AC exploration           | open                | uncomplicated |
| Alevizos [38] | 1 | 95  | F   | RUQ pain and abdominal mass | no         | CT                            | n/a                     | exploration         | laparoscopy         | uncomplicated |
| Arslan [39]  | 1 | 47  | M   | RUQ pain         | yes        | US                            | AC exploration           | open                | uncomplicated |
| Miyakura [40] | 1 | 61  | F   | RUQ pain         | no         | US, CT                        | GBV                      | CT                  | laparoscopy         | uncomplicated |

Key: AC = acute cholecystitis; AXR = abdominal x-ray; CT = computed tomography; ERCP = endoscopic retrograde cholangiopancreatography; GBV = gall bladder volvulus; HIDA = hepatobiliary iminodiacetic acid scan; MRCP = magnetic resonance cholangiopancreatography; MRI = magnetic resonance imaging; US = ultrasound.
