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# Cholecystitis secondary to *Salmonella typhi*: a rare pathology with an unreported management option—a case report and literature review

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## Abstract

**Background:** This report describes the presentation and course of treatment for one of the youngest reported cases of empyema of the gallbladder. Given the rare occurrence of this disease process, we elected to proceed with a systematic review of the literature. This is only the 7th case series discussing pediatric empyema of the gallbladder due to Salmonella typhi in the literature, and the second case ever reported in the USA.

**Case presentation:** We report a case of a previously healthy 13-month-old girl who presented with diffuse peritonitis and equivocal imaging studies. Diagnostic laparoscopy revealed purulent peritonitis. The gallbladder was distended with intraluminal pus. Laparoscopy was converted to laparotomy to facilitate exposure, and a cholecystostomy tube was placed. Cultures from the fluid were positive for *Salmonella typhi*. The patient received a 14-day course of intravenous Ceftriaxone followed by 14 days of oral amoxicillin and clavulanate. A cholangiogram performed 8 weeks after surgery confirmed normal biliary anatomy. The cholecystostomy tube was removed. The patient recovered uneventfully and is doing well over 9 months later.

**Conclusion:** There is no consensus on treatment with options reported ranging from medical management with antibiotic therapy to more invasive procedures such as cholecystostomy tube or cholecystectomy. Less invasive management options are an alternative for Salmonella cholecystitis.

**Keywords:** Infant, Salmonella, Cholecystitis, Empyema, Cholecystostomy

## Background

While the exact incidence of acute cholecystitis in children is unknown, both acute and chronic cholecystitis are less frequently seen in the pediatric population than in adults [1]. Chronic cholecystitis is more common than previously thought in the pediatric population, and data suggests upwards of 87% of all patients presenting with cholecystitis have the chronic type [2]. All forms of cholecystitis are most commonly the result of cholelithiasis, which is typically seen in patients who are obese, have hematologic disorders such as sickle cell disease, who require total parental nutrition, or have experienced periods of prolonged fasting [3].

Acalculous cholecystitis is proportionally more common in children than adults, occurring in about 50–70% of total pediatric cholecystitis cases as compared to 2–15% in adults [4]. Acute acalculous cholecystitis is typically observed in children with prolonged intensive care unit hospitalizations, burn patients, those with bone marrow transplantation or receiving chemotherapy, or in other chronically ill patients such as those with chronic

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granulomatous diseases or other forms of immunodeficiency [5, 6]. Acute acalculous cholecystitis in previously healthy children is less frequently observed and is most commonly associated with bacterial or viral infections [7]. While acute acalculous cholecystitis due to Salmonella species has been reported in adults and pediatric patients, it is uncommon in previously healthy individuals. Furthermore, there are no clear recommendations for management and treatment of acute acalculous cholecystitis secondary to salmonella typhi.

## Case presentation

At our institution, a 13-month-old, healthy, full-term girl presented with a 36-h history of non-bilious, non-bloody emesis, diffuse abdominal pain, and lethargy. There was no recent travel or known exposure to dirty water, incorrectly prepared food, or animal feces. On arrival, she was tachycardic with low-grade temperatures to 100.5°F. Labs were notable for a normal hematocrit/hemoglobin and a white blood cell count of 14,970 (per μL), without a left shift. AST/ALT were 30/23 (U/L) respectively, total bilirubin was 0.6 (mg/dL), and alkaline phosphatase was 1047 (U/L). An abdominal ultrasound was obtained that showed only a few scattered lymph nodes and was non-diagnostic. A computed tomography scan was notable for gallbladder thickening and distention, non-specific free fluid, and small bowel thickening (Fig. 1).

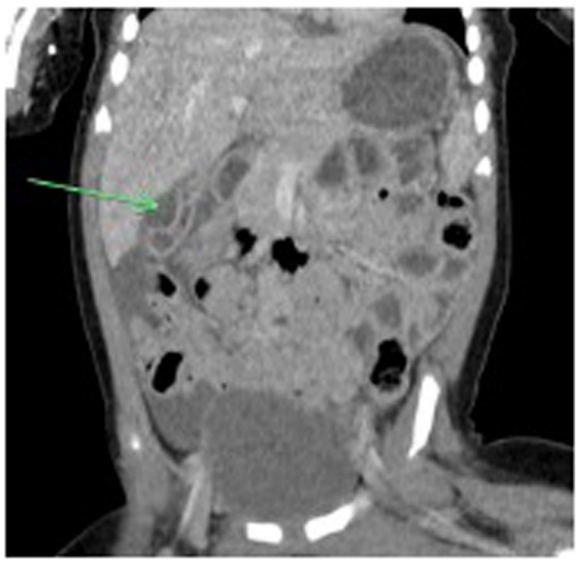

**Fig. 1** CT image on admission demonstrating a distended gallbladder with wall-thickening and non-specific free fluid

Upon evaluation by the pediatric surgery, there was evidence of peritonitis on examination with diffuse abdominal tenderness, guarding, and rebound. Intravenous piperacillin-tazobactam was started, and she was taken for emergent diagnostic laparoscopy after resuscitation.

On laparoscopy, there was a large amount of white, non-malodorous pus in the abdomen and a normal appearing appendix. The examination of the abdomen with the laparoscope revealed a significantly distended gallbladder (Fig. 2) with omentum and duodenum adherent to the gallbladder. The aspiration of the gallbladder revealed frank pus. The laparoscopy was converted to an open procedure as exposure to the biliary tract was limited by inflammatory adhesions. There was no frank perforation in the gallbladder. While there was no perforation of the gallbladder, we hypothesize that the generalized peritonitis was secondary to transmural spread of the bacteria. A cholecystostomy tube and a Jackson-Pratt drain were placed.

The culture of the pus obtained from the lumen of the gallbladder was positive for *Salmonella typhi* on postoperative day 1, and intravenous antibiotics were changed to ceftriaxone 50 mg/kg two times per day for 14 days. The patient progressed well and by POD # 5 was tolerating a regular diet. Repeat complete

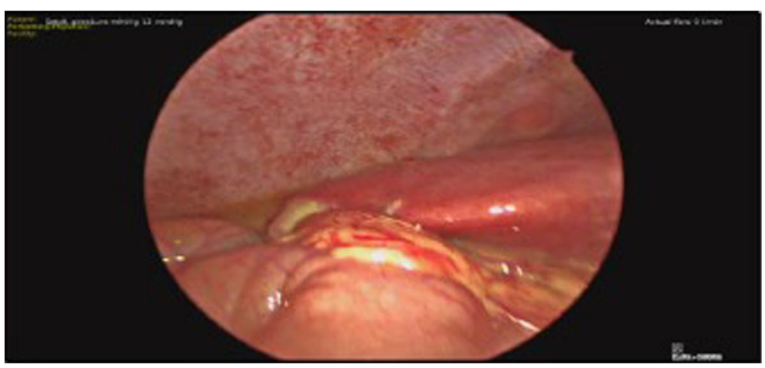

**Fig. 2** Laparoscopic image of right upper quadrant demonstrating adherent omentum overlying the gallbladder

metabolic panel prior to discharge was normal and notable for decreased alkaline phosphatase (639 units/L), normal AST/ALT (27/13 units/L), and total bilirubin (< 0.3 mg/dL). No postoperative inflammatory markers were obtained after antibiotic treatment. Ceftriaxone was continued until discharge per infectious disease recommendations, and the patient was transitioned to oral amoxicillin/clavulanic acid until follow-up in clinic. Prior to her discharge, her drain was clamped. She was seen in clinic 2 weeks after in good spirits, with scant drain output when unclamped in clinic, tolerating a regular diet without abdominal pain or additional episodes of emesis. Eight weeks after placement of the cholecystostomy tube, a cholangiogram (Fig. 3) revealed normal biliary anatomy, and the cholecystostomy tube was removed. The patient has remained asymptomatic and is doing well over 9 months later.

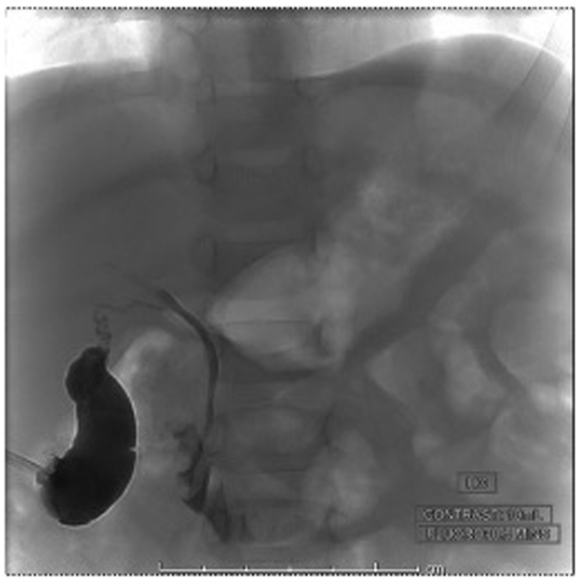

**Fig. 3** Eight weeks post-op cholangiogram through cholecystostomy demonstrating patent cystic duct entering common bile duct with appropriate, uninterrupted drainage to duodenum

## Discussion

Acute acalculous cholecystitis is an infrequent yet serious medical and surgical condition. *Salmonella* typhi has previously been reported as a cause of acalculous cholecystitis in adults, but is exceptionally rare in the pediatric population, with an aggregate of only 27 cases described in a total of 6 case reports in the literature (Table 1) [8–13]. *Salmonella* is typically transmitted to humans through contaminated food or water. Although there was no known exposure for this patient, the family had been displaced by a category four hurricane, Hurricane Ida, which increased the risk of exposure.

Interestingly, in the pre-operative ultrasound, there were no significant findings as noted by our radiologists; however, operatively, we observed significant gallbladder distention. In review of this discrepancy, the radiology team believes that technician techniques may have inhibited visualization of the free fluid. The review of such discrepancies in the literatures shows there is limited data from a single-institution study that demonstrates ultrasound is not as sensitive in diagnosing pediatric cholecystitis as previously thought. In this study by Blackwood et al., 95.3% of patients who underwent a preoperative ultrasound had it read as cholelithiasis while the pathology results showed 92% having either acute or chronic cholecystitis findings [2]. The exact sensitivity and specificity of ultrasound in the pediatric population is an area that will require further investigation.

While treatment for acute acalculous cholecystitis in adults can range from antibiotics and tube cholecystostomy or cholecystectomy, in the setting of suspected *Salmonella* cholecystitis, non-operative treatment with antibiotics has been successful [9, 13, 14]. Oftentimes, unless blood cultures are positive for Salmonella typhi, the exact etiology of the cholecystitis is unknown until

**Table 1** Reported cases of acute acalculous cholecystitis due to *Salmonella typhi* in pediatric patients

| Age | Sex | Antibiotic | Treatment | Location | Reference |
|---|---|---|---|---|---|
| 3–15 years (median 7) | 5 Males<br>1 Female | Unknown | Cholecystectomy | Nigeria | [6] |
| 11 years | Female | Ceftriaxone | Antibiotics | Pakistan | [7] |
| 8–18 years (median 11) | 13 Males<br>3 Females | Chloramphenicol | Cholecystectomy | Nigeria | [8] |
| 10 years | Male | Unknown | Cholecystectomy | Georgia, USA | [9] |
| 10 years | Male | Cipro/flagyl, then ceftriaxone | Delayed cholecystectomy | Australia | [10] |
| 6 years | Female | Ceftriaxone | Tube cholecystostomy | Israel | [11] |
| 13 months | Female | Ceftriaxone | Tube cholecystostomy | Louisiana, USA | Current case |

pathology returns. In our case presentation, we believe that clearance of the infection will result in long-term resolution of this patient's cholecystitis. As the disease process is not one of obstruction, but instead infection, we hypothesize the patient will not suffer from recurrent biliary colic or chronic cholecystitis. However, a long-term follow-up will be required to determine if the gallbladder remains healthy or if cholecystectomy will be required in the future. At this time, the patient is 9 months out from treatment of her acalculous cholecystitis without recurrence or issue.

## Conclusion

The incidence of pediatric acalculous cholecystitis secondary to Salmonella typhi is an uncommon finding, with only 6 case series/reports in the literature. Cholecystectomy is oftentimes the treatment as these patients have cholecystitis on imaging and physical examination. However, in this case report and a few others, antibiotic treatment with drainage via a cholecystostomy tube is seemingly an acceptable treatment as this is not an obstructive disease process. Nevertheless, further long-term follow-up of our patient is warranted. Furthermore, investigation into the pathophysiology of this disease process and diagnostic methods used to formulate a diagnosis are required prior to pursuing antibiotic therapy and placement of a cholecystostomy tube as standard treatment.

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**Authors' contributions**
Dr. Ghio, Dr. Brandt, Dr. Billiot, and Dr. Zagory performed the literature review, drafted the initial manuscript, then reviewed, and revised the manuscript. The authors approved the final manuscript as submitted and agree to be accountable for all aspects of the work.

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**Availability of data and materials**
Available upon request.

## Declarations

**Ethics approval and consent to participate**
Ethics approval is not applicable, and written informed consent was obtained from the patient for publication of this case report and accompanying images.

**Competing interests**
The authors declare that they have no competing interests.

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## Publisher's Note