

# Laparoscopic cholecystectomy of gallbladder stone presenting as empyema in a 9-year-old boy: A case report

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**Background:** The gall bladder stones (GBSs) are common disease related to diet habit, obesity, hematological diseases, diabetes mellitus, and receiving total parenteral nutrition. GBS is a rare cause of hospitalization of pediatric patients but have been increasingly diagnosed in recent years due to widespread use of ultrasonography. The aim of this case report study is to determine the clinical presentation, risk factors, valuable diagnostic procedures, and outcome of laparoscopic management of cholelithiasis in children.

**Case report:** Our case is a 9-year-old boy with empyemic gallbladder complaining of attacks of colicky epigastric pain associated with recurrent vomiting. On abdominal palpation, there is positive sign of deep tenderness at hypochondrium area and positive murphy sign. He has central obesity with body mass index of 29.9, skin folds >3.5 cm and waist circumference >90 cm. He has history of high cholesterol and fatty diet and fast food habit, prolonged intake of vitamin D, and positive family history. While no other associated risk factors was detected in our patient, all laboratory investigations was within normal ranges even for his lipid profile. Although empyema was present no leukocytosis was detected. Abdominal ultrasound showed the gall bladder wall is slightly thick surrounded by pericholecystic fluid, solitary GBS of 3 cm size and normal CBD. Post-operative histopathological examination revealed thick wall gallbladder with multiple tiny stones of cholesterol type. The patient was treated with laparoscopic cholecystectomy with promising outcome and no complications.

**Conclusion:** Pediatric surgeons should consider cholelithiasis from differential diagnosis of abdominal pain associated with vomiting in children. Empyema of gallbladder should be considered once murphy sign is positive in such child patients. Child obesity, fatty diet, vitamin D deficiency, and family history are possible risk factors. Ultrasonography is the mainstay of diagnosis. Laparoscopic cholecystectomy is the appropriate management for symptomatic cholelithiasis in children.

**Keywords:** Gallstones, empyema, children, boy, laparoscopic cholecystectomy

## Introduction

Gallbladder disease today is a common health problem affecting 10%–15% of the adult population.<sup>1</sup> In contrast to adulthood, gallstones in childhood are rare. However, the incidence is increasing with the diagnosis of asymptomatic gallstones with the widespread use of ultrasonography.<sup>2</sup> Risk factors for gallstones in children include hemolytic disease, obesity, prematurity, sepsis, total parenteral nutrition (TPN), chronic liver disease, inflammatory bowel diseases, diuretic use, and ceftriaxone use.<sup>3</sup> Sickle cell disease (SCD) is the most important cause of cholelithiasis in children. Pigment gallstones affect 15% of children with SCD younger than 10 years of age and more than 80% of those older than 30 years.<sup>4</sup> Gallstones found in adults are primarily cholesterol stones or mixed stones but in children, pigment stones formed as a consequence of hemolytic diseases like sickle cell anemia, thalassemia, and hereditary spherocytosis are more common.<sup>5</sup> In general, gallstones are uncommon in children, with patients under 15 years old, comprising only 0.1%–0.2% of the incidence of the disease.<sup>6</sup> Even so defining the association between the obesity and gall bladder stones (GBSs) in pediatric population were very few studies and taking long time on the PubMed. These few clinical reports suggest that hemolytic diseases are no longer the most frequent cause of pediatric gallbladder disease. Concomitant with the epidemic of childhood obesity and the shift towards extreme childhood obesity, the prevalence of gallstones in children and adolescents may be increasing due to childhood obesity.<sup>7</sup> In addition of risk of GBS in obese youngest children nowadays, the risk of choledocholithiasis had significantly increased with high body mass index (BMI) than those with

simple cholelithiasis.<sup>8</sup> Cholelithiasis is sometimes diagnosed in patients incidentally or as silent stones. In some other cases, they are reported in association with clinical symptoms such as cholecystitis and cholangitis.<sup>9,10</sup> However, there is little information about the epidemiology of GBS in children from Libya and no consensus among Libyan pediatric surgeons regarding management of gallstones in children. We want to report our experience of a rare case of a 9-year-old with gall bladder large stone and sludge bile, complicated with empyema, operated straightforward by urgent laparoscopic cholecystectomy.

## Case presentation

Obese male child 9 years old presented to our outpatient clinic after having attended several other facilities, complaining of attacks of colicky epigastric pain associated with recurrent vomiting 2 months back, aggravated by fatty meal, relieved by IV medications and vomiting. History taking revealed high cholesterol and fatty diet and fast food habit; long duration of Vitamin D intake and a positive family history of laparoscopic cholecystectomy (LC) for his mother and uncle (his mother's brother). No history of easily bruising, oral mucosa petechial rash, bleeding tendency, blood transfusion, or previous operations. Physical examination revealed vital signs (temperature, pulse rate, blood pressure) were normal. The child was obese with abdominal skin fold 5 cm, axillary skin folds 3 cm, height 140 cm, weight 58 kg, BMI is 29.9 (normal range in this age is between 14.2 and 19.4), waist circumference 93 cm, mid-arm circumference 29 cm and mid-thigh circumference 55 cm. No jaundice, no pallor, and no edema were present and oral mucosa and nostrils were completely normal. Per abdominal

examination showed no distension, normal movement with breathing, no scratch markings, no visible mass. Generally, the abdomen was soft by palpation with positive sign of deep tenderness at hypochondrium area and positive murphy sign. Bowel sounds was normally heard.

## Laboratory Findings

Routine laboratory examination was done including WBC, full blood count, erythrocyte sedimentation rate, renal function test, liver function tests, serum amylase and lipase, serum sodium and potassium, HBA1C, and blood sugar. All the previous investigations were within normal limits. Total bilirubin was 0.2 mg/dl and alkaline phosphatase was 302 U/L which is not considered to be high in this age group. Others were normal levels. In addition, lipid profile (triglycerides, cholesterol, HDL, LDL) was normal. No other laparotomy investigations were indicated.

## Radiological Findings

Abdominal ultrasonography showed homogenous fatty liver, the gall bladder wall is slightly thick surrounded by pericholecystic fluid, solitary single GBS of 3 cm size, common bile duct is normal in diameter, spleen and otherwise are normal (Figs 1-4).

## Laparoscopic Cholecystectomy

The positive murphy sign and the deep tenderness of the right hypochondria area regardless the afebrile status and normal level of WBC, let our thinking and decision are very clear and the patient was candidate for elective LC. After appropriate pre-operative investigations and discussion with anesthesia team, critical view LC was done under general anesthesia. The time of operation was 1 h and 20 min, standard four laparoscopic ports inserted, after pneumoperitoneum achieved at 12 mmhg and camera 30° inserted, the view was difficult due to fatty omentum, the gall bladder was empyemic and large in size with significant adhesions and edematous wall, release of adhesions performed and critical view applied. The Calot's triangle has been skeletonized and was found normal. Cystic

duct and cystic artery were identified, clipped and ligated, no gall bladder bed oozing is noted and finally cholecystectomy done (Fig. 5). Recovery of the patient was smoothly without any complications, patient kept in the ward nil per mouth with IV fluid maintenance, antibiotics IV, perfelgan IV, and

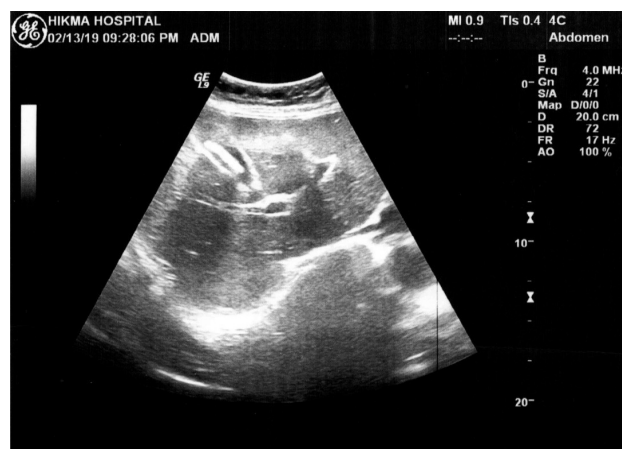


Fig. 2 Abdominal ultrasonography showing slightly thick gall bladder wall with CBD normal in diameter.



Fig. 3 Abdominal ultrasonography showing thick gallbladder wall surrounded by pericholecystic fluid.



Fig. 1 Abdominal ultrasonography showing homogenous fatty liver.



Fig. 4 Abdominal ultrasonography showing solitary single gallbladder stone of 3 cm size.



Fig. 5 Site of laparoscopic cholecystectomy in our operated 9-year-old obese boy.

ranitidine IV. 12 hours post-operative, the general condition was normal, patient mobilized, his vital signs were within normal, afebrile, the bowel sound early regain to function, diet initiation with no vomiting and nausea. He has been discharged Day 2 post-operation with good general condition; no complain with only few cc serousanguinous discharge in the drain. Stitches has been removed 1 week after operation. Regular follow up applied at 2 months, 6 months, and 1 year. The patient was symptomatically free with no GIT or cholecystectomy-related complications.



Fig. 6 Gallbladder containing tiny yellowish lucent stones.

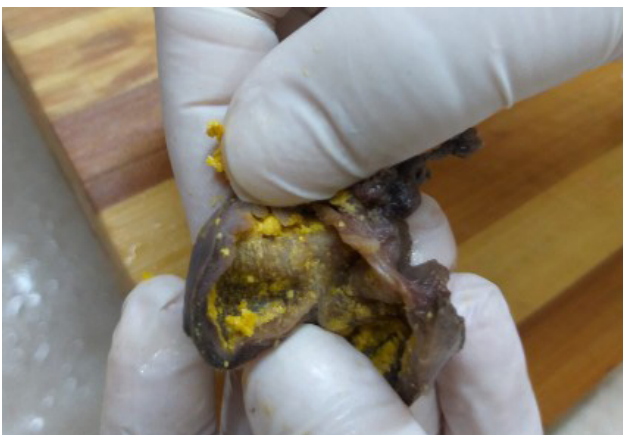


Fig. 7 Gallbladder showing ulcerated mucosa.

## Histopathological Findings

After cholecystectomy, the biopsy was sent to histopathology. The result showed that lumen contains tiny yellowish lucent stones, ulcerated mucosa, moderate wall fibrosis, and transmural infiltrations of lymphocyte and eosinophil cells (Figs 6–9).

## Discussion

Little information is known about the epidemiology of gallbladder stones in children. The exact prevalence of gallstones in children is not known but some studies have shown an overall prevalence of gallstone disease of 0.13%–0.2% in children.<sup>11,12</sup> Cholelithiasis in children have been increasing due to increased use of TPN, frusemide, and phototherapy in the infants.<sup>11</sup>

Our patient is a 9-year-old boy with central obesity with skin folds more than 3.5 cm and waist circumference more than 90 cm. This overweight was helpful to us in diagnosis. He has history of high cholesterol and fatty diet and fast food habit. This is supported by other studies in which the prevalence of gallstones among obese children was shown to be quite high (2%).<sup>13</sup>

Although both genders are equally affected in early childhood, most previous studies have demonstrated a female



Fig. 8 Gallbladder with thick wall.

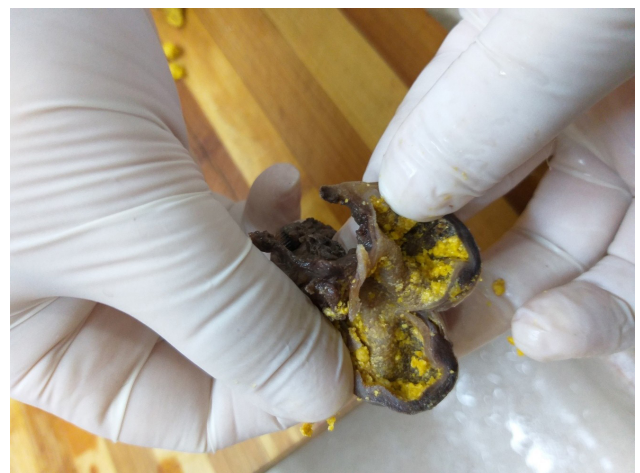


Fig. 9 Gallbladder with moderate wall fibrosis.

predominance in pediatric gallbladder disease, starting from puberty. In fact, most cases of cholelithiasis is at young age and are diagnosed in the second decade of life.<sup>14-16</sup>

The relation of cholesterol GBSs in obese child could be related to cholesterol metabolism or related to the compression effect of fatty omentum and intestine on the stasis of biliary radicles (lithogenic effect). Hypersaturation of bile is caused by either increased hepatic cholesterol uptake or increased cholesterol synthesis. Second, dysmotility and impaired contraction of the gallbladder is caused by the direct influence of cholesterol at the cellular level onto the plasma membrane of smooth muscle cells in the gallbladder wall.<sup>8</sup>

Tsai et al.<sup>17</sup> performed prospective study of abdominal adiposity and gallstone disease in United States men. The conclusion was that the collected data for abdominal obesity in relation to the incidence of symptomatic gallstone disease suggested presence of a significant association between abdominal adiposity and the incidence of symptomatic gallstone disease. As measures of abdominal adiposity, abdominal circumference and waist-to-hip ratio predict the risk of developing gallstones independently of BMI.<sup>17</sup>

Several risk factors for gallstones in adults are well-established, including age, female sex, Hispanic ethnicity, obesity, use of female sex hormones, pregnancy, sedentary lifestyle, and a family history of gallstones. However, scant information is available regarding risk factors for gallstones in the pediatric population.<sup>7,18</sup>

In our patient, there was positive family history and history of long duration of vitamin D intake. While many other risk factors was absent as no hemolytic diseases, no diabetic, no history of biliary atresia, or choledochal cyst.

Generally, the incidence and prevalence of cholelithiasis are influenced by age, gender, genetics, and race. Epidemiological studies have indicated the involvement of genetic factors in the formation of cholelithiasis. The effect of a gene on incontinentia pigmenti chromosome has been confirmed in the formation of cholelithiasis. In fact, patients with ABCB11 mutations are at a higher risk of cholelithiasis.<sup>9,10,19</sup>

While, Onal and his collages in their study revealed that vitamin D deficiency is suggested to be associated with gallbladder stasis, and a role for vitamin D supplementation is thought to have potential to prevent gallstones in this special population.<sup>20</sup> This may explain the occurrence of gallbladder stones in our patient as a result of vitamin D deficiency in early childhood, and that was not due to increased intake of vitamin D as it seems to be. Our patient takes vitamin D to replace its deficiency and the deficiency of vitamin D itself is responsible for gall bladder stasis with development of stones in our case. In other studies, long-term use and high-dose use of ceftriaxone was founded to be associated with increase the probability of occurrence of gallstones.<sup>21</sup>

Our patient was complaining of attacks of colicky epigastric pain associated with recurrent vomiting. On abdominal palpation, there is positive sign of deep tenderness at hypochondrium area and positive murphy sign. The results of laboratory investigation was mostly normal in our case, even WBCs was of normal level, despite the presence of empyema and that may be explained as a result of the previous empirical antibiotic course administrated in other clinics before the case attended our outpatient clinic. Abdominal ultrasound

was the method of choice in diagnosis of the reported case. While radiological investigations other than ultrasound (i.e. MRCP) was not indicated and so it was not performed. Cholelithiasis in children have been increasingly diagnosed in recent years due to better medical imaging (especially ultrasonography) and its usage in investigating children with unexplained abdominal pain.<sup>11</sup> So, we should consider the cholelithiasis as from the differential diagnosis of unexplained abdominal pain associated with vomiting in children and we have to confirm that by conducting abdominal ultrasonography to avoid the complications of GBS as acute cholecystitis, empyema, biliary pancreatitis, and sepsis. In addition, empyema of gallbladder should be considered once murphy sign is positive in such child patients even with absence of leukocytosis.

The youngest age of the patient, making the final decision of LC is delayed from other clinics, for considerations of exclusion of some risk factors as hemolytic diseases. For this reason, he was operated lately. The patient was treated with LC with prolonged time but with clear anatomy.

This is in agreement with the recommendations of other studies, which stated that the LC is safe and preferable in pediatric patients. LC have better results, short post-operative hospital stay and with low complication rates in particular, zero bile duct injuries were noted.<sup>22,23</sup>

Post-operative histopathological examination revealed thick wall gallbladder with multiple tiny stones of cholesterol type. Our findings were compatible with that of Agostino Di Ciaula who investigated several pathogenic mechanisms in literature review article. The major pathogenetic factors for cholesterol gallstones include a genetic background, hepatic hypersecretion of cholesterol, and supersaturated bile, which give life to precipitating cholesterol crystals that accumulate and grow in a sluggish gallbladder.<sup>24</sup> While our study is in contrary to our other studies which stated that pigment stones containing bilirubin salts are more common in the pediatric population.<sup>11</sup> Nevertheless, our explanation is that these types of bilirubin stones are associated with hemolytic disorders, most commonly sickle cell anemia, which none of them were identified in our patient.<sup>4</sup>

## Conclusion

Though cholelithiasis is rare in children, pediatric surgeon should consider the cholelithiasis as from differential diagnosis of abdominal pain associated with vomiting in the youngest age group even with absence of positive laboratory investigations, to avoid the complications of GBS like acute cholecystitis, empyema, biliary pancreatitis, and sepsis. In addition, empyema of gallbladder should be considered once murphy sign is positive in such child patients even with absence of leukocytosis. Ultrasonography is the mainstay of diagnosis and it is very useful in detecting these cases. Child obesity, fatty diet, and family history were the most frequent risk factors in our patient. Vitamin D deficiency is suggested to be associated with gallbladder stasis, and may increase the risk of cholelithiasis. LC is the appropriate management for symptomatic cholelithiasis in children, as it can be performed safely using technique of single-incision. We emphasize the importance of further researches to explore the epidemiology of gallbladder disease in children for better diagnosis and management of such gallbladder disease in children for better diagnosis.

## Consent

An informed consent was obtained from our patient's parents for publication of this case report and the accompanying images.

## Competing interests

The authors declare they have no competing interests.

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