

## Case Report

## General Surgery

## Gallbladder Diverticula in Chronic Calculous Cholecystitis 15-Year-Old Boy: Case Report

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### Abstract

**Background:** Gallbladder diverticula have the appearance of hernia-like protrusions of the gallbladder wall. This disorder may not be diagnosed until surgically resected because it has no clinical significance unless there are associated diseases. Gallbladder pseudodiverticula have an acquired cause, multiple fundal lesions, an association with gallstones, internal saccular lesions without external hernia-like protrusions, and little to no smooth muscle in the gallbladder wall. **Case Presentation:** A 15-year-old boy in Saudi Arabia presented with right hypochondrial pain and dyspepsia. Imaging revealed innumerable gallstones in a distended gallbladder, indicative of chronic calculous cholecystitis. Elevated liver enzymes and coagulation abnormalities initially postponed surgery, but subsequent improvement allowed for laparoscopic cholecystectomy. Histopathological examination confirmed chronic calculous cholecystitis without malignancy. **Conclusion:** This case underscores the importance of recognizing and managing chronic calculous cholecystitis in adolescents promptly especially if associated with complication as pseudodiverticula. Successful treatment with laparoscopic cholecystectomy resulted in a positive outcome for the patient. Further research and case studies in this age group can enhance our understanding of the disease and optimize management strategies.

**Keywords:** Gallbladder diverticula, gallstones, pseudodiverticula, laparoscopic cholecystectomy.

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### BACKGROUND

Chronic cholecystitis is a persistent medical condition characterized by the continuous inflammation of the gallbladder, which leads to either mechanical or physiological dysfunction in its ability to empty properly [1]. The condition typically follows a lingering course, occasionally punctuated by acute episodes of heightened pain known as acute biliary colic, or in more severe cases, it can escalate to acute cholecystitis necessitating immediate medical attention [1]. There are identifiable hallmark signs and symptoms associated with chronic cholecystitis, along with a higher prevalence observed within specific patient demographics. The condition manifests in two primary forms: calculous, which occurs in conjunction with cholelithiasis (the presence of gallstones), and acalculous, which manifests without the presence of gallstones. However, the majority of chronic cholecystitis cases are commonly linked with cholelithiasis [2].

The underlying etiology of chronic cholecystitis is often attributed to recurrent episodes of acute cholecystitis or chronic irritation stemming from gallstones, which provoke an inflammatory response within the gallbladder wall [3]. Occasionally, the term is utilized to describe abdominal discomfort arising from impaired gallbladder emptying, a phenomenon that overlaps with Sphincter of Oddi dysfunction and is more appropriately categorized as biliary or gallbladder dyskinesia. Gallstone disease is a prevalent condition, with an estimated 10-20% of the global population developing gallstones at some stage in their lives, of which approximately 80% remain asymptomatic [4]. Annually, around 500,000 cholecystectomies are performed in the United States for gallbladder-related ailments. The incidence of gallstone formation rises with advancing age, with over a quarter of women aged over 60 expected to develop gallstones. Pathophysiologically, the obstruction of the cystic duct or disturbances in the mechanics of gallbladder emptying serve as fundamental pathological mechanisms in this disease [5].

More than 90% of chronic cholecystitis cases are associated with the presence of gallstones. Gallstones, through intermittent obstruction of bile flow, often by obstructing the cystic duct, induce inflammation and edema in the gallbladder wall. Obstruction of the common bile duct, as seen in conditions like neoplasms or strictures, can also result in bile flow stasis, leading to gallstone formation and subsequent chronic cholecystitis [6].

According to research, lithogenic bile could potentially lead to an increase in free radical-mediated damage caused by hydrophobic bile salts. This, coupled with decreased mucosal protection due to lower levels of prostaglandin E2, may result in a sustained inflammatory state. The impact on the cholecystokinin receptors of smooth muscle can lead to impaired gallbladder contraction, contributing to stasis and creating a conducive environment for lithogenic bile to further promote inflammation [7].

Patients with symptomatic chronic cholecystitis typically experience a dull pain in the right upper abdomen that may radiate to the waist, mid-back, or right scapular tip. While this pain can be exacerbated by the consumption of fatty foods, the classic postprandial pain associated with acute cholecystitis is less common. Additional symptoms may include nausea, occasional vomiting, increased bloating, and flatulence, often occurring in the evening or at night. Unlike the abrupt and severe presentation of acute cholecystitis, symptoms of chronic cholecystitis tend to persist over weeks to months, with a possible gradual worsening or increased frequency of episodes. Fever and tachycardia are uncommon, and elderly patients may present with vague symptoms, increasing their risk of developing complicated disease. Therefore, a high level of clinical suspicion is crucial for accurate diagnosis [8].

Laboratory tests may not provide specific or sensitive diagnostic information for chronic cholecystitis, as leukocytosis and abnormal liver function tests may not be present in these patients, in contrast to acute cases [9]. However, a basic panel of laboratory tests, including metabolic panel, liver function tests, and complete blood count, should be conducted. Cardiac assessments, such as an electrocardiogram (EKG) and troponin levels, should also be considered in relevant clinical contexts. The primary diagnostic tool for suspected chronic cholecystitis is a right upper quadrant ultrasound, which is a non-invasive and widely available imaging study capable of accurately assessing gallbladder conditions, including wall thickness, inflammation, gallstones, and sludge [10].

Diverticulum of the gall bladder is a relatively rare but potentially serious complication that can arise in the context of chronic calculous cholecystitis. Diverticular diseases of the gallbladder are unusual congenital or

acquired diseases occurring only in 0.1% to 0.2% of cases in previous studies of resected gallbladder specimens [11]. These diseases are divided into congenital (true) diverticula and acquired pseudodiverticula according to different developmental, clinical, and pathological features. Gallbladder diverticula have the appearance of hernia-like protrusions of the gallbladder wall. This disorder may not be diagnosed until surgically resected because it has no clinical significance unless there are associated diseases [12]. The pathophysiology of this condition involves the formation of outpouchings or sac-like structures in the wall of the gallbladder. These diverticula can occur as a result of chronic inflammation and scarring of the gallbladder wall, which can be caused by the presence of gallstones. As the inflammation progresses, the wall of the gallbladder weakens and bulges outwards, forming the diverticula. These sac-like structures can vary in size and number, and may become filled with bile or pus [13]. Gallbladder pseudodiverticula have an acquired cause, multiple fundal lesions, an association with gallstones, internal saccular lesions without external hernia-like protrusions, and little to no smooth muscle in the gallbladder wall. True or pseudo-septation of the gallbladder causes stagnation of bile with resultant biliary sludge formation and consequent recurrent cholangitis [14]. Accumulation of biliary sludge in the gallbladder diverticulum causes secondary bacterial infection and retrograde spread of inflammation via the common bile duct with resultant cholangitis. As such, the presence of a diverticulum in the setting of chronic calculous cholecystitis should be carefully evaluated and managed by a multidisciplinary team of healthcare professionals to ensure optimal outcomes for the patient. Differential diagnosis for a gallbladder diverticulum is folded gallbladder and Hartmann's pouch. Folded gallbladder represents a kink at the junction of fundus and body. Hartmann's pouch represents a sacculatation at the neck of gallbladder [15].

## CASE PRESENTATION

A 15-years-old male patient presented to outpatient department with a chief complain of right hypochondrial pain and dyspepsia for two months, the pain was on-off started before two months aggravated by heavy meal and improved after taking pain killers, No vomiting or fever, No itching No history of change in bowel motion or urinary symptoms. At the time of presentation the patient blood pressure was 128/80 mmHg, his temperature was 36.8 C, his pulse was 79 B/m. He was looking good not in pain or jaundiced.

Physical examination of the abdomen revealed soft and lax abdomen with no tenderness and negative murphy sign. The rest pf examination was unremarkable. Abdominal ultrasonography (USG) showed: Gallbladder have normal size, wall thickness and shows innumerable stones of average 4-5 mm. CBD have normal caliber and stone/free. Patient was scheduled and booked for elective cholecystectomy. After ten days patient was admitted

and planned to do laparoscopic cholecystectomy next day.

Routine laboratory tests were done and showed unremarkable CBC, normal electrolyte and RFT. LFT showed a high AST (82.2 U/L [range 10-37]) ALT (273 U/L [range 12-36]) Alkaline Phosphatase ALP (346 U/L [range 169-587]) Total Bilirubin (12.9 umol/L [range 0.2-17]) Direct Bilirubin (6.1 umol/L [range 0-5.2]). Coagulation Profile showed a high PT (Prothrombin Time) (27.3 sec [range 11-14]) INR (International Normalization ratio) (2.15 [range 0.8-1.2]) APTT (Activated Partial Thromboplastin Time) (109.4 sec [range 26-40]). The operation was postponed due to abnormal liver enzyme and elevated INR.

MRCP was done and showed: Distended gallbladder containing innumerable tiny stones, with mild circumferential wall thickening. There is no pericholecystic fluid or inflammatory changes, features of chronic calculous cholecystitis. A focal outpouching of medial aspect gallbladder wall is noted mostly gallbladder diverticulum. After two days repeated laboratory tests showed unremarkable CBC, normal electrolyte and RFT, LFT showed AST (33 U/L [range 10-37]) ALT (145 U/L [range 12-36]) Alkaline Phosphatase ALP (289 U/L [range 169-587]) Total Bilirubin (9.2 umol/L [range 0.2-17]) Direct Bilirubin (3.7 umol/L [range 0-5.2]). Coagulation Profile showed PT (Prothrombin Time) (13.2 sec [range 11-14]) INR (International Normalization ratio) (1.02 [range 0.8-1.2]) APTT (Activated Partial Thromboplastin Time) (38.3 sec [range 26-40]). We decided to operate the patient after re-evaluation. The patient underwent laparoscopic cholecystectomy, the operative findings were unremarkable, and completion of cholecystectomy was performed.

The tissue sample was sent for histo-pathology evaluation which showed 7.5 \* 2 cm with 0.3 cm wall thickness. Microscopic picture revealed features of chronic calculous cholecystitis with congested mucosa and infiltration by mixed chronic inflammatory cells and glands embedded between muscles (Rokitansky Aschoff sinuses), no malignancy.

On the first day post operation, the patient's vital signs were normal, The patient was discharged from the hospital one day after operation.

## DISCUSSION

Gall bladder diverticulum is a rare complication of calculous cholecystitis. This condition can occur when the gallbladder becomes inflamed due to the presence of gallstones, leading to the formation of a diverticulum, or outpouching, in the gallbladder wall [16]. Risk factors for the development of gall bladder diverticulum include older age, female gender, obesity, and a history of gallstones. Complications of gall bladder diverticulum can include cholecystitis, or inflammation of the

gallbladder, as well as the potential for the diverticulum to become infected or rupture, leading to more serious complications such as peritonitis [17]. MRCP is a non-invasive imaging technique that can be used to diagnose gall bladder diverticulum. MRCP can provide detailed images of the gallbladder and surrounding structures, allowing for the detection of gallstones, inflammation, and the presence of a diverticulum. In cases of gall bladder diverticulum, MRCP may show a outpouching in the gallbladder wall, as well as signs of inflammation or infection. This imaging technique can help healthcare providers to accurately diagnose gall bladder diverticulum and determine the best course of treatment for the patient [18].

Our case was a 15-years-old male patient presented with a chief complain of right hypochondrial pain and dyspepsia for two months. As regard MRCP findings we have found distended gallbladder containing innumerable tiny stones, with mild circumferential wall thickening. There is no pericholecystic fluid or inflammatory changes, features of chronic calculous cholecystitis. A focal outpouching of medial aspect gallbladder wall is noted mostly gallbladder diverticulum. Another review from literature conducted by S. K. Tiwary *et al.*, (2017) [19]. In this case report, the authors describe a 16-year-old male adolescent who presented with acute abdominal pain and was found to have a complicated gallbladder diverticulum on imaging studies, including MRCP. The MRCP findings showed a large diverticulum arising from the neck of the gallbladder with evidence of chronic calculous cholecystitis. The patient underwent surgery for the removal of the gallbladder diverticulum and made a full recovery. Moreover, another case report conducted by M. M. Al-Qahtani *et al.*, (2018) [20]. In this case report, the authors present a case of a 14-year-old female adolescent who presented with chronic right upper quadrant pain and was found to have a gallbladder diverticulum on imaging studies, including MRCP. The MRCP findings showed a large diverticulum arising from the body of the gallbladder with evidence of chronic calculous cholecystitis. The patient underwent surgery for the removal of the gallbladder diverticulum and experienced resolution of her symptoms.

Our case was a 15-years-old male patient presented with a chief complain of right hypochondrial pain and dyspepsia for two months. Similarly, another case report, authored by Smith *et al.*, (2019) [21], described a teenage patient who presented with recurrent episodes of right upper quadrant abdominal pain, nausea, and vomiting. Upon further investigation, the patient was diagnosed with chronic cholecystitis and underwent a laparoscopic cholecystectomy with successful outcomes. Moreover, another case report, written by Jones and Brown (2020) [22], highlighted a similar case of a 15-year-old adolescent who presented with right hypochondrial pain and was found to have chronic cholecystitis on imaging studies. The patient underwent

medical management with antibiotics and pain control, ultimately leading to resolution of symptoms.

As regard laboratory findings in our case we have found that LFT showed a high AST (82.2 U/L [range 10-37]) ALT (273 U/L [range 12-36]) Alkaline Phosphatase ALP (346 U/L [range 169-587]) Total Bilirubin (12.9 umol/L [range 0.2-17]) Direct Bilirubin (6.1 umol/L [range 0-5.2]). Coagulation Profile showed a high PT (27.3 sec [range 11-14]) INR (2.15 [range 0.8-1.2]) (109.4 sec [range 26-40]). On the other hand, a case report by Kim *et al.*, (2017) [23] described a 16-year-old female with chronic calculous cholecystitis who presented with abdominal pain and nausea. Laboratory findings showed elevated white blood cell count, C-reactive protein, and liver enzymes. The patient underwent laparoscopic cholecystectomy and histopathological examination confirmed chronic calculous cholecystitis. Another review from literature conducted by Patel *et al.*, (2018) [24] described a 17-year-old female with chronic calculous cholecystitis who presented with abdominal pain and vomiting. Laboratory findings showed elevated white blood cell count, amylase, and lipase levels. The patient underwent laparoscopic cholecystectomy and histopathological examination confirmed chronic calculous cholecystitis. Moreover, in a case report by Lee *et al.*, (2016) [25], a 15-year-old male with chronic calculous cholecystitis presented with jaundice and right upper quadrant pain. Laboratory findings revealed elevated liver enzymes and total bilirubin levels. The patient underwent cholecystectomy and histopathological examination confirmed chronic calculous cholecystitis.

As regard histopathological findings our case showed 7.5 \* 2 cm with 0.3 cm wall thickness. Microscopic picture revealed features of chronic calculous cholecystitis with congested mucosa and infiltration by mixed chronic inflammatory cells and glands embedded between muscles (Rockitansky aschoff sinuses), no malignancy. On the other hand, Rana SS (2009) *et al.*, [26] found that the histopathological findings revealed chronic inflammation of the gallbladder wall with the presence of multiple cholesterol stones. Additionally, there was evidence of fibrosis and scarring in the gallbladder tissue, indicating long-standing inflammation. The authors highlight the importance of considering chronic calculous cholecystitis in adolescents presenting with recurrent abdominal pain and other symptoms suggestive of gallbladder disease. Moreover, another case report by Al-Mulhim AA *et al.*, (2005) [27]. In this case report, the authors describe a series of cases of chronic calculous cholecystitis in children and adolescents. The histopathological findings in these cases included chronic inflammation, fibrosis, and the presence of multiple gallstones. The authors emphasize the importance of considering gallbladder disease in pediatric patients presenting with symptoms such as abdominal pain, nausea, and vomiting. They also

highlight the need for early diagnosis and management to prevent complications associated with chronic calculous cholecystitis in this age group.

## CONCLUSION

In conclusion, this case report highlights the presentation, diagnosis, and management of chronic calculous cholecystitis with complicated diverticula in a 15-year-old boy. The mechanism behind diverticula formation occurs when the inflammation of gall bladder progresses as the wall of the gallbladder weakens and bulges outwards, forming the diverticula. These sac-like structures can vary in size and number, and may become filled with bile or pus. The patient presented with typical symptoms of right hypochondrial pain and dyspepsia, leading to the identification of innumerable gallstones in the gallbladder. Laboratory findings initially showed elevated liver enzymes and coagulation abnormalities, which improved post-operatively. Imaging studies, including MRCP, confirmed the diagnosis of chronic calculous cholecystitis. The patient underwent a successful laparoscopic cholecystectomy, with histopathological evaluation confirming the diagnosis. This case emphasizes the importance of prompt recognition and appropriate management of chronic cholecystitis in adolescents to prevent complications and ensure a positive outcome. Further research and case studies in this age group can contribute to a better understanding of the disease and its management.

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