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Case Report

Pancreatobiliary in a Patient with Spontaneous Perforation of Duodenal Diverticulum: Case Report and Management Proposal

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Abstract: Duodenal diverticula are most found in the second portion of the duodenum. They may be associated with pancreatobiliary diseases, such as choledocholithiasis and acute pancreatitis, though the understanding of this relationship remains limited. Other complications, such as spontaneous perforation of these diverticula, are rare and severe, often requiring surgical intervention and carrying high morbidity and mortality rates. In this article, we review the literature on this topic and describe the case of a patient with biliary acute pancreatitis and choledocholithiasis associated with retroperitoneal air due to duodenal diverticulum perforation. The patient was managed with conservative treatment for the perforation and clinical management of the pancreatitis, followed by endoscopic treatment of the choledocholithiasis.

Keywords: Acute Necrotizing Pancreatitis; Choledocholithiasis; Diverticulum; Intestinal Perforation.

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1. Introduction

Duodenal diverticula are relatively common and generally asymptomatic, with an incidence of up to 22% in autopsy studies, most frequently located in the second portion of the duodenum, usually on its medial border, particularly in the periampullary region (70-75% of all duodenal diverticula) [1]. Spontaneous perforation of a duodenal diverticulum is a rare and severe complication, with an estimated mortality rate of approximately 6%, traditionally managed surgically. However, especially in elderly patients with high surgical risk or with few symptoms, conservative treatment may be considered [2]. For still unclear reasons, there appears to be a relationship between duodenal diverticula and other pancreatobiliary diseases, such as acute pancreatitis and choledocholithiasis. It is known that the risk of choledocholithiasis is increased in these patients, which is a risk factor for acute pancreatitis [1, 2]. Even in the presence of a duodenal diverticulum, endoscopic retrograde cholangiopancreatography (ERCP) remains the treatment of choice for choledocholithiasis in these patients [3].

Given the rarity of this complication and the complexity of therapeutic decision-making, we present a case of an elderly patient with duodenal diverticulum perforation, evidenced by computed tomography, and acute pancreatitis, successfully managed conser-

vatively. Additionally, during the same hospitalization, she was diagnosed with choledocholithiasis and cholelithiasis, which were successfully managed after the resolution of the acute condition.

2. Case Report

An 88-year-old female patient was admitted to a tertiary hospital with a clinical history of severe epigastric pain radiating to the back, associated with nausea and vomiting, with a duration of 3 days. The patient had no prior medical history of note, no similar episodes in the past, and no history of smoking or alcohol use. On physical examination, she was hemodynamically stable, non-icteric, with a tender abdomen on deep palpation in the epigastric and right hypochondriac regions, without signs of peritonitis. No other significant findings were noted in the systemic review. Laboratory tests revealed a significant elevation (more than three times the reference value) of amylase and lipase levels, a white blood cell count of 12,200/mm^3 with 6% bands, C-reactive protein at 16.7 mg/dL (reference value < 0.5), total bilirubin at 0.4 mg/dL, creatinine at 0.74 mg/dL, and urea at 27 mg/dL. Initial abdominal and pelvic computed tomography (CT) showed free peripancreatic fluid, the presence of retroperitoneal air near the Treitz ligament, and dilation of the bile ducts. Based on the clinical history and imaging findings, biliary acute pancreatitis and duodenal perforation were suspected. Subsequently, an ultrasound (US) of the right hypochondrium was requested to investigate the etiology of acute pancreatitis, along with a repeat contrast-enhanced CT of the abdomen and pelvis to better elucidate the potential for perforative acute abdomen.

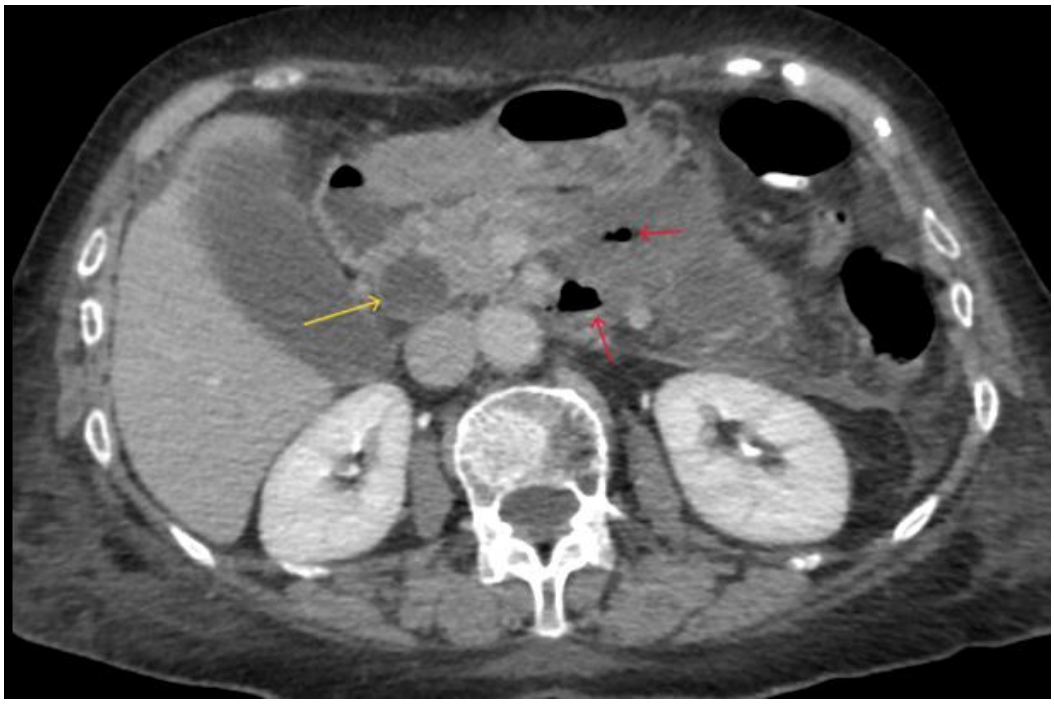
The ultrasound revealed a gallbladder with thin and regular walls, without gallstones, an enlarged common bile duct, and thickening of the pancreatic parenchyma with an adjacent collection near the tail of the pancreas. The contrast-enhanced CT showed two large diverticula in the first and fourth portions of the duodenum, measuring 38 mm and 22 mm, respectively (Figures 1 and 2), as well as a moderate amount of free abdominal fluid, a pancreas of normal size and contours without areas of necrosis, with more peripancreatic fluid along the lower margin, and a small retroperitoneal air collection (Figure 3).

Figure 1. Oral contrast phase - Red arrow: duodenal diverticulum in the 1st portion, measuring 38 mm in diameter at its largest axis.

Moderate dilation of the intra- and extrahepatic bile ducts was also observed, with the common bile duct measuring up to 19 mm in diameter. Small, spontaneously hyperdense images were seen within the common bile duct, appearing nonspecific to the imaging method (Figure 3). Consequently, the diagnostic hypotheses considered were biliary acute pancreatitis, spontaneous perforation of a diverticulum in the 4th portion of the duodenum, and dilation of intra- and extrahepatic bile ducts of unclear etiology.

Figure 2. Oral contrast phase - Red arrow: duodenal diverticulum in the 1st portion, measuring 38 mm in diameter at its largest axis.

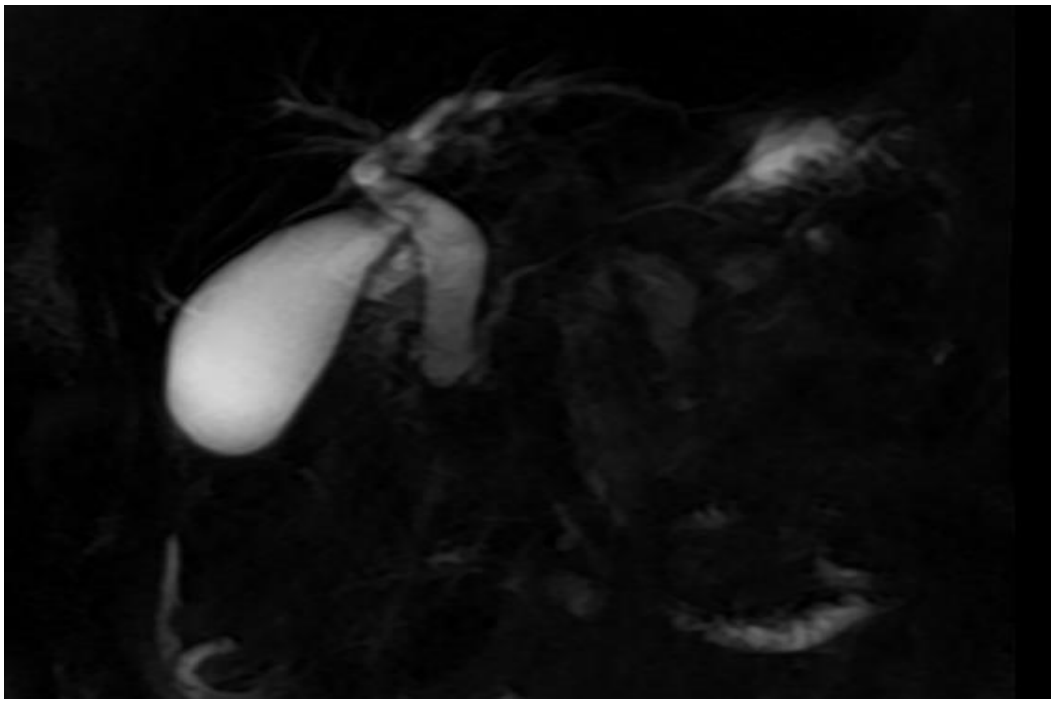
Figure 3. Portal phase - Yellow arrow: dilated common bile duct measuring 19 mm in diameter; Red arrows: retroperitoneal air and peripancreatic fluid collection.



Upon hospital admission, the patient, despite still experiencing abdominal pain, showed partial improvement, with no signs of localized or diffuse peritonitis. Considering the patient's age, hemodynamic stability, absence of organ dysfunctions, and CT findings showing no collections or abscesses, a conservative treatment approach was chosen for the spontaneous duodenal diverticulum perforation. The patient was managed with oral fasting, parenteral nutrition (PN), intravenous antibiotic therapy, and close clinical and laboratory monitoring. The patient showed gradual improvement, with plans to perform serial imaging for monitoring the condition, as well as magnetic resonance cholangiopancreatography (MRCP) for a more detailed assessment of the bile ducts. On the second day of hospitalization, a follow-up CT of the abdomen and pelvis was performed, which showed no significant changes, no increase in retroperitoneal air, and no formation of collections or abscesses.

Magnetic resonance imaging (MRI), conducted seven days after admission, revealed the persistence of a small amount of free intra-abdominal fluid, diverticula in the first and fourth portions of the duodenum, moderate dilation of the intra- and extrahepatic bile ducts, with dimensions similar to the previous exam, and the common bile duct containing material suggestive of biliary sludge or microlithiasis (Figures 4 and 5). The pancreas was evaluated as having normal dimensions and contours, with increased parenchymal signal on T2 and slight obliteration of adjacent fat planes, as well as peripancreatic fluid layers, the largest along the inferior margin of the pancreatic body, with no cleavage plane with the duodenum.

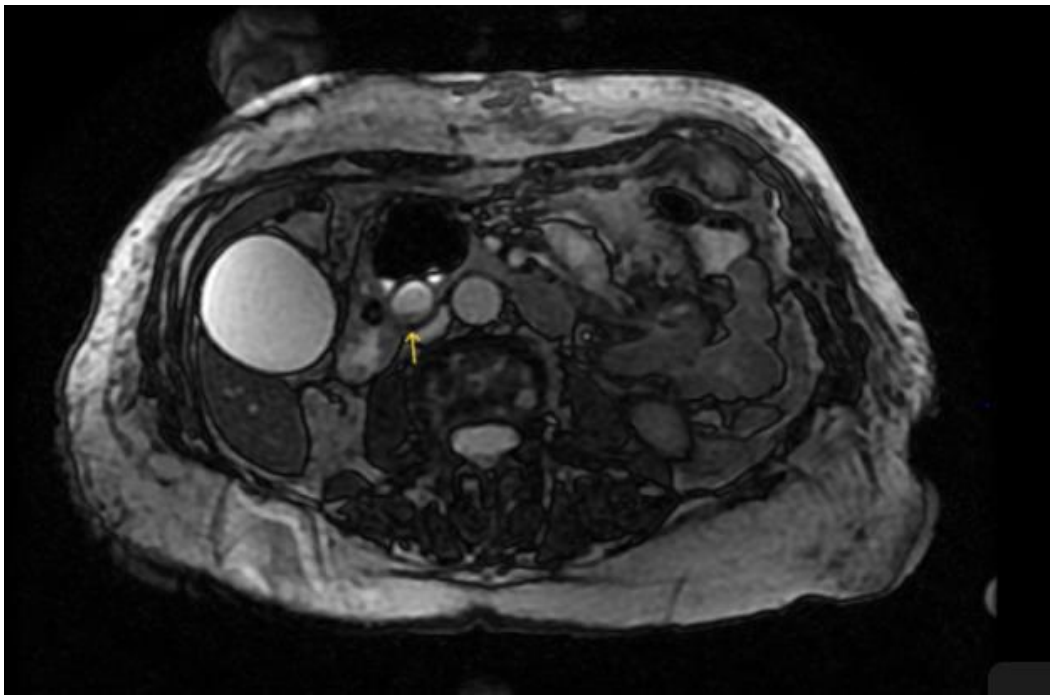
Figure 4. Moderate dilation of the intra- and extrahepatic bile ducts.



Oral diet introduction began on the 7th day of hospitalization, along with the discontinuation of antibiotic therapy and parenteral nutrition. The patient continued to show progressive clinical and laboratory improvement, with good acceptance of the offered diet and complete resolution of pain complaints. In collaboration with the hospital's digestive endoscopy team, an endoscopic evaluation of the duodenal papilla and bile ducts with endoscopic retrograde cholangiopancreatography (ERCP) was scheduled to be performed six weeks after the onset of symptoms, with a plan for laparoscopic cholecystectomy (LC) during the same hospital stay.

During the ERCP, the papilla of Vater was observed to be located at the edge of a large duodenal diverticulum. After several unsuccessful attempts at cannulating the common bile duct, successful cannulation was achieved by passing a guidewire through the pancreatic duct and a second guidewire into the common bile duct, which was uniformly dilated without filling defects. Additionally, dilated intrahepatic bile ducts were visualized, also without defects. A wide papillotomy (biliary sphincterotomy) was performed, and the hepatobiliary duct was swept with the assistance of an extraction balloon, with no sludge or gallstones being retrieved. At the end of the procedure, good drainage of contrast and bile into the duodenum was observed. Both the ERCP and LC procedures were performed without complications. The patient had a favorable clinical course and was discharged early, without any clinical complaints.

Figure 5. Yellow arrow: T2 hypointense image suggestive of microlithiasis/biliary sludge.



3. Discussion

In general, duodenal diverticula, when uncomplicated, are clinically asymptomatic, although several studies have already demonstrated a relationship between the presence of these diverticula and an increased risk of choledocholithiasis. In a systematic review, Wijarnpreecha et al. concluded that patients with juxtapapillary duodenal diverticula were 2.3 times more likely to have choledocholithiasis than patients without diverticula [3]. Recent studies show that the presence of duodenal diverticula is an independent risk factor for choledocholithiasis secondary to acute cholangitis, likely due to a disturbance in bile excretion caused by the mechanical compression of the diverticulum. Additionally, especially in large diverticula, the accumulation of food debris within the diverticulum, with secondary bacterial proliferation, could lead to chronic fibrosis and dysfunction of the sphincter of Oddi, resulting in pancreatobiliary reflux, bacterial infection, cholangitis, and choledocholithiasis [4].

It is also known that patients with duodenal diverticula have a higher risk of developing acute pancreatitis, although the pathophysiology of this association remains uncertain. It is possible that the presence of food debris inside the diverticulum could compress the pancreatic duct, or that the position of the duodenal papilla in relation to the diverticulum could compromise the effective drainage of pancreatic juice, leading to episodes of acute pancreatitis. On the other hand, some studies suggest that the higher incidence of

acute pancreatitis may be related only to the increased presence of choledocholithiasis in these patients [4-6].

Complications of duodenal diverticula are rare, with an estimated incidence of 0.03% per year [7], and are quite severe, including cases associated with acute diverticulitis, bileopancreatic obstruction, cholangitis, bleeding, or perforation [8]. Perforation is the rarest of these complications and can occur spontaneously or secondary to diverticulitis, ulceration, abdominal trauma, or even iatrogenesis (during ERCP) [9]. The clinical and laboratory presentation of duodenal diverticulum perforation is usually nonspecific, with epigastric pain being the main symptom, often accompanied by leukocytosis. On physical examination, epigastric and periumbilical tenderness is common, with or without signs of localized or generalized peritonitis. Computed tomography is essential for confirming the diagnosis, and it is common to find a retroperitoneal collection or abscess [7, 8, 10].

Traditionally, duodenal perforation is managed surgically, generally with diverticulectomy combined with manual or stapled suturing, particularly in unstable patients with generalized peritonitis, sepsis, or those who have not responded well to conservative treatment [10]. Possible complications of surgical management include duodenal fistula, retroperitoneal abscess, iatrogenic bile duct injury, and acute pancreatitis [2]. On the other hand, conservative treatment with fasting, broad-spectrum antibiotic therapy, with or without parenteral nutrition, has emerged as an alternative to surgical treatment in selected patients—those without signs of peritonitis, with mild symptoms, good general condition, elderly, and high surgical risk patients [3, 11].

Farné et al., in an extensive literature review, compiled 210 cases of duodenal diverticulum perforation from 1907 to 2021. In the time frame from 1989 to 2021, of 107 patients with duodenal diverticulum perforation, 75% underwent surgical treatment, 22% conservative treatment, and 3% endoscopic treatment. The complication rate for those who underwent surgical treatment was 28%, compared to 4% in the conservative group. The mortality rate was 8% in the surgical group and 0% in the conservative group [11]. We believe that the differences in complications and mortality between these groups likely reflect the different severities of clinical presentation of this complication rather than the superiority of conservative treatment over surgical treatment. Furthermore, this review highlights the viability and effectiveness of conservative treatment in selected patients.

Endoscopic retrograde cholangiopancreatography (ERCP) has transformed the removal of common bile duct stones from a major surgery to a minimally invasive procedure [12]. The literature on the impact of the presence of periampullary duodenal diverticula on the success of ERCP and the complications related to this procedure is controversial. Older studies report a higher failure rate of papilla of Vater cannulation and post-ERCP complications in patients with duodenal diverticula [13], while more recent studies demonstrate success rates similar to those without the presence of diverticula [14].

A recent meta-analysis, including 25 studies and 23,826 patients, did not demonstrate a higher failure rate of cannulation in patients with duodenal diverticula when studies published after the year 2000 were analyzed individually. However, a higher and statistically significant failure rate is observed when older studies (1980-2018) are included. Nevertheless, this meta-analysis concludes that there is no evidence that the presence of periampullary diverticula hinders bile duct cannulation. To explain these findings, three points are raised: better understanding of periampullary diverticula by endoscopists, improved strategies for cannulation, including sphincterotomy prior to cannulation, and increased technical skill [15].

4. Conclusions

The case reported in this article demonstrates the effectiveness and safety of conservative treatment for duodenal diverticulum perforation, even in the presence of other pancreatobiliary diseases. Additionally, to our knowledge, this is the first reported case of successful ERCP after conservative treatment of duodenal diverticulum perforation. Finally, this study emphasizes the need for new studies aimed at objectively identifying

the group of patients who benefit most from conservative treatment of this rare complication.

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Conflicts of Interest: The authors declare no conflicts of interest.

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