




Management of Gallbladder Perforation: A Single Center Clinical Experience

Safra Kesesi Perforasyonunun Yönetimi: Tek Merkez Klinik Deneyimi

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Abstract

Background: Cholelithiasis and cholecystitis are among the most common general surgery diseases. Gallbladder perforation (GBP) is a rare but potentially fatal complication of these conditions. GBP can present with varied clinical manifestations among patients. We present our clinical experience regarding the diagnosis and treatment of patients treated for GBP in our clinic.

Materials and Methods: This study included patients admitted to our clinic between January 2018 and January 2022, diagnosed with GBP either preoperatively or intraoperatively, and treated using medical or surgical methods. Demographic and clinical records were retrospectively collected from the patients' electronic records and analyzed.

Results: Eighteen patients (10 males and 8 females) were included in the study. The mean age of the patients was 68.1 ±18.1 years. Neimeier classification revealed that 2 patients had Type I, 14 had Type II, and 2 had Type III GBP. Laparoscopic cholecystectomy was performed on 6 patients, open cholecystectomy on 5, and 3 patients required conversion to open cholecystectomy. Percutaneous cholecystostomy was performed in 3 patients. One patient received medical treatment due to a self-limiting abscess, with cholecystectomy recommended electively. Ultrasonography (USG) and computed tomography (CT) were used together for diagnose in 12 patients. Diagnosis was made in 3 patients only by USG, in 1 patient only by CT, and in 2 patients using both CT and MRI. Sixteen of these patients had comorbidities, with diabetes mellitus (DM) and hypertension (HT) being the most common. The mean hospital stay was 14.4 ± 9.5 days, and mortality occurred in only one patient.

Conclusions: Although GBP is a rare but potentially fatal complication of cholecystitis, it is associated with high morbidity and mortality. Lacking specific pathognomonic features, GBP often leads to misdiagnosis or delayed diagnosis. Early diagnosis and prompt surgical intervention are essential for successful outcomes in GBP. Laparoscopic cholecystectomy may be challenging in these patients, necessitating open or partial cholecystectomy. Percutaneous cholecystostomy presents a viable option for elderly patients and those with comorbidities.

Keywords: Acute cholecystitis, Cholelithiasis, Gallbladder perforation

Öz

Amaç: Kolelitiyazis ve kolesistit en sık görülen genel cerrahi hastalıkları arasındadır. Safra kesesi perforasyonu (SKP), bu durumların nadir görülen ancak potansiyel olarak ölümcül bir komplikasyondur. SKP, farklı klinik belirtilerle kendini gösterebilir. Kliniğimizde SKP nedeniyle tedavi edilen hastaların tanısı ve tedavisiyle ilgili klinik deneyimimizi sunuyoruz.

Materyal ve Metod: Bu çalışmaya Ocak 2018 ile Ocak 2022 arasında kliniğimize başvuran, ameliyattan önce veya ameliyat sırasında SKP tanısı konulan ve tıbbi veya cerrahi yöntemlerle tedavi edilen hastalar dahil edildi. Demografik ve klinik veriler, hastaların elektronik kayıtlarından retrospektif olarak toplandı ve analiz edildi.

Bulgular: Çalışmaya on sekiz hasta (10 erkek ve 8 kadın) dahil edildi. Ortalama yaş 68,1 yıl (yaş aralığı: 27-92) idi. SKP'nin Neimeier sınıflamasına göre dağılımı; 2 hastada Tip I, 14 hastada Tip II ve 2 hastada Tip III SKP şeklindeydi. Altı hastaya laparoskopik kolesistektomi, 5 hastaya açık kolesistektomi uygulandı ve 3 hastada laparoskopik kolesistektomiden açık kolesistektomiye dönüldü. 3 hastaya perkütan kolesistostomi uygulandı. Bir hastaya kendiliğinden sınırlanan apse nedeniyle tıbbi tedavi uygulandı ve elektif olarak kolesistektomi önerildi. On iki hastaya tanı koymak için ultrasonografi (USG) ve bilgisayarlı tomografi (BT) birlikte kullanıldı. Tanı, 3 hastada yalnızca USG ile, 1 hastada yalnızca BT ile ve 2 hastada ise hem BT hem de MRI ile konuldu. Bu hastaların 16'sında eşlik eden hastalıklar vardı ve en yaygın olanları diabetes mellitus (DM) ve hipertansiyon (HT) idi. Ortalama hastanede kalış süresi 14,4 gündü ve sadece bir hastada mortalite meydana geldi.

Sonuç: SKP, yüksek morbidite ve mortaliteye sahip kolesistitin nadir bir komplikasyonu olmasına rağmen, spesifik patognomik özelliklerden yoksundur ve bu da sıklıkla yanlış tanıya veya geç tanıya yol açar. SKP'nin erken tanısı ve acil cerrahi tedavisi çok önemlidir. Laparoskopik kolesistektomi bu hastalarda zorlayıcı olabilir, açık veya kısmi kolesistektomi gerektirebilir. Perkütan kolesistostomi yaşlı hastalar ve eşlik eden hastalıkları olanlar için uygulanabilir bir seçenektir.

Anahtar Kelimeler: Akut kolesistit, Safra kesesi taşı, Safra kesesi perforasyonu

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Introduction

Gallbladder perforation (GBP) is a rare but potentially mortal complication of acute or chronic cholecystitis. It occurs following inflammation of the gallbladder due to both calculous and acalculous cholecystitis. Some gallbladder diseases can progress to GBP. The incidence of both cholecystitis and GBP increases with age (1). Due to its varied clinical presentations, GBP can be diagnosed late or incorrectly. The clinical features of GBP can range from symptoms of acute cholecystitis limited to the right upper quadrant to generalized peritonitis. GBP can lead to various clinical conditions, including localized abscess formation around the gallbladder, generalized peritonitis, and cholecystoenteric fistula in chronic cases.

The Niemeier classification, introduced in 1934, is the most commonly used system for classifying GBP. It divides free gallbladder perforations into three types: Type I (acute) involves free perforation into the peritoneal cavity, leading to generalized peritonitis; Type II (subacute) is characterized by localized fluid collection, pericholecystic abscess, and localized peritonitis; and Type III (chronic) presents as a cholecystoenteric or cholecystocutaneous fistula (2, 3, 4).

Causes of GBP can be classified as traumatic, iatrogenic or idiopathic. Systemic diseases, such as infections, malignancies, diabetes mellitus, trauma, corticosteroid use and atherosclerotic heart disease are among the most common predisposing factors (3,5). In asymptomatic diabetic patients, gangrenous cholecystitis and perforation have been reported to be due to gallbladder ischemia resulting from diabetic neuropathy or nerve denervation (4,6).

In the progression toward gallbladder perforation (GBP) and abscess formation, a stone obstructing the cystic duct triggers inflammation. This inflammation, combined with bile stasis, increases intraluminal pressure in the gallbladder, leading to ischemic necrosis and eventual perforation, most commonly in the fundus region (7,8). Depending on the location of the perforation, it may remain confined to adjacent organs, resulting in localized pericholecystic abscess formation. If GBP is not promptly diagnosed and managed, it can progress to generalized peritonitis, significantly increasing morbidity and mortality rates. Ultrasonography (USG) is the diagnostic modality of choice, and in cases where USG findings are inconclusive, computed tomography (CT) or magnetic resonance imaging (MRI) may be utilized (6).

GBP poses a significant challenge for surgeons due to its difficulty in early diagnosis, often only being identified intraoperatively. The mortality rate associated with GBP, a rare complication of acute cholecystitis, has been reported to range from 2% to 42% in previous reviews (9)(10). Patients with GBP typically present with abdominal pain, fever, and nausea and vomiting. However, these symptoms can also be indicative of other conditions such as acute cholecystitis, pancreatitis, cholangitis, or appendicitis, complicating the diagnosis.

The fundus of the gallbladder, where vascular supply is weakest, is the most common site for perforation (3, 9). Fundus perforations and Type I perforations usually present with widespread peritonitis rather than localized abscess or fistula formation. In these cases, standard abdominal CT plays a critical role in diagnosing GBP. For acute cholecystitis with pericholecystic fluid detected by ultrasonography, upper abdominal CT may enhance the rate of preoperative GBP diagnosis (5,11).

This study aims to evaluate 18 patients diagnosed with GBP before or intraoperatively at our clinic for the treatment of gallbladder diseases, alongside a review of existing literature, and to share our clinical experiences.

Materials and Methods

This retrospective study included patients diagnosed with GBP either before or during surgery who presented to the emergency department or general surgery clinic of Inonu University between January 2018 and January 2022. Ethics committee approval was obtained from the Inonu University Clinical Research Ethics Committee dated 14-05-2024 and numbered 2024/5972. Patient data were retrospectively collected from the hospital's information system. The included patients were classified according to Niemeier's GBP classification, based on both radiological and intraoperative findings. The following parameters were analyzed: age, gender, hospitalization diagnosis, laboratory values, radiological diagnostic tools, radiological findings, time of surgery, surgical techniques used, comorbidities, Endoscopic Retrograde Cholangiopancreatography (ERCP) procedures, antibiotic treatments, management options for perforation, length of hospital stay, survival rates, and histopathological data (Table-1 and 2).

Results

A total of 18 patients were included in the study, consisting of 10 males (55.5%) and 8 females (44.5%). The mean age of the patients was 68.1 ± 18.1 years. According to the Niemeier classification, the distribution was as follows: Type I (2 patients, 11.1%), Type II (14 patients, 77.7%), and Type III (2 patients, 11.1%). The mean ages of these groups were 66.5, 66.2, and 82.5 years, respectively. Type II was the most common perforation type, with 14 patients. Type I GBP was diagnosed intraoperatively; one patient underwent laparoscopic cholecystectomy, and another underwent open cholecystectomy. Preoperative diagnosis for Type II GBP was made using radiological methods in 10 patients. In this group, 5 patients underwent laparoscopic cholecystectomy, 6 patients underwent open cholecystectomy, and 2 patients underwent percutaneous cholecystostomy. Patients who underwent percutaneous cholecystostomy did not undergo surgical cholecystostomy. One patient received medical treatment for a self-limiting abscess, with no clinical or laboratory findings necessitating urgent surgery.

Cholecystectomy was planned electively. Open cholecystectomy was performed on one patient with Type III GBP, while cholecystostomy was performed under local anesthesia for abscess drainage and biliary drainage in one

patient with fistulization to the skin. Overall, 6 patients underwent laparoscopic cholecystectomy, 5 underwent open cholecystectomy, and 4 underwent conversion cholecystectomy (Table-1 and 2).

Table 1. Demographic, clinical characteristics and laboratory values of the patients.

Variables	Mean	SD	Median	IQR
Age	68.1	18.1	70.5	19
AST	32.8	25.4	21.5	26
ALT	44.6	85.2	20	23
CRP	15.8	15.7	11	20
T.BIL	1.54	2.06	0.8	0.28
ALP	207.3	295.4	109.5	100
GGT	108.9	127.7	66	90
WBC	18.4	23.4	10.5	10.5
HGB	8.8	4.6	9.5	8
PLT	334.4	134.6	286.5	109
Amylase	44.1	29.3	33	27.5
Hospital Stay (Day)	14.4	9.5	11.5	15.5
Cost (Dollar)	1815	1554	1293	1949

Abbreviations (normal value ranges) of the laboratory parameters: Amylase: (25-125 U/L), AST: Aspartate aminotransferase (1-40 IU/mL), ALT: Alanine aminotransferase (1-40 IU/mL), CRP: C-Reactive Protein (0-0,35 mg/dL) T. Bil: Total Bilirubin (<1.2 mg/dL), ALP: Alkaline Phosphatase (100-400 IU/mL), GGT: Gamma Glutamyl transferase (1-36 IU/mL), WBC: White Blood Cell (4,3-10,3 10³ µl), HGB: Hemoglobin (13,6-17,2 g/dL), PLT: Platelet (156 – 373 10³ µl)

Table 2. Diagnosis, Treatment and clinical features of the patient.

	Count (n)	Percentage (%)
Gender (Male/Female)	10 / 8	55.5 / 44.5
Hospitalization Diagnosis (Acute Cholecystitis / Perforation / Other)	7 / 8 / 3	38.9 / 44.4 / 16.7
Radiological Imaging (USG / BT / MRG)	15 / 14 / 2	83.3 / 77.8 / 11.1
Gallstone	12	66.7
Medical Treatment (Yes / None)	12 / 6	66.7 / 33.3
Time of Diagnosis (Preop / Intraop)	13 / 5	72.2 / 27.8
Surgery Type (Open / Laparoscopic / Conversion)	5 / 6 / 3	35.7 / 42.9 / 21.4
Percutaneous Bile Drainage (Yes / None)	7 / 11	61.1 / 38.9
ERCP (Yes / None)	2 / 16	11.1 / 88.9
Pathology (Cholecystitis/ Adenocarcinoma / N/A)	11 / 2 / 5	61.1 / 11.1 / 27.8

GBP was diagnosed during follow-up examinations in 8 patients whose symptoms did not improve despite medical treatment for cholecystitis and cholelithiasis. One patient had perforation detected while being treated for a primary sclerosing cholangitis attack and underwent emergency surgery (Figure 1). Another patient had perforation identified during elective surgery for symptomatic cholelithiasis (Figure 2). In one patient with a previous history of stomach cancer who was being examined for a mass at the head of the pancreas, laparotomy was performed due to acute abdomen, revealing intraoperative GBP, and cholecystectomy was subsequently performed.

Seven patients (38.9%) underwent percutaneous cholecystostomy, and 5 patients underwent delayed cholecystectomy. In the other two patients, cholecystectomy was performed during the same hospitalization after percutaneous cholecystostomy proved ineffective.

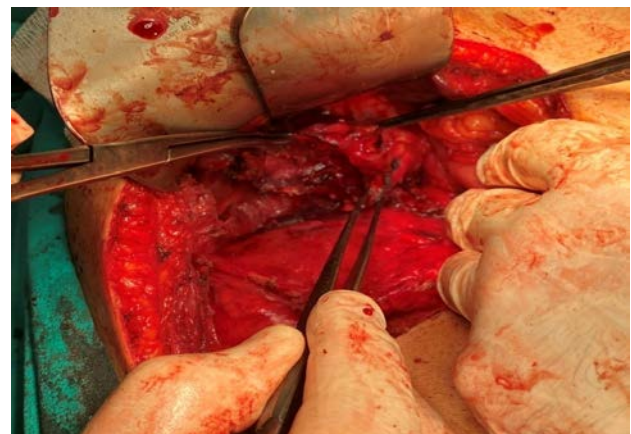


Figure 1. Type II perforation identified in a patient who underwent emergency surgery after being diagnosed with perforation while receiving treatment for an acute attack of primary sclerosing cholangitis.

During hospitalization, elevated parameters included a median CRP of 11 (Interquartile Range (IQR): 20), a median WBC of 10.5 (IQR: 10.5), a median total bilirubin of 0.8 (IQR: 0.28), a median ALP of 109.5 (IQR: 100), and a median GGT of 66 (IQR: 90). AST, ALT, amylase, and PLT levels were within normal ranges. The median hemoglobin value was below the reference range at 9.5 (IQR: 8) (Table-1).

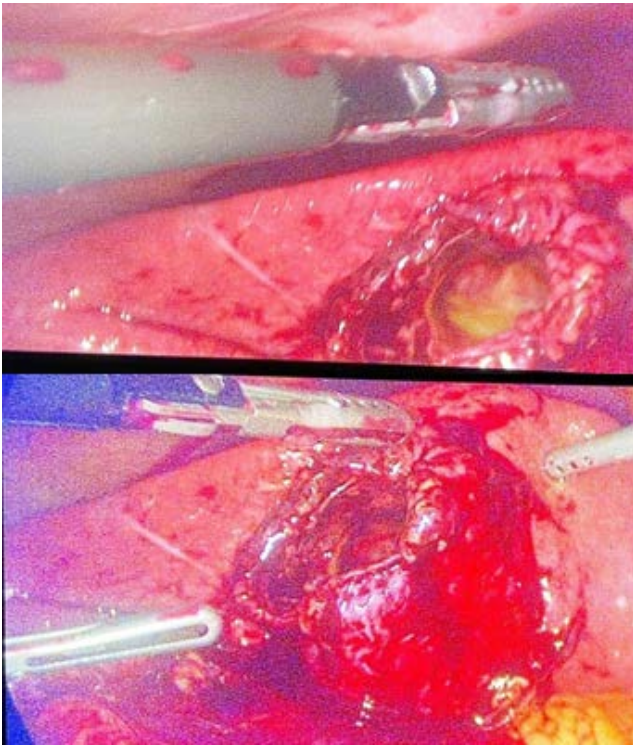


Figure 2. Type II perforation identified in a patient during elective surgery for symptomatic cholelithiasis.

Postoperatively, broad-spectrum antibiotics were initiated by the infectious diseases department in 11 patients, while 7 patients continued the antibiotics that had been started prophylactically. USG and CT were used together to diagnose of 12 patients. Three patients were diagnosed with only USG, one patient with only CT, and two patients with both CT and magnetic resonance imaging (MRI). Pathological examination revealed the following diagnoses: 5 patients with acute cholecystitis, 3 with chronic cholecystitis, 2 with xanthogranulomatous cholecystitis, 1 with adenocarcinoma, and 1 with gastric cancer metastasis. Fifteen of these patients had additional comorbidities, with the most common being diabetes mellitus (8 patients), hypertension (8 patients), and coronary artery disease (4 patients). A total of 7 patients had more than one comorbidity. Postoperatively, an abscess catheter was inserted radiologically in one patient due to the development of an intra-abdominal abscess. The mean hospital stay was 14.4 ± 9.5 . One 90-year-old patient, with an ejection fraction of 35% and a pacemaker, died of postoperative cardiac arrest (mortality rate: 5.6%). Seventeen patients (94.4%) were discharged in recovery (Table-1 and 2).

Discussion

In two literature reviews involving 198 and 176 patients, Type II perforation was the most common, occurring in 46.2% and 45.5% of cases, respectively. The incidence of Type I perforation was 40.6% and 42.6%, and Type III perforation was reported at 10.1% and 11.9% (3,10). In our study, the distribution of perforation types was different, with Type II at 77.7%, Type I at 11.1%, and Type III at 11.1%. This shift is likely due to our center's high volume of liver transplant cases, which often involve Type II and III perforations, while Type I cases are generally treated at other centers. Our study's mean patient age and male percentage (55.5%) align with the literature, which reports an average age range of 55-77 years and a male proportion of 55%-60% (9).

Type III perforations are associated with significant complications, such as abscess formation and fistulization to adjacent structures (3,6). In our study, one patient developed skin fistulization, which was managed successfully with antibiotic therapy and drainage. Cholecystectomy was not performed due to the patient's advanced age (92) and comorbidities. Although GBP is more common in elderly patients, our study also included a 27-year-old male with acute calculous cholecystitis, underscoring that even younger patients can experience this condition, as documented in the literature (12,13).

The role of timely antimicrobial therapy is emphasized by guidelines from the Surgical Infection Society and Infectious Disease Society of America, particularly for secondary peritonitis, which requires coverage of both aerobic and anaerobic bacteria (14,15). In our study, patients were given third-generation cephalosporin and ornidazole preoperatively. Postoperatively, the antibiotic regimen was adjusted for 11 patients based on infectious disease consultations, and 7 patients continued prophylactic antibiotics. Only one patient developed an intra-abdominal abscess, which required percutaneous drainage.

Mortality rates for GBP vary widely, with reported figures ranging from 6.25% to 10.8% (5,6,7). In contrast, our study had a relatively low mortality rate of 5.6%, with the sole death attributed to cardiac causes rather than sepsis. The treatment of GBP remains controversial, with options such as open or laparoscopic cholecystectomy and percutaneous cholecystostomy. Cholecystectomy is considered the treatment of choice for Type I and III perforations, while the management of Type II perforations remains more complex. Laparoscopic cholecystectomy is preferred due to its minimally invasive nature, but conversion to open surgery may be necessary in cases with anatomical challenges (9,16). Additionally, many surgeons opt for percutaneous cholecystostomy in emergency settings for Type II perforations associated with subacute cholecystitis (10,17). Ultimately, the decision between surgical options should account for the patient's age, comorbidities, and the severity of the perforation, as mortality rates appear to be independent of perforation type.

Our study found a notable shift in perforation type distribution compared to the literature, with Type II accounting for 77.7%, compared to the 46.2% and 45.5% reported in other studies (3,10). This could be attributed to the high volume of liver transplant cases at our center, which often result in more complex cases involving Type II and III perforations. These patients are typically referred to our hospital, whereas less severe Type I perforations are often managed at other centers. This trend highlights the need to consider GBP as a differential diagnosis in a wide range of patients, including younger individuals and those with underlying comorbidities, who may present atypically.

The management of Type II perforations in our study included a variety of approaches, including preoperative radiological assessment, laparoscopic cholecystectomy, open cholecystectomy, and percutaneous cholecystostomy. While laparoscopic cholecystectomy remains the standard treatment for Type I and III perforations, the management of Type II perforations requires careful consideration of patient-specific factors. Percutaneous cholecystostomy serves as an important option in high-risk patients, especially those who are not surgical candidates due to age or comorbidities. Tailoring the treatment approach to the individual patient's condition is essential for optimizing outcomes and reducing the risk of complications.

Conclusion

Gallbladder perforation can lead to various clinical conditions, including peritonitis, abscess formation, fistulas, and sepsis. The impact of advanced age and comorbidities, and delays in diagnosis and treatment, must be considered. Early diagnosis and timely medical and surgical interventions are crucial for reducing morbidity and mortality in patients with complicated GBP. Percutaneous cholecystostomy is a valuable option for patients who are not surgical candidates.

Ethical Approval: Ethics committee approval for the study was obtained from the Inonu University Non-Interventional Clinical Research Ethics Committee with the decision numbered 2024/5972 on 14-05-2024 in its 9th session.

Author Contributions:

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Analysis and interpretation: A.T., Z.O.

Writing manuscript: A.T., Z.O.

Critical revision of manuscript: A.T., Z.O., E.K.

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