

Endoscopic and surgical management of iatrogenic biliary tract injuries

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ABSTRACT

BACKGROUND: Iatrogenic biliary tract injury (BTI) is a rare complication but has high risks of morbidity and mortality when it is not early noticed. Although the treatment varies depending on the size of injury and the time until the injury is noticed, endoscopic and percutaneous interventions are usually sufficient. However, it should be remembered that these interventions may cause major complications in the following years, such as biliary stricture, recurrent episodes of cholangitis and even cirrhosis. In this paper, we aimed to present our approach to BTI following cholecystectomy and our treatment management in the light of the literature.

METHODS: The medical records of 105 patients who were treated for BTI between January 2015 and July 2019 were evaluated retrospectively. The majority of the patients consisted of the patients who underwent cholecystectomy at an external medical center and were referred to our clinic due to biliary leakage (BL). Patients were grouped according to Strasberg classification determined by the place of leakage.

RESULTS: Among 105 patients included in this study, 55 were male, and 50 were female. Mean age was 55.2 ± 16.26 years (range, 21–93 years). According to Strasberg classification, type A, B, C, D and E injuries were detected in 57, 1, 3, 29 and 15 patients, respectively. Eighty-five patients were successfully treated with endoscopic and percutaneous interventions, while 20 patients underwent surgery.

CONCLUSION: In all patients with suspected BTI, a detailed screening and appropriate treatment provide a significant decline in morbidity and mortality. Therefore, early diagnosis is very important for both early and late outcomes.

Keywords: Biliary tract injuries; endoscopy; iatrogenic; surgery.

INTRODUCTION

Cholecystectomy has become standard procedure in the treatment of symptomatic gallstones. Biliary leakage (BL) following cholecystectomy is a rare complication but has high risks of morbidity and mortality when it is not early noticed.^[1] The rate of this complication is higher in laparoscopic cholecystectomy (LC) than open cholecystectomy (OC).

Cystic duct stump and Luschka (subvesical bile duct) are the most common places of the leakage. Leakage that occurs due

to iatrogenic injuries is mostly seen in the proximal parts of the hepatic duct.^[2] Anatomic variation and inexperienced surgeon were presented to be the most common causes of the injuries.^[2] In the late postoperative period, it can cause some late complications, such as biliary stricture or recurrent cholangitis, which may bring serious legal problems for us as physicians.^[3]

Currently, treatment of the bile duct injuries recorded significant improvement with the development of laparoscopic and endoscopic procedures.^[4] Most cases can be treated with

Cite this article as: Acar T, Acar N, Güngör F, Alper E, Gür Ö, Çamyar H, et al. Endoscopic and surgical management of iatrogenic biliary tract injuries. *Ulus Travma Acil Cerrahi Derg* 2020;26:203-211.

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Ulus Travma Acil Cerrahi Derg 2020;26(2):203-211 DOI: 10.14744/tjtes.2019.62746 Submitted: 15.08.2019 Accepted: 18.12.2019 Online: 21.02.2020

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endoscopic sphincterotomy and/or stenting without any need for surgical intervention.^[4]

In this study, our aim was to seek answers to the following five questions: 1. What are the factors that increase the risk of injury? 2. What is the most common type of injury, according to Strasberg classification? 3. Which type of injury has a higher success rate for the endoscopic/percutaneous interventions? 4. Which procedure is our primary preference for surgical treatment? 5. What are the probable complications that may be encountered during the short and long term follow-up of these cases, and how should they be managed?

MATERIALS AND METHODS

The medical records of the patients who underwent cholecystectomy between January 2015 and December 2019 in our clinic or were referred to our clinic from other hospitals due to BL were evaluated retrospectively. Average 6500 cholecystectomy procedures were performed in five years. One hundred five patients, who had been diagnosed with BL and had been treated successfully, were included in the study group. The majority of the patients consisted of the patients who underwent cholecystectomy at an external medical center and were referred to our clinic due to BL.

Biliary leakage was diagnosed with the postoperative clinical signs, drainage follow-up and/or imaging methods. Clinicopathologic features of the patients, performed surgical procedures, place and amount of the leakage, the success of the endoscopic interventions and the need for additional percutaneous drainage and/or secondary operation were analyzed. Types of the injury were classified according to Strasberg classification^[5] (Fig. 1, Table 1).

The patients who were treated in the same session owing to detecting biliary tract injury during the operation (n=9), could not be followed up after treatment (n=6) and had spontaneous closure of the fistula without any endoscopic or surgical procedure within five days (n=12) were excluded from this study.

ERCP (Endoscopic Retrograde Cholangiopancreatography)

Following the oropharyngeal lidocaine anesthesia and intravenous premedication (Diazepam or meperidine and midazolam), ERCP was performed using Olympus TJF 10, 20, Pentax FD-34X duodenoscopies or Olympus TJF-240 video-duodenoscopy (Fig. 2). Sphincterotomy was performed, and catheter or plastic stent (various sizes) was placed when it was essential according to imaging results.

Roux- Y Hepaticojejunostomy (HJ)

The jejunum was cut from 25 cm proximal of the ligament of Treitz and prepared. The distal end was brought to the

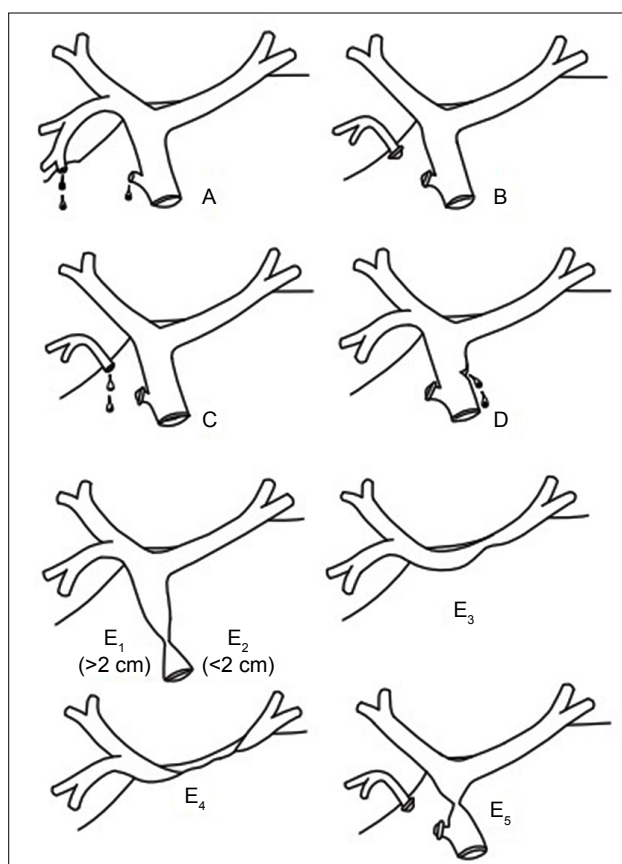


Figure 1. Strasberg-Bismuth classification of injuries to the biliary tract.

Table 1. Strasberg classification for biliary tract injuries

Type A	Bile leak from cystic duct or liver bed without further injury
Type B	Partial occlusion of the biliary tree, most frequently of an aberrant right hepatic duct (RHD)
Type C	Bile leak from duct (aberrant RHD) that is not communicating with the common bile duct (CBD)
Type D	Lateral injury of the biliary system, without loss of continuity
Type E1	Common hepatic duct division ≥ 2 cm from bifurcation
Type E2	Common hepatic duct division < 2 cm from bifurcation
Type E3	Common duct division at the bifurcation
Type E4	Separate left and right hepatic duct strictures
Type E5	Combined injury to main duct at the bifurcation and right segmental bile duct

hilus of the liver by passing through the mesocolonretrocolically. Roux limb was anastomosed end-to-side to the hepatic duct with interrupted 4.0 PDS sutures (Fig. 3). Afterwards, a double-layer side-to-side enteroenterostomy was applied between 40–60 cm distal of Roux limb and the proximal end of the jejunum, which was divided at the beginning. We per-

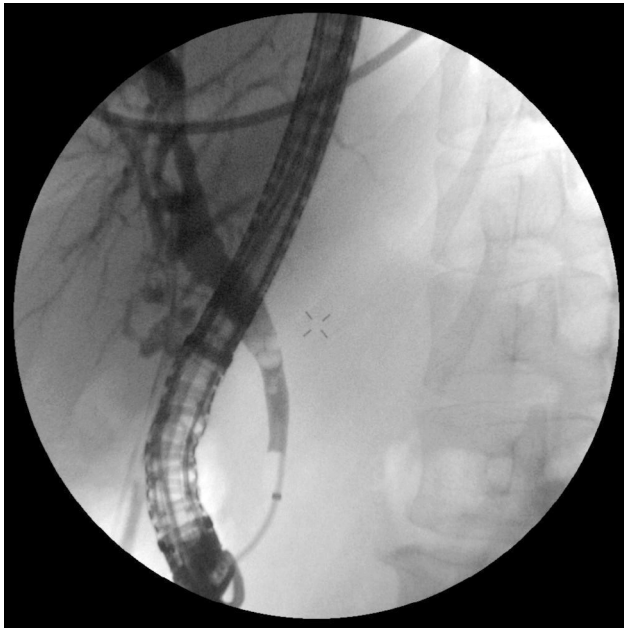


Figure 2. Bile tract injury detection with ERCP (Type E leakage).

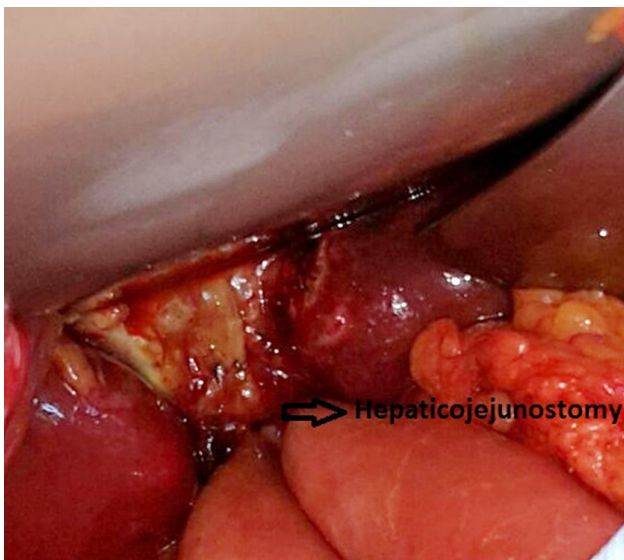


Figure 3. Hepaticojejunostomy.

formed portoenterostomy in some patients with complete bile duct trauma. We added these patients to the HJ patient group.

RESULTS

Demographics and clinical characteristics of the patients are given in Table 2. Among 105 patients, 52.4% were male. Mean age was 55.2 ± 16.26 years (range, 21–93 years). Seventy-nine patients (75%) diagnosed with BL had undergone LC, 13 patients (12.5%) had undergone laparoscopic switched to OC, and 13 (12.5%) patients had undergone OC. The most common symptom was bile flow from the drain and/or wound (32.7%) and other common symptoms were abdominal distention, biloma, peritonitis, obstructive jaundice and cholangitis.

Table 2. Demographic and clinical characteristics of the patients (n=105)

Age (range)	
Mean	55.2±16.26 (21–93)
Male	60.2±14.26 (37–90)
Female	50.8±17.24 (21–93)
Gender, n (%)	
Female	50 (47.6)
Male	55 (52.4)
Operation type, n (%)	
Laparoscopic cholecystectomy (LC)	79 (75)
Laparoscopic switched to open surgery	13 (12.25)
Open surgery	13 (12.25)
Symptom, n (%)	
Distention, fever	24 (23.1)
Biloma	17 (16.3)
Bile leak	35 (32.7)
Peritonitis	8 (7.7)
Obstructive jaundice	7 (6.7)
Cholangitis	14 (13.5)
Strasberg classification according to the type of injury, n (%)	
Type A	57 (54.1)
Type B	1 (1)
Type C	3 (2.9)
Type D	29 (27.6)
Type E1	3 (2.9)
Type E2	5 (4.8)
Type E3	4 (3.8)
Type E4	2 (1.9)
Type E5	1 (1)
Risk factors, n (%)	
Cholecystitis	24 (23.1)
Obesity	6 (5.7)
History of previous surgery	9 (8.7)
Pancreatitis	6 (5.7)
Bleeding disorders	4 (3.8)
Other	8 (7.7)
Biliary obstruction (e.g., stone and stenosis)	27 (26)
Unspecified	48 (45.3)
Leak flow, n (%)	
High flow (>300 ml/day)	27 (25.7)
Low flow	78 (74.3)

Ultrasonography (USG) and computed tomography (CT) were performed for the diagnosis initially. Magnetic Resonance Cholangiopancreatography (MRCP) was performed to 45

(43.3%) patients who were not certain for BL and/or for identifying the place of injury (Fig. 4). All patients underwent ERCP both for diagnosis and treatment. After all tests and examinations, patients were classified using Strasberg Classification. According to this classification, type A injury was detected in 57 (54.1%) patients, type B injury was detected in one (1%) patient, type C injury was detected in three (2.9%) patients, type D injury was detected in 29 (27.6%) patients and type E injury was detected in 15 (14.4%) patients (Fig. 5a, b).

Leakage with a daily amount of below 300 milliliters was defined as low, and above 300 milliliters was defined as high-output. According to this, 74% of the patients had low-output leakage. 57 (54.7%) patients had risk factors, such as the previous episodes of acute cholecystitis, obesity, history of previous surgery, pancreatitis episode, diabetes mellitus and bleeding disorders. It was observed that previous biliary tract disorders significantly increase the risk of leakage.

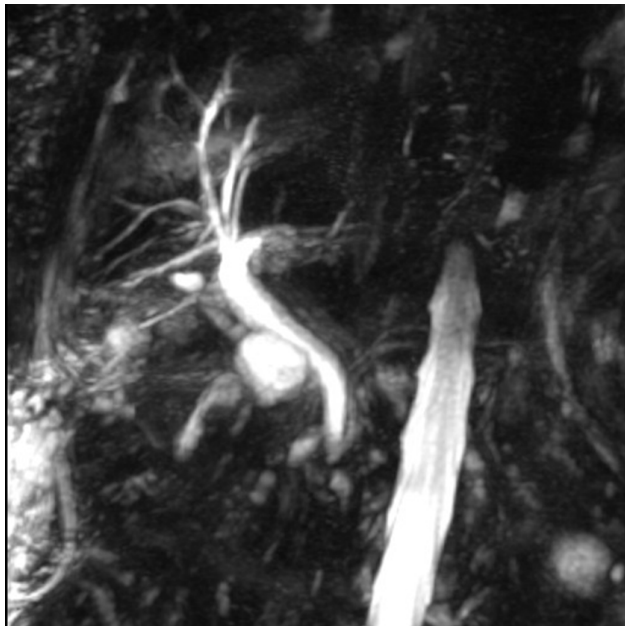


Figure 4. Bile tract injury detection with MRCP (Type E leakage).

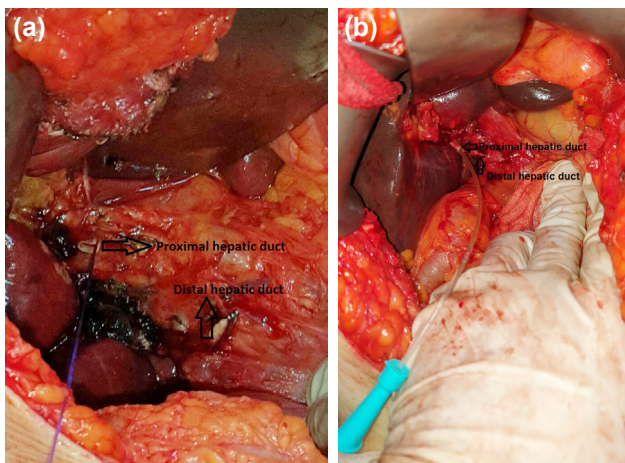


Figure 5. (a, b) Type E bile duct injury (Intraoperative view).

The findings showed that 81% of all patients were successfully treated with endoscopy. Leakage was spontaneously closed after ERCP without any additional intervention in nine patients, all with the low-output leakage. The period for the spontaneous closure after ERCP was average seven (3–14) days. Spontaneous closure was achieved in 14 patients who underwent sphincterotomy during ERCP and in 56 patients who underwent plastic stent placement additionally to sphincterotomy. Percutaneous drainage catheter was placed to cholecystectomy site in addition to sphincterotomy and stent in six patients. Twenty (19%) patients underwent surgery in which ERCP had been failed. Primary repair, T-tube drainage and reconstruction were applied to 5, 2 and 12 of these patients, respectively. Additional right hepatectomy was performed in one patient because of the necrotic areas in the right lobe of the liver due to the complete right portal vein and hepatic artery injuries. Peroperative cholangiography was performed not to miss the multiple leakages and in cases that place of leakage could not be detected. One patient was found to have multiple metal clips at the level of intrahepatic bile tracts, proximal to the leakage site (Fig. 6).

Performed interventions are presented in Tables 3, 4, and postoperative complications are presented in Table 5.

Pancreatitis occurred in three (2.9%) patients and perforation occurred in one (1%) patient after the endoscopic intervention. One patient with high-risk factors, such as comorbidity and advanced age, was exitus after surgical reconstruction during the postoperative follow-up. Duration of the hospital stay after the treatment was found to be average 7.7 (4–21) days in the patient group who recovered spontaneously during the follow-up and/or after ERCP and 18.4 (10–27) days in the patient group who underwent surgery.

Mean follow-up duration was 33 (1–57) months. Fistula developed in six patients in the early period but closed spontaneously without any additional intervention. Cholangitis

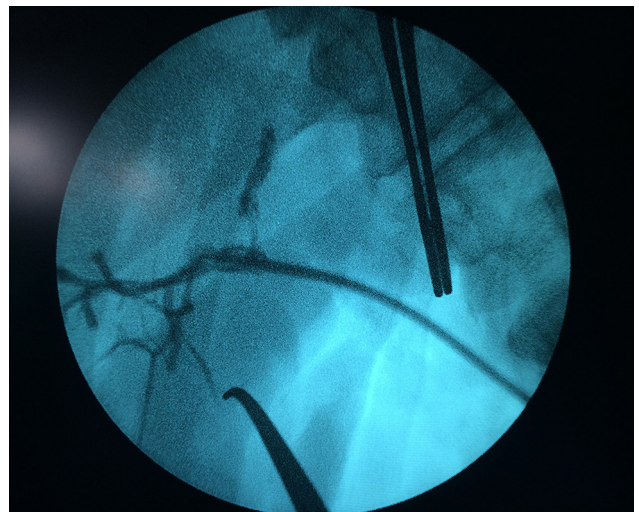


Figure 6. Intraoperative cholangiography (Type E leakage).

Table 3. The management of bile tract injury with endoscopy (n=85)

Type	Patient (n)	ERCP+follow	ERCP+SF	ERCP+SF+stent	ERCP+ PD
A	56	6	10	37	3
C	3	1			2
D	26	2	4	19	1
Total, n (%)	85	9 (10.6)	14 (16.5)	56 (65.8)	6 (7.1)

ERCP: Endoscopic Retrograde Cholangio-Pancreatography; SF: Sphincterotomy; PD: Percutaneous drainage.

Table 4. The management of bile tract injury with surgery (n=20)

Type	Patient (n)	ERCP+primary repair	ERCP+T-tube drainage	ERCP+Roux-Y HJ*	HP
A	1	1			
B	1			1	
D	3	2	1		
E	15	2	1	11	1
E1	3	1		2	
E2	5	1		4	
E3	4		1	3	
E4	2			2	
E5	1				1
Total, n (%)	20	5 (25)	2 (10)	12 (60)	1 (5)

ERCP: Endoscopic Retrograde Cholangio-Pancreatography; HJ: Hepaticojejunostomy; HP: Hepatectomy.

Table 5. Treatment modalities and complications of the patients (n=105)

Treatment modality	Complications, n(%)			
	Pancreatitis	Perforation	Cholangitis	Fistula
Endoscopic intervention	3 (2.9)	1 (1)	4 (3.8)	
Primary repair			1 (1)	2 (1.9)
T-tube drainage			1 (1)	1 (1)
Hepaticojejunostomy				2 (1.9)
Hepatectomy				1 (1)

occurred in four patients with stent placement, one patient with primary repair, and one patient with T-tube drainage. Tests revealed biliary duct stenosis in these patients. Upon this, ERCP and Percutaneous Transhepatic Cholangiography (PTC) were performed and self-expanded metal stent (FC-SEMS) was placed after balloon dilation. We have still been following-up these six patients, and none of them have had any additional complaints or the episode of cholangitis.

DISCUSSION

Cholecystectomy is one of the most common operations performed by surgeons. Although the complaints recover in a

short time after the operation in many patients, undesirable complications may cause high morbidity and mortality. Symposia about safe cholecystectomy techniques are held in many medical centers to minimize and manage these complications properly. However, there is still no significant decline in complication rates.

Biliary duct injury from these complications after cholecystectomy is the most feared major complication with high morbidity (9.3%–43%) and early mortality (0%–1.7%).^[6,7] Biliary tract injury after cholecystectomy was evaluated in many previous studies.^[6,7] The importance of endoscopic

treatment was emphasized in many of them, and morbidity and mortality rates were reported to be increased, especially in late diagnosis and the cases which had to undergo surgery. However, there is no clear treatment algorithm based on the type of biliary tract injury, which leads to a more invasive surgical intervention to an injury that can be treated with less complex endoscopic procedures in some cases. Therefore, it would be more appropriate to determine the type of injury in the preoperative period and to apply step-wise interventions. In this article, we aimed to present the efficacy of endoscopic and surgical treatments in acute BL after cholecystectomy, the management of the treatment in the light of literature and our long-term results. In addition, we sought to classify the patients according to the type of injury and to establish a treatment algorithm.

Our data support prior studies in the literature with the results showing that type A was the most common type of injury and 81% of these were treated successfully with endoscopic interventions. Surgery was required, especially in Type E injuries and the most preferred surgical procedure was HJ.

The risk of BL is higher in males, and its incidence increases significantly with the presence of previous episodes of acute cholecystitis.^[8] Histopathological alterations develop in the gallbladder, and its surrounding tissues due to acute cholecystitis contribute to the risk of iatrogenic injuries.^[8] Among other major risk factors are anatomic variations, obesity, shortcystiduct, cystic duct running parallel to the common bile duct (CBD) and history of previous surgery.^[8,9] Also, leakage may occur due to technical problems that arise from the insufficiency of the clip used in the closure of the cystic duct.

In our study, the number of male patients (52.4%) was higher than females, and 54.7% of all patients had many risk factors, such as previous or ongoing acute cholecystitis leading them (23.1%). Other risk factors included obesity, history of previous surgery, pancreatitis, bleeding disorders and use of the inappropriate clips. Additional to the risk factors, bile tract stones, or benign stenosis were detected in 27 patients. These pathologies are assumed to lead the cystic duct leakages by causing an increase in the pressure of the bile tract.

Postoperative diagnosis varies depending on the presence of a drain and type of the injury. In the present study, the mean time between cholecystectomy and the detection of bile leak was 5.3 days (range, 1 to 21) with non-specific symptoms, such as nausea, distention, fever, vomiting, bloating, widespread abdominal pain, general discomfort, and anorexia.^[10] Early diagnosis of the leakage has a significant effect on morbidity and mortality rates.^[10,11] If detected late, larger amounts of bile will be collected in the abdomen, which leads to a more severe clinical picture of biliary peritonitis.

In our study, the mean time between cholecystectomy and the detection of bile leak was 6.1 days (range, 1 to 24), and

most of the patients were diagnosed with bile flow from the drain. Also, some patients had developed symptoms, such as abdominal distension, fever, biloma collection in the cholecystectomy area, jaundice and cholangitis.

In general, imaging USG and CT should be performed firstly.^[12] Thus, preliminary information about intra-abdominal fluid collection and characteristics of this fluid if there is any can be obtained. Also, it may detect probable CBD dilatation and associated vascular injury.^[12] Afterwards, ERCP, which allows determining the exact diagnosis and localization, is required.^[13] Being an invasive procedure that may develop complications, such as perforation, pancreatitis creates a disadvantage for ERCP.^[13]

The output of the leakage can also be detected with MRCP. Thus, recently, the use of MRCP for this purpose has become more common.^[14] However, since MRCP is inadequate to show collapsed bile tracts, MRCP should be performed in case of the biliary tract is dilated due to an obstruction rather than the biliary tract perforation where there is BL into the peritoneal cavity. Another disadvantage of MRCP is that you cannot perform any therapeutic interventions in contradiction to ERCP.

Perioperative cholangiography confirms the location of the leakage that was diagnosed in the preoperative period, and additionally, to detect any second leakage, if there is, it increases the success rate.^[15] Therefore, intraoperative cholangiography is very important to evaluate the biliary tree.

We had firstly performed USG and CT when BL was suspected. Magnetic Resonance Cholangiopancreatography was performed in 43.3% of the patients who could not be certainly diagnosed with bile tract injury and/or when the injury could not be localized. We obtained the definitive diagnosis with these imaging methods, but we could not identify the localization and/or type of the injury in most of the patients. Thus, all of the patients underwent ERCP. Patients were classified for output of the leakage and type of the injury according to ERCP results. Three patients had a pancreatitis episode, and one patient had perforation after the endoscopic intervention. None of these complications were mortal. We performed perioperative cholangiography for all patients. Additional to the preoperative localization of the leak, we detected leak also in the intrahepatic duct in one patient and in subvesical bile duct (Luschka) in one patient.

Treatment varies depending on the type of injury. Cystic duct and Luschka are the most common places of the leakage.^[16] The duct of Luschka mostly drains into the right and common hepatic ducts, and less frequently drains into the subsegmental ducts, sectoral ducts, and left hepatic duct.^[16] Due to this anatomy, injury to the right and main duct is more frequent than left. Sphincterotomy and plastic stent placement with ERCP are usually sufficient in patients who have

an intact tract and do not have signs of peritonitis.^[17] Therefore, laparotomy should not be performed unless the injury is properly classified.^[17] According to the European Society of Gastrointestinal Endoscopy (ESGE) clinical guideline, partial divisions of ducts can be successfully treated endoscopically in more than 90% of the cases.^[18] Also, Jabłonska et al. reported that endoscopic interventions had a 93% success rate, especially in type A and D injuries.^[19] This rate is 100% in sole cystic duct leakages.^[19]

The type, optimal diameter and length of the stent to be placed may vary according to the type of injury.^[20] Sometimes, when the diameter of the plastic stent is small, and the stent cannot be kept in the bile duct longer than 4-8 weeks, usage of self-expanding metal stents (SEMS) or multiple plastic stents may be required [21]. In previous studies, success and complication rates of both stents were the same.^[20-22]

Surgical reconstruction is required when endoscopic intervention failed; bile duct was cut completely or tied and in patients who have severe symptoms. Purpose of this was to provide a proper bile flow to the feeding route.^[19] The success of surgery depends on many factors, such as the timing of repair, level of injury, presence of infection, associated vascular injury and poor operative technique.^[23] Many publications suggest that late-detected BL and patients with diffuse peritonitis should wait three months for definitive surgery after primary control surgery to relieve the inflammation for best results.^[1,23,24]

Roux-Y HJ is usually preferred as surgical procedure.^[25,26] However, depending on the type of injury, more complicated procedures like Kasai can also be performed.^[27] Results are more promising if there is a not complete cut in CBD and evidence of diffuse peritonitis. Lubikowski et al. reported that 92% of patients with Roux-Y HJ remained in good condition with normal liver function tests after a median follow-up of 59 months (6–102 months).^[28] T-tube and end-to-end anastomosis are the other surgical options which have conflicting results about their success.^[19,29] However, there are studies reporting that the leakage area would be widened, tension would occur in the anastomosis line and stenosis may develop in up to 80% during the long-term follow-up.^[30]

In some rare cases, hepatectomy may be required due to concomitant vascular injuries; proximal BDI and liver/bile duct necrosis and/or failed surgical reconstruction.^[31]

In our study, ERCP was successful in 98.2% patients with type A injury, 100% patients with type C, and 89.7% patients with type D, a total number of 85 (81%) patients. Primary repair, T-tube drainage, Roux-Y HJ and hepatectomy were performed in patients with Type B and DBLin which ERCP had failed. Although ERCP is expected to be adequate for type B injury, one patient with type B injury from our series had to undergo surgery since the patient had a past surgical history of antrec-

tomy. Hepaticojejunostomy was preferred as the surgical modality instead of primary repair or T-tube drainage since this patient was young and did not receive sphincterotomy.

Complications after the surgical procedures, such as pancreatitis, fistula in the early period and stenosis, cirrhosis and acute-chronic hepatic insufficiency in later times, may occur during the follow-up.^[28-30] Previous studies introduced several risk factors for the late anastomotic stricture, which were multiple attempts for repair, presence of peritonitis, postoperative biliary fistula, anastomosis on a non-dilated duct, preoperative and postoperative percutaneous biliary drainage, associated vascular injury and level of injury according to biliary bifurcation.^[32] Most of the fistulas can be followed without any additional intervention, and stenosis can be treated with dilatation with ERCP or PTC. Surgery is required when the fistula turns to have uncontrolled output, and the stenosis cannot be identified with endoscopic procedures.^[29,33]

In our patient group, fistula occurred in six of our patients, but they spontaneously closed without the need for any additional intervention. Six patients had recurrent cholangitis episodes due to stenosis of the bile duct. Balloon dilatation with ERCP was performed and self-expanding metal stent (FC-SEMS) was placed. These six patients who are already in our follow-up have not had any additional complaints or cholangitis episodes yet.

In addition to its distinct aspects, there are also few limitations of this study, including its retrospective and single-center design. Also, data on long term follow-up of the patients after surgery are limited.

Conclusion

Currently, bile duct injuries are managed with a multimodal approach, including radiology, endoscopy and surgery. The best solution in cases with biliary duct injuries, especially in low volume hospitals, is to refer these cases to the experienced centers with hepatobiliary units or experienced surgical teams.

According to our own experience, BL due to cystic duct, Luschka, or right intrahepatic branch (due to anatomical variation) injury is more common. It is very crucial to realize and to treat these injuries in the early period before developing peritonitis.

The majority of BL (especially Type A and Type D injuries) can be treated with sphincterotomy and stents by ERCP. In case of a complete cut in the CBD (Type E), the only treatment method is surgery, and HJ is usually performed because of its better long-term results.

It should be kept in mind that patients who underwent surgery due to major injuries may develop some complica-

tions, such as cirrhosis, hepatic insufficiency, and especially cholangitis episodes and jaundice due to the stricture. The majority of the strictures can be treated with minimally invasive methods, such as dilatation or placing self-expanding metal stents with PTK, while liver transplantation may be required for other major complications.

Acknowledgments

The authors thank all the general surgery staff for their cooperation

Ethics Committee Approval: Approved by the local ethics committee.

Peer-review: Internally peer-reviewed.

Authorship Contributions: Concept: T.A., N.A.; Design: T.A., N.A.; Supervision: E.A., Ö.G., M.H., O.N.D.; Fundings: F.G., H.Ç.; Materials: T.A., N.A., E.A., H.Ç., O.N.D.; Data: T.A., N.A., F.G., O.N.D.; Analysis: E.A., Ö.G., M.H., O.N.D.; Literature search: T.A., N.A.; Writing: T.A., N.A.; Critical revision: E.A., H.Ç., M.H., O.N.D.

Conflict of Interest: None declared.

Financial Disclosure: The authors declared that this study has received no financial support.

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ORİJİNAL ÇALIŞMA - ÖZET

İyatrogenik safra yolu yaralanmalarının endoskopik ve cerrahi yönetimi

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AMAÇ: İyatrogenik safra yolu yaralanmalarını, nadir görülen bir komplikasyon olup erken tanınmadığında yüksek morbidite ve mortaliteye neden olur. Tedavisi, yaralanma boyutu ve yaralanmanın fark edilmesine dek geçen süreye göre değişmekle birlikte, çoğunlukla endoskopik ve perkütan girişimler yeterli olmaktadır. Fakat bu tedaviler sonrasında ilerleyen yıllarda biliyer striktür, tekrarlayan kolanjit atakları ve hatta siroz gibi majör komplikasyonlara neden olabileceği unutulmamalıdır. Bu yazımızda postkolesistektomi biliyer kaçaklara yaklaşımımızı ve literatür eşliğinde tedavi yönetimini sunmayı amaçladık.

GEREÇ VE YÖNTEM: Ocak 2015–Temmuz 2019 tarihleri arasında biliyer kaçak nedeniyle tedavi ettiğimiz 105 hastanın dosyası geriye dönük olarak değerlendirildi. Hastaların çoğunluğunu, dış merkezde kolesistektomi geçirip, biliyer kaçak saptanması üzerine kliniğimize sevk edilenler oluşturmaktaydı. Hastalar kaçak yeri ve miktarına göre belirlenen Strasberg sınıflandırmasına göre gruplandırıldı.

BULGULAR: Çalışmaya alınan 105 hastanın 55'i erkek, 50'si kadın olup ortalama yaş 55.2 ± 16.26 yıl (21–93 yıl) idi. Strasberg sınıflamasına göre; 57 hastada tip A, 1 hastada tip B, 3 hastada tip C, 29 hastada tip D ve 15 hastada tip E yaralanma mevcut idi. Seksen beş hasta endoskopik ve girişimsel radyolojik yöntemlerle başarı ile tedavi edilirken, 20 hastaya cerrahi girişim yapıldı.

TARTIŞMA: Biliyer kaçaktan şüphelenilen her hastada, ayrıntılı tarama ve uygun tedavi morbidite ve mortalitede önemli bir düşüş sağlar. Bu sebeple, erken tanı hem erken hem de geç dönem sonuçlar açısından çok önemlidir.

Anahtar sözcükler: Cerrahi; endoskopi; iyatrogenik; safra yolu yaralanmaları.

Ulus Travma Acil Cerrahi Derg 2020;26(2):203-211 | doi: 10.14744/tjtes.2019.62746