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Treatment of biliary leakages after cholecystectomy and importance of stricture development in the main bile duct injury

Kolesistektomi sonrası safra kaçaklarının tedavisi ve ana safra duktus hasarında darlık gelişmesinin önemi

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Background/aims: *Endoscopic treatment of biliary leakages after cholecystectomy, though widely accepted, has some restrictions. The efficacy and safety of endoscopic treatments in this patient group are evaluated in this study, and the problem of biliary stricture development in time after biliary ductal injuries is also emphasized.* ***Methods:*** *Seventy-four patients (20 male, 54 female, mean age 50.9±21 years) referred for ERCP between 1992-2002 were included in the study. Minor leakages (cystic duct leaks, accessory bile duct leaks) were managed by nasobiliary drainage ± endoscopic sphincterotomy; major leakages were managed by nasobiliary drainage ± endoscopic sphincterotomy ± stenting.* ***Results:*** *Twenty-seven patients with cystic duct leaks and 6 patients with accessory bile duct leaks were successfully treated with nasobiliary drainage. Endoscopic treatment could not be performed on patients with total bile duct obstruction (7 patients) and aberrant bile duct injury (7 patients). All leakages from main bile ducts were closed (27 patients). Six of 27 patients had strictures at the beginning and they were treated by stenting. Twenty-one patients had no strictures at the beginning. Eight of 21 were treated by stenting and only 1 of them developed biliary stricture. Seven of 13 patients who had been treated by nasobiliary drainage developed biliary strictures. There were no mortalities due to procedure.* ***Conclusions:*** *ERCP is an effective and safe method for diagnosis and management of bile leakages after cholecystectomy. Stricture development in the main bile duct leakages was an important complication.*

Key words: Cholecystectomy, biliary complication, ERCP

Amaç: *Kolesistektomi sonrası safra kaçaklarının tedavisinde endoskopik tedaviler bazı sınırlamaları olmakla birlikte kabul görmüştür. Bu çalışmada bu hasta grubunda endoskopik tedavinin etkinliği ve güvenliği yanında ana safra kanal hasarında biliyer darlık gelişme problemi incelendi.* ***Yöntem:*** *ERCP için 1992-2002 yılları arasında başvuran 74 hasta (20 erkek, 54 kadın, ortalama yaş 50.9±21 yıl çalışmaya alındı. Minor kaçaklar (sistik kanal kaçakları, aksesuar safra kanal kaçakları) nazobiliyer drenaj ± endoskopik sfinkterotomi; major kaçaklar nazobiliyer drenaj ± endoskopik sfinkterotomi ± stentleme ile tedavi edildiler.* ***Bulgular:*** *Sistik kanal kaçağı olan 27 hasta ve aksesuar safra kanal kaçağı olan 6 hasta nazo biliyer drenajla tedavi edildi. Total safra duktus obstrüksiyonu olan (7 hasta) ve aberran safra kanal kaçağı olan (7 hasta) hastalara endoskopik tedavi yapılamadı. Ana safra kanaldan olan kaçakların hepsi (27 hasta) kapandı. Bu 27 hastanın altısında başlangıçta darlık vardı, bunlar stentleme ile tedavi edildiler. Yirmibir hastanın başlangıçta darlığı yoktu. Bu hastaların sekizi stentleme ile tedavi edildiler ve bunların sadece birinde darlık gelişti. Nazobiliyer drenajla tedavi edilen diğer 13 hastanın yedisinde darlık gelişti. İşleme bağlı mortalite görülmedi.* ***Sonuç:*** *ERCP kolesistektomi sonrası safra kaçaklarının tanı ve tedavisinde etkili ve güvenlidir. Ana safra kanal kaçaklarında darlık gelişmesi önemli komplikasyonudur.*

Anahtar kelimeler: Kolesistektomi, biliyer komplikasyon, ERCP

INTRODUCTION

Cholecystectomy has been the treatment of choice for symptomatic gallstones. Laparoscopic cholecystectomy (LC) has recently become the more preferred operation over open cholecystectomy (OC). Although LC has shortened hospitalization and decreased mortality and morbidity, reviews have reported that LC has a two-fold higher incidence of bile duct injuries than OC (0.6% vs 0.3%)(1-3). There are also some reviews which have reported the incidence of biliary leakages as up to 1.1% (4).

Endoscopic therapies for bile duct leaks after cholecystectomy have been widely accepted after the early postoperative period due to the restrictions

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of percutaneous (5, 6) and surgical (7-11) therapy (12-29).

Cystic duct and accessory bile duct leaks are generally treated easily without a problem. Stricture development after endoscopic treatment of main bile duct leaks, even in patients without stricture at the beginning, is a remarkable point (15, 24, 31).

The aim of this study was to share endoscopic experience of our tertiary care center for diagnosis and treatment of bilary leakages after cholecystectomy and to emphasize the problem of stricture development after endoscopic treatment of main bile duct leaks.

MATERIALS AND METHODS

The results of endoscopic retrograde cholangiopancreatography (ERCP) performed between January 1992 and December 2002 in the treatment of biliary complications after cholecystectomy were evaluated retrospectively. Biliary leakages which developed for other reasons such as from trauma or from surgeries other than cholecystectomy were not included in the study. The results of 74 patients with biliary leakages after cholecystectomy are reviewed.

Biliary leakages were classified in this study according to anatomic localizations at ERCP. Cystic duct leakages (CDLs) were described as type 1, and leakages from accessory bile duct (Luschka's ducts) were classified as type 2. These types of leakages were accepted as minor leakages. Common bile duct leakages (CBDLs) and leakages from common hepatic duct (CHDLs) were accepted as major leakages and described as type 3. Leakages from aberrant bile ducts were considered type 4. The exact diagnosis of type 4 was done by percutaneous transhepatic cholangiography (PTC).

ERCP was performed with diagnostic or therapeutic endoscopes (Olympus JF 1T10, JF 1T20 and TJF 240) under concious sedation with midazolam ± meperidine. Duodenal peristalsis was inhibited by IV administration of hyoscine N-butylbromide. Antibiotics were routinely administered prophylactically before endoscopic procedure. Informed consent was obtained before each procedure.

Tapered or normal tip ERCP catheters or sphincterotomes were used during diagnostic cholangiography. Precutting was needed for cannulation in some patients. Sphicterotomes with 2-3 cm cutting wire and 7 F diameters or with 2 cm cutting wire with 5 F diameters, or needle-knife sphincterotomes were used for precutting. Guide-wires of 0.021 or 0.035 inches and straight tip or thigh J tip were used for cannulation.

Endoscopic sphincterotomy was performed if precut was needed for selective cannulation or if there was a stone to extract. Stones were extracted by balloon or baskets.

All patients with minor leakages were treated by nasobiliary drainage (NBD) (Figure 1, 2). Aberrant bile duct injuries (Figure 3, 4) could not be treated by ERCP because there was no communication with endoscopically reached bile ducts and site of leakage. These patients were treated according to referring center preference.

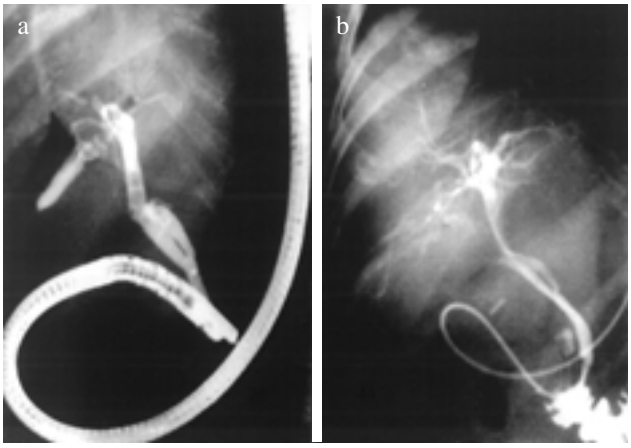

Figure 1: a) Retrograde cholangiogram showing extravasation of contrast medium from the divided duct of Luschka and common bile duct stones, **b)** Cholangiogram through the nasobiliary tube showing closure of the fistula seven days after its placement

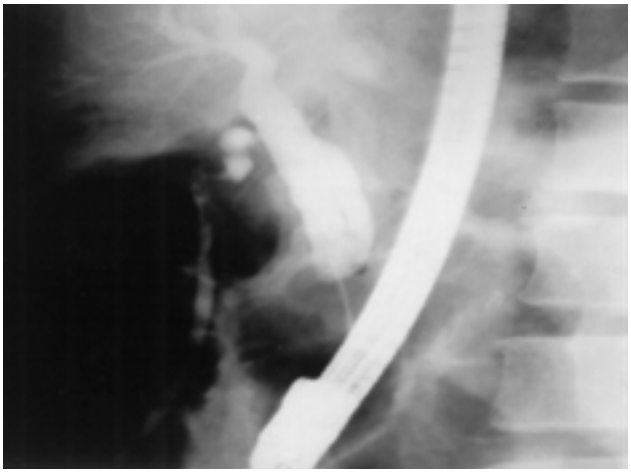

Figure 2: a) Retrograde cholangiogram showing extravasation of contrast medium from the cystic duct in patient with Billroth II gastroenterostomy

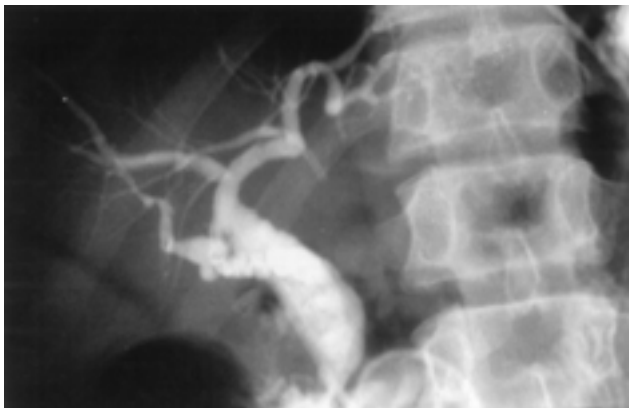

Figure 2: b) Cholangiogram through the nasobiliary tube showing closure of the fistula seven days after its placement

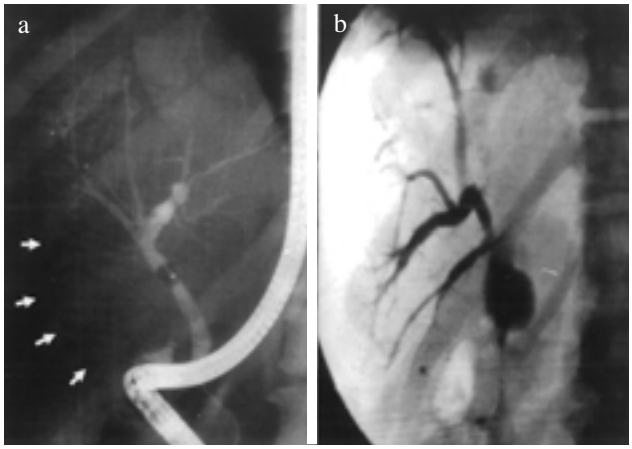

Figure 3: a) Retrograde balloon occluded cholangiogram showing the nonfilling of a segment of the right hepatic lobe (arrows) **b)** Percutaneous transhepatic cholangiography demonstrating a dilated disconnected right hepatic duct with leakage into subhepatic bilioma

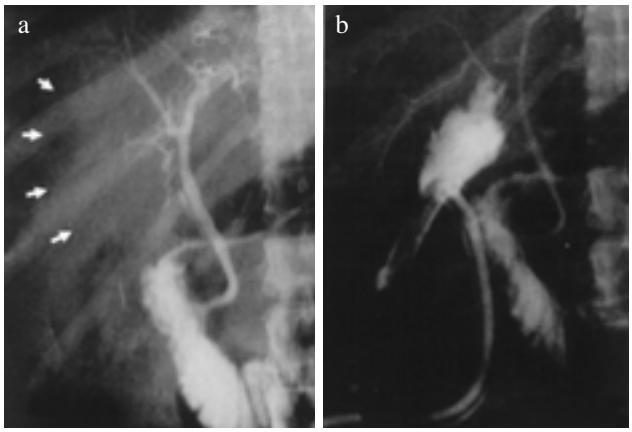

Figure 4: a) Cholangiogram through the nasobiliary tube showing the nonfilling of a segment of the right hepatic lobe (arrows) **b)** Contrast injection into bilioma drain showing disconnected ducts

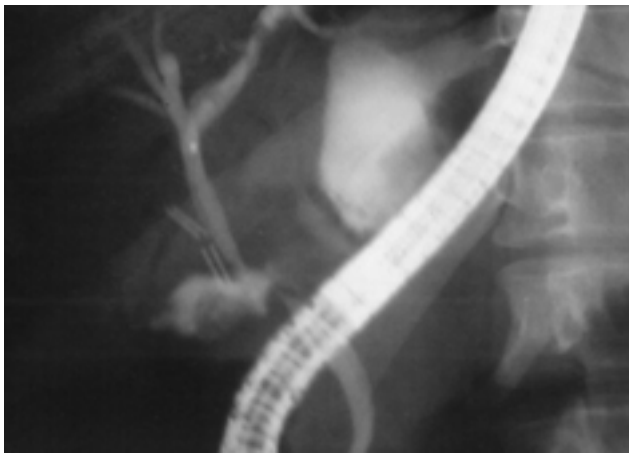

Figure 5: a) Biliary leak from common bile duct after laparoscopic cholecystectomy in the region of several surgical clips

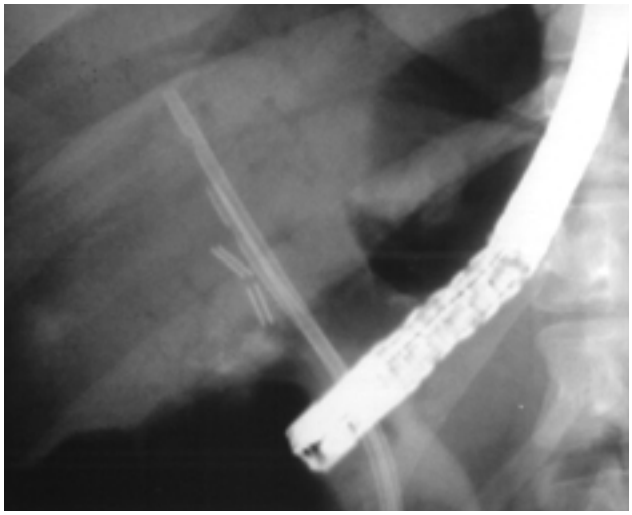

Figure 5: b) Two 10 F biliary endoprotheses were placed

Patients with major bilary leakages were treated by NBD in the early years. Stenting was not performed on these patients if there was no stricture after leakage was resolved. These patients were treated by stenting recently as if they had stricture. NBD was performed transiently if there was a stone which was not extracted or if the patient had cholangitis.

Thirteen patients with type 3 leakages were treated by NBD. Stenting was performed first if there was no significant leakage output or if the patient's condition was satisfactory (8 patients) (Figure 5, 6). If there was a stricture with leakage, NBD was done first and stenting was performed later (6 patients). Biliary strictures were dilated with 6 or 8 mm pneumatic biliary dilatation ballo-

Figure 5: c) Fistula was sealed with common bile duct stricture at the time of removal

on or 5, 7 or 10 F bougie. Amsterdam type polyethylene stents with 7.2 or 10 F were used for stenting. Follow-up of patients with NBD was done with weekly injection of contrast material through nasobiliary catheter tip. Leakages were accepted as resolved and NBDs were extracted if leakage was observed as stopped. Follow-up ERCPs of patients with stents were done three months later.

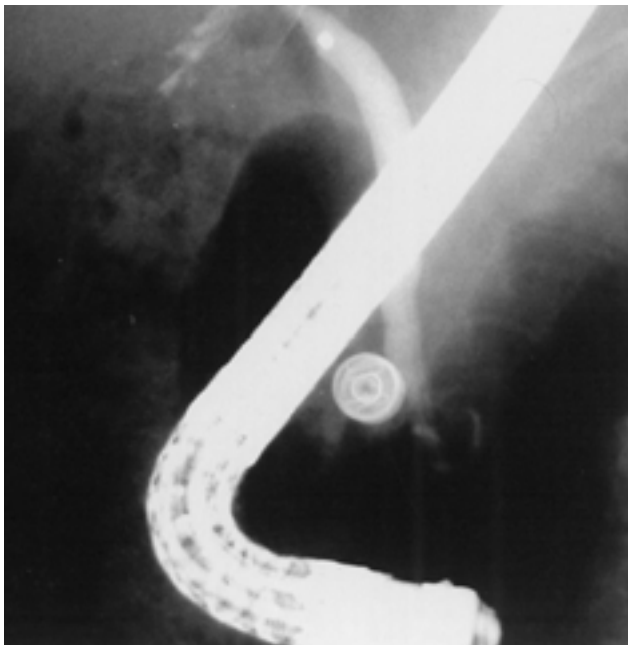

Figure 6: a) Biliary leak from common bile duct after open cholecystectomy

Stenting was performed on patients with strictures every three months until optimal bile duct opening was constructed. Effort was made to insert as many stents as possible at every ERCP period in order to correct biliary strictures.

Results are reported as mean ± standard deviation or median. Leakage closure time after NBD or stent insertion was calculated by the life table analysis according to Kaplan and Meier.

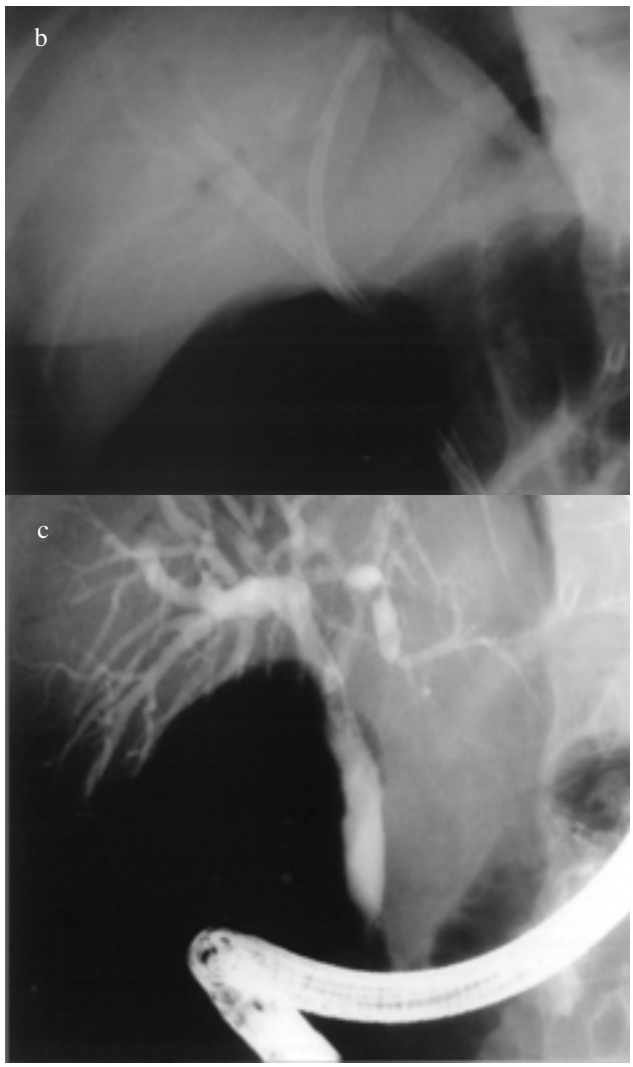

Figure 6: b) Three 10 F biliary endoprotheses were placed. **c)** Fistula was sealed without stricture at the time of removal

RESULTS

The results of 74 patients who were followed up properly during this 10-year period are included (20 males, 54 females, mean age 50.9±21 years).

Most of the patients had LC and the most common presentation was biliary leakage from operation site or bilioma. Detailed information about patients before biliary procedures is given in (Table 1).

If patients were evaluated according to leakage type, 34 patients (45.9%) had type 3; 27 patients (36.5%) had type 1; 7 patients (9.4%) had type 4 and 6 patients (8.1%) had type 2 leakages. Seven patients had total cut. Ten of 74 patients (13.5%) had stones with leakages.

Technical success of ERCP procedure to establish the pathology was 100%. Seventy of 74 patients had cannulation during first ERCP session, and 4 during the second session. Forty patients (54%) had cannulation without the necessity of precutting; 26 patients (35.1%) had cannulation with precutting. Needle-knife sphincterotomes were used for cannulation in 8 (10.8%) patients. Sixty-two patients (83.3%) had endoscopic sphincterotomy (ES), 55 patients (74.3%) had NBD for therapy. The stones of 10 patients were extracted. One patient had perforation retroperitoneally during ES and 1 patient had mild pancreatitis. They were treated medically.

Thirteen of 74 patients (17.6%) had strictures with biliary leakages at the initial procedure (7 patients had total cut, 6 patients had partial strictures). ERCP were performed on patients who had partial strictures at approximately 2.5 weeks after operation (3 patients at the 4th week, 2 patients at the 2nd week, 1 patient at the 1st week). Five of the patients with stones had type 1 leakage, 3 had type 3, and 2 had type 2.

Surgery was performed on 7 patients who had total cut with leakages and on 1 patient with type 3 leakage in whom it was not possible to advance the guide-wire in the common bile duct. Seven patients could not be treated endoscopically due to aberrant bile ducts (Figure 3, 4). Treatment of these patients was done by referring center. Treatment of 2 patients with CBDLs is continuing, so their results were not included in this study. Thus, results of endoscopic treatment of 57 patients are included.

Leakages were resolved in all patients who were treated endoscopically (100%). Mean period for healing was 11.8±12.9 days (median 7 days) (Figure 7). Overall success rate of endoscopic therapy was 77% (57/74).

All minor leaks were closed by NBD if minor leaks were evaluated separately (Figure 1, 2). The ratio of patients with resolution of CDLs at the 1st week follow-up was 81.5% (22/27), at the 2nd week 11.2% (2/27), and at the 3rd week 7.4% (2/27). Four patients who had accessory bile duct leakages (ABDL) were fully recovered at the 1st week, 1 patient at the 2nd week, and 1 patient at the 3rd week.

Six of 28 patients with major leakage had stricture in the beginning. These patients were treated by 26.4 french (14-30) stents and average stent period was 2.2 (1-3). Thirteen of 21 patients without stricture in the beginning were treated by NBD; 8

Table 1. Patients' characteristics before endoscopic procedure

Features of operation	
Open cholecystectomy (OC), n (%	26 (35.1)
Laparoscopic cholecystectomy (LC), n (%)	48 (64.9)
LC converted OC at the same session, n (%)	5 (10.4)
CBD exploration and T tube, n (%)	16 (21.6)
Repair at the same session, n (%)	2 (2.7)
Re-operation, n (%)	3 (4.1)
Duration for re-operation, mean ± SD, day	20 ± 13.2
Duration between operation and admission	21.7±44.0 day (2 day -1 year)
Presentation	
Biliary leakage from surgical drain, n (%)	37 (50)
Bilioma, n (%)	25 (33)
Bile peritonitis, n (%)	6 (8.1)
Cutaneous fistula, n (%)	2 (2.7)
Icterus, n (%)	11 (14.9)
Cholangitis, n (%)	10 (13.5)
Laboratory (mean±SD)	
ALT, U/L	122±116
AST, U/L	75±51
ALP, U/L	506±328
GGT, U/L	218±200
T Bilirubin, mg/dl	8.4±6.4
D Bilirubin, mg/dl	4.3±5.2

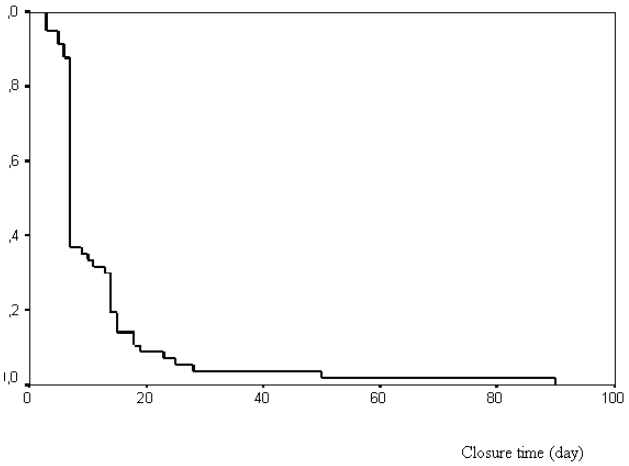

Figure 7. Leakage closure time

of 21 were treated by stenting (median=22.4 F, 14-30 F). Five of 6 patients who were followed up without stents around 45 (4-81) months still have had no recurrences. One patient still has stents at 3rd stent period.

Seven of 21 patients (25.8%) who had no strictures in the beginning with type 3 leakages developed strictures at the site of leakages later. Six were the patients who were treated with NBD in the beginning (6/13). Only 1 of 8 patients treated by stents developed strictures (Figure 5). When patients were admitted with biliary symptoms, strictures were diagnosed 12.2 (1-15) months after recovery of leakages. Six of these patients had been followed up without stents at 2.6 (1-6) stent period after stenting with 24.3 F(14-30F) stents. These patients were followed up 32.6 months (4 months-8 years). One of these patients developed recurrence of stricture at the 4th month during follow-up without stents. The therapy of this patient is continuing with stenting. One patient who was admitted to hospital with jaundice after the 5th month of NBD therapy had such a severe stricture that surgery was required, as it was not possible to reach the proximal side of the stricture with a guide-wire.

In 1 of 2 patients with aberrant bile duct leakages due to LC, the leakage was noticed during operation and clamped in the same session. The other patient's leakage developed after OC and resolved at the 4th day of relaparotomy. These patients were referred to our clinic due to persistence of the leakages. Diagnosis of these patients was done by PTC (Figure 3). They were followed up with medical treatment and their leakages resolved spontaneously 2 and 2.5 months after operation, respectively. There were no clinical problems at 8 and 10 months of follow-up, respectively. One patient with aberrant bile duct leakage was diagnosed by fistulography (Figure 4). The treatment of this patient was decided by the referring clinic, which followed the patient medically.There was no biliary fistula at the 3rd month of follow-up. Biliary leakage of 1 patient after OC was diagnosed with fistulography, and fistulojejunostomy was performed by the Department of Gastroenterologic Surgery at our hospital. We have no information about the follow-up of the other 3 patients who were referred from other hospitals.

Two patients died during the follow-up period, but for reasons other than their primary diseases.

DISCUSSION

This study evaluated 74 patients with biliary leakages after cholecystectomy and indicated that ERCP was an effective and safe method for diagnosis and treatment of biliary leakages.

It is accepted that LCs cause more bile duct injuries than OCs (1-3). Since 1994, when LC was initiated in our country, we have seen an increase in biliary injuries. Laparoscopic cholecystectomy was performed in 64.9% of patients with biliary leakages (Table 1). It should be kept in mind, however, that LC is performed more than OC and this preference can account in part for the high ratio.

According to the series which have evaluated biliary leakages, there is a common opinion that the most common site of biliary leakage is the cystic duct (15, 18, 20, 22-24). We found more CHD and CBDL than CDLs in our series. The reason could be that our hospital is a tertiary hospital and most surgeons from peripheral areas send their complicated LC patients to our hospital. Leakages from aberrant ducts and Luschka's ducts were seen less frequently in our series, which is similar to the literature (9.4% vs 8.1%).

Some surgeons have managed leakages after biliary surgery by open surgical therapy (7, 8). More than one surgery is needed for these patients (7). There are also high mortality (8%) and morbidity rates, especially in the early postoperative period (9, 10). There are some studies which indicate laparoscopic correction or drainage is successful in patients who have no jaundice or biliary stones. But this method is not suggested for major leakages (11). Percutaneous therapy has some disadvantages as well. It is difficult to puncture the biliary tree when it is not dilated. There is also the fear of hemorrhage and biliary leak during stenting with large diameters (30). But some studies have shown percutaneous treatment as effective (5, 6).

We prefer ERCP as the first choice of treatment for biliary leakages after cholecystectomy. Percutaneous treatment is used when endoscopic procedures are not successful, cannot be performed, or show accessory ducts. We believe surgical treatment is only indicated for patients with biliary leakages who were not successfully treated endoscopically or percutaneously (Figure 8).

In fact, minor leakages can heal spontaneously. Endoscopic treatment accelerates the healing period by decompressing the biliary system by remo-

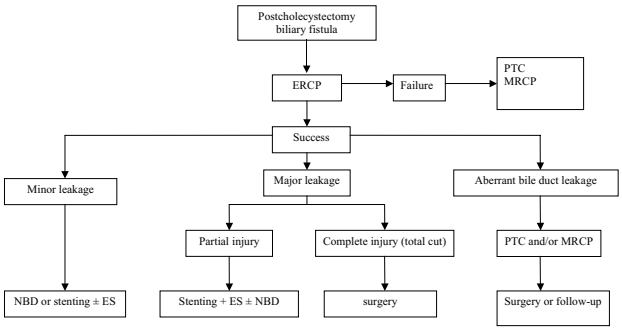

Figure 8. Our postcholecystectomy biliary leakage management program

ving bile. Endoscopic treatments, in addition to decompressing the biliary system, close the defect physically and act as a bridge at the site of extravasation for major leakages. Stenting also acts as a mold and prevents stricture formation during the recovery period.

Stenting is a more accepted treatment than NBD according to the literature. The pressure gradient between the biliary tree and duodenum disappears through stents and biliary flow becomes easier. We use NBD more than stenting as we believe it shortens the recovery period with the help of a higher bilioathmospheric gradient than bilioduodenal gradient. Furthermore, it is possible to monitor the leakage without risk of second endoscopic procedure and premedication. Although carrying NBD is not comfortable, this is an important advantage.

We found an overall success rate of 77% if we considered all patients with leakages. Most of the patients who were unable to be treated endoscopically were those with either a total cut or with aberrant biliary leakages without any communication with the main biliary system.

The success rate for leakages from cystic ducts or Luschka's ducts was 100%, similar to rates reported in the literature (12-29).

According to our results, biliary leakages after cholecystectomy are not the only cause of mortality. Two patients died in the early postoperative period because of other health problems. There are some studies which show that post cholecystectomy leakages could have a worse prognosis. Hillis et al. (7) noted death due to subhepatic abscess in their series. Deaths were due to sepsis in the series of Davids et al. (15).

With appropriate treatment, major biliary leakages can close during the early post- operative period. Strictures due to fibrosis were the long-term sequela. Seven of 21 patients who had type 3 leakages without stricture in the beginning developed strictures. If we include the 13 patients who had strictures in the beginning, a total of 20 patients (58.8%) had strictures with leakages. Two of the type 3 leakages and all of the total cut underwent surgery for correction. Others were treated by endoscopic stenting. Today we prefer to treat CBDLs or CHDLs as if there was stricture even in the absence of stricture at the time (at least 2 10 F plastic stents), taking into account the frequency of stricture development during NBD treatment periods. Stricture development has been reported in some other series. Davids et al. (15) reported a stenosis rate of 6% after stent removal. Bergman et al. (23) reported 3 of 11 patients with strictures: 2 were treated by hepaticojejunostomy and 1 by stenting. Costamagna et al. (31) also suggested stenting in order to prevent stricture development.

According to our results, ERCP is an effective and safe method for management of postoperative biliary leakages. ERCP can be used for diagnosis of strictures and stones as well. It should be kept in mind that strictures can develop as a result of main bile duct injuries during the recovery period.

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