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# Efficacy and safety of nasobiliary drain in patients with postoperative biliary leakage

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**Abstract**

The aim of the present study is to examine the efficacy of nasobiliary drainage with endoscopic retrograde cholangiopancreaticography on the necessity of a subsequent surgery or endoscopic or radiological intervention for patients with biliary leakage. 37 cases of bile leakage were followed. The location of the biliary leakage with endoscopic retrograde cholangiopancreaticography, the presence of post-endoscopic retrograde cholangiopancreaticography complications and whether a second surgery was performed were retrospectively reviewed. The study sample included 37 patients, namely 22 women and 15 men. The average age of the patients was 45.6 years. The biliary leakage identified among the patients (26/37) by way of the endoscopic retrograde cholangiopancreaticography procedure was located in their intrahepatic biliary tract in 27.0%, their gallbladder cavity in 37.8%, and the hilar region in 5.4%, and was unspecified suspected leakage in 29.7%. 24 (64.8%) of the cases had undergone cholecystectomy and 10 (27.0%) hydatid cyst surgery, while one of case lobectomy + cholecystectomy and 2 of sharp-object injuries. Their average duration of hospitalisation was 17.7 days. The cases that had undergone surgery for hydatid cysts exhibited an average duration of hospitalisation of 24.6 days. Nasobiliary drainage had secured medical treatment without the need for a surgical intervention in 91.9% of the cases. Experienced medical centres should primarily prefer the effective and reliable procedure of endoscopic retrograde cholangiopancreaticography and the administration of nasobiliary drain as highly successful method for the non-surgical treatment of postoperative biliary leakage.

**Keywords:** Biliary leakage, nasobiliary drain, efficacy, ERCP

## Introduction

Biliary leakage generally occurs as a result of damage to extrahepatic biliary tracts during cholecystectomy [1-3]. The incidence of biliary leakage during laparoscopic cholecystectomy was reported to be 1% in general and 0.3-0.5% at experienced centres [4], while various centres were indicated to have observed biliary leakage in 2% of cholecystectomies and 13% of partial hepatectomies [5-7]. Biliary leakage is most commonly associated with such invasive procedures as hepatobiliary surgery, open or laparoscopic cholecystectomy, liver resection, liver transplantation, liver biopsy, and percutaneous transhepatic cholangiography [8]. Intrahepatic biliary leakage is, on the other hand, observed following liver surgery and blunt or penetrant abdominal trauma although less commonly [9-11]. Biliary leakage giving way to abdominal bile collection may develop after such operations as cholecystectomy, hydatid cyst surgery, pancreaticoduodenectomy, and hepatic segmentectomy [12]. Early diagnosis is of great importance for cases of biliary leakage, which may lead to severe adverse effects [13]. Post-surgical or post-traumatic biliary leakage can be managed with great reliability and efficacy through percutaneous radiological Endoscopic Retrograde CholangioPancreatography (ERCP) [14]. Endoscopic drainage reduces or even eliminates the transpapillary pressure in the sphincter of Oddi, thereby pushing bile away from the leakage site [14]. In recent years, the treatment strategy employed for biliary leakage has changed considerably with steps moving away from the surgical approach and closer to the group of minimally invasive courses of treatment [12,14-16].

Our aim with the present study is to examine the effect of Nasobiliary drain (NBD) placement through ERCP in patients with biliary leakage on the necessity of a subsequent surgical, endoscopic or radiological intervention and the procedure employed for pancreaticobiliary surgical operations (laparoscopic/laparotomy) on subsequent complications and the necessity of a secondary interventio.

## Materials and Method

The study sample included 37 patients with biliary leakage that

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had undergone hepatobiliary surgery at the General Surgery of Firat University Faculty of Medicine. Biliary leakage had been demonstrated through persistent biliary flow through surgical drain, radiological ultrasonography (USG) identification of pericystic or perihepatic fluid collection, or identification of leakage in intrahepatic biliary tracts or accessory biliary tracts through ERCP. Biliary leakage was divided into biliary cavity (Cystic duct, Duct of Luschka), Intrahepatic ducts, common bile duct, Suspicious undetectable groups [17,18]. All patients had undergone sphincterotomy resulting in the placement of NBD. The age, sex, surgical indication, and the type of operation (laparoscopic/ laparotomic) were recorded for all patients. Within the context of ERCP, the procedure implemented, location of leakage, time from surgical procedure to inserting NBD, and procedural complications were noted. Examinations were conducted to identify the number of days for which surgical drains had remained in place along with the daily quantity of bile received. The same figures were specified also for NBD. Retrospective records were taken for the performance or lack of a secondary surgical intervention following the procedure for each patient, as well as their duration of hospitalisation. The NBDs were removed once no leakage had been observed in any patient as a result of contrast imaging through NBD and the surgical drains were removed one day after. Patients with full choledochal incisions, with structuring in choledoccus, and with a history of surgery for malignity were excluded from the study sample.

### Statistics

All data were made subject to statistical analysis on SPSS 22.00 package software. The results were presented in percentage for categorical variables or in average ± standard deviation or median (minimum-maximum) for continuous variables. The ratios identified for the group were compared through the use of chi-squares and Fisher's exact test. Any alpha value $P < 0.05$ was considered significant.

### Results

The study sample included 37 patients, namely 22 women (59.5%) and 15 men (40.5%). The average age of the patients was 45.6 years (min/max: 11/84). The biliary leakage identified among the patients was located in their intrahepatic biliary tract in 10 (27.0%); their gallbladder cavity in 14 (37.8%); and the hilar region in 2 (5.4%); and was unspecified suspected leakage in 11 (29.7%), which consisted of cases with suspected subvesical duct leakage (Table 1).

**Table 1.** Postoperative bile leak localization

| Leak location | N | % |
|---|---|---|
| **Intrahepatic bile ducts** | 10 | 27.0 |
| **Biliary cavity** | 14 | 37.8 |
| **Hilar- proximal choledoc** | 2 | 5.4 |
| **Suspicious undetectable** | 11 | 29.7 |

Among patients with biliary leakage, 14 (37.8%) and 13 (35.1%) had undergone laparoscopic surgery at our centre and at an external centre through referral, respectively, amounting to 27 laparoscopic procedures (73%) in total. In addition, 10 cases (27%) had undergone laparotomic (open) surgery. 24 of the cases (64.8%) had undergone cholecystectomy with 15 (40.5%) there of performed at our centre and 9 (24.3%) at an external centre, and 10 (27.0%) hydatid cyst surgery, while one had developed biliary leakage as a result of lobectomy + cholecystectomy and 2 of sharp-object injuries (Table 2).

**Table 2.** Distribution of surgical operations

| Operation | N | % |
|---|---|---|
| **Cholecystectomy** | 24 | 64.8 |
| **Hydatid cyst** | 10 | 27.0 |
| **Lobectomy-cholecystectomy** | 1 | 2.70 |
| **Sharp-object injuries** | 2 | 5.4 |

**Table 3.** Characteristics of patients

| | Average | Minimum | Maximum |
|---|---|---|---|
| **Age (years)** | 45.6 | 11 | 84 |
| **Length of stay (days)** | 17.7 | 2 | 55 |
| **From the surgical drain (daily / ml)** | 158.5 | 0 | 600 |
| **From the NBD (daily / ml)** | 292.7 | 0 | 780 |
| **Postoperative ERCP time (days)** | 7.9 | 1 | 60 |
| **NBD withdrawal time (days)** | 9.6 | 2 | 38 |
| **Surgical drains withdrawal time (days)** | 11.1 | 0 | 40 |

The average duration of hospitalisation was calculated to be 7.7 days (min/max: 2/55 days) with ERCP performed on day 7.9 (min/max: day 1/60) on average postoperatively. In addition, NBDs had been removed on day 9.6 on average (min/max: 2/38), whereas surgical drains had been removed on day 11.3 on average (min/max: 3/40). The follow-up of cases indicated the average quantity of bile received through NBD to be 292 ml (min/max: 0/780 ml) and the average quantity of bile received through surgical drainage with NBD in place to be 158 ml (min/max: 0/680 ml) (Table 3).

For cases that had been subject to surgery for hydatid cysts, ERCP had been placed on day 6.2 (min-max: 1-12) postoperatively with an average quantity of bile received through surgical drainage of 189 ml (min-max: 0-600); an average quantity of bile received through NBD of 249 ml (min-max: 0-500); an average duration of hospitalisation of 24.6 days (min-max: 8-55 days); and the number of days before the removal of NBD of 11.2 days (min-max: 2-38 days).

None of the patients had developed postoperative mortality. Complications due to ERCP were observed as minör haemorrhage in only three cases (%8,1), which had been, in turn, improved conservative monitoring. Two of the cases that had undergone ERCP (5.4%) had been subject to surgery for the removal of stones, while one (2.7%) had the same procedure for sludge. Nasobiliary drainage had secured medical treatment without the need for a surgical intervention in 91.9% of the cases (34/37), while only 8.1% of the patients (3/37) had been subject to a secondary surgical intervention, namely laparoscopic fistula surgery in one and open surgery and cholectomy resulting in the placement of a T-tube in the other. The third patient had undergone peritoneal lavage at 3000 cc without additional surgical intervention.

### Discussion

Biliary leakage may result from various conditions including

surgical intervention in the liver or gallbladder, abdominal trauma, liver abscess, and cystic rupture in biliary system. Biliary leakage following cholecystectomy is rare; however, it leads to severe complications [19-21]. ERCP assumes a role in both diagnostic and therapeutic processes [22] and is instrumental in the localisation of biliary leakage and the identification and treatment of stones present in the biliary duct [22-24].

Endoscopic drainage reduces or even eliminates the transpapillary pressure in the sphincter of Oddi, thereby pushing bile away from the leakage site [14].

The present study found 37.8% of the cases to have arise from remnant biliary cavity in consistency with the results obtained by Tsolakis AV. et al. [25]. Bile leakege was most frequently observed in this localization. This localization was similar to the literatüre.

Pinkas H. et al. reported findings of stones and sludge in the biliary duct in 20% of their sample of 20 cases[14], 19% of the cases exhibiting choledochal stones, sludge, or strictures [25], while this ratio was identified to be 8.1% in the present study. The present study included biliary leakage resulting from not only cholecystectomy, but also secondary to hydatid and abdominal trauma, thereby leading to the incidence of stones in the biliary duct to remain low. Choledocholitizis was less common in our study because of non-biliary patologies.

Among the cases addressed by Tsolakis AV. et al. [25], 68% had undergone laparoscopic surgery and they had had ERCP performed on day 7 on average following surgical intervention. The initial ERCP identified biliary leakage in the remnant biliary duct in 42% of the cases [25]. The present study, laparoscopic surgery had been performed on 73% of the patients, ERCP had been implemented on day 7.9 on average, and 37.8% of the cases had exhibited leakage in the gallbladder cavity; all of these findings were similar to those in the relevant literature. Laparoscopic cholesistectomy most common cause of bile leakage. Therefore, patient with laparoscopic cholesistectomy should be very cautious and alert for bile injuries and leakage.

Having included 20 cases of prior cholecystectomy and evaluated 10 cases with NBD in place, the study found biliary leakage to have ceased on day 4.7 on average (min/max: 2/11 days) [14]. For the purposes of our study, however, the leakage had ceased on day 9.6 on average. This study observed NBD placement in a small number of patients, 10 patients to be exact, and the present study included groups of patients with histories of varying surgical interventions including those for hydatid cyst and abdominal trauma. The biliary leakage may have ceased after a longer period of time within the course of the present study due to the larger surfaces involved by liver and gall tract damage arising from the surgical intervention and trauma employed in hydatid cyst surgery.

Agarwal S. et al. İn a study of 86 patients who were operated for hydatid cyst; postoperative 14 (16%) cases developed biliary leakage, 11 cases underwent spontaneous closure with external drainage and 3 cases underwent endoscopic stent or NBD. Cases awaiting spontaneous closure had shown an average time for leakage to cease of 30 days (min-max: 11-84 days) and the study had established the placement of endoscopic stent or NBD to have a shortening effect on the time to closure [25]. In the context of the present study, 10 patients had been subject to surgical intervention for hydatid cyst. The time for the leakage to cease with NBD in place was 11.2 days (min-max: 2-38 days), i.e. significantly shorter than that identified in spontaneous closure. The use of ERCP and NBD placement should be definitely considered for cases with biliary leakage and a history of surgery for hydatid cyst as they have a reducing effect on the duration of hospitalisation and morbidity and mortality.

Two of our cases had been treated successfully with NBD placement on grounds of sharp-object injuries without the need for an additional biliary surgical intervention. De Baker et al. had two cases with biliary leakage arising from blunt trauma treated with NBD and these cases had enjoyed clinical improvement [27]. Therefore, patients with biliary leakage secondary to blunt abdominal traumas and sharp-object injuries may be treated reliably through ERCP and NBD leaving no need for an additional biliary surgical intervention.

Within the course of a study addressing the treatment of 57 patients through the non-surgical methods of percutaneous transhepatic catheter (PTC), secondary percutaneous drainage catheter, and ERCP along with NBD placement [16], 2 patients had died and 5 required secondary surgical intervention with 50 patients (82.5%) treated successfully with no surgical intervention needed. The present study secured successful treatment in all 4 patients that had undergone ERCP. 91.9% of the cases included in our study had enjoyed successful treatment without a secondary surgical operation. No mortality was observed among patients with NBD placed in through ERCP. When ERCP is compared with other non-surgical methods, morbidity and mortality is much lower and treatment success is higher. Therefore ERCP should be prefered to other non-surgical methods

**Conclusions**

Consequently, experienced medical centres should primarily prefer the effective and reliable procedure of ERCP and the administration of NBD as highly successful method for the non-surgical treatment of postoperative biliary leakage. However, the retrospective design of the study has inherent limitations, and a prospective randomized study comparing treatment options and timing of intervention is needed.

**Competing interests**
*The authors declare that they have no competing interests.*

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**Ethical approval**
*Firat University Ethical Committee for Non-Interventional Research approval was obtained for this study. Date: 05/01/2017, no:21.*

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