

# Outcomes of Salvage Percutaneous Biliary Drainage after Occlusion of Endoscopic Stents

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## ABSTRACT

**Purpose:** To describe outcomes of patients with malignant biliary obstruction who undergo salvage percutaneous biliary drainage after occlusion of endoscopic biliary stents.

**Materials and Methods:** A single-center retrospective review was performed of 47 patients (25 men, 22 women) who underwent percutaneous biliary drainage for recurrent obstruction after endoscopic stent placement between 2005 and 2015. Primary malignancies were bile duct ( $n = 13$ ), colorectal ( $n = 11$ ), gallbladder ( $n = 7$ ), pancreas ( $n = 5$ ), hepatocellular ( $n = 4$ ), and other ( $n = 7$ ). Indication for salvage drain placement was infection ( $n = 19$ ) and jaundice or need to decrease bilirubin ( $n = 28$ ). Kaplan-Meier and Cox regression methods were used for survival analysis. Logistic and multivariate regressions were employed to identify factors associated with survival.

**Results:** Median survival after salvage biliary drain placement was 1.8 months (95% confidence interval [CI], 1.3–2.7). Elevated international normalized ratio (INR)  $\geq 1.5$  before drainage was associated with poorer survival after drainage (median survival 0.7 months vs 2.4 months,  $P < .01$ ). Median survival was shorter in 28 patients (64%) with bilirubin  $\leq 2$  mg/dL ( $34.2 \mu\text{mol/L}$ ) after drainage (1.2 months vs 5.4 months,  $P < .001$ ). Left-sided drain placement, elevated bilirubin, and elevated INR correlated with decreased likelihood of achieving bilirubin  $\leq 2$  mg/dL ( $34.2 \mu\text{mol/L}$ ) (odds ratio [OR] 0.13, 95% CI, 0.02–0.71,  $P = .02$ ; OR 0.18, 95% CI, 0.05–0.69,  $P = .01$ ; OR 0.10, 95% CI, 0.01–0.90,  $P = .04$ ).

**Conclusions:** Survival is limited for most patients who undergo salvage percutaneous biliary drainage. Elevated bilirubin and INR before drainage portend a poor prognosis.

## ABBREVIATIONS

CI = confidence interval, HR = hazard ratio, INR = international normalized ratio, OR = odds ratio

Endoscopic retrograde biliary drainage is the procedure of choice for most patients who present with new-onset malignant biliary obstruction. Endoscopic retrograde biliary drainage spares patients an external catheter, improves quality of life, and has low complication rates (1–3). Percutaneous biliary drainage is typically reserved for patients in whom endoscopic drainage fails or

patients who have hilar obstructions that are unlikely to respond to endoscopic retrograde biliary drainage (4–6). Reported patency rates vary among the different types of endoscopic stents. However, over time, tumor overgrowth, biliary sludge, or enteric contents may result in stent occlusion requiring reintervention (7–9). When this stent occlusion occurs and further endoscopic drainage is no longer possible, patients may benefit from percutaneous biliary drainage. The purpose of this study was to evaluate the outcomes in this subset of patients undergoing salvage percutaneous biliary drainage after occlusion of endoscopic biliary stents.

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## MATERIALS AND METHODS

A single-center retrospective review was approved by the local institutional review board. The hospital picture archiving and communications system was searched to

identify all patients who had percutaneous biliary drainage. Data from the hospital electronic medical records spanned the years 2005–2015. Patients were included in the study if they were found to have indwelling, obstructed metal or plastic endoscopically placed biliary stents at the time of percutaneous biliary drainage. Of the 304 patients who underwent biliary drainage during this time period, 47 were found to meet inclusion criteria. All patients were deemed not to be candidates for additional endoscopic drainage before attempted percutaneous procedure by the treating gastroenterologist. The study group included 25 (53%) male patients. Median patient age was 69 years (range, 33–83 y). Baseline demographic data are presented in **Table 1**. Of all patients, 24 (51%) had existing uncovered metal endoscopic stents, 22 (47%) had existing plastic biliary stents, and 1 (2%) had both metal and plastic stents in place. All patients undergoing salvage biliary drainage received prophylactic antibiotics before the procedure. Salvage biliary drainage procedures consisted of placement of internal-external drains in 28 (60%) patients, external drains in 14 (30%) patients, internal-external and external drains in 3 (6%) patients, and primary uncovered metal stents in 2 (4%) patients. Drains placed were between 8 F and 10 F. An additional 8 patients were subsequently converted from percutaneous drains to uncovered metal stents after the initial procedure. Indications for salvage biliary drainage were infection in 19 (40%) patients and clinical jaundice or need to reduce bilirubin for further chemotherapy administration in the remaining 28 (60%) patients. Procedural data are presented in **Table 2**. The medical

**Table 1.** Baseline Demographic Information

Characteristics	Values
No. patients	47
No. male/female patients	25/22
Age, y, median (range)	69 (33–83)
Primary malignancy, n	
Cholangiocarcinoma	13
Colorectal	11
Gallbladder	7
Pancreas	5
Hepatocellular	4
Other	7
ERBD stent, n	
Metallic	24
Plastic	22
Both	1
Bismuth level at ERCP, n (%)	
I	11 (23)
II	7 (15)
III	4 (9)
IV	25 (53)

ERBD = endoscopic retrograde biliary drainage; ERCP = endoscopic retrograde cholangiopancreatography.

**Table 2.** Salvage Biliary Drain Procedure Patient Data

Data	Values
Laboratory data before drainage, median (range)	
ALT, U/L	84 (18–316)
AST, U/L	105 (14–878)
Alkaline phosphatase, U/L	544 (56–2,306)
Total serum bilirubin, mg/dL	10.2 (0.2–23)
INR	1.2 (1–2.4)
Indication for biliary drain, n (%)	
Infection	19 (40)
Jaundice/need to lower bilirubin	28 (60)
Bismuth level at drain placement, n (%)	
I	5 (11)
II	3 (6)
III	2 (4)
IV	37 (79)
Drain side, n (%)	
Right	23 (49)
Left	15 (32)
Bilateral	9 (19)
No. drains, n (%)	
1	30 (64)
≥ 2	17 (36)
Drain type, n (%)	
Internal-external	28 (60)
External	14 (30)
Internal-external and external	3 (6)
Internal (metal) stent	2 (4)

ALT = alanine aminotransferase; AST = aspartate aminotransferase; INR = international normalized ratio.

record was reviewed for laboratory data obtained before and after the procedure, procedural information, 30-day complications, subsequent chemotherapeutic treatment, and repeat biliary procedures. Patients were followed to date of death ( $n = 44$ ) or loss to follow-up ( $n = 3$ ). Imaging of salvage biliary drainage procedures were reviewed by 3 authors (J.K., A.L., J.L.), and the level of biliary obstruction was documented according to the Bismuth classification (10). The most proximate international normalized ratio (INR) to the percutaneous biliary procedure was analyzed except in situations where patients were given blood products before the procedure to correct an abnormality. In these patients, the baseline value before blood product administration was used. Bilirubin values were analyzed based on total serum bilirubin. Bilirubin was analyzed in patients until death or loss to follow-up. Bilirubin after the procedure was analyzed based on the nadir value achieved. Laboratory values were analyzed as continuous variables. Additionally, bilirubin was analyzed after drainage according to whether patients achieved a value of  $\leq 2$  mg/dL ( $34.2 \mu\text{mol/L}$ ). INRs were also analyzed after drainage according to whether values were  $\geq 1.5$ . The 30-day complications were classified according to the Society of Interventional Radiology (SIR) guidelines (11).

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