

ORIGINAL ARTICLE

External biliary drainage following major liver resection for perihilar cholangiocarcinoma: impact on development of liver failure and biliary leakage

Pim B. Olthof, Robert J.S. Coelen, Jimme K. Wiggers, Marc G.H. Besselink, Olivier R.C. Busch & Thomas M. van Gulik

Department of Surgery, Academic Medical Center – University of Amsterdam, Amsterdam, The Netherlands

Abstract

Background: Preoperative biliary drainage is considered essential in perihilar cholangiocarcinoma (PHC) requiring major hepatectomy with biliary-enteric reconstruction. However, evidence for postoperative biliary drainage as to protect the anastomosis is currently lacking. This study investigated the impact of postoperative external biliary drainage on the development of post-hepatectomy biliary leakage and liver failure (PHLF).

Methods: All patients who underwent major liver resection for suspected PHC between 2000 and 2015 were retrospectively analyzed. Biliary leakage and PHLF was defined as grade B or higher according to the International Study Group of Liver Surgery (ISGLS) criteria.

Results: Eighty-nine out of 125 (71%) patients had postoperative external biliary drainage. PHLF was more prevalent in the drain group (29% versus 6%; $P = 0.004$). There was no difference in the incidence of biliary leakage (32% versus 36%). On multivariable analysis, postoperative external biliary drainage was identified as an independent risk factor for PHLF (Odds-ratio 10.3, 95% confidence interval 2.1–50.4; $P = 0.004$).

Conclusions: External biliary drainage following major hepatectomy for PHC was associated with an increased incidence of PHLF. It is therefore not recommended to routinely use postoperative external biliary drainage, especially as there is no evidence that this decreases the risk of biliary anastomotic leakage.

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Correspondence

Pim B. Olthof, Department of Experimental Surgery, Academic Medical Center, Meibergdreef 9, 1105 AZ, Amsterdam, The Netherlands. Tel: +31 20 56 68837. Fax: +31 20 697 6621. E-mail: p.b.olthof@amc.nl

Introduction

Perihilar cholangiocarcinoma (PHC) is a tumor that originates at or near the confluence of the bile ducts which typically obstructs the central bile ducts causing cholestasis and jaundice.¹ Radical surgical resection is considered the only potentially curative treatment and entails a major liver resection with hilar resection and biliary-enteric anastomoses. Liver regeneration is essential for patients recovering from major hepatectomy. However, obstructive cholestasis hampers the regenerative capacity of the liver and hereby increases postoperative morbidity and

mortality.² Therefore, preoperative biliary drainage is mostly used to treat cholestasis prior to surgery for PHC.³

Preoperative biliary drainage can be achieved using internal/external percutaneous transhepatic biliary drainage (PTBD) or by endoscopic stenting. PTBD is often needed after a failed endoscopic attempt to achieve the required therapeutic effect of biliary decompression.^{4,5} These percutaneous drains can subsequently be left in situ during resection as trans-anastomotic drains with the intent to protect the biliary-enteric anastomosis. In case of endoscopic stents, the stents are removed and a retrograde trans-anastomotic external drain may be placed during the operation. However, evidence for the use of

Pim B. Olthof and Robert J.S. Coelen contributed equally to this work.

postoperative external biliary drains in the prevention of biliary leakage is currently lacking in patients with PHC. Furthermore the identification of bile acids as mediators of liver regeneration might advocate against postoperative external biliary drainage, as external loss of bile by the biliary drainage will reduce the regenerative response after hepatectomy.⁶ Notwithstanding the ongoing debate on the effects of preoperative biliary drainage, there is currently little evidence for the use of external biliary drainage after major hepatectomy for biliary drainage.

The current study investigated the impact of postoperative external biliary drainage in PHC patients undergoing curative resection on the development of complications, mainly post hepatectomy anastomotic biliary leakage and liver failure (PHLF).

Methods

Data were retrospectively collected from a database including all consecutive patients submitted to exploratory laparotomy for PHC between January 2000 and July 2015 at the Academic Medical Center, Amsterdam. Inclusion criteria included curative-intent major liver resection, defined as either left or right (extended) hemihepatectomy or central liver resection of at least three segments for PHC.

Preoperative optimization and surgical strategy were performed as previously reported.⁷ Briefly, preoperative biliary drainage of the future liver remnant (FLR) is considered standard practice in the presence of obstructive cholestasis with jaundice in our center. Preoperative biliary drainage was most often initiated at the referring center and attempted endoscopically. Additional drainage in our center was indicated when prior endoscopic drainage had failed to obtain adequate drainage with ongoing cholestasis in the FLR and/or elevated total bilirubin level. The optimal method (endoscopically or percutaneously) for additional drainage procedures was decided at the multidisciplinary team meeting, based on the cause of failure of drainage and biliary anatomy. Bile ducts that were unintentionally opacified upstream from the obstruction were always drained. In the case of a percutaneous approach, 10 Fr internal/external drains, with side holes from the tip towards the intrahepatic part were used and after crossing the biliary stricture, were positioned with the tip in the duodenum. Computed tomography volumetric data of the FLR were available in all patients and calculated as the percentage of FLR volume of the total liver volume. The presence of an intra-operatively placed postoperative external biliary drain through the biliary-enteric anastomosis was determined according to the operative report. The attending surgeon decided whether to use such a drain or not. Postoperatively, external biliary drains were allowed free drainage. Drains were closed when drainage was <50 cc/day or after 5 days postoperatively and left in situ for 2–6 weeks. Using the external drain, cholangiography was performed to check the anastomosis when considered indicated. Postoperative abdominal drains were

standard in all patients and were removed when postoperative production was below 100 cc/day.

Study variables included baseline patient characteristics, details of surgery, postoperative complications and mortality. Postoperative morbidity was defined as any severe complication (i.e. Clavien-Dindo Grade III and higher) within 30 days after surgery. Complications were further stratified into post-hepatectomy liver failure (PHLF), biliary (anastomotic) leakage, hemorrhage and infectious complications. Post-hepatectomy liver failure, biliary leakage and haemorrhage were scored and graded according to the International Study Group of Liver Surgery (ISGLS) criteria, with grade B and C being considered as clinically relevant.^{8–10} Infectious complications were scored when a patient showed clinical and/or laboratory signs of infection (e.g., fever, malaise, or leukocytosis) that necessitated an intervention such as antibiotic treatment or percutaneous drainage. Postoperative mortality was defined as death within 90 days after surgery or within the same hospital admission.

Statistical analysis

Univariable analyses of differences in baseline and postoperative outcomes between the drain and no-drain group were tested using Pearson's chi-squared or Fisher's exact test for categorical variables and using Mann–Whitney *U* or unpaired *t*-test for continuous variables. The association between an external bile drain and grade B/C PHLF was assessed in multivariable analysis by logistic regression, which was adjusted for demographic data (age, gender), and previously described risk factors such as FLR volume,¹¹ preoperative bilirubin level¹² and preoperative cholangitis.¹³ All analyses were performed using IBM SPSS Statistics for Windows (Version 22.0, IBM Corp., Armonk, NY, USA). Two-tailed *P*-values of <0.05 were considered to indicate statistical significance.

Results

A total of 126 consecutive patients underwent a major liver resection for PHC during the study period. One patient was excluded from the analysis due to insufficient data. Eighty-nine out of 125 (71%) patients had postoperative external biliary drainage. A preoperatively placed PTC drain was used as postoperative drain in 46 patients and the other 43 patients received a new external drain during surgery. Patient and operative characteristics of the drain and no-drain group are provided in [Table 1](#). A higher preoperative bilirubin level was observed in the drainage group, although only 5 patients in the study cohort (4 with external bile drain) had a preoperative bilirubin level above 50 $\mu\text{mol/L}$ and the median preoperative bilirubin levels were in the normal range. Preoperative suspicion of PHC was microscopically confirmed postoperatively in 83 out of 89 patient in the external bile drain group and in 26 out of 36 in the group

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