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Primary percutaneous metal stenting above the ampulla in resectable perihilar cholangiocarcinoma

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ABSTRACT

Introduction: We present a case of a patient with resectable perihilar cholangiocarcinoma (pCCA) who underwent primary metal stenting above the ampulla, followed by a successful surgical resection. Biliary drainage is a crucial step in the preoperative management of pCCA, yet there is no consensus on the optimal approach. Traditional drainage methods involve passing through the ampulla and/or the skin barrier, thereby increasing the risk of bacterial contamination of the biliary tree and secondary cholangitis.

Method: A novel drainage technique was utilised in this case. A metal stent was percutaneously placed across the malignant hilar stenosis without external biliary drainage. During the procedure, both guidewires and stents were meticulously prevented from passing through the ampulla. Additionally, percutaneous access to the biliary tree was removed during the index procedure to minimise the risk of biliary colonisation and cholangitis.

Results: Following the drainage, bilirubin levels rapidly normalised, and no clinical or biochemical signs of cholangitis were observed. This allowed for rapid and uncomplicated surgical resection.

Conclusion: This case illustrates the potential of a novel biliary drainage technique in patients with pCCA. By minimising the risk of biliary colonisation and cholangitis, this approach could potentially improve surgical outcomes.

Abbreviations: AF: Alkaline Phosphatase; ALAT: Alanine Aminotransferase; ASAT: Aspartate Transaminase; CBD: Common Bile Duct; CT: Computed Tomography; FLR: Future Liver Remnant; GGT: Gamma-Glutamyl Transferase; HPB: Hepato-Pancreatico-Biliary; MHBO: Malignant Hilar Biliary Obstruction; MRCP: Magnetic Resonance Cholangiopancreatography; MRI: Magnetic Resonance Imaging; PBD: Preoperative Biliary Drainage; PHLF: Post-Hepatectomy Liver Failure; PTBD: Percutaneous Transhepatic Biliary Drainage; pCCA: Perihilar Cholangiocarcinoma

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Introduction

The preoperative work-up of patients with resectable perihilar cholangiocarcinoma (pCCA) poses several challenges, of which preoperative biliary drainage (PBD) is one of the most crucial. Despite extensive literature on the subject, a clear consensus regarding indication, timing, and method of PBD is still lacking [1,2].

A major adverse effect of biliary drainage, when using traditional techniques, is bacterial colonisation of the biliary tree. This can occur following endoscopic drainage through the ampulla, percutaneous internal-external drainage, or percutaneous external drainage that breaches the skin barrier

[3,4]. Bacterial colonisation can lead to refractory cholangitis, requiring antibiotic treatment, and often repeated reinterventions, hospitalisations and mortality. These complications can then render these patients inoperable due to poor performance status despite initially being operable [4]. This has been illustrated by a Dutch nationwide analysis, in which only 15% of pCCA patients underwent surgery [5]. For those that do undergo surgery, cholangitis can compromise the function of the small future liver remnant (FLR), and thus increase the chance of post-hepatectomy liver failure (PHLF), leading to high morbidity and mortality. Ninety-day mortality rates range from 8.3% to 18%, and within the first-year post-surgery, more than half of the

patients experience at least one major complication following resection [6].

In this case report, the use of a novel technique for biliary drainage in a patient with resectable pCCA is illustrated, highlighting its potential benefits and challenges.

Case report

A 70-year-old Caucasian male was referred to our institution because of painless jaundice. Over the course of the two years prior to presentation, the patient had a moderate weight loss of 4 kilograms. Until presentation, he had an uneventful medical history.

Initial evaluation revealed clear cholestatic disturbances (total bilirubin 13.46 mg/dL (230.1 μ mol/L), conjugated bilirubin 11.56 mg/dL (197.6 μ mol/L), Gamma-Glutamyl Transferase (GGT) 591 U/L and Alkaline Phosphatase (AF) 698 U/L) and mildly elevated liver enzymes (Alanine Aminotransferase (ALAT) 126 U/L, Aspartate Transaminase (ASAT) 134 U/L). An abdominal ultrasound showed severe dilatation of the intrahepatic bile ducts with a suspicion of a malignant hilar biliary obstruction (MHBO). Subsequent computed tomography (CT) imaging confirmed the clinical suspicion of a pCCA, without clear vascular involvement or distant metastases. The patient was then referred to our institution for further evaluation and treatment. Additional magnetic resonance imaging (MRI) and

magnetic resonance cholangiopancreatography (MRCP) showed similar findings, confirming the clinical diagnosis of a Bismuth-Corlette type IIIb pCCA (Figure 1B). During a multidisciplinary evaluation, the tumour was considered resectable by left-sided extended hemihepatectomy (including caudate lobectomy). Due to the long-standing jaundice and poor performance status, the patient was referred for preoperative percutaneous biliary drainage.

An ultrasound-guided puncture of a dilated bile duct in the right liver was performed under locoregional anaesthesia and sedation. Percutaneous cholangiography confirmed a hilar stenosis in the biliary tract, suspicious of a pCCA. Initially, a Amplatz Super Stiff™ guidewire 0.035 inch x 260 cm (Boston Scientific®, USA), was advanced through the stenotic tumour into the common bile duct (CBD), avoiding passing through the ampulla. Afterwards, a 10 x 80 mm Protégé™ GPS Self-expanding Biliary Stent (Medtronic®, USA) was placed from the right hepatic duct into the CBD under fluoroscopy. The distal part of the stent was positioned just above the upper border of the pancreas. Final cholangiography confirmed a good outflow of the right bile duct, confirming stent patency. The procedure was completed with removal of the access to the right bile duct and haemostasis of the puncture tract using absorbable haemostatic sponges (Spongostan™) (Figure 1A).

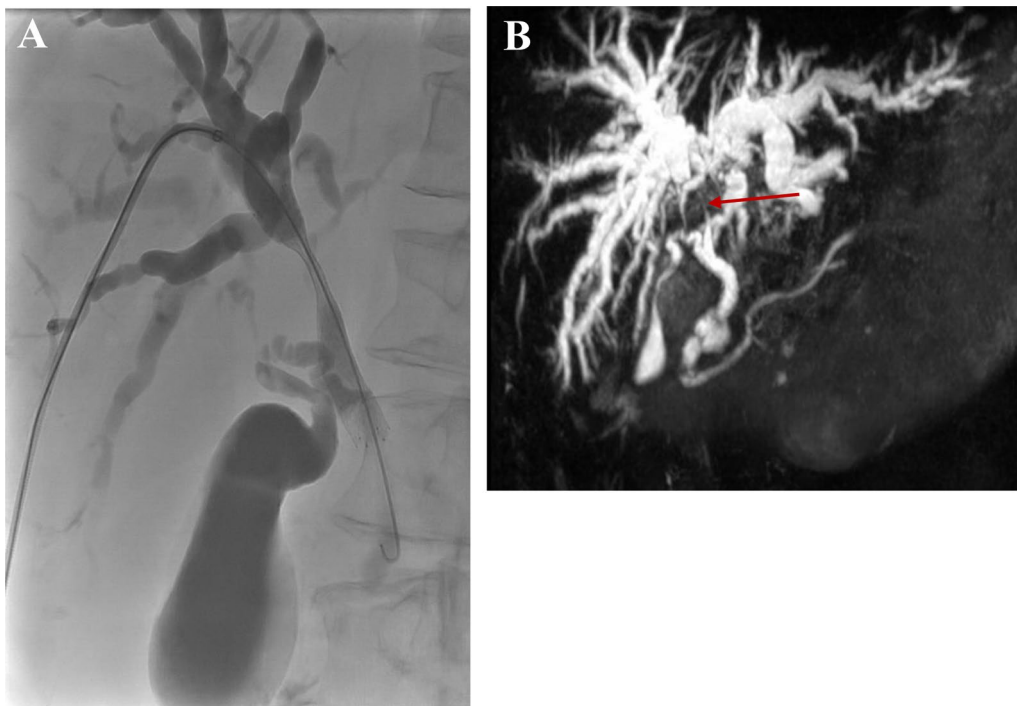


Figure 1. (A) Percutaneous cholangiography illustrating the use of a primary metal stent above the ampulla in a patient diagnosed with Bismuth-Corlette IIIb perihilar cholangiocarcinoma. The guide wire, metal stent, and the impression caused by the malignant hilar obstruction are clearly visible. (B) Magnetic resonance cholangiopancreatography (MRCP) demonstrating the malignant hilar biliary obstruction, indicated by the red arrow.

One day after the intervention the patient was discharged. A clinical and biochemical evaluation at the outpatient clinic 16 days later showed good recovery, with a rapid decrease in total serum bilirubin from 13.46 mg/dL (230.1 μ mol/L) to 2.8 mg/dL (47.8 μ mol/L). One month after drainage, the bilirubin levels had completely normalised (Figure 2). No portal venous embolisation was performed.

Forty-nine days after biliary drainage the patient was scheduled for surgery. First, a regional lymphadenectomy along the hepatic artery, up to the celiac trunk, and in the hepatoduodenal ligament was conducted. Then a left hemihepatectomy with en bloc caudate lobectomy and partial resection of segment V was performed. To complete the resection, three separate bile ducts of the right liver were transected just proximally to the metal stent. The intraoperative frozen section showed no malignancy in the transected bile ducts. After resection of the specimen, a Roux-en-Y biliodigestive reconstruction was performed with the 3 separate bile ducts.

The postoperative course was uneventful, and the patient was discharged on day nine postoperatively. Final pathologic analysis confirmed an R0 resection of a perihilar cholangiocarcinoma, with a classification as pT2b N2 according to the TNM classification (UICC, 8th edition). In 4 of the 12 harvested lymph nodes micrometastases were found.

Unfortunately, 13 months following the surgical intervention, the patient was diagnosed with peritoneal metastases and received palliative systemic treatment in the form of gemcitabine and cisplatin.

Discussion

In this case report we present a patient with pCCA who underwent surgical resection following biliary drainage using primary metal stenting above the ampulla. This case illustrates the potential use of novel methods for PBD. By stenting above the ampulla, the risk of biliary tree colonisation and subsequent cholangitis, a significant challenge in this patient population, may be omitted.

Until now, there has been no real consensus on the timing and indication for PBD in pCCA patients. Even when drainage is deemed necessary, there is no consensus on the preferred method [7]. Two randomized controlled trials have attempted to determine the optimal drainage method to treat jaundice in patients with pCCA. The Dutch D.R.A.I.N.A.G.E. trial was prematurely halted due to increased mortality in the PTBD group (41% vs 11%) [8]. In the 54 randomized patients, the trial did not show any significant differences in drainage-related complications, or short and long-term outcomes when comparing the two interventions [8,9]. The INTERCPT trial, which was conducted in the United States, was prematurely stopped due to insufficient patient accrual [10]. These examples underscore the significant challenges of conducting research in this field, which contributes to the lack of established guidelines. A recent meta-analysis pooled data from seventeen studies and 2284 patients (of which six studies included 636 patients with resectable pCCA) and has shown lower morbidity rates in patients with resectable pCCA that underwent PTBD, when compared to endoscopic drainage [11]. Until now, local culture and expertise significantly influence the

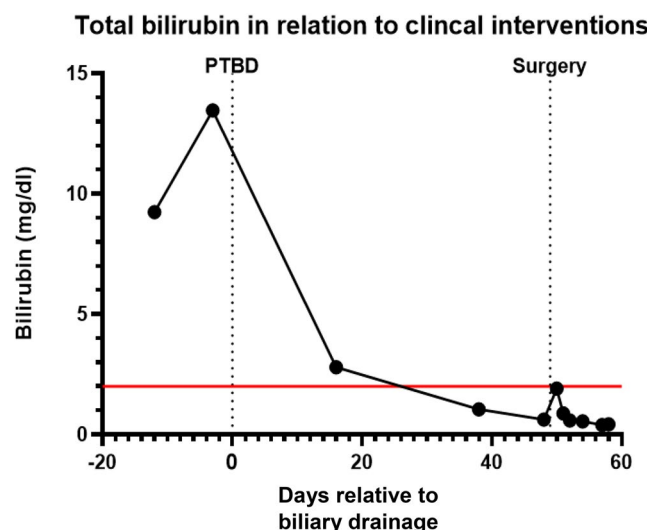


Figure 2. Total serum bilirubin concentration (mg/dl) in a patient with Bismuth-Corlette IIIb perihilar cholangiocarcinoma following percutaneous transhepatic biliary drainage (PTBD) with primary stenting above the ampulla ($D=0$) and surgery ($D=49$). The red line indicates the threshold level of 2 mg/dl.

approach to biliary drainage. For instance, nasobiliary drainage is commonly performed in Japan, whereas it is rarely utilized in Europe [12].

Patients with a suspicion of a MHBO are often referred to expert centres only after initial biliary drainage has been performed, frequently without prior consultation. This practice can lead to misalignments in treatment approaches, as local expertise typically dictates the drainage and resection strategy. Such misalignments can result in difficult-to-treat cholangitis, necessitate reinterventions, and cause delays in referral, all of which may prevent patients from undergoing surgery. An Italian multicentre study highlighted that primary drainage failure is more common in non-expert centres, leading to higher post-surgical morbidity and mortality. This disparity underscores the need for standardised protocols and earlier referral to expert centres to improve patient outcomes [13].

Referring patients to expert centres prior to biliary drainage allows for a more comprehensive preoperative management plan. This allows for surgery without biliary drainage whenever feasible, biliary drainage according to the surgical plan, and the use of novel drainage techniques, such as the one illustrated in this case. The technique of metal stenting above the ampulla in case of MHBO, as illustrated in this case report, is currently under investigation in a Dutch randomised clinical trial in the palliative setting (*registered in the Netherlands with the Central Committee on Research Involving Human Subjects (CCMO), code NL9624*). Results from a single-centre pilot study on the technique in this patient population have been promising, with an initial success rate of this intervention of 98.5%, a majority of patients starting systemic treatment within 4 weeks after biliary drainage, and no cholangitis observed [14]. These data support the concept that avoiding the ampulla can significantly reduce the risk of cholangitis in this patient population. Metal stenting above the ampulla could theoretically improve postoperative outcomes by avoiding bacterial colonisation of the biliary tree, thereby reducing pre-operative dropout rates and the likelihood of PHLF and ultimately improving resectability rates in pCCA by preventing refractory cholangitis.

Despite the possible advantages listed above, the use of this novel biliary drainage technique could be subject to certain limitations in patients with resectable pCCA. The use of metal stents and the removal of the access route to the biliary tree during the index procedure may complicate reinterventions such as additional diagnostics (brush

cytology or next-generation sequencing of bile cell-free DNA) [15]. Similar to other drainage techniques, it is essential to perform adequate imaging prior to stent placement, as post-placement imaging can complicate interpretation. Furthermore, the difficulties during surgery and the effect on the interpretation of intraoperative frozen sections have not been studied.

This case illustrates the use of a novel biliary drainage procedure in patients with resectable pCCA, stressing the importance of undrained referral to expert centres to ensure the best possible care in this patient population. Further investigation is warranted to evaluate the potential and possible drawbacks of this technique in the preoperative work-up of patients with resectable pCCA.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Informed consent

Informed consent has been obtained prior to publication.

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Data availability statement

No datasets were generated or analysed during the current study. Therefore, no data are available

References

- [1] Soares KC, Kamel I, Cosgrove DP, et al. Hilar cholangiocarcinoma: diagnosis, treatment options, and management. *Hepatobiliary Surg Nutr.* 2014;3(1):18–34. <https://pubmed.ncbi.nlm.nih.gov/24696835/> doi: 10.3978/j.issn.2304-3881.2014.02.05.
- [2] Ellis RJ, Soares KC, Jarnagin WR. Preoperative management of perihilar cholangiocarcinoma. *Cancers (Basel).* 2022;14(9):2119. doi:10.3390/cancers14092119.
- [3] Bednarsch J, Czigany Z, Heij LR, et al. Bacterial bile duct colonization in perihilar cholangiocarcinoma and its clinical significance. *Sci Rep.* 2021;11(1):2926. doi:10.1038/s41598-021-82378-y.
- [4] Keulen A-MV, Gaspersz MP, van Vugt JLA, et al. Success, complication, and mortality rates of initial biliary drainage in patients with unresectable perihilar cholangiocarcinoma. *Surgery.* 2022;172(6):1606–1613. doi:10.1016/j.surg.2022.06.028.
- [5] van Keulen A-M, Franssen S, van der Geest LG, et al. Nationwide treatment and outcomes of perihilar cholangiocarcinoma. *Liver Int.* 2021;41(8):1945–1953. doi:10.1111/liv.14856.

- [6] van Keulen A-M, Buettner S, Erdmann JI, et al. Multivariable prediction model for both 90-day mortality and long-term survival for individual patients with perihilar cholangiocarcinoma: does the predicted survival justify the surgical risk? *Br J Surg*. 2023;110(5):599–605. doi:10.1093/bjs/znad057.
- [7] Ratti F, Marino R, Muiesan P, et al. Results from the european survey on preoperative management and optimization protocols for PeriHilar cholangiocarcinoma. *HPB (Oxford)*. 2023;25(11):1302–1322. doi:10.1016/j.hpb.2023.06.013.
- [8] Coelen RJS, Roos E, Wiggers JK, et al. Endoscopic versus percutaneous biliary drainage in patients with resectable perihilar cholangiocarcinoma: a multicentre, randomised controlled trial. *Lancet Gastroenterol Hepatol*. 2018;3(10):681–690. doi:10.1016/s2468-1253(18)30234-6.
- [9] Nooijen LE, Franssen S, Buis CI, et al. Long-term follow-up of a randomized trial of biliary drainage in perihilar cholangiocarcinoma. *HPB (Oxford)*. 2023;25(2):210–217. <https://pubmed.ncbi.nlm.nih.gov/36376222/> doi:10.1016/j.hpb.2022.10.009.
- [10] Elmunzer BJ, Smith ZL, Tarnasky P, et al. An unsuccessful randomized trial of percutaneous vs endoscopic drainage of suspected malignant hilar obstruction. *Clin Gastroenterol Hepatol*. 2021;19(6):1282–1284. doi:10.1016/j.cgh.2020.05.035.
- [11] Moll CF, de Moura DTH, Ribeiro IB, et al. Endoscopic biliary drainage (EBD) versus percutaneous transhepatic biliary drainage (PTBD) for biliary drainage in patients with perihilar cholangiocarcinoma (PCCA): a systematic review and meta-analysis. *Clinics (Sao Paulo)*. 2023;78:100163. (. doi:10.1016/j.clinsp.2022.100163.
- [12] Olthof PB, Miyasaka M, Koerkamp BG, et al. A comparison of treatment and outcomes of perihilar cholangiocarcinoma between Eastern and Western centers. *HPB (Oxford)*. 2019;21(3):345–351. doi:10.1016/j.hpb.2018.07.014.
- [13] Giuliante F, Ardito F, Aldrighetti L, et al. Liver resection for perihilar cholangiocarcinoma: impact of biliary drainage failure on postoperative outcome. Results of an Italian multicenter study. *Surgery*. 2021;170(2):383–389. doi:10.1016/j.surg.2021.01.021.
- [14] Rousian M, Franssen S, van Verschuer V, et al. Primary percutaneous stenting above the ampulla for unresectable malignant hilar biliary obstruction: a single-center phase II trial. *HPB (Oxford)*. 2024;26: S79–S80. doi:10.1016/j.hpb.2024.03.134.
- [15] Arechederra M, Rullán M, Amat I, et al. Next-generation sequencing of bile cell-free DNA for the early detection of patients with malignant biliary strictures. *Gut*. 2022;71(6):1141–1151. <https://pubmed.ncbi.nlm.nih.gov/34285068/> doi:10.1136/gutjnl-2021-325178.