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# Percutaneous Biliary Interventions for Malignant Biliary Obstruction in Low and Middle-Income Countries: Experiences of Northwestern Nigeria

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## Abstract

**Introduction:** Malignant causes of biliary obstruction are common in low and middle-income countries (LMICs) and patients usually present late with unresectable masses. The options for endoscopic and surgical management are scarce in many LMICs. In settings with access to ultrasound and fluoroscopy, percutaneous biliary drainage (PBD) is a promising and minimally invasive option for relieving obstruction and improving the quality of life of these patients.

**Method:** We present a case series of six patients in northwestern Nigeria with cholestatic jaundice caused by malignant biliary obstruction successfully treated by PBD.

**Results:** In five cases, imaging revealed a locally invasive pancreatic head mass causing obstruction. One of the patients had obstruction from biopsy-proven cholangiocarcinoma. Three patients had internal biliary drainage past the obstruction and three patients had only external biliary drainage due to the severity of the obstructions. One patient with internal drainage went on to cholangioplasty and deployment of the balloon-expandable stent over the stenotic segment. All procedures were uncomplicated and patients had a gradual clearance of jaundice and resolution of pruritus. Two of the elderly patients died within six months of the procedure (one from hepatic encephalopathy and the other from stroke). The remaining four survived but were lost to follow-up by 10 months.

**Conclusions:** PBD is a feasible and beneficial option for decompressing malignant biliary obstruction in LMICs.

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## Introduction

There has been an increasing burden of non-communicable diseases, including cancers, in sub-Saharan Africa for the past two decades due to factors such as worsening diet, obesity, and environmental exposures (1). Considering the insidious onset of symptoms, patients with malignant biliary obstructions usually present with advanced/unresectable tumors (2). Even for patients with resectable tumors, there is a paucity of surgeons with the technical skills to perform complex surgeries, such as a Whipple procedure, in most LMICs (3).

In developed countries, endoscopic retrograde cholangiopancreatography (ERCP) with stenting is typically the standard of care to relieve malignant biliary obstruction (4). Patients in LMICs often do not have access to ERCP. For example, the closest and only hospital in Nigeria to have ERCP is over 900 km from our hospital (Aminu Kano Teaching Hospital). Patients also typically cannot afford the cost of ERCP or surgical care due to sub-optimal medical insurance (5). In hospitals with radiologists trained in image-guided percutaneous biliary interventions, percutaneous biliary drainage (PBD) offers a safer and less expensive alternative to relieve the distressing symptoms of biliary obstruction.

So far, there is only one case series on percutaneous biliary interventions for the treatment of choledocholithiasis in Nigeria (6). This case series of six patients with advanced malignant biliary obstruction highlights the learning points and feasibility of percutaneous image-guided biliary interventions in a resource-limited setting.

## Case series

We present six patients with severe cholestasis secondary to malignant biliary obstructions treated with PBD at Aminu Kano Teaching Hospital (AKTH) in Kano, Nigeria. AKTH is a 700-bed tertiary healthcare facility established in 1988 within the Kano metropolis. The Kano metropolitan area covers 499 km2 with a 2022 projected population of 15,462,200. The principal inhabitants of the city are members of the Hausa and Fulani ethnic groups.

The radiology department is equipped with five X-ray machines (including static and c-arm fluoroscopy), ten US units, one CT scanner (160 slice), and one MRI (1.5T). A dedicated cath lab c-arm (GE Innova 3100, General Electric, Boston, Massachusetts, USA) has been non-functional since 2017 and the hospital has not been able to afford repairs. For initial diagnosis, patients underwent ultrasound (US) and/or computed tomography (CT).

As exemplified in Figure 1 and Figures 2a-b, the abdominal US and CT findings of all pancreatic cases revealed poorly defined masses of intermediate density and minimal contrast enhancement arising from the pancreatic head with associated biliary obstruction.

The general surgery and hepatology units are largely responsible for the care of pancreatic and hepatobiliary diseases. However, there currently are no gastroenterologists who perform ERCP or dedicated hepatobiliary surgeons. The closest hospital that performs ERCP and has a hepatobiliary surgeon is over 900 km from Kano, a journey which most of the patients cannot afford.

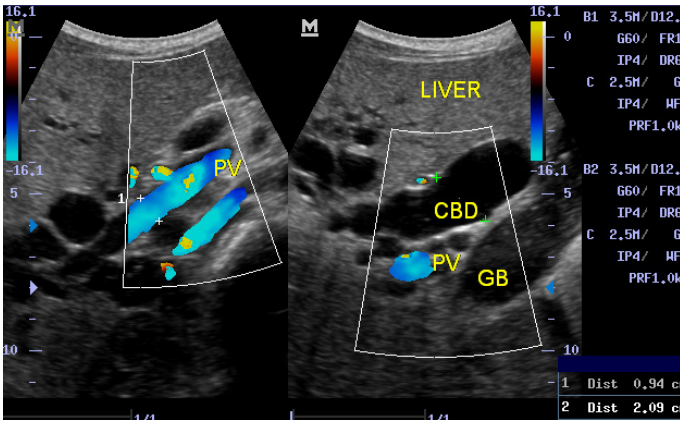
All percutaneous biliary interventions were performed by Dr. Abdulkadir Musa Tabari and Dr. Anas Ismail. Dr. Tabari received interventional radiology (IR) training in Austria. Dr. Ismail completed a radiology residency at AKTH in 2006-2011, with subspecialty training in IR via Dr. Tabari and Dr. Ahmed Ahidjo, as well as externships abroad. Dr. Ismail is currently the only interventional radiologist trained in percutaneous biliary interventions within a 500 km radius of Kano, Nigeria.

Procedures were explained in detail to the patients and informed consent was obtained. In preparing for PBD, adequate hydration with intravenous fluid, pre-procedure antibiotics, and vitamin K supplementation were ensured as needed.

The procedures were performed with a c-arm fluoroscopic unit (GE Innova 3100 and Italray digital systems) (Italray, Florence, Italy) after local anesthesia using 1% xylocaine and conscious sedation using intravenous midazolam and fentanyl.

Preliminary liver US was performed to plan the procedure. A peripheral branch of the right or left intrahepatic biliary tree was punctured with a 22G Chiba needle (Cook Medical, Bloomington, Indiana, USA) under US and fluoroscopic guidance. The core needle was then removed and diluted iodine contrast (Ultravist-300, Bayer AG, Leverkusen, Germany) was carefully injected while withdrawing the needle until bile ducts were visualized. In cases of a difficult puncture, a central duct was accessed first and contrast medium was injected to opacify the peripheral ducts, of which one was then punctured using a second needle.

**Figure 1.** Transverse color Doppler ultrasound at the porta hepatis demonstrates severe dilatation of the intrahepatic and extrahepatic bile ducts.



**Figures 2a-b.** Contrast-enhanced coronal **(2a)** and axial **(2b)** CT images of the abdomen demonstrate a poorly defined mass of intermediate density and mild contrast enhancement arising from the pancreatic head with associated dilatation of the intrahepatic and extrahepatic ducts.



Following a successful puncture, a 0.018" nitinol guide wire (Cook Medical) was inserted into the intrahepatic biliary tree followed by a 7F introducer set (Neff Percutaneous Access Set, Cook Medical). Attempts were then made with a 0.035" Glidewire (Terumo Corporation, Tokyo, Japan) and a 4F hydrophilic catheter (Glidecath, Terumo) to access the small bowel past the obstruction. When successful, the Glidewire was exchanged for a stiff 0.035" Amplatz guide wire (Boston Scientific Corporation, Marlborough, Massachusetts, USA), and an 8.5F drain (ReSolve® Biliary Locking Drainage Catheter, Merit Medical Systems, South Jordan, Utah, USA) was placed.

In three patients, access into the duodenum was achieved for internal drainage either during the initial procedure or within a few days of the initial procedure. For the other three patients where access past the obstruction was unsuccessful, an external drain (ReSolve® Biliary Locking Drainage Catheter, Merit Medical) was placed. Repeated attempts were made to access the small bowel past the obstruction, though these were unsuccessful.

While in the hospital, the drains were flushed daily. This was continued at home by the patient or a dedicated caregiver. Routine catheter exchanges were scheduled approximately every eight weeks.

### *Case 1*

An 85-year-old female presented with a one-month history of jaundice, worsening pruritus, pale stool, and tremors. Laboratory results revealed a total bilirubin of 5.9 mg/dl. CT demonstrated a poorly defined and minimally enhancing mass arising from the pancreatic head encasing the superior mesenteric vessels. There was associated severe dilatation of the entire biliary tree as well as severe ascites.

To reduce the risk of bleeding from the hepatic capsular puncture, the ascites was drained percutaneously in the procedure room prior to the PBD. Following a right-sided biliary access, an external biliary drain was placed after unsuccessful attempts at accessing the small bowel (Figures 3a-b). A repeated attempt after one week was also unsuccessful.

The patient had a transient clinical improvement within the first four weeks after the drainage, with a reduction of serum bilirubin to 2.8 mg/dl and resolution of the flapping tremors; she was discharged thereafter. She had one exchange 11 weeks lateral. However, she died six months after the procedure from hepatic encephalopathy.

### *Case 2*

A 55-year-old male presented with a three-month history of dull upper abdominal pain, jaundice, pruritus, and non-tender hepatomegaly. Laboratory results showed a total bilirubin of 6.1 mg/dl. CT revealed a pancreatic head mass with severe intrahepatic and extrahepatic biliary ductal dilatation, as well as multiple hepatic metastatic deposits.

This patient also had drainage of the ascites in the procedure room prior to the PBD, which was achieved via right-sided biliary access. Access into the small bowel was achieved for internal drain placement. There was a gradual reduction in

the bilirubin levels to as low as 1.2 mg/dl and resolution of pruritus within six weeks. This patient had drain exchanges three times, every 8-9 weeks until he was lost to follow-up.

### *Case 3*

A 40-year-old female presented with a two-month history of dull epigastric pain, abdominal fullness, jaundice, and pruritus. Laboratory results showed a total bilirubin of 4.9 mg/dl. CT revealed a poorly defined pancreatic head mass with encasement of the superior mesenteric vessels and severe dilatation of the intrahepatic and extrahepatic bile ducts.

The initial attempt at PBD placement via a right-sided biliary access resulted in placement of an external drain, as attempts at advancing the guide wire through the obstructed common bile duct (CBD) were not successful. After three days, a repeat attempt was successful.

Our hospital received a donation of two 6 mm x 60 mm WallFlexTM biliary stents (Boston Scientific Corporation) from a colleague in the United Kingdom for this patient. Two weeks after the insertion of the PBD, the obstructed CBD was dilated (Figure 4) followed by the deployment of overlapping WallFlexTM biliary stents to cover the stenotic segment. Post-stenting cholangiogram showed satisfactory drainage of bile into the duodenum (Figure 5). The external drain was then removed.

Following the procedure, the patient showed gradual clearance of jaundice (with a gradual reduction in the serum bilirubin to 1.3 mg/dl) and resolution of pruritus. The patient was lost to follow-up about 10 months after the stenting procedure.

### *Case 4*

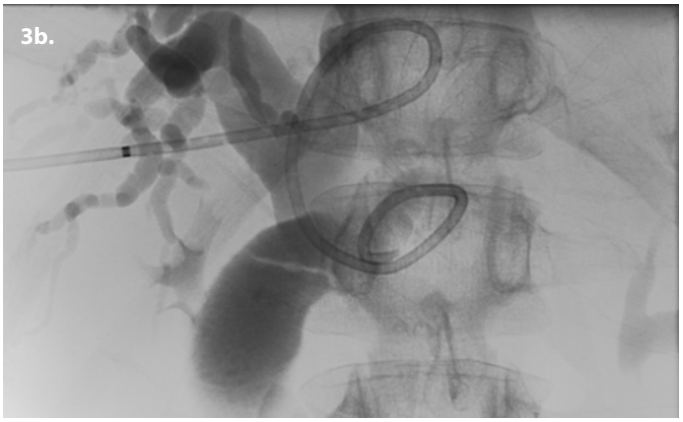
A 48-year-old male presented with a two-month history of dull upper abdominal pain, jaundice, and refractory pruritus. Laboratory results showed a total bilirubin of 6.2 mg/dl. CT revealed a poorly defined hypodense, non-enhancing mass arising from the pancreatic head with encasement of the portal vein and severe dilatation of the entire intrahepatic and extrahepatic bile ducts.

This patient had a left-sided biliary access followed by external drain placement due to unsuccessful access past the obstruction. A repeated attempt was made several days later, though also unsuccessful. He had a gradual and consistent reduction in pruritus and serum bilirubin (to 0.9 mg/dl). The drainage catheter was replaced twice at 8-week intervals before he was lost to follow-up after nine months.

### *Case 5*

An 80-year-old female presented with a two-month history of jaundice, weight loss, pruritus, pale stool, tremors, abdominal distention, and mild hepatic encephalopathy. Laboratory results showed a total bilirubin of 6.1 mg/dl. The US revealed a poorly-defined pancreatic head tumor with dilatation of the common bile duct measuring 19 mm in diameter. This was also confirmed on an abdominal CT scan demonstrating an irregular minimally enhancing mass arising from the pancreatic head, with encasement of the superior mesenteric vessels and portal vein, intrahepatic and extrahepatic biliary ductal dilatation, and marked ascites.

**Figures 3a-b.** (3a) Diagnostic cholangiogram showing severely dilated intrahepatic and extrahepatic ducts. (3b) Percutaneous transhepatic cholangiogram demonstrates successful deployment of the external drainage catheter resulting in significant decompression of the severely dilated biliary system.


In preparation for PBD, this patient took daily vitamin K supplementation for one week due to a mildly elevated INR of 1.75 in the setting of marked ascites. The ascites was drained by paracentesis 24 hours before the procedure. After access via a right-sided bile duct, access past the obstruction was unsuccessful. The repeated attempt was also unsuccessful. Although the patient's bilirubin declined to 3.3 mg/dl and pruritus improved, she died after four weeks due to a stroke.

### *Case 6*

A 48-year-old male presented with a six-month history

**Figure 4.** Cholangioplasty of the common bile duct.

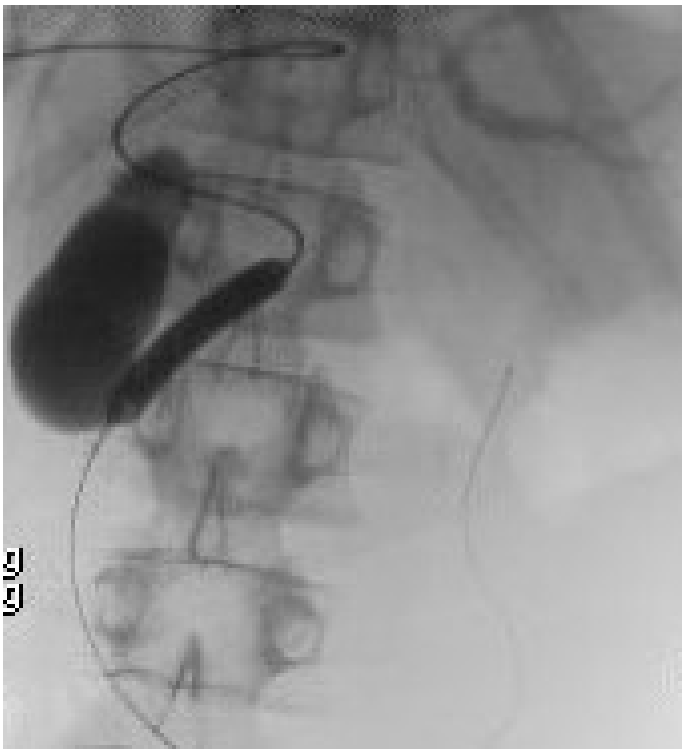


**Figure 5.** Post-stent cholangiogram demonstrates satisfactory drainage of bile and opacification of the duodenum.

of jaundice, dark urine, pale stool, severe pruritus, and significant weight loss. Laboratory results revealed an elevated total bilirubin of 5.9 mg/dl. CT demonstrated a low attenuation mass in the right hepatic lobe extending towards the hilum on non-contrast scans, with heterogeneous peripheral enhancement on the arterial phase and gradual centripetal filling on the delayed phase. The mass measured 45 mm x 61 mm in the widest axial dimension and showed encasement of the portal vein and infiltration of common hepatic ducts, with predominant dilatation of the left hepatic ducts.

Pathology results from an US-guided biopsy revealed conventional perihilar cholangiocarcinoma. In this patient, the percutaneous biliary access was achieved via left bile duct. Access to the small bowel was not achieved and an external drain was placed.

Within two weeks after PBD, the bilirubin improved to 3.8 mg/dl with remarkable relief of pruritus. The external drainage catheter was replaced twice at 8-week intervals. However, the patient died shortly thereafter from a massive upper gastrointestinal bleed.

## Discussion

In resource-limited settings with access to IR procedures, percutaneous biliary interventions are promising procedures for improving the quality of life of patients with distressing symptoms of malignant biliary obstruction (6). These interventions include external drainage, internal drainage, and balloon cholangioplasty with stent placement (7,8).

Three of our patients had external percutaneous biliary drainage due to unsuccessful fluoroscopic access past the obstruction. The other three patients had successful access past the obstruction for internal drainage. One patient went on to have cholangioplasty and placement of internal stents with removal of the percutaneous biliary drain. A similar experience was also observed by Sarkodie et al. (9) in Ghana, West Africa. However, due to the expense of internal stents, only one of our patients was able to be treated in this manner.

In this case series, five of the six patients with malignant biliary obstruction presented with advanced-stage pancreatic head cancer. This further corroborates the findings from a study by Rahman et al. (10) in Nigeria, where it was observed that the most common cause of obstructive jaundice was carcinoma in the head of the pancreas. Hepatic masses are also one of the most common causes of intrahepatic cholestasis (11). One of our patients presented with hepatic masses as a cause of obstructive jaundice, and also had a successful palliative intervention.

All of our patients presented clinically with jaundice and distressing pruritus. Following PBD, there were improvements in these symptoms. We encountered minor

**Table 1.** Summary of patients.

| Case No. | Age | Sex | Presentation | Imaging Diagnosis | Drainage | Outcome |
|---|---|---|---|---|---|---|
| 1 | 85 | F | Jaundice, pruritus, pale stool, and tremors; total bilirubin of 5.9 mg/dl | Pancreatic head mass with severe cholestasis | External drainage with a pigtail catheter | Decreased total bilirubin to 2.8 mg/dl with resolving pruritus and tremors; had one drain exchange at 11 weeks; died after 6 months due to hepatic encephalopathy |
| 2 | 55 | M | Abdominal pain, jaundice, pruritus, and hepatomegaly; total bilirubin of 6.1 mg/dl | Pancreatic head mass with severe cholestasis | Internal drainage with a pigtail catheter | Decreased total bilirubin to 1.2 mg/dl with resolving pruritus; had 3 drain exchanges at 8-9-week intervals; lost to follow-up after 10 months |
| 3 | 40 | F | Abdominal pain/fullness, jaundice, pruritus; total bilirubin of 4.9 mg/dl | Pancreatic head mass with severe cholestasis | Internal drainage followed by percutaneous cholangioplasty and stenting | Decreased total bilirubin to 1.3 mg/dl with resolving pruritus; lost to follow-up at 10 months |
| 4 | 48 | M | Abdominal pain, jaundice, pruritus; total bilirubin of 6.2 mg/dl | Pancreatic head mass with severe cholestasis | Internal drainage with a pigtail catheter | Decreased total bilirubin to 0.9 with resolving pruritus; had 2 drain exchanges at 8-9-week intervals; lost to follow-up at nine months |
| 5 | 80 | F | Abdominal distention, jaundice, pruritus, tremors, and hepatic encephalopathy; total bilirubin of 6.1 mg/dl | Pancreatic head mass with severe cholestasis | External drainage with a pigtail catheter | Decreased total bilirubin to 3.3 mg/dl with resolving pruritus; patient died after 4 weeks due to a stroke |
| 6 | 48 | M | Jaundice, dark urine, pale stool, pruritus, weight loss; total bilirubin of 5.9 mg/dl | Right intrahepatic/hilar mass biopsy proven to be cholangiocarcinoma | External drainage with a pigtail catheter | Decreased total bilirubin to 3.8 mg/dl with resolving pruritus; exchanged twice at 8-week intervals; patient died shortly thereafter from massive upper gastrointestinal bleeding |

complications such as bleeding and pain, which have also been documented in the literature (12). Further study, including long-term follow-up, is needed.

## Conclusion

In summary, the experiences of these six cases show the promise of using PBD as a minimally invasive option in the resource-limited settings of LMICs to relieve symptoms of malignant biliary obstruction.

## Conflicts of interest

The authors report no conflicts of interest.

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