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Opacification of nondilated bile ducts through the gallbladder as an aid to percutaneous transhepatic biliary drainage

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KEYWORDS
Interventional imaging;
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Percutaneous transhepatic biliary drainage (PTBD)

Abstract
Purpose: The purpose of this study was to retrospectively assess the potential of percutaneous transhepatic biliary drainage (PTBD) in patients with nondilated bile ducts (NDBD) using a transgallbladder opacification of the bile ducts.
Patients and methods: Eight patients with NDBD (7 men, 1 women; median age, 65 years; Q1—Q3, 35—69 years; range, 22—77 years) who underwent PTBD after opacification of the bile ducts through the gallbladder were evaluated. Opacification of NDBD was performed using a retrograde injection of contrast material through the gallbladder. The opacified peripheral NDBD was punctured percutaneously and a drainage catheter was introduced under fluoroscopy guidance. The success and safety of the procedure were assessed.
Results: PTBD could be achieved in 6/8 patients (75%) and no significant complications were observed. The biliary tree opacification was attempted but could not be achieved due to biliary sludge that obstructed the cystic duct in 2/8 patients (25%). Two minor complications in two different patients were observed consisting of transient hemobilia and chills.
Conclusion: Opacification of the bile ducts using a transgallbladder approach appears to be a safe and successful procedure for PTBD in patients with NDBD.

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Percutaneous transhepatic biliary drainage (PTBD) has been utilized for decompressing dilated bile ducts for almost 40 years [1]. In addition, PTBD has been used for temporary drainage in patients with nondilated bile duct (NDBD) [2]. At first, PTBD in patients with NDBD reported to be receiving a success rate of below 25%, with a complication rate of more than 20% [3,4]. In the development of new technologies and acquiring more experience with this technique, PTBD started to be a preferred method in patients having NDBDs with a higher success rate [5—8].

To our knowledge, visualization of bile ducts using opacification of the gallbladder was first reported by Illescas et al. [9]. Kühn et al. reported a few patients who underwent PTBD using a transgallbladder approach [10]. However, PTBD in patients with NDBD using a transgallbladder approach has not received a specific interest so far.

The purpose of this study was to retrospectively assess the potential of PTBD in patients with nondilated bile ducts (NDBD) using a transgallbladder opacification of the bile ducts.

Materials and methods

Protocol

Institutional review board approval was obtained prior to initiation of the study. Patients were informed about the procedure and informed consent was obtained. Between January 2012 and May 2016, 8 percutaneous biliary drainages through the transgallbladder approach in NDBDs (7 men and 1 women; median age, 65 years; Q1—Q3, 35—69 years; range, 22—77 years) were attempted at our institution. In all patients, biliary obstruction, bile leakage or biliary stricture was presumed likely by the consultant physician. All patients had increased serum direct bilirubin levels (median: 4.9 mg/dL, range: 1.2—8.7 mg/dL).

NDBDs were confirmed on ultrasonography (Aplio 50®, Toshiba Medical Systems Inc., Tokyo, Japan) or computed tomography (CT) (Somatom Definition®, Siemens Healthineers, Forchheim, Germany) before PTBD or by direct demonstration of the NDBD during the procedure. None of the patients had indwelling T-tubes.

The underlying diseases and indications for percutaneous biliary drainage were suspected biliary obstruction at the level of distal common biliary duct in 5 patients, biliary leakage in 1 patient and biliary strictures caused by previous episode of cholecystitis at the right main hepatic duct in 1 patient and chronic pancreatitis at the distal common bile duct in 1 patient. PTBDs were performed to relieve symptoms and decrease serum bilirubin level in all patients.

Data analysis

Radiologic and electronic chart review was performed in all patients. All relevant pathology reports, surgical notes and laboratory data were analyzed. The Society of Cardiovascular and Interventional Radiology guidelines were used to determine complications of PTBD [11]. Complications were categorized as either acute or delayed. Acute complications of biliary procedures were divided into major and minor ones. Major complications consisted of significant venous or arterial hemobilia, biliary sepsis, abscess, peritonitis, cholecystitis pancreatitis, transgression of adjacent structures (colon, pleura, and bowel) and death. Minor complications included procedural pain, acute pancreatitis without clinical symptoms, transient venous hemobilia, fever and chills. Delayed complications included postclamping cholangitis, cholangitis with multiple segmental obstruction, leaking around catheter, dislodgement of catheter, delayed cholangitis and tube obstruction [12,13].

Fluoroscopy time was evaluated in patients as an indirect measure of the radiation exposure and it was defined as the total time of exposure to x-rays per procedure.

Operative technique

Complete blood count and bleeding tests were done before the procedure. Patients with an INR < 1.5 and platelet count > 50,000/mm^3 were eligible for the procedure. All procedures were performed using a flat panel angiography unit (Axiom Artis® Biplane Angiosuite and Artis Zee®, Siemens Healthineers) under local anesthesia (prilocaine 20 mg/mL, Citanest®, AstraZeneca, Cambridge, UK) by an interventional radiologist with 15 years of experience. Oxygen saturation, blood pressure, heart rate and rhythm were monitored in all patients by using non-invasive methods. The risk of sepsis was decreased by administration of prophylactic antibiotics. Piperacillin/tazobactam (Zosyn®; Wyeth Pharmaceuticals, Inc, Philadelphia, PA), which covers gram-positive and negative organisms, was utilized in all patients and dosage adjustments were done as needed.

After skin preparation (povidone iodine 10%, Batticon®, Adeka) of the right flank, local anesthesia was injected and the puncture was started by advancing the 22-gauge (G) Chiba needle (Argon Medical, Athens, Texas) through the skin into the liver. Then the needle was advanced through a transhepatic course into the gallbladder. Sonographic guidance was used to localize the needle. Approximately, 50 mL iodinated contrast agent (Ultravist 300®, Schering AG, Berlin, West Germany) was injected into the gallbladder and cholangiogram was obtained with an infusion of contrast media. At the end of the gallbladder puncture and retrograde opacification of the intrahepatic biliary tree, a volume of combined contrast and bile greater than that originally injected was aspirated and the needle was then removed from the gallbladder. Following opacification of the biliary tree, the inferior part of the right lobe was established for right-sided access. A 22 G Chiba needle was accessed to the liver in the mid-axillary line and was directed toward an opacified peripheral ducts (Fig. 1). For left-sided approaches, the needle punctured just lateral to the xiphoid and directed toward an opacified peripheral ducts in the left lobe depending on the biliary anatomy under fluoroscopy guidance. In all patients, a 0.018-inch guidewire was advanced into the bile duct, toward the common bile duct. Thereafter, a sheathed dilator (Accustick set®; Meditech/Boston Scientific, Watertown, MA) was passed over the wire. The wire was supported with a 0.035-inch guidewire (Terumo Medical, Tokyo, Japan) in selected cases. Lastly, an 8-French (F) drainage catheter (Argon Medical) was placed through the guidewire with its tip in the duodenum (Fig. 1).

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