

Percutaneous transhepatic biliary drainage/cholangiodrainage Percutaneous transhepatic gall bladder drainage/cholecystostomy

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Percutaneous transhepatic biliary drainage (PTBD) is one of the effective procedures for the obstructive jaundice due to the malignant or the benign diseases such as biliary stone. PTBD has been established since 1970's and has become popular in the worldwide and been made more sophisticated by the improvement of the medical equipment such as ultrasound and some devices about percutaneous puncture. Recently endoscopic approach has been established and spread widely according to development and improvement of endoscopy, however there are still difficult cases to perform endoscopic approach such as post surgical state like the Billroth II reconstruction after gastrectomy or hilar bile duct obstruction. Interventional radiologists should be familiar with PTBD including percutaneous transhepatic gall bladder drainage (PTGBD). In this lecture we will discuss about indication, conventional procedure, management and complication about percutaneous biliary intervention, especially PTBD.

Indication

PTBD has been indicated for obstructive jaundice, cholangitis, especially acute obstructive suppurative cholangitis (AOSC), removal of foreign body in bile duct and so on. Obstructive jaundice is caused by the benign disease such as biliary stone, pancreatitis, cholangitis and iatrogenic status and the malignant disease such as pancreatic cancer, bile duct cancer, cholangiocarcinoma, gall bladder cancer, lymph node metastasis and so on.

The purpose of PTBD is not only drainage but also the next step as follows to relief the patients' condition or problem. In case with biliary stone the lithotomy and/or the removal of stone would be followed via percutaneous route. In cases with benign stricture the continuous dilatation of biliary tract would be performed by thick drainage tube and/or the permanent stent. On the other hand, in most of case with malignant biliary obstruction the metallic stent is useful. In cases without definitive diagnosis, benign or malignant, the forceps biopsy via the percutaneous route is effective.

Endoscopic retrograde cholangiography (ERC) is the first attempt for biliary interventional choice. PTBD is more invasive and painful than ERC, mainly because the PTBD procedure involves puncturing the liver capsule and parenchyma. It also poses the risks of hemoperitoneum and bile peritonitis and the risk of dissemination in malignant disease. PTBD is currently indicated for the patients in whom ERC is failed when the

biliary tract cannot be cannulated or when the distal bile duct of the obstruction cannot be visualized.

We should perform PTBD and PTGBD carefully in cases with bleeding tendency because bleeding tendency is one of the risk factors of hemorrhagic complication in percutaneous procedure. And massive ascites is a relative contraindication. (We could perform PTBD after the aspiration of the ascites.)

Preparation, procedures and managements

The operator should evaluate patient laboratory data and grasp the anatomical features of biliary tree and the level of the obstruction of bile duct by ultrasound, CT, MRI including MR cholangiography (MRC) to plan the actual procedure in detail such as the puncture site and the needle size before the procedure.

After the patients is positioned appropriately, sterilized (fig 1) and draped, intravenous sedation is sometimes performed and also the antibiotics is administered because most of patients with obstructive jaundice have infected bile. The local anesthesia (using 1% lidocaine) is performed for the small skin incision and needle puncture. It is very important to anesthetize not only the skin puncture site and also the hepatic capsule to reduce the pain during the procedure (fig 2,3,4,). The small incision for the needle puncture is also important to advance the needle without any resistance (fig 5).

The ultrasound is the most popular guiding image for the needle puncture so we should be familiar with ultrasound-guided puncture (fig 6). We advance the thick needle (19-gauge) for the dilated bile duct (larger than accompanying portal vein) but the puncture would be performed for the non-dilated bile duct with a thinner needle (21-23 gauge).

After confirming the needle cross the targeted bile duct under US guidance, the inner stylet is removed and then pull it back gradually until the bile juice is refluxed (fig 7). Then we injected the small amount of contrast material. We should never use too much volume of the contrast material because the injection of much volume of contrast material, 'overdistention of an obstructed bile duct' results can cause bacteremia, sepsis, and endotoxic shock.

After confirming the puncture point of the bile duct and the anatomy of bile duct, we advance the guidewire into the bile duct (fig 8). The hydrocoated guidewire should never been inserted through the metallic needle because the coating of the hydrocoated guidewire is peeled off when the guidewire is removed through the metallic needle.

The aspirated bile duct should be examined for chemical examination, cytology and bacteriology.

Finally we place the drainage tube such as pigtail type catheter, straight type catheter and the tube with some locking system (fig 9).

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The drainage tube should be fixed tightly not to migrate it (fig 10).

Usually a few days after the 1st PTCD we perform 'the endoprosthesis', which means we advance the catheter/the drainage tube over the obstruction.

The fixation of the drainage tube on the skin is very important to prevent the migration of the drainage tube. We have to check the volume of the drained bile juice everyday because decreasing the volume of bile juice may suspect the migration of the drainage tube.

Complication

Complication during the procedure include pneumothorax, bleeding, vagal reflux, bacteremia including sepsis and endotoxic shock, and bile peritonitis.

Complications after the procedure include dehydration, electrolyte imbalance, bile peritonitis and bile pleuritis.

Complications related the drainage tube include the tube migration, the perforation or the penetration of the tube into the duodenum or the bile duct, the tube impairment. Patients with coagulopathy, cholangitis, stones, malignant obstruction, or proximal obstruction will have higher complication rates.

Management of bleeding complications

Major bleeding related the PTBD procedure is caused by portal vein injury or arterial injury.

Bleeding due to the portal injury is not critical. The exchange of a thicker drainage tube is effective. But arterial bleeding is sometimes life threatening and the patients sometimes complain hematemesis or melena. Arterial bleeding is mainly caused by the injury of the accompanying artery with the puncture site bile duct. So selective transcatheter arterial embolization (TAE) is one of the most effective treatments for hemostasis.

Summary

PTBD is a simple technique but this procedure includes many important techniques and tips of non-vascular intervention. Interventional radiologist should be familiar with this procedure and need to know the complication and management.

Reference

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Saad WEA, Wallace MJ, Wojak JC, Kundu S, Cardella JF. Quality improvement guidelines for percutaneous transhepatic cholangiography, biliary drainage, and percutaneous cholecystostomy. J Vasc Interv Radiol 21:789-795; 2010



Figure 1 Sterilized area



Figure 2 local anesthesia; inject lidocaine until skin is lifted and pores be clarified

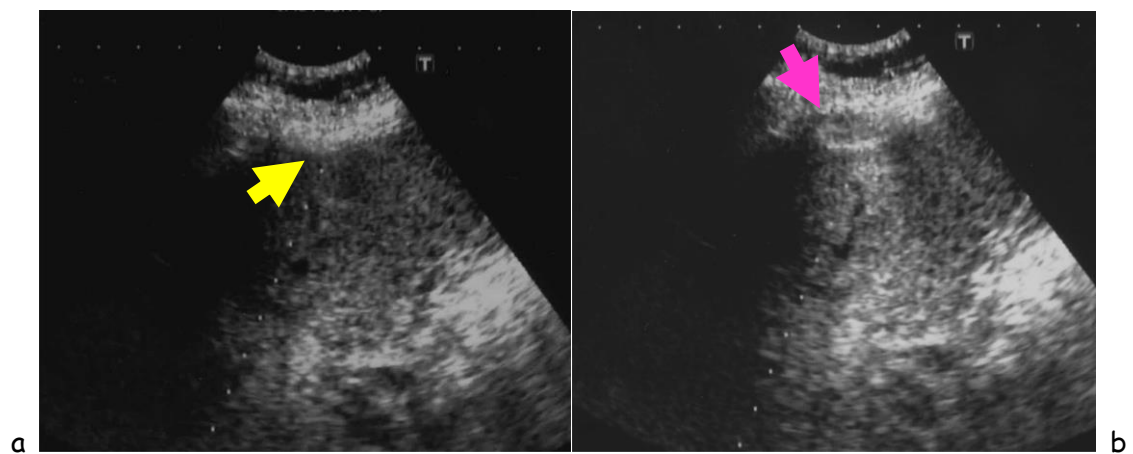


Figure 3; inject Lidocaine into the surface of the liver
3a before injection of lidocaine, 3b after injection

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Figure 4; skin incision
Skin incision with sufficient depth and length



Figure 5; expansion of the incision site



Figure 6
Needle puncture with grasping the probe firmly under US guidance

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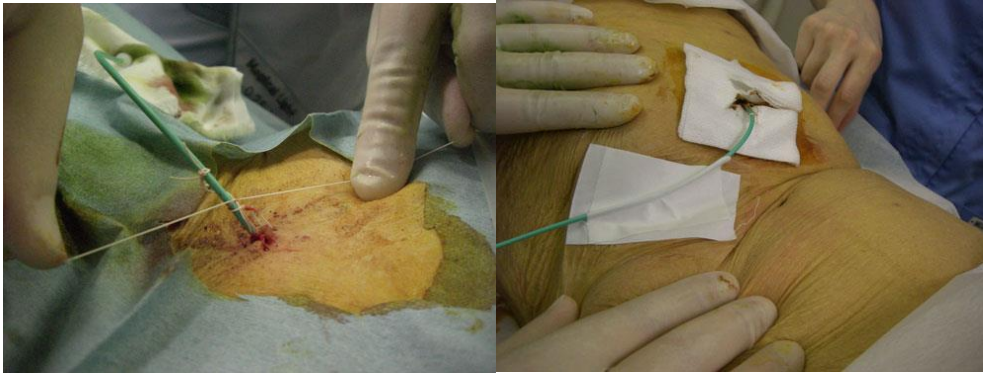
Figure 7; aspirate the bile juice



Figure 8 advance the guidewire



Figure 9 Exchange the drainage tube



a|b

Figure 10 Fixation of the drainage tube

a: fixation with suturing, b fixation and dressing of the drainage tube with a cohesive tape