Journal of Korean Medical Science
Vol. 7, No. 4, 325-332 December 1992

Percutaneous Transhepatic Biliary Biopsy Using Gastrofiberscopic Biopsy Forceps

Chong Soo Kim, M.D., Young Min Han, M.D., Ho Young Song, M.D., Ki Chul Choi, M.D., Dae Ghon Kim, M.D.,* Baik Hwan Cho, M.D.**

Departments of Radiology, Internal Medicine, and Surgery***
Chonbuk National University Medical School

To obtain a histopathologic diagnosis at the site of a biliary obstruction, we recently have performed 24 cases of biliary biopsy using gastrofiberscopic biopsy forceps (Olympus, Tokyo, Japan) via transhepatic tracts provided in the course of the procedure of percutaneous biliary drainage.

Histopathologic diagnosis was successfully made at the first attempt of biopsy procedure but a second trial was made a week later in 6 cases who were negative for malignant cells on the first attempt. The histological results from the biopsy specimens were 18 adenocarcinomas, 5 chronic inflammations and one normal epithelium. Of 6 cases who were negative for malignant cells on forceps biopsy specimen, three cases were confirmed as adenocarcinoma of the ampulla of Vater, adenocarcinoma of the pancreas and chronic pancreatitis by surgical biopsy. The latter was a true negative result, which was diagnosed as chronic inflammation on forceps biopsy and verified as chronic pancreatitis by surgery. The remaining two cases were diagnosed as malignant obstructive jaundice by clinical and radiological follow-up findings.

Major complications (bile peritonitis, bleeding, and hemopneumothorax) occurred in 3 patients, which mainly arose in the earlier period of study.

This procedure can be performed at the same time as percutaneous transhepatic biliary drainage with low morbidity or mortality, and although the potential for perforation of bile ducts and injury to adjacent blood vessels is considered, it is a useful addition to existing biopsy techniques for yielding material sufficient for histologic analysis.

Key Words: *Bile ducts, biopsy • Bile ducts, percutaneous drainage • Biopsies, technique*

INTRODUCTION

Preoperative diagnosis of the causes of bile duct obstruction can be made by ultrasound, computed tomography or percutaneous transhepatic cholangiography. However, imaging findings often have limited value in differentiating bile duct carcinoma from other possible causes of biliary obstruction. In these instances, tissue diagnosis is very important and sometimes the correct diagnosis can be established only after operation (Smith-Ayre, 1978). So far, over several years, variable methods for obtaining tissue specimens have been developed (Hall-Craggs et al., 1986; Cropper et al., 1983; Portner et al., 1982; Cope et al., 1988; Yip et al., 1989). But most methods did not produce material suitable for histopathologic interpretation, only providing specimens for cytologic interpretation.

We have tried to perform a biopsy with gastrofiberscopic biopsy forceps via the transhepatic tracts which were installed for decompression of biliary obstruction. The purpose of this study is to describe a method to provide satisfactory specimens from the bile duct for histopathologic interpretation.

Address for correspondence: *Chong-Soo Kim, Department of Radiology, Chonbuk National University Medical School. San 2-20, Keumam Dong, Chonju City 560 182, Republic of Korea. Tel: (0652) 250-1173*

PATIENTS AND METHOD

Between February 1989 and December 1991, 24 patients with malignant bile duct stricture diagnosed by clinical or radiological studies were included in the study. Fourteen patients were men, and ten were women. The average age of the patients was 59 (range, 39-79 years). All of our patients received intravenous antibiotics before the biopsy procedure.

First, percutaneous transhepatic access for the biopsy forceps was made by the same technique of percutaneous biliary drainage which is described elsewhere (Harell et al., 1981; Smith-Ayre, 1978). After gradual dilation with several dilators (up to 8 French), an 8.3F Desilet-Hoffman catheter set (COOK, Bloomington, U.S.A.) was inserted, and positioned at the site of the mass under fluoroscopic control (Fig. 1A). In order to get enough specimens to make a precise histopathologic diagnosis, it was most important to secure the Desilet-Hoffman catheter set into the tumor mass so that the forceps could hold the tissue in the center of the mass. After removal of introducer, only the 8.3F sheath was placed within the mass (Fig. 1B), and after an additional injection of contrast media, radiographs were obtained to confirm that the sheath is within the stricture. Then, a long biopsy forceps of the gastrofiberscope (Olympus, Tokyo, Japan) was forcefully advanced through the sheath to the center of the mass under fluoroscopic control (Fig. 1C). After the tip of biopsy forcep was correctly positioned within the tumor, specimens were taken from the mass (Fig. 1D). Biopsy was performed as many times as necessary to obtain adequate tissue for diagnosis. The specimens were inspected macroscopically by the radiologists and pathologic technician to assess the adequacy of the specimen. After biopsy, the guide wire was directed through the obstructing lesion and then the introducer sheath was followed along the guide wire. Finally, internal drainage or stent placement was performed. If the guide wire could not be advanced through the obstruction, only external drainage was performed.

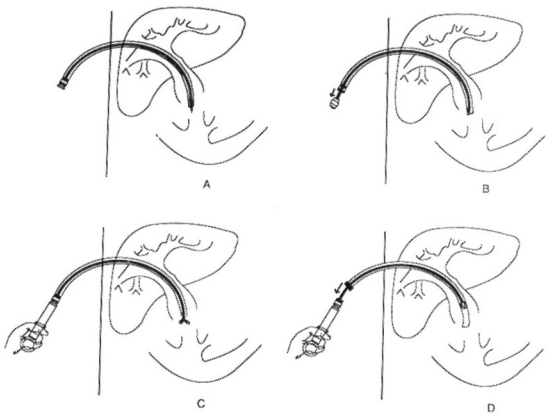


Fig. 1. Schematic representation of the procedure.
a) An 8.3F Desilet-Hoffman catheter set is packed into the tumor mass.
b) After removal of introducer, only the sheath is left.
c) Long biopsy forceps are advanced as far as it will pack into the mass under fluoroscopic control.
d) Biopsy specimen is taken from the mass.

RESULTS

The level of the biliary obstruction was the common hepatic duct in ten patients, common bile duct in twelve patients, and ampulla of Vater in two patients.

The first attempt of forceps biopsy provided satisfactory pieces of tissue from the obstructive site of the bile duct for histopathologic diagnosis except in 2 cases which revealed degenerative blood clots and fibrotic fragments. The results at the first attempt were adenocarcinoma in 16 cases, acute or chronic inflammations in six cases and inadequate specimens in 2 cases. In 6 out of 8 cases who had shown non-malignant cells at the first attempt, second trial was done after one week, which added two adenocarcinoma from the re-biopsy specimens. But in the remaining two cases, we could not try second trial because of sudden death and refusal of rebiopsy. So, the sum of the histopathologic results after froceps biopsy was consistent with 17 adenocarcinoma of bile duct (Fig. 2), one adenocarcinoma of the ampulla of Vater (Fig. 3), five acute or chronic inflammations and one normal columnar epithelium. Ten patients were verified as adenocarcinomas of the bile duct, ampulla of Vater and pancreatic cancer by operation (Table 1). One patient who had undergone surgery 1 year earlier for bile duct malignancy was confirmed as a recurrence of cholangiocarcinoma. Of six patients who were negative for malignancy after forceps biopsy, final diagnosis was established by surgery in three, which indicated pancreatic carcinoma, adenocarcinoma of the ampulla of Vater and chronic pancreatitis. The remaining cases were suggested as malignancy only by clinical and radiological follow-up. The remaining one case had revealed a chronic inflammation after forceps biospy and chronic cholangitis with pancreatitis on surgical specimen. So, it was regarded as a true negative result (Fig. 4). An analysis of our result revealed that the sensitivity was 78.2% and specificity 100% without false positive result.

Major complications occurred in three patients, but they mainly occurred in the early period of the study. The bile peritonitis was a fatal complication. Another complication was bleeding from the drainage tube and the last one was hemopneumothorax. The bleeding stopped spontaneously and the hemopneumothorax was controlled only by thoracostomy.

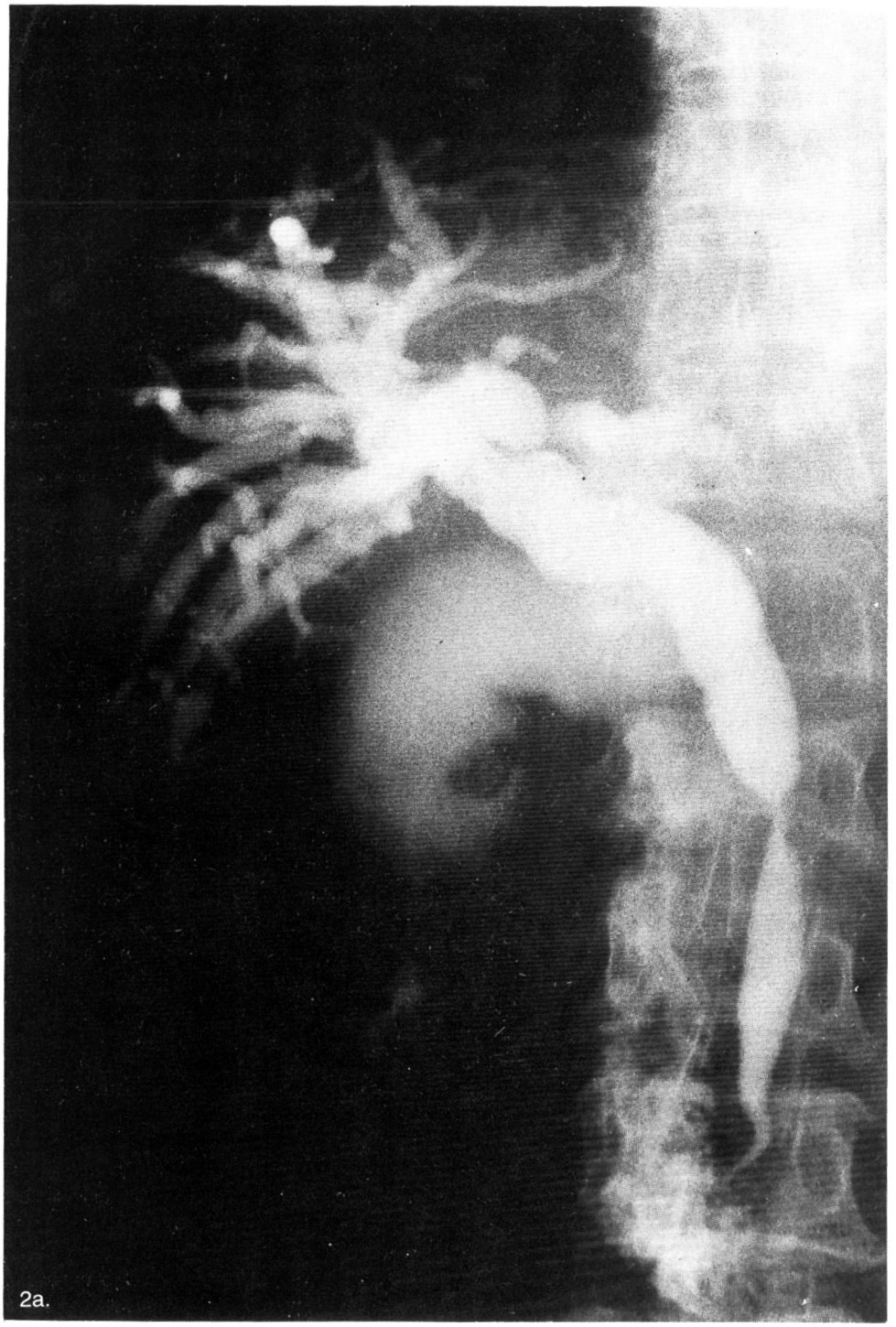
DISCUSSION

Bile cytology was recommended as a simple noninvasive method for confirmation of cholangiographic diagnosis in patients undergoing percutaneous biliary drainage. But it has revealed a high false negative rate because, if the obstructing tumor has not completely eroded through the endothelium of the bile duct, the exfoliative cells of bile cannot serve as a medium for cytologic diagnosis (Harell et al., 1981; Muro et al., 1983). According to the precise localization of mass by new imaging modalities such as ultrasound and computed tomography, percutaneous fine needle aspiration biopsy has been well established as a method of nonoperative tissue diagnosis. However, biliary tumor is very difficult to localize because it may be small, particularly if no mass is present (Hall-Craggs and Lees, 1986).

When a transhepatic biliary drainage catheter is in place, the access route provided by percutaneous transhepatic catheterization may be used as a conduit for variable biopsy instruments such as a long needle, brushes or forceps and could easily be approached to the ductal or periductal mass instead of multiple transperitoneal punctures. Among a variety of methods previously performed for biopsy in patients with biliary drainage catheters, brush biopsy (Croper and Gold, 1983; Mendez et al., 1980) has been a popular sampling method. However, since this technique only scrapes the mucosal surface, it has not often been suitable for biopsy of tumors growing predominantly in the submucosal layers (Portner and Koolpe, 1982). To overcome the disadvantages, modified methods from conventional brush biopsy or various other techniques were developed and could reduce the proportion of failure due to sampling er-

Table 1. Correlation with forceps biopsy and operative results in 10 patients

Patient	Age/Sex	Forceps biopsy	Operative biopsy
1	62/M	Chronic inflammation	Adenocarcinoma of the ampulla of Vater
2	58/M	Adenocarcinoma, well differentiated	Cholangiocarcinoma, well differentiated
3	74/M	Adenocarcinoma, well differentiated	Cholangiocarcinoma, well differentiated
4	58/M	Adenocarcinoma, moderately differentiated	Cholangiocarcinoma, moderately differentiated
5	46/F	1st trial: Fibromuscular tissue 2nd trial: Adenocarcinoma, well differentiated	Cholangiocarcinoma, well differentiated
6	49/M	1st trial: Normal epithelium 2nd trial: Chronic inflammation	Adenocarcinoma of the pancreas
7	46/F	1st trial: Chronic inflammation 2nd trial: Chronic inflammation	Chronic cholangitis with chronic pancreatitis
8	68/F	Adenocarcinoma, well differentiated	Cholangiocarcinoma, well differentiated
9	60/F	Adenocarcinoma, well differentiated	Adenocarcinoma of the ampulla of Vater
10	78/F	Adenocarcinoma, poorly differentiated	Cholangiocarcinoma, poorly differentiated



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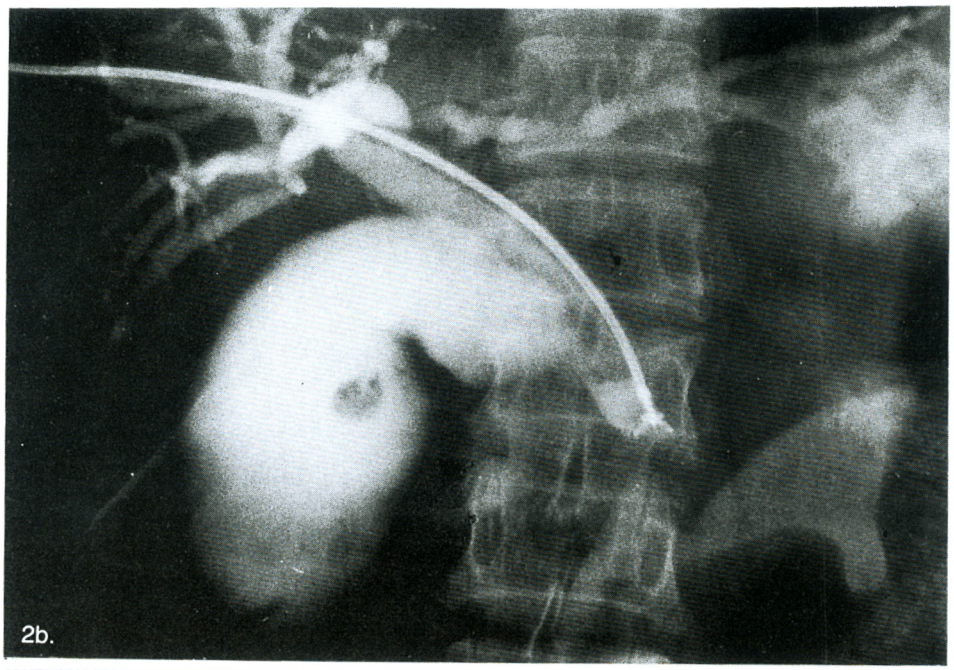


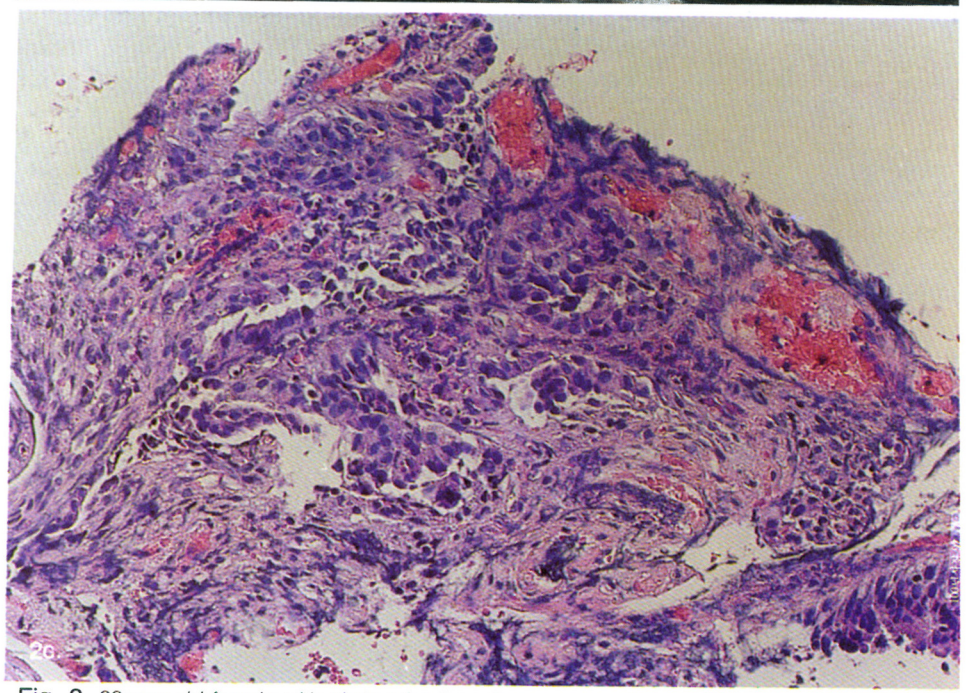
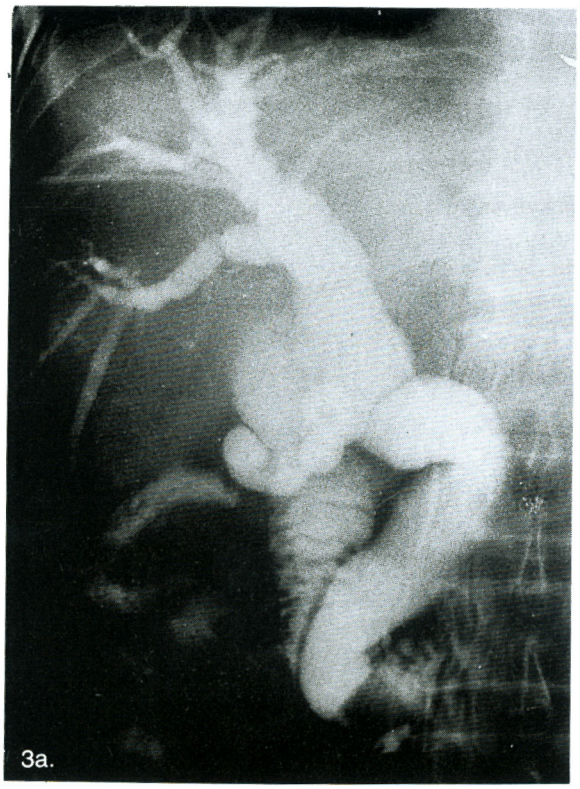
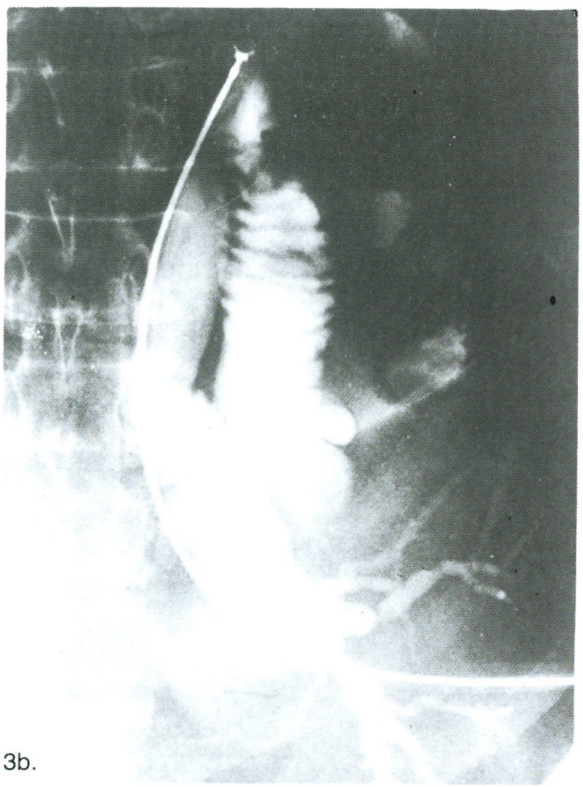


Fig. 2. 68-year-old female with obstructive jaundice.
a) Transhepatic cholangiogram shows typical "rat-tail" shaped segment in the proximal CBD, and a stone in the GB.
b) Forceps are introduced through an introducer sheath into the tumor, and then sample tissue specimen is taken.
c) Microscopic specimen shows an adenocarcinoma, duct-like structures being lined by cuboidal or columnar cells.





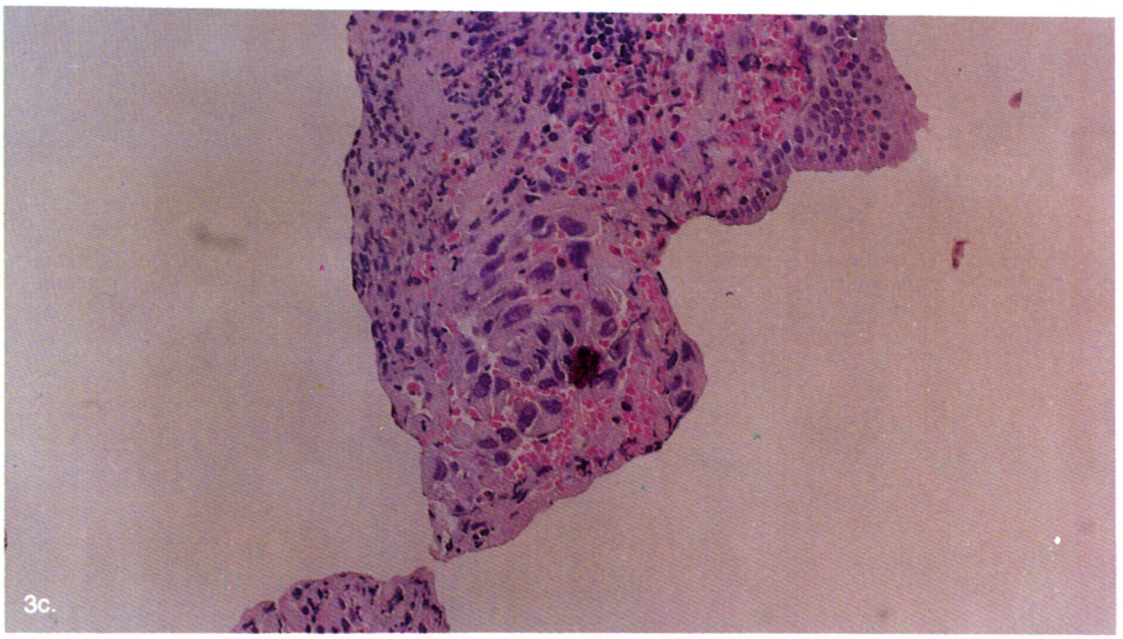
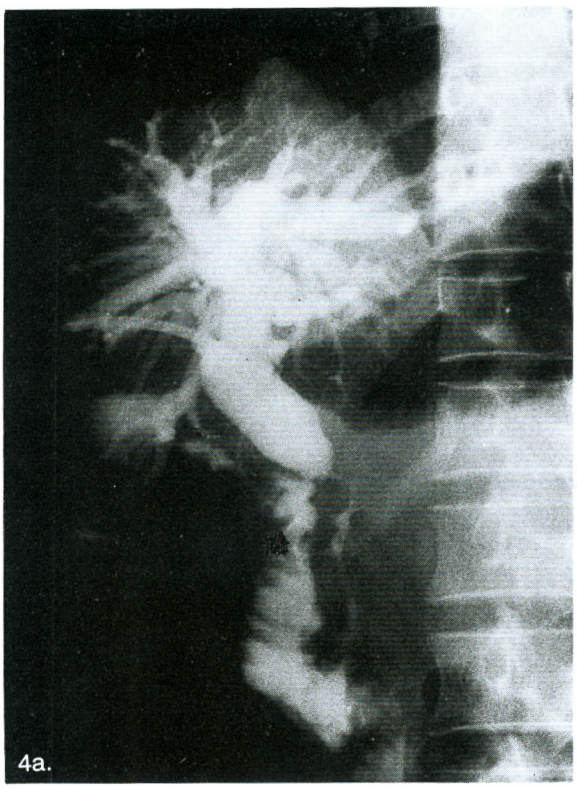


Fig. 3. 60-year-old female with jaundice.
a) Cholangiogram shows smooth tapering of distal CBD and marked dilatation of biliary trees.
b) Biopsy forcep was packed into the site of the obstruction, which is the area of the ampulla of Vater, and multiple tissue samples were taken.
c) The microphotograph shows vascular proliferation, inflammatory cells infiltration and embeded neoplastic cell nests in the stroma. It was proved as adenocarcinoma of the ampulla of Vater by operation.



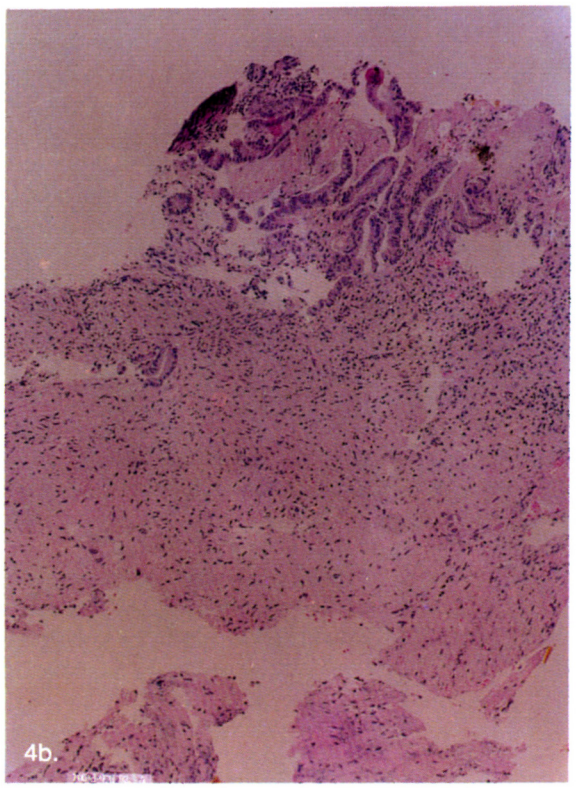


Fig. 4. A 47-year-old women, who had recurrent jaundice, fever, and right-upper-quadrant pain.
a) Transhepatic biliary drainage was performed. Cholangiogram shows a long stricture of the common bile duct, from which subsequently multiple tissue specimens were taken at the stricture site. Histological examination of first attempt was consitent with fibroblast proliferation and chronic inflammation.
b) Tissue specimens from second trial were also consistent with normal columnar epithelium and heavily inflammatory cell infiltration, without neoplastic cells.It was proved as chronic pancreatitis with cholangitis by operation (Transduodenal Sphincteroplasty with transampullary septectomy). After operation, she has remained free from recurrent jaundice and fever for 13 months.

rors (Cope et al., 1988; Portner and Koolpe, 1982; Yip et al., 1989). Most techniques are based on only scraping the mucosal surface or simple aspiration so that only specimen suitable for cytologic examination can be obtained.

It has been stated that cytologic specimens can not identify the origin of neoplastic tissue and that it may be difficult to diagnose well differentiated tumors such as cholangiocarcinomas (Cotran et al., 1989; Muro et al., 1983). Therefore, to obtain deeper biopsy specimens including from the submucosal layers and to obtain the histopathologic diagnosis, Kim and colleagues (1990) have used atherectomy devices designed originally for the treatment of atherosclerotic occlusive disease. But this technique could not be performed routinely because it always had a high potential for injury during passage to the bile duct. On the other hand, although only one case was performed and the result was a false negative, forceps biopsy through percutaneous transhepatic catheterization had been reported early by Elyaderani and Gabriele (1980). We also used biopsy forceps designed for gastrofiberscopic biopsy as a biopsy instrument via the transhepatic tract. Since it is long enough to reach the site of distal biliary obstruction and flexible enough to allow passage easy through the angulation of the bile duct, we thought, it would be suitable to approach percutaneously the site of a biliary obstruction. An analysis of our results revealed that desirable results were obtained in intraductal tumors, whereas less satisfactory results were obtained in extraductal tumors. The main reason for false negative results with extraductal tumors was probably due to the failure to penetrate the ductal wall which acts as barrier. To overcome this problem, in the later review, our consideration was forcefully to pack the forceps tip into the center of the mass, if possible. However, it has some limitations in obtaining extraductal tissue such as pancreas or liver.

Complications such as bile duct perforation, bleeding, and hemopneumothorax occurred in three cases, but they mainly occurred in the earlier period of this study. The perforation which was fatal was caused by catheterization process rather than the biopsy procedure. Hemopneumothorax which may be due to a puncture at high level was easily controlled by proper management and the hemorrhage from the drainage tube stopped spontaneously after one day. Theoretically, it may be safer to perform intrahepatic biopsy rather than an extrahepatic biopsy because hemorrhage and bile leakage can be limited by the parenchyma of the liver (Cope et al., 1988). Although our results come only from a small series of cases, we had relatively a few complications with our procedures in spite of mostly extrahepatic obstruction. Generally, biting instruments such as biopsy forceps should be used with great caution to avoid perforation of bile ducts and injury to adjacent blood vessels.

Percutaneous transhepatic cholangioscopy (Gandini et al., 1988; Nimura et al., 1988) and transcatheteral cholangioscopy are other methods for collecting tissue material if the cholangioscopy is available. It takes 2 weeks to insert a flexible fiberoptic choledochoscope through the intrahepatic fibrous tract after dilatation of transhepatic duct to a larger diameter. Also, in transcatheteral cholangioscopy, a catheter of a larger diameter and more extensive dilatation are needed for the passage of the cholangioscope through the catheter, which can cause more complications.

As a conclusion, although our results have been obtained from a small series, we presume that this method is a desirable method for making a precise histopathological diagnosis routinely during the procedure of percutaneous transhepatic biliary drainage. Also the overall sensitivity of 78.2% compares favorably with the sensitivities of bile cytology (34%) (Murc et al., 1983), percutaneous fine needle aspiration (60%) (Hall-Craggs and Lees, 1986) and brush biopsy (57-60%) (Mendez et al., 1980; Cropper and Gold, 1983; Yip et al., 1989).

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