

## RESEARCH ARTICLE

# Comparison of Infection between Internal-External and External Percutaneous Transhepatic Biliary Drainage in Treating Patients with Malignant Obstructive Jaundice

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## Abstract

**Purpose:** Percutaneous transhepatic biliary drainage (PTBD) is a form of palliative care for patients with malignant obstructive jaundice. We here compared the infection incidence between internal-external and external drainage for patients with malignant obstructive jaundice. **Methods:** Patients with malignant obstructive jaundice without infection before surgery receiving internal-external or external drainage from January 2008 to July 2014 were recruited. According to percutaneous transhepatic cholangiography (PTC), if the guide wire could pass through the occlusion and enter the duodenum, we recommended internal-external drainage, and external drainage biliary drainage was set up if the occlusion was not crossed. All patients with infection after procedure received a cultivation of blood and a bile bacteriological test. **Results:** Among 110 patients with malignant obstructive jaundice, 22 (52.4%) were diagnosed with infection after the procedure in the internal-external drainage group, whereas 19 (27.9%) patients were so affected in the external drainage group, the difference being significant ( $p < 0.05$ ). In 8 patients (36.3%) in the internal-external group infection was controlled, as compared to 12 (63.1%) in the external group ( $p < 0.05$ ). The mortality rate for patients with infection not controlled in internal-external group in one month was 42.8%, while this rate in external group was 28.6% ( $p < 0.05$ ). **Conclusion:** External drainage is a good choice, which could significantly reduce the chance of biliary infection caused by bacteria, and decrease the mortality rate at one month and improve the long-term prognosis.

**Keywords:** Internal-external drainage - external drainage - infection incidence - malignant obstructive jaundice

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## Introduction

Percutaneous transhepatic biliary drainage (PTBD) is becoming more and more useful as a palliative treatment for patients with malignant obstructive jaundice, which could not only significantly reduce bilirubin levels, improve liver function and prolong survival time, but also be used as a preoperative drainage, provide the conditions for subsequent treatment (De et al., 2013). But several studies have confirmed that biliary infection after PTBD is a major independent risk factor affecting patients with malignant obstructive jaundice survival time, which could damage the patient's liver function, reduce survival quality, shorten the life time (Kawakami et al., 2011; Yu et al., 2010). In our center, if the guide wire could pass through the occlusion and into the duodenum, we prefer to use internal-external drainage, while the occlusion is not crossed, external drainage biliary catheter is placed. We think that internal-external drainage in the treatment of

malignant obstructive jaundice not only leading bile flow into intestine, maintaining the physical channel of bile drainage, also declining bilirubin level quickly which is beneficial to the recovery of liver function and reduce the gastrointestinal complications caused by lack of bile (Xu et al., 2014; Xu et al., 2014; Xu et al., 2014). In order to compare the infection incidence between internal-external and external percutaneous transhepatic biliary drainage for patients with malignant obstructive jaundice, we collect patients with malignant obstructive jaundice receiving these procedures in January 2008 and July 2014.

## Materials and Methods

### Patients

We retrospectively analysis 193 patients with malignant obstructive jaundice receiving internal-external or external drainage in January 2008 and July 2014. 110 patients with no infection preprocedure were analyzed,

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**Table 1. Bacteria Culture Results**

Bacteriology	Internal-external group	External group
<i>E. coli</i>	4	3
Dung enterococcus	5	2
Excrement enterococcus	3	
Giallo enterococcus	2	
<i>Pseudomonas aeruginosa</i>	2	3
<i>Klebsiella pneumonia coli</i>	1	3
<i>Staphylococcus aureus</i>	1	2
<i>Acinetobacter baumannii</i>	2	2
ESBLs <i>e. coli</i> example	1	1
ESBLs with <i>klebsiella pneumoniae</i>	1	3

including 42 patients with internal-external drainage and 68 patients with external drainage. All patients provided written, informed consent for the procedure, and our institutional review board approved the retrospective review of the patients' medical and imaging records.

#### Treatment

PTBD was performed in the interventional diagnosis and treatment center, with the patient under local anesthesia by two interventional radiologist, using continuous fluoroscopy. Intravenous prophylactic antibiotic was given before all procedures using a second-generation cephalosporin or according to the oncologist's recommendation. Biliary puncture were carried out using a 21G Chiba needle through the ninth or tenth intercostal space at the right hemiclavicular line level for the right-lobe bile duct access or by the left anterior subxiphoid access for left-lobe bile ducts. After bile duct contrastation, a coaxial system (NPAS-100; Cook, Bjæverskov, Denmark) was introduced and a 0.035-in. angled-tip hydrophilic guidewire (Glidewire; Terumo, Tokyo, Japan) was used to cross the stenotic/obstructive area. During the procedure, if the guide wire could pass through the occlusion and into the duodenum, we prefer to use internal-external drainage, external drainage biliary catheter was placed if the occlusion was not crossed.

#### Biliary infection diagnostic criteria

Patients with biliary infection diagnostic criteria after PTBD in 1 month: chills, high fever, with or without abdominal pain, have jaundice, peripheral blood WBC > 10.0×10<sup>9</sup>/L and neutrophils ratio > 75%, combined with blood and bile bacteria culture results, and exclude other causes of infection.

#### Bacterial culture and drug susceptibility analysis

All patients with postprocedure infection were received cultivation of blood and bile bacteriology. Bacterial culture and drug susceptibility analysis: sterile loop line inoculated in sheep blood/rabbit blood AGAR plate within 20 min, and place in the 37 °C incubation box 24 hours. Choosing appraisal board accord to the colony morphology and using French merry Emmanuel VITEK - AMS60 automatic analyzer to analyze bacteria. Quality control strains were *E. coli* standard strains (ATCC25922), *pseudomonas aeruginosa* standard strains (ATCC27853), *staphylococcus aureus* (ATCC25923). The judgement

standard on the basis of the National Committee for Clinical Laboratory Standards (NCCLS). ESBLs test according to NCCLS recommended double paper method, drug sensitive test is Kirby-Bauer diffusion method and drug susceptibility of paper is from oxoid company in America.

#### Statistical analysis

Infection incidence parameters were evaluated by t test and  $\chi^2$  or Fisher's exact test, and considered as statistically significant if the P value was under 0.05. All statistical analyses were done using SPASS 17.0.

## Results

110 patients with malignant obstructive jaundice underwent PTBD were all successful, including 42 patients with internal-external drainage, 68 patients with external drainage, no major complication occurred during the process of procedure. According to biliary infection diagnostic criteria after PTBD in one month, germiculture and drug susceptibility analysis. All patients with infection received biliary/blood bacteria culture and drug susceptibility analysis. Experience antibiotics were used before results come out, and sensitive antibiotic treatments were taken until bacteriology results conformed (bacteria culture results are shown in Table 1).

22 patients with infection after procedure in the internal-external drainage group, the infection incidence was 52.4%. 19 patients infection in the external drainage group, the infection incidence was 27.9%. The comparison was statistically significant ( $P < 0.05$ ). 8 patients with infection in the internal-external group were under controlled, 14 patients were not controlled (infection control incidence was 36.3%). 12 patients with infection in the external group were under controlled, 7 patients were not controlled (infection control incidence was 63.1%) ( $P < 0.05$ ). 8 patients (internal-external group was 6, external group was 2) were dead in one month in 21 patients with infection were not controlled, mainly for septic shock and multiple organ failure. The mortality rate of patients with infection not controlled of internal-external group in one month was 42.8%, while the mortality rate of external group was 28.6%, the comparison was statistically significant ( $P < 0.05$ ).

## Discussion

Malignant obstructive jaundice is a cumbersome complication in patients with advanced solid malignancies. PTBD offers a safe and effective method in providing palliative treatment for patients with biliary obstruction, which can relieve symptoms and restore serum biochemistry to normal. This optimizes the clinical condition of the patients for receiving palliative chemotherapy or radiotherapy, bringing about an improvement in their quality of life (Lofts et al., 1997; Shin et al., 2013). Biliary infection is one of the most common complications after PTBD, also is the important cause leading patients death (Dambraukas et al., 2003). Biliary obstruction could lead cholestasis, while bile is

a good medium which is advantageous to the bacteria breeding (Herzog et al., 2012). High bilirubin levels is easy to cause bacterial translocation, intestinal flora and damage intestinal mucosa barrier (Ho et al., 2013). Patients' resistance is often poor, which aggravating the possibility of infection.

It is generally believed that there are three possible ways cause infection after PTBD (Ozden et al., 2005; Kaya et al., 2012). The first is bacteria from out of body vitro drainage tube into the bile duct; the second is from intestinal flora retrograde into the bile duct; the third is from blood spread to biliary tract. In our study, we consider that the infection mainly related to retrograde intestinal juice because most of the bacteria come from the intestinal flora according to the result of culture. On the one hand, this may relate to the guide wire enter into the intestinal during procedure and take the intestinal bacteria into the biliary tract when withdraw the wire. On the other hand, intestinal juice may flow into the biliary tract tube when drainage the bile due to the external drainage bag pressure is lower than the pressure in the intestine, which cause infection. And patients with malignant obstructive jaundice generally have weak status, the immune system function is lower, and increases the risk when take a further invasive treatment (Boursier et al., 2009).

It is generally believed that the internal-external drainage conforms to physiological drainage, the patient's infection rates should be lower and get a better prognosis. In previous reports, the incidence of biliary infection after external drainage was 6.5% - 22% (Todoroki et al., 2000). Our analysis suggests, however, the infection rate in the internal-external drainage group is 52.4%, significantly higher than the 27.9% in the external drainage group. The internal-external drainage does not reduce infection incidence after PTBD. Infection is also the independent factor influencing the prognosis of patients with malignant obstructive jaundice (Namias et al., 2005; Zhu et al., 2012). In our study, patients' mortality in the internal-external group was 42.8% in one month due to infection was not controlled, significantly higher than the 28.6% in the external group. The infection rate in the internal-external group is high, and the infection is not easy to control after procedure, increasing risk of death within one month after the drainage. Other literatures also conform that patients' mortality who receiving internal-external drainage significantly higher than the external drainage or biliary stenting treatment (Simmons et al., 2006; Westwood et al., 2010). The internal-external drainage has no related to be beneficial for the physiological drainage and could achieve good prognosis as we previous thought. We analyze this phenomenon may related to the structure of the internal-external drainage design. Some bile flow into the intestine and also there were some bile flow into to the drainage bag at the same time because we did not shut three-way cock when drainage, this inevitably cause intestinal juice reflux, which greatly increases chances of intestinal retrograde infection, as most of the bacteria from the intestinal which is consistent with the culture results. The infection rate in the external drainage group was lower than those of the internal-external drainage group, because patients with malignant obstructive jaundice received the

external drainage, guide wire is not pass the obstructive position into the intestines, and few bacteria come into the biliary tract through wire, reduced the risk of biliary infection. Due to biliary obstruction without opening, also reduce the chances of bacteria retrograde infection. Some scholars suggested that considering the general condition of patients with malignant obstructive jaundice are poor and their survival time are short (Englesbe et al., 2005; Thunyaharn et al., 2013). The external drainage is a good choice to treat the malignant obstructive jaundice, especially combined with patients with preoperative infection, which could significantly reduce the chance of biliary infection caused by bacteria retrograde (Jong et al., 2013).

To sum up, although the internal-external drainage seems to satisfy physiological drainage, the higher infection and mortality rate after drainage affect the long-term prognosis. We believe that patients with malignant obstructive jaundice need to biliary drainage, the external drainage is a good choice, especially combined with patients with preoperative infection, which could significantly reduce the chance of biliary infection caused by bacteria retrograde, increase bile drainage efficiency and improve the long-term prognosis.

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