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Author: J. Shu, Q. Yang, X. Lv, W. Zhang, M. Li, X. Zhang, D. Song, G. Ye and L. Wang

Title: Percutaneous endoscopic gastrostomy/jejunostomy combined with percutaneous transhepatic biliary drainage in treating malignant biliary obstruction

Journal: Medical Principles and Practice **ISSN:** 1011-7571

Year: 2011

Volume: 20

Issue: 1

Pages: 47-50

Abstract: Objective: To investigate the safety and efficacy of percutaneous endoscopic gastrostomy/jejunostomy (PEG/PEJ) combined with percutaneous transhepatic biliary drainage (PTCD) in treating malignant biliary obstruction. Subjects and Methods: Nine patients (6 males, average age 71.3-±5.5 years) with complete obstruction of biliary tract were treated with PEG/PEJ after PTCD. The PEG/PEJ and PTCD tubes were linked outside of abdominal wall to direct the externally drained bile back to jejunum through the PEG/PEJ intestinal tube. Clinical symptoms and liver function were assessed following the treatment. Results: The operations were successfully completed in the 9 patients within in 40 min (average 35-±2.9 min). Clinical symptoms, such as jaundice, abdominal distension, stomachache and diarrhea appear to be alleviated within 7 days of the operation. Serum levels of bilirubin, AST and ALT were reduced ($P < 0.01$) 4 weeks following the treatment. There were no procedural complications. Conclusions: Combined PEG/PEJ and PTCD appears to be safe and effective in the management of malignant biliary obstruction. Further, larger scale studies will be needed to verify findings of this report.

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URL: http://www.gastro2009.org/scien_prog/abstract_detail.php?navId=93&ssid=2395

<http://www.ncbi.nlm.nih.gov/pubmed/21160214>

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CRO Number: 11983

**Percutaneous endoscopic gastrostomy/jejunostomy combined with
percutaneous transhepatic biliary drainage in treating malignant biliary
obstruction**

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Key words: percutaneous endoscopic gastrostomy/jejunostomy; percutaneous transhepatic
biliary drainage; biliary obstruction; hepatic function.

Abstract

Objective: To investigate the safety and efficacy of percutaneous endoscopic gastrostomy/jejunostomy (PEG/PEJ) combined with percutaneous transhepatic biliary drainage (PTCD) in treating malignant biliary obstruction. **Subjects and Methods:** Nine patients (**6 males, average age 71.3±5.5 years**) with complete obstruction of biliary tract were treated with PEG/PEJ after PTCD. The PEG/PEJ and PTCD tubes were linked outside of abdominal wall to direct the externally drained bile back to jejunum through the PEG/PEJ intestinal tube. Clinical symptoms and liver function were assessed following the treatment. **Results:** The operations were successfully completed in the 9 patients within in 40 min (average 35±2.9 min). Clinical symptoms, such as jaundice, abdominal distension, stomachache and diarrhea **appear to be alleviated** within 7 days of the operation. Serum levels of bilirubin, AST and ALT were reduced ($P<0.01$) 4 weeks following the treatment. There were no procedural complications. **Conclusions:** Combined PEG/PEJ and PTCD **appears to be safe and effective in the management of** malignant biliary obstruction. **Further, larger scale studies will be needed to verify findings of this report.**

Introduction

Obstruction jaundice has been associated with decreased quality of life in patients with biliary tract malignancy [1]. Treatment of malignant biliary obstruction depends on the resectability of the underlying neoplasm. In patients who are inoperable due to advanced stages of cancer, drainage catheters or stents have been used in recent years to relieve the symptoms associated with the biliary obstruction [2-5]. **The primary purpose of this study was to evaluate the efficacy and safety of** percutaneous endoscopic gastrostomy/jejunostomy (PEG/PEJ) combined with percutaneous transhepatic biliary drainage (PTCD) in treating malignant biliary obstruction.

Materials and methods

Patient recruitment

This study was approved by the institutional review board of Guangzhou Red Cross Hospital. Written informed consent was obtained from all participants. Between May 2004 and September 2009, 9 patients who were inoperable for malignant biliary obstruction were recruited to this study. All patients underwent routine physical and laboratory examination, including blood cell count, prothrombin time, liver and kidney function, electrocardiogram (ECG) and chest x-ray. Computer tomography (CT) examination was carried out to confirm the location of biliary obstruction. Upper gastrointestinal endoscopy examinations were also performed to exclude pyloric obstruction, stomach tumor, or gastric ulcer.

Percutaneous transhepatic biliary drainage (PTCD)

PTCD was chosen as a primary therapy and performed according to a previously reported method [6]. Under local anesthesia and guided by fluoroscopy, a 20-21G Chiba needle (Nycomed, Paris, France) was inserted into the biliary tract through the space between right 11th and 12th thoracic vertebra. A contrast medium was injected through the needle into the biliary tract to display the position and degree of obstruction. When this was achieved, a thin (0.018) guide wire was inserted through the needle into the biliary system, and the needle was removed. A 5F tube was inserted via the guide wire into the biliary tract and the site of obstruction.

The guide wire was then replaced by an ultra hard guide wire, the 5F tube was removed and a 7F biliary drainage catheter (Biosphere Medical, Louviers, France) was passed over the guide wire and placed into the bile ducts. This drainage catheter was flushed with antibiotic once or twice daily. Intravenous antibiotics were also given to all patients for about a week following the insertion of the drainage catheter.

Percutaneous endoscopic gastrostomy/jejunostomy (PEG/PEJ)

Under light sedation, PEG procedure was performed according to the method reported by Ponsky [7, 8]. PEJ operation was performed on the basis of PEG [9]. After the placement of gastrostomy tube, the PEJ intestinal tube (Freka® PEG Set Gastric FR 15, Fresenius Kabi AG, Bad Homburg, Germany) was inserted to the stomach through the gastrostomy tube. The distal end of the intestinal tube was grasped with a forceps and the endoscope with the forceps in its channel was passed into the duodenal bulb. Under direct observation the tip of the intestinal tube was grasped while in the stomach as shown and then advanced to a

point below the ligament of Treitz (Fig1). The PEJ intestinal tube was fixed to the PEG gastrostomy tube. Then the PEG/ PEJ tube was connected with the PTCD tube outside of the abdominal wall (Fig 2). **Under physiological conditions, bile is excreted into duodenal lumen through duodenal papilla. The jejunal extension tube connected with PTCD tube is beneficial to maintain normal biliary circulation and avoid injuries of gastric mucosa caused by the bile.**

Statistics

Results were expressed as Means \pm SD. Statistical difference were examined by student *t* test. Differences were considered to be statistically significant at $P < 0.05$.

Results

There were 6 males and 3 females, with an average age of 71.3 ± 5.5 years (rang 61-81 years). The complete obstruction of biliary tract was caused by cholangiocarcinoma (n=4), pancreas cancer (n=4) or liver cancer (n=1). Serum bilirubin was greater than $179 \mu\text{mol/l}$ in all patients.

Each operation was completed within 40 min (average 35 ± 2.9 min). Biliary drainage was successfully created in all patients. This was confirmed by the flow of contrast medium from the biliary system to jejunum through PEJ tubes under X-ray inspection (Fig 3).

There was a significant reduction in serum bilirubin, GGT, AST and ALT within 4 weeks of the procedure (Table 1). **All patients reported relief of jaundice, abdominal distension, abdominal pain and diarrhea within 7 days of the operation.**

No complications were observed during or following the operations. **There was no peri-operative infection, and no preventative antibiotics were used in these patients. The biliary drainage was examined daily during the hospitalization, and weekly after discharge. The drainage tube could be easily assessed by observing the quality and quantity of the discharges, and now contrast media examination was required or attempted. There was no evidence of tube dislodgement or occlusion during the followed up.** The average time of survival of the patients following the operation was 5.7 ± 2.1 months (range 2 to 10 months).

Discussion

The major findings of this study are: 1) in patients with malignant biliary obstruction, PEG/PEJ combined with PTCD provided adequate bile drainage, leading to significant improvement of clinical symptoms; 2) the serum levels of bilirubin were reduced and liver function was improved following this novel treatment; 3) there were no procedural complications such as infection of drainage tube dislodgment or obstruction during hospitalization or follow up.

PTCD is a common choice of therapy when surgical or endoscopic therapies were unsuccessful or unsuitable [3-5]. However, following PTCD patients have to carry drainage pack for a long time which is inconvenient. Furthermore, long-term loss of massive bile may cause metabolic disturbances and affect the quality of life of the patients.

Combined PEG/PEJ and PTCD offers several benefits in treating malignant obstruction of biliary tract: 1) bile circulation route accords with physiological enterohepatic circulation; 2) the procedure helps with the normal absorption and digestion processes; 3) it reduces the

loss of fluid, gastric acid and electrolytes; 4) it may improve the patient's quality of life through the relief of symptoms associated with biliary obstruction.

Despite the difficult conditions seen in such patients, thus far no major technical problems have been encountered during tube placement. One of the potential limitations of this study is that the numbers of the patients were relatively small, and the follow up was relatively short because of the life span constraints on these terminally ill patients. Therefore the long-term effect of this treatment is unknown. Frequently mentioned contraindications for PEG, such as infiltration of the stomach by tumor, ascites, or peritoneal carcinosis (10, 11), would apply to this combined PEG/PEJ and PTCD therapy. Furthermore, patients with coagulation disturbance will not be suitable candidates for these procedures.

In conclusion, the combined PEG/PEJ and PTCD procedure appears to be safe and effective in alleviating the symptoms of malignant biliary obstruction. Larger clinical trials are required to confirm the long-term safety and efficacy of this treatment.

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Table 1. Liver function before and after PTCd and PEJ procedures (n=9).

	Before	Week 1	Week 2	Week 3	Week 4
Tbil ($\mu\text{mol/L}$)	350.8 \pm 34.2	227.9 \pm 28.4	135.5 \pm 22.8	119.3 \pm 19.7	54.9 \pm 16.2*
GGT (U/L)	369.2 \pm 39.8	291.6 \pm 29.9	173.3 \pm 25.3	127.8 \pm 21.2	124.6 \pm 13.6*
ALT (U/L)	196.7 \pm 27.7	71.0 \pm 9.5	39.3 \pm 6.2	26.0 \pm 4.6	24.0 \pm 3.4*
AST (U/L)	166.4 \pm 23.3	54.3 \pm 8.1	45.0 \pm 6.9	44.7 \pm 7.5	44.0 \pm 5.1*

Note: * $P < 0.01$. TBil: total bilirubin; GGT: gamma glutamyl transferase; ALT: alanine aminotransferase; AST: aspartate aminotransferase.

Figure legends

Fig 1. Under direct observation the tip of the intestinal tube was grasped while in the stomach as shown and then advanced beyond the ligament of Treitz.

Fig 2. PTCD tube (A) was joined with PEG/PEJ tube (B) outside of the abdominal wall.

Fig 3. Under X-ray inspection, successful biliary drainage was confirmed by the flow of contrast medium (arrow) from the biliary system to jejunum through PTCD and PEJ tubes.

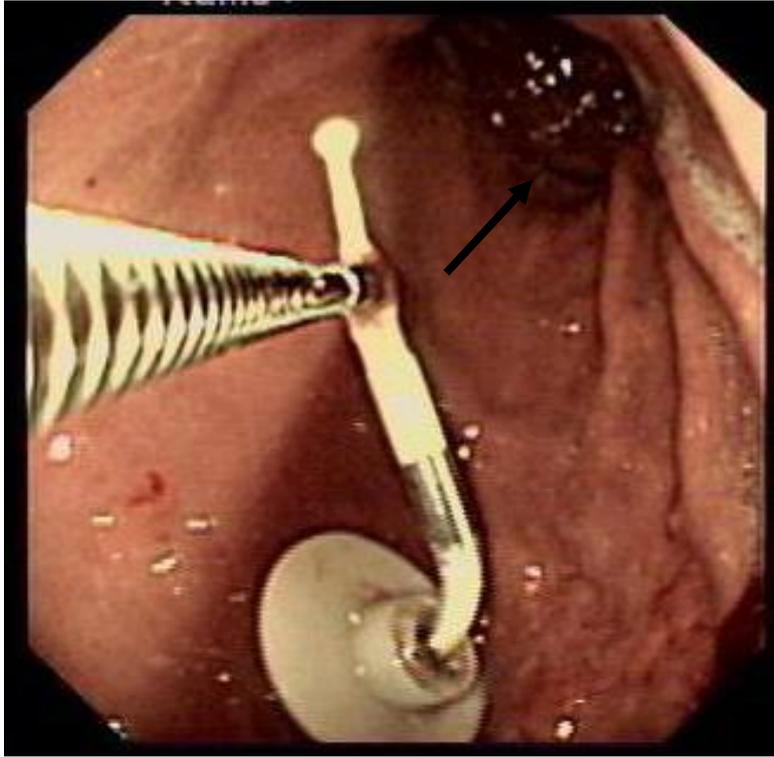


Fig 1.

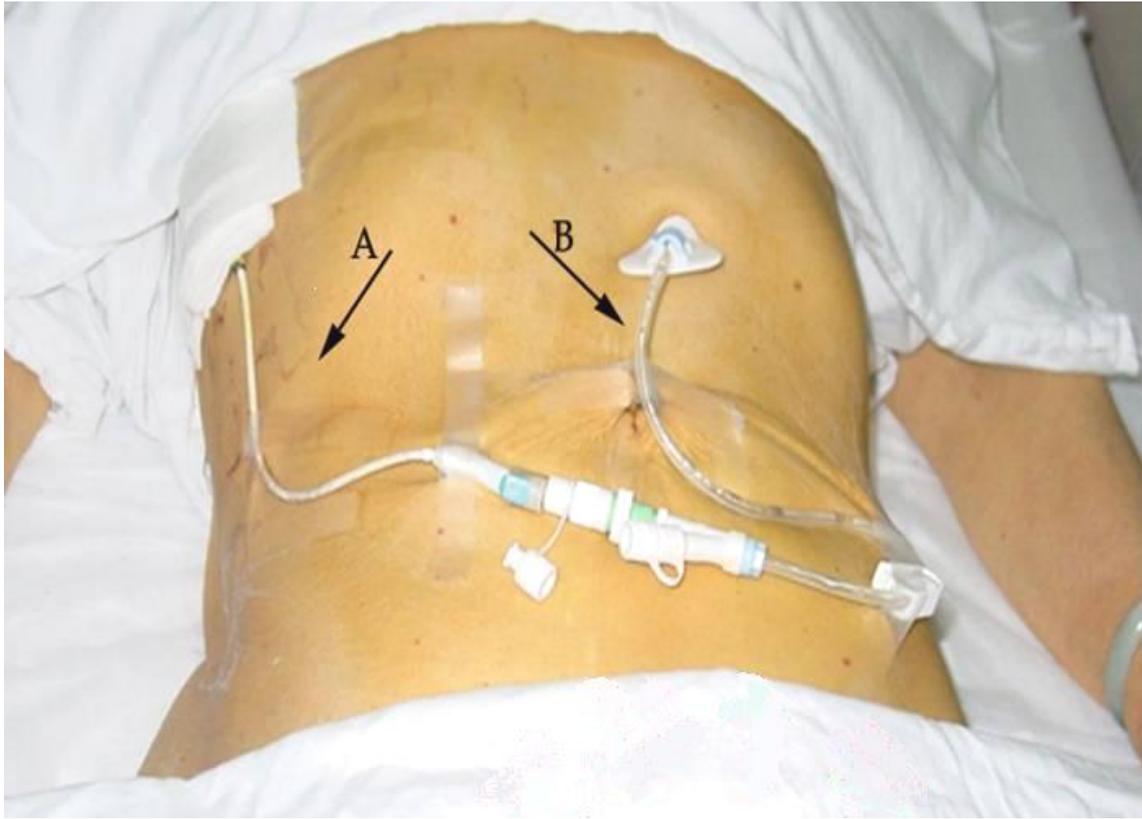


Fig 2.

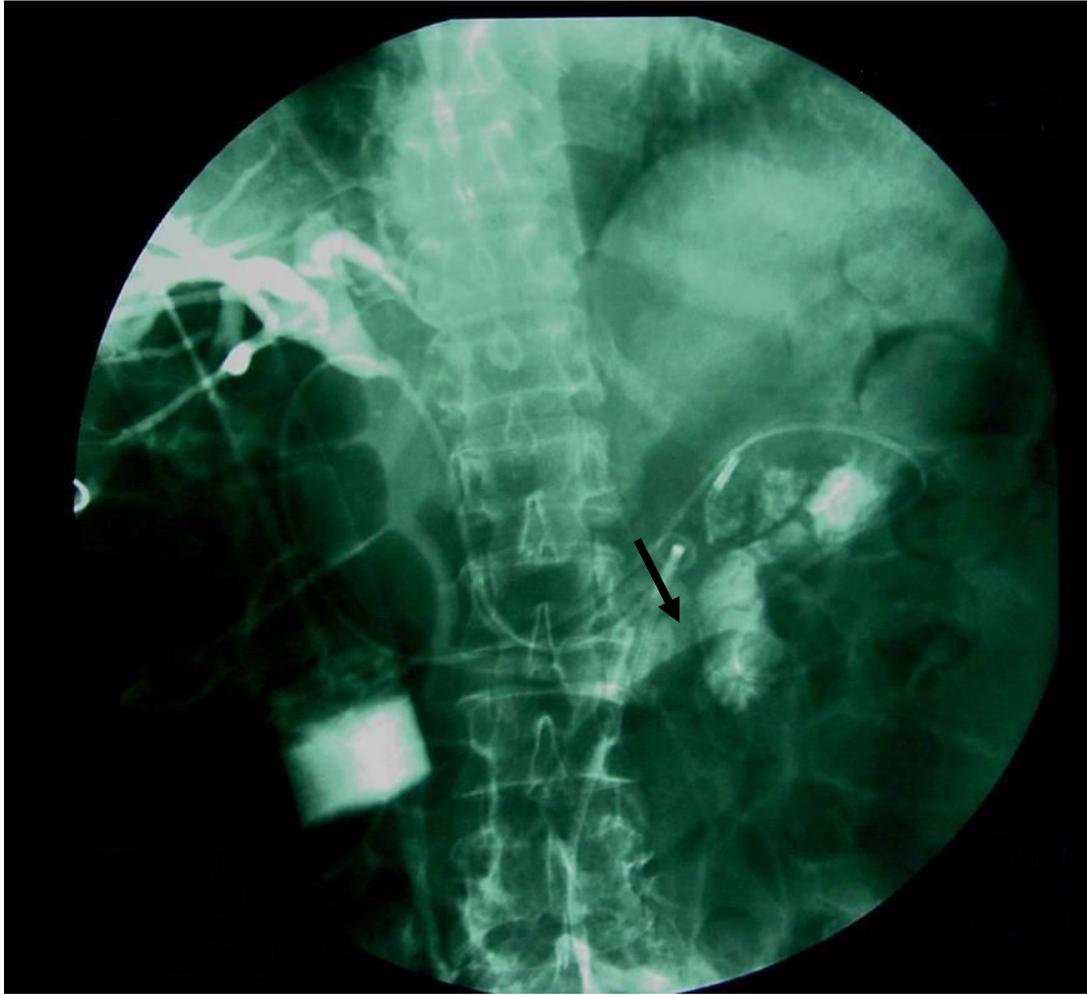


Figure 3.