

# Percutaneous Drainage for Afferent Limb Syndrome and Pancreatic Fistula via the Blind End of the Jejunal Limb after Pancreatoduodenectomy or Bile Duct Resection

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## ABSTRACT

**Purpose:** To investigate the feasibility of percutaneous drainage via the blind end of the jejunal limb (BEJL) for afferent limb syndrome and pancreatic fistula.

**Materials and Methods:** Percutaneous drainage via the BEJL was performed in eight patients (seven men and one woman; mean age, 63 y; range, 42–71 y) presenting with afferent limb syndrome (n = 6) or pancreatic fistula (n = 2) following pancreatoduodenectomy or bile duct resection with reconstruction at our institute from March 2005 to June 2013. Reconstruction was performed by using a modified Child method or the Roux-en-Y method, and the BEJL was surgically fixed to the abdominal wall. Afferent limb syndrome was caused by tumor recurrence or postoperative complications. Technical success, clinical success, and complications were evaluated retrospectively.

**Results:** Technical success of drainage via BEJL was achieved in all patients. Drainage catheters (5–10 F) were inserted into the afferent limbs of six patients, into the pancreatic duct of one patient, and into the pancreatic fistula of one patient. Metallic stents were subsequently placed to address malignant afferent limb obstruction in two patients. Clinical success was achieved in seven patients (87.5%), and no patients developed major complications. Drainage catheters were removed from four patients. The mean catheter indwelling period in all patients was 143 days (range, 21–292 d).

**Conclusions:** Percutaneous drainage via BEJL after pancreatoduodenectomy or bile duct resection may be a feasible treatment for afferent limb syndrome and pancreatic fistula.

## ABBREVIATIONS

BEJL = blind end of the jejunal limb, PD = pancreatoduodenectomy, PTBD = percutaneous transhepatic biliary drainage

For patients with pancreatic and biliary cancers, the prognosis remains poor and surgical resection is the only available curative treatment (1,2). Postoperative or

delayed complications can occur after pancreatoduodenectomy (PD) or bile duct resection with reconstruction (3–5). Occasionally, it is difficult to treat these conditions because of the occurrence of complicated anatomic changes after operative reconstruction. The best reconstruction method in the context of PD has been controversial, and several reconstruction methods exist, including a modified Child method (6–8). During the postoperative management associated with this modified Child method, pancreatic and biliary drainage tubes are guided outside of the body through the jejunal limb, and the blind end of the jejunal limb (BEJL) is surgically fixed to the abdominal wall (7,8). On the contrary, reconstruction during bile duct resection has been generally performed by using the Roux-en-Y method, during

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which biliary drainage tube insertion is guided by using the same method used for PD (9,10).

Postoperative complications includes pancreatic fistula, bile leakage, and afferent limb syndrome. The reported incidence rates of pancreatic fistula and bile leakage range from 5%–25% and 0.4%–8%, respectively (3,4,7). Afferent limb syndrome was defined as mechanical obstruction of the afferent limb resulting in pancreatobiliary problems (5). The reported incidence of afferent limb syndrome after PD for pancreatic cancer in a single-center experience (5) was 13%, with the incidence of malignant afferent limb obstruction secondary to recurrence being 33% in these patients.

The treatment for pancreatic fistula and bile leakage is external drainage of the pancreatic and bile fluids that have leaked from the anastomotic site (3,4,7). However, major leakages occasionally require a long treatment period (4). Previously, afferent limb syndrome was treated via palliative surgical bypass or percutaneous transhepatic biliary drainage (PTBD) (5,11,12). However, the success rate of palliative surgical revision in patients with afferent limb syndrome is low because of the poor general condition of the patient, peritoneal adhesions, or disseminated tumors (13). Although PTBD provides excellent symptom relief, it may introduce the risk of retrograde biliary infection and is unsuitable for patients with massive ascites (13–15). Recently, the efficacy of metallic stent placement to treat afferent loop syndrome via the PTBD route has been described (13,16), and the usefulness of endoscopic intervention for afferent limb syndrome has also been reported (5,17). However, these procedures may be technically difficult in patients with adhesions or massive ascites.

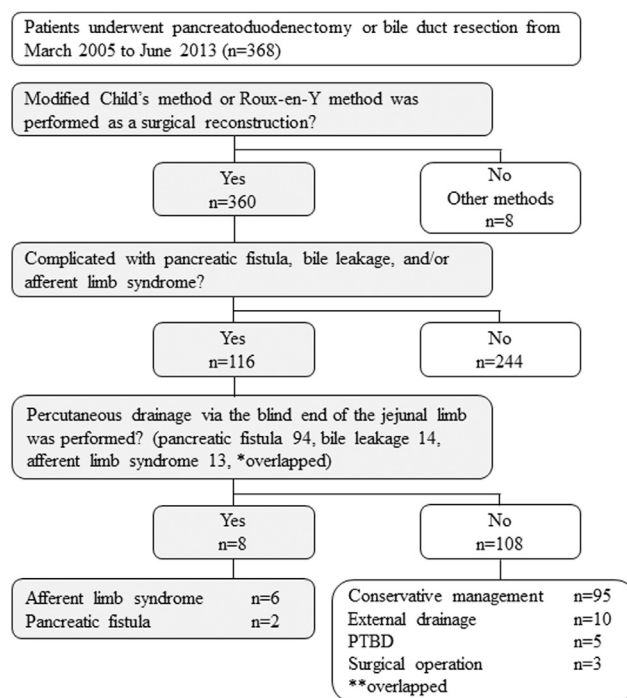
Therefore, in the present study, we investigated the feasibility of percutaneous drainage via the BEJL to address anastomotic failure and afferent limb syndrome after PD or bile duct resection.

## MATERIALS AND METHODS

This retrospective study was approved by the institutional review board of our institution, and all patients provided written informed consent. The medical records of the patients in this study were thoroughly reviewed to evaluate technical successes, clinical successes, and complications of percutaneous drainage via BEJL.

### Patients

A flow chart of the patients included in this study is shown in Figure 1. Between March 2005 and June 2013, 368 consecutive patients underwent PD or bile duct resection at our institution. During PD and bile duct resection, reconstruction was performed by using the modified Child method and Roux-en-Y method, respectively. As part of those reconstruction methods, the BEJL was surgically fixed to the abdominal wall. A total of 360 patients underwent



**Figure 1.** Flowchart of patients included in this study. (\*Three patients had pancreatic fistula and bile leakage, and two patients had pancreatic fistula and afferent limb syndrome. \*\*Three patients underwent conservative management and external drainage, and two patients underwent conservative management and PTBD.)

surgical reconstruction via those methods. Postoperative or delayed complications of pancreatic fistula, bile leakage, and/or afferent limb syndrome were observed in 116 patients, and 108 patients underwent conservative management, external drainage, PTBD, or surgical operation.

Eight consecutive patients underwent percutaneous drainage via the BEJL to address pancreatic fistulae or afferent limb syndrome after PD or bile duct resection with reconstruction. The patients' characteristics are summarized in Table 1. Computed tomography (CT) was used to evaluate complications in all patients before this procedure. Six patients had afferent limb syndrome and two patients had pancreatic fistula. The etiology of afferent limb syndrome was tumor recurrence ( $n = 4$ ) or postoperative complication ( $n = 1$ ). The interval between surgery and drainage via BEJL ranged from 7 to 1,392 days (median, 753 d). Pancreatic fistula was a recurrent condition in both patients with this condition (intervals, 146 d and 1,392 d, respectively).

The complication sites were classified according to the location of the afferent limb (Fig 2). A complication that occurred between the anastomosis of the bile duct and the gastrojejunostomy in PD or Roux-en-Y anastomosis was defined as a distal-site complication. A proximal-site complication was defined as a complication occurring between the anastomosis of the bile duct and the BEJL. The complication sites included proximal type in four patients, anastomosis of bile duct in two patients, and distal type in two patients.

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