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Percutaneous drainage of pancreatic fistula following pancreatectomy with CT-fluoroscopic guidance

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KEYWORDS
Pancreas;
Fistula;
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Abstract
Purpose: To evaluate the clinical utility of percutaneous drainage of pancreatic fistula following pancreatectomy with real-time CT-fluoroscopic guidance.
Material and methods: During January 2007 through March 2013, of 295 patients who underwent pancreatectomy, 20 patients received percutaneous drainage of pancreatic fistula with real-time CT-fluoroscopic guidance. The mean diameter of pancreatic fluid collections was 8.1 ± 2.7 (SD) cm (range: 3.5—15.0 cm). Feasibility, safety, and clinical success were evaluated. Primary and secondary clinical successes were defined respectively as the resolution of pancreatic fistula by initial drainage alone, and after additional intervention. Factors affecting primary clinical success and the drainage period were also evaluated.
Results: Drainage catheters were placed in planned sites in all patients. No major complication occurred except in 1/20 patient (5%) who experienced endotoxin shock. Primary and secondary clinical success rates were, respectively, 50% (10/20) and 90% (18/20). An amylase level greater than 30,000 IU/L in the fluid collection was a significant factor lowering the primary clinical success rate ($P < 0.02$) and prolonging the drainage period (> 30 days) ($P < 0.02$).
Conclusion: Real-time CT-fluoroscopic guided drainage is a feasible, safe, and useful therapeutic option for the management of pancreatic fistula after pancreatectomy. The fluid amylase level is a useful indicator to predict refractory pancreatic fistula.

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Pancreatic fistula is the most frequent major complication after pancreatectomy [1—5]. Its frequency has been reported as 3—26% after distal pancreatectomy and 6—24% after pancreaticoduodenectomy [1—5]. Once pancreatic fistula occurs after pancreatectomy, it can be the cause of hemorrhage and infection and increases the mortality rate of up to 40% [4—7].

Image-guided percutaneous drainage, mainly using ultrasonography or computed tomography (CT), has been performed increasingly for the treatment of abdominal fluid collection. Its utility has also been reported in the management of pancreatic fistula [8—11]. Given that pancreatic fluid collection tends to develop deep in the body with a complex anatomy after pancreatectomy and given that CT-fluoroscopy enables real-time monitoring of catheter placement as well as fluid collection and surrounding critical organs, CT-fluoroscopy would appear as an ideal imaging guidance to monitor the drainage procedure of pancreas fistula [12—15]. Nevertheless, its utility in the management of pancreas fistula has not been well established.

This study was conducted to evaluate the clinical utility of percutaneous drainage of pancreatic fistula following pancreatectomy under real-time CT-fluoroscopic guidance.

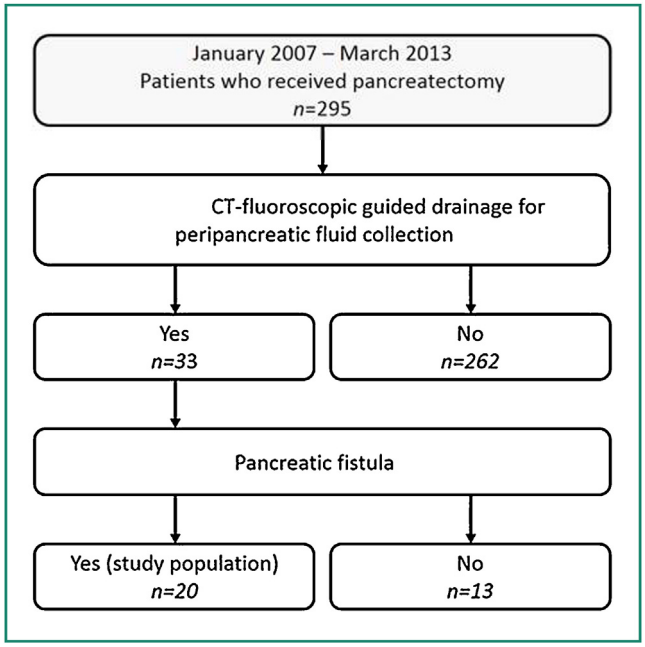

Figure 1. Flow chart diagram of the study population.

Materials and methods

Patients

Patients who received percutaneous drainage under real-time CT-fluoroscopic guidance because of pancreatic fistula in our institution were retrospectively included in this study. The definition of pancreatic fistula according to Study Group on Pancreatic Fistula (ISGPF) was as follows: a drain output of any measurable fluid on or after postoperative day 3 with amylase content greater than three times the serum amylase activity [16].

During January 2007 through March 2013, of 295 patients who underwent pancreatectomy at our institution, 33 received percutaneous drainage of peripancreatic fluid collection using CT-fluoroscopic guidance. Of those patients, 20 patients (6.8%, 20/295) met the inclusion criteria and were included in this study (Fig. 1). There were 13 men and 7 women with a mean age of 67.1 ± 10.3 (SD) years (range, 45—83 years). Patient backgrounds, surgical procedures, and characteristics of pancreatic fistula are presented in Table 1.

These patients with pancreatic fistula underwent pancreatectomy for pancreatic tumor in 15 patients, carcinoma of ampulla of Vater in 2 patients, carcinoma of the extrahepatic bile duct, retroperitoneal metastasis of ovarian carcinoma and malignant fibrous histiocytoma in one patient each. Distal pancreatectomy had been done in 9 patients, pancreaticoduodenectomy in 8 patients, pancreas segmentectomy, tumor enucleation, and both distal and pancreaticoduodenectomy in one patient each. Surgical intervention such as splenectomy and cholecystectomy was performed in addition to pancreatectomy in 10 patients (Table 1). Pancreatic fistula developed with mean interval of 17.0 ± 12.1 (SD) days (range, 3—57 days) after pancreatectomy. The mean maximum diameters of pancreatic fluid collection were 8.1 ± 2.7 (SD) cm (range, 3—57 cm) (Fig. 2).

Written informed consent to perform CT-fluoroscopic guided drainage was obtained from all patients before the procedure. Our institutional review board approved this study. Requirement for informed consent from each patient to use their data for research purpose was waived.

Drainage under the CT-fluoroscopic guidance

When peripancreatic fluid collection was found on CT images, indication of percutaneous CT-fluoroscopic guided drainage was decided by multidisciplinary team including surgeons, endoscopists, and interventional radiologists. In this study, all 20 patients showed worsening postoperative inflammatory reaction that was considered the indication for percutaneous CT-fluoroscopic guided drainage. All patients underwent routine physical examination, laboratory tests, and contrast-enhanced CT images before drainage procedures.

All procedures were performed using real-time CT-fluoroscopy (Asteion®; Toshiba Medical Systems Corp., Otawara, Japan). Three interventional radiologists (KY, AN, and HT) who had experience in interventional procedures of 20 years, 18 years, and 8 years at the time of beginning of this study, respectively, performed the drainage procedures. To avoid radiation exposure to the operator hands, needles and drainage catheters were grasped using forceps. A drainage route was selected to avoid organ and blood vessel injuries referring to contrast-enhanced CT images. After selecting the slice position, local anesthesia at the puncture site was administered using a 21-gauge needle and 0.5% lidocaine hydrochloride (Xylocaine®; AstraZeneca International plc, Osaka, Japan). Subsequently, a 21-gauge needle was inserted into the fluid collection. Then, fluid of 1—2 mL was aspirated for checking the fluid characteristics, for laboratory analysis, and

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