CLINICAL STUDY

Better Outcomes if Percutaneous Drainage Is Used Early and Proactively in the Course of Necrotizing Pancreatitis

Motokazu Sugimoto, MD, PhD, David P. Sonntag, MD, Greggory S. Flint, BS, Cody J. Boyce, MD, John C. Kirkham, MD, Tyler J. Harris, MD, Sean M. Carr, MD, Brent D. Nelson, MD, Don A. Bell, MD, Joshua G. Barton, MD, and L. William Traverso, MD

ABSTRACT

Purpose: To compare outcomes after percutaneous catheter drainage (PCD) for acute necrotizing pancreatitis versus those in a randomized controlled trial as a reference standard.

Materials and Methods: Between September 2010 and August 2014, CT–guided PCD was the primary treatment for 39 consecutive patients with pancreatic necrosis. The indication for PCD was the clinical finding of uncontrolled pancreatic juice leakage rather than infected necrosis. Subsequent to PCD, the drains were proactively studied with fluoroscopic contrast medium every 3 days to ensure patency and position. Drains were ultimately maneuvered to the site of leakage. These 39 patients were compared with 43 patients from the Pancreatitis, Necrosectomy versus Step-up Approach (PANTER) trial.

Results: The CT severity index was similar between studies (median of 8 in each). Time from onset of acute pancreatitis to PCD was shorter in the present series (median, 23 d vs 30 d). The total number of procedures (PCD and subsequent fluoroscopic drain studies) per patient was greater in the present series (mean, 14 vs 2). More patients in the PANTER trial had organ failure (62% vs 84%), required open or endoscopic necrosectomy (0% vs 60%), and experienced in-hospital mortality (0% vs 19%; $P < .05$ for all).

Conclusions: Even though patients in the present series had a similar CT severity index as those in the PANTER trial, the former group showed lower incidences of organ failure, need for necrosectomy, and in-hospital mortality. The use of a proactive PCD protocol early, before the development of severe sepsis, appeared to be effective.

ABBREVIATIONS

PANTER = Pancreatitis, Necrosectomy versus Step-up Approach [trial], PCD = percutaneous catheter drainage, SIRS = systemic inflammatory response syndrome, VARD = video-assisted retroperitoneal debridement

In 2010, van Santvoort et al (1) published a multicenter randomized controlled trial on the treatment of necrotizing pancreatitis. That trial, the Pancreatitis, Necrosectomy versus Step-up Approach (PANTER) trial (1), showed that 35% of patients treated with a minimally invasive drainage procedure could avoid necrosectomy while subject to a similar mortality rate (19%) as patients treated with primary open necrosectomy (16%). Since that publication, percutaneous catheter drainage (PCD) has been used more frequently. The goal of PCD is effective drainage in addition to

From the Center for Pancreatic and Liver Disease (M.S., G.S.F., J.G.B., L.W.T.), Department of Interventional Radiology (D.P.S., T.J.H., S.M.C., B.D.N., D.A.B.), and Department of Diagnostic Radiology (C.J.B., J.C.K.), St. Luke's Health System, 100 E. Idaho St., Suite 301, Boise, ID 83712. Received April 19, 2015; final revision received and accepted November 23, 2015. **Address correspondence to** M.S.; E-mail: msugimot7@gmail.com

None of the authors have identified a conflict of interest.

J Vasc Interv Radiol 2016; XX:■■■–■■■

http://dx.doi.org/10.1016/j.jvir.2015.11.054

removal of infected material, whereas the goal of surgical necrosectomy focuses solely on the latter. The pioneering work of Freeny et al (2), along with subsequent reports (3–5), emphasized the importance of effective drainage of pancreatic necrosis with PCD. The recurrent problem was how to provide effective drainage over a long enough period of time to allow the patient to survive.

In the PANTER trial (1), all patients had to have infected necrosis before enrollment. One group was treated with a minimally invasive "step-up" approach, which mainly used PCD first, and the other group was treated with primary open necrosectomy. If no clinical improvement occurred within 72 hours of the initial PCD, the step-up protocol allowed for only one additional minimally invasive procedure to adjust the drain if positioning was inadequate or to add a drain if further collections needed to be drained. If the patient's condition failed to improve within an additional 72 hours, the protocol required video-assisted retroperitoneal necrosectomy (VARD) or open necrosectomy.

In contrast to the PANTER trial (1), the protocol for the present series used clinical criteria suggesting uncontrolled pancreatic juice leakage as an indication for PCD (Table 1), rather than waiting for documentation of infection of the peripancreatic space, which permitted earlier intervention. In addition, the number of post-PCD procedures was not limited. The protocol called for frequent imaging, additional PCD, and fluoroscopic drain studies until effective drainage was achieved. Effective drainage requires two key elements to control pancreatic juice leakage: drain location and patency. Even though the drain may initially be placed in the center of a fluid collection, subsequent computed tomography (CT) and fluoroscopic studies help to direct the drain to the site of leakage from the pancreas, preventing long sinus tracts and the development of additional fluid collections elsewhere. Frequent fluoroscopic drain studies, such as exchanging, upsizing, and lavage, can maintain drain patency.

Table 1. Indications for Percutaneous Catheter Drainage and Frequency in the Present Series (N = 39)

Symptom/Sign	Incidence
Symptoms	
Refractory abdominal pain despite use of narcotics	28 (72)
Inability to begin oral intake	20 (51)
Clinical signs	
Persistent or enlarging fluid collections (fluid/necrosis) by CT	39 (100)
Persistent or increasing inflammatory data (C-reactive protein and/or WBC count)	33 (85)
Persistent abdominal distention/ileus	24 (62)
Systemic inflammatory response syndrome	24 (62)
Organ failure	10 (26)
Persistent increase in serum amylase or lipase activity suggesting persistent pancreatic juice leakage	8 (21)

WBC = white blood cell.

The aim of the present study was to compare the indications, methods, and outcomes of PCD between patients in the present series and the PANTER trial (1) as the current reference standard. To use this reference standard for comparison, major inherent limitations had to be addressed.

MATERIALS AND METHODS

Patients and Indications for PCD in the Present Series

Between September 2010 and August 2014, 941 patients were admitted to the study institution with acute pancreatitis. Abdominal pain and increased serum amylase or lipase activity were the clinical criteria to diagnose acute pancreatitis. Initial treatment consisted of volume replacement, pain control, and nutritional support. Of these 941 patients with acute pancreatitis, 56 had a lack of enhancement of the pancreatic parenchyma during intravenous contrast-enhanced CT, resulting in a diagnosis of pancreatic necrosis. Among them, 39 consecutive patients underwent PCD. They met the same inclusion criteria as the step-up group in the PANTER trial (1), with the exception of suspected or confirmed infection of necrotic pancreatic tissue. Exclusion criteria were also the same: a flare-up of chronic pancreatitis, previous necrosectomy, previous drainage, pancreatitis caused by abdominal surgery, or an acute intraabdominal event such as perforation of a visceral organ or bleeding. Because of the retrospective nature of this outcomes report, the study received an institutional approval waiver by the review board.

With the institutional standardized approach to pancreatic necrosis in the present series (5), the indications for PCD did not include confirmation of infected pancreatic necrosis as in the PANTER trial (1), but rather were based on the presence of persistent or enlarging collections (fluid/necrosis) (6) and the clinical symptoms or signs outlined in Table 1 that suggested the presence of uncontrolled pancreatic juice leakage (5).

Standardized PCD Protocol

CT-guided PCD began, in general, with placement of a 12-F pigtail drainage catheter (Cook, Bloomington, Indiana) attached to a low-pressure, closed suction drainage system (TRU-CLOSE; UreSil, Skokie, Illinois). The catheters were flushed with 10–20 mL of sterile saline solution three times daily. Contrast-enhanced CT scans were obtained every 3 days after PCD to observe the status of the collection. To minimize the radiation