Endoscopic and Percutaneous Drainage of Symptomatic Walled-Off Pancreatic Necrosis Reduces Hospital Stay and Radiographic Resources

MICHAEL GLUCK,* ANDREW ROSS,* SHAYAN IRANI,* OTTO LIN,* ELLEN HAUPTMANN,‡ JUSTIN SIEGAL,‡ MEHRAN FOTOOHI,‡ ROBERT CRANE,‡ DAVID ROBINSON,‡ and RICHARD A. KOZAREK*

Digestive Disease Institute and ‡Department of Radiology, Virginia Mason Medical Center, Seattle, Washington

See related article, Garg PK et al, on page 1089 in this issue of *CGH*; see Editorial on page 1000.

BACKGROUND & AIMS: Walled-off pancreatic necrosis (WOPN), a complication of severe acute pancreatitis (SAP), can become infected, obstruct adjacent structures, and result in clinical deterioration of patients. Patients with WOPN have prolonged hospitalizations, needing multiple radiologic and medical interventions. We compared an established treatment of WOPN, standard percutaneous drainage (SPD), with combined modality therapy (CMT), in which endoscopic transenteric stents were added to a regimen of percutaneous drains. **METHODS:** Symptomatic patients with WOPN between January 2006 and August 2009 were treated with SPD (n = 43, 28 male) or CMT (n = 23, 17 male) and compared by disease severity, length of hospitalization, duration of drainage, complications, and number of radiologic and endoscopic procedures. **RESULTS:** Patient age (59 vs 54 years), sex (77% vs 58% male), computed tomography severity index (8.0 vs 7.2), number of endoscopic retrograde cholangiopancreatographies (2.0 vs 2.6), and percentage with disconnected pancreatic ducts (50% vs 46%) were equivalent in the CMT and SPD arms, respectively. Patients undergoing CMT had significantly decreased length of hospitalization (26 vs 55 days, $P < .0026$), duration of external drainage (83.9 vs 189 days, $P < .002$), number of computed tomography scans (8.95 vs 14.3, $P < .002$), and drain studies (6.5 vs 13, $P < .0001$). Patients in the SPD arm had more complications. **CONCLUSIONS: For patients with symptomatic WOPN, CMT provided a more effective and safer management technique, resulting in shorter hospitalizations and fewer radiologic procedures than SPD.**

Keywords: Endoscopic Therapy and Percutaneous Therapy of Walled-off Pancreatic Necrosis; Complications of Severe Acute Pancreatitis; Reduction in Hospital Stay; Reduction in Resource Utilization.

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Walled-off pancreatic necrosis (WOPN), a complication of severe acute pancreatitis (SAP), typically emerges during the second week of SAP. WOPN can become infected, can obstruct or fistulize to adjacent anatomical structures, can compress or erode into vasculature, and can markedly delay a patient's functional improvement. The computed tomography (CT) scan shows a mixed density peripancreatic solid and liquid mass with a rind of fibrous tissue contiguous with the stomach or duodenum. Emergent drainage and debridement are necessitated when WOPN becomes infected or obstructs nearby structures (personal communication, M. G. Sarr, MD, March 24, 2009).[1,2] Although historically WOPN was debrided by surgeons, recent studies demonstrated that surgical treatment is associated with poorer outcomes, higher morbidity, and increased mortality.[3–6] Less invasive techniques such as percutaneous and endoscopic drainage and debridement of WOPN have evolved during the past 15 years that show equivalent efficacy and probably lower morbidity than surgery.[7–10] These less invasive techniques require frequent CT scans, multiple catheter exchanges, and repeat endoscopic procedures as well as substantial doses of ionizing radiation to monitor the progress of therapy.

The authors recently described the technical aspects of combined modality therapy (CMT) for patients with symptomatic WOPN. The technique combines percutaneous large-bore catheter drainage with endoscopic transgastric or transduodenal stent placement into the necrotic fluid collection.[11] The current study compares patients with symptomatic WOPN who were managed with CMT with a group of patients managed by standard percutaneous drainage (SPD) alone.

Methods

Patients

Patients with symptomatic WOPN who underwent either SPD or CMT between January 2006 and August 2009 were identified retrospectively and included in this analysis. We define symptomatic WOPN as follows: (1) infection unresponsive to parenteral antibiotics evidenced by persisting fevers, leukocytosis, and/or sepsis syndrome; (2) gastric outlet obstruction impeding feeding or causing persistent nausea and vomiting; (3) biliary obstruction as a result of WOPN (Figure 1, representative baseline coronal CT scan with bile duct obstruction); (4) fistulous connection between the WOPN and adjacent anatomical structures; (5) clinical deterioration in the face of maximal medical therapy short of drainage.

Patient data were entered into an institutional review board database approved by the Virginia Mason Medical Center Institutional Review Board. Data collected included patient demo-

Abbreviations used in this paper: CMT, combined modality therapy; CT, computed tomography; CTSI, CT scoring index; ERCP, endoscopic retrograde cholangiopancreatography; LOH, length of hospitalization; PCF, pancreatic-cutaneous fistula; SAP, severe acute pancreatitis; SPD, standard percutaneous drainage; WOPN, walled-off pancreatic necrosis.

1542-3565/$36.00
doi:10.1016/j.cgh.2010.09.010

graphics, etiology of SAP, severity of SAP as defined by the CT scoring index (CTSI), number of endoscopic and radiographic procedures performed, length of hospitalization (LOH) from the placement of drainage tubes, complications encountered, and mortality.

Drainage Techniques

In SPD, symptomatic SAP patients had percutaneous drainage tubes placed into areas of WOPN as described by Freeny et al.[7] Aspirated fluid was sent for amylase and culture. Radiologically placed drainage catheters were positioned within necrotic fluid collections, attempting to avoid pulmonary, hepatic, colonic, and vascular structures. After placement and aspiration of as much fluid as possible, 12F drains were left to gravity and irrigated with 10–20 mL of sterile saline 3 times daily. Percutaneous catheters were sequentially upsized to a maximum of 28F as patients demonstrated signs of tube occlusion or lack of improvement in WOPN.

In the CMT group, CT-guided percutaneous drains were initially placed into WOPN as in standard therapy, but only 10 mL of fluid was aspirated for culture and amylase. The percutaneous tube was clamped, and the patient was moved immediately to an endoscopy suite, at which point endoscopic drainage of the WOPN was performed by using either a transgastric or transduodenal approach. Endoscopic ultrasound was used when there was no clearly definable luminal bulge from the necrotic fluid collection (Figure 2, radiograph with percutaneous drain in place and 3 endoscopically placed transgastric stents).[11]

Endoscopic retrograde cholangiopancreatography (ERCP) was performed to determine whether a pancreatic duct leak existed, and if identified, an endoprosthesis was placed. If not, no endoprosthesis was placed in the pancreatic duct. If a biliary obstruction was found, a biliary endoprosthesis was placed (Figure 3). A nasojejunal feeding tube was inserted.

Figure 1. CT scan of patient with WOPN before CMT showing dilated common duct (*arrowhead*) and WOPN (*white circles*).

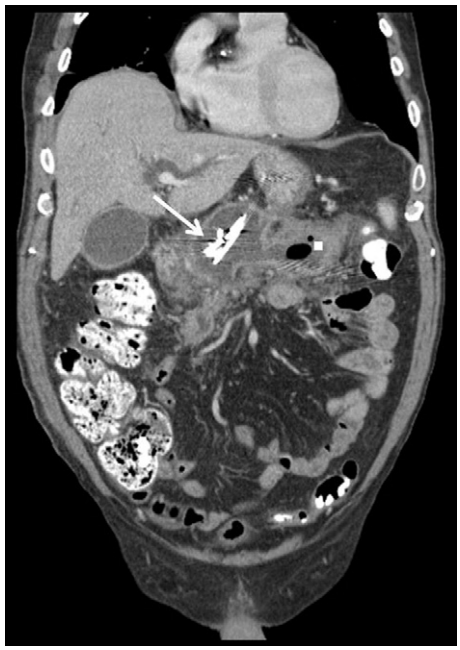

Figure 2. CT scan of same patient 1 week later demonstrating transgastric endoscopically placed stents (*white arrowhead*) and air in WOPN caused by procedures (*white diamond*).

Regardless of the drainage technique, patients received culture-directed antibiotics. Tube dysfunction or occlusion resulted in exchanges, often preceded by a CT scan of the abdomen. This approach was the same in both groups. Patients were

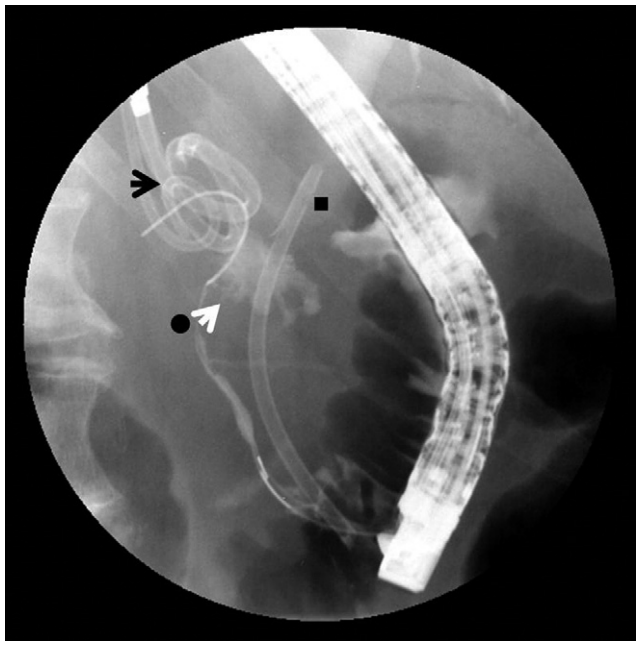

Figure 3. Pancreatogram of same patient demonstrating disruption at genu near transgastric stents (*black circle*), transgastric endoscopically placed stents (*black arrow point*), biliary stent (*black square*), and contrast extravasation at disrupted pancreatic duct (*white arrowhead*).