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Expanding role of percutaneous cholecystostomy and interventional radiology for the management of acute cholecystitis: An analysis of 144 patients

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Abstract
Purpose: To investigate the rates of interval cholecystectomy and recurrent cholecystitis after initial percutaneous cholecystostomy (PC) and identify predictors of patient outcome after PC.
Materials and methods: A total of 144 patients with acute cholecystitis who were treated with PC were included. There were 96 men and 48 women, with a mean age of 71 ± 13 (SD) years (range: 25—100 years). Patient characteristics, diagnostic imaging studies and results of laboratory tests at initial presentation, clinical outcomes after the initial PC treatment were reviewed.
Results: Among the 144 patients, 56 patients were referred for acute acalculous and 88 patients for calculus cholecystitis. Five procedure-related major complications (3.6%) were observed including bile peritonitis ($n=3$), hematoma ($n=1$) and abscess formation ($n=1$). Recurrent acute cholecystitis after initial clinical resolution and PC tube removal was observed in 8 patients (6.0%). The rate of interval cholecystectomy was 33.6% (47/140) with an average interval period of 100 ± 482 (SD) days (range: 3—1017 days). PC was a definitive treatment in 85 patients (60.7%) whereas 39 patients (27.9%) had elective interval cholecystectomy without having recurrent cholecystitis. The clinical outcomes after PC did not significantly differ between patients with calculous cholecystitis and those with acalculous cholecystitis. Multiple prior abdominal operations were associated with higher rates of recurrent cholecystitis.
Conclusion: For both acute acalculous and calculous cholecystitis, PC is an effective and definitive treatment modality for more than two thirds of our study patients over 3.5-year study period with low rates of recurrent disease and interval cholecystectomy.
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Acute cholecystitis (AC) is a common condition, affecting 1 to 4% of patients with gallstones annually [1,2], and 0.2 to 0.4% of critically ill patients without gallstones [3]. Surgical cholecystectomy (SC), particularly with the introduction of the laparoscopic approach in 1985, is well established as the treatment of choice [4–6]. Percutaneous cholecystostomy (PC) has been traditionally considered a temporizing measure until interval cholecystectomy is performed [4,6,7]. However, as the surgically unfit and aging population is growing, PC is now utilized more than previously thought [8,9]. A review of Medicare claims between 1994 and 2009 revealed a 567% increase in the number of PC procedures performed annually while the number of laparoscopic cholecystectomies was increased only by 3% [8]. In view of this increased utilization of PC, several groups have observed that percutaneous drainage may not only work as a temporizing measure but as the definitive treatment, given unexpectedly low rates of delayed surgical cholecystectomy or recurrent cholecystitis [10–15]. The rates of interval cholecystectomy or recurrent cholecystitis after PC range between 0 and 50% with the lowest rates observed in patients with acalculous cholecystitis [10,16–19].

Despite these observations, there are no consensus guidelines or recommendations advocating percutaneous cholecystostomy as a definitive treatment in acute cholecystitis in selected patients, likely due to the lack of large-scale randomized controlled trials [20].

The goal of this study was to investigate the rates of interval cholecystectomy and recurrent cholecystitis after initial PC and identify predictors of patient outcome after PC.

Materials and methods

Patients

The study was approved by the Institutional Review Board, which waived the requirement for informed consent. The electronic database of our institution was queried using current procedural terminology codes for PC for the period of May 2010 to December 2013.

A total of 144 patients were identified. There were 96 men and 48 women with a mean age of 71 years $\pm$ 13 (SD) (range: 25–100 years). In the presence of clinical signs and symptoms of acute cholecystitis, either ultrasound or computed tomography (CT), or both were used for all of 144 patients. ^{99m}Technetium-hepatobiliary imino-diacetic acid (HIDA) scan was added in 11 patients with equivocal findings. Of note, 6 patients initially underwent magnetic resonance cholangiopancreatography or endoscopic retrograde cholangiopancreatography with the clinical suspicion of ascending cholangitis and found to have acute cholecystitis, which was subsequently confirmed by ultrasound. Acalculous cholecystitis was diagnosed when no gallstones were observed in pre-procedural diagnostic imaging tests as well as intra-procedural imaging during PC placement and follow-up cholangiogram. The demographics, laboratory values, comorbidities, diagnostic imaging and other relevant clinical information of the 144 patients were reviewed.

Procedures

The decision for PC was made in a multidisciplinary manner. All PCs were performed under ultrasound and fluoroscopic guidance by five experienced interventional radiologists in our department. The decision of transperitoneal or transhepatic approach was made based on technical feasibility of the transhepatic approach. In brief, using sterile technique and local anesthesia, an 18-gauge trocar needle was advanced under ultrasound guidance into the gallbladder fundus. A 0.038-inch guidewire (Amplatz, Boston Scientific, Boston, Massachusetts, USA) was inserted followed by placement of an 8.5-Fr pigtail catheter (Cook, Bloomington, IN, USA). General surgeons followed all patients for at least 4–6 weeks after PC. Interval follow-up cholangiograms were obtained to confirm the patency of cystic and common bile ducts until the decision was made to remove the catheter or perform cholecystectomy. The decision for the interval elective cholecystectomy was tailored by general surgeons on an individual basis for each patient.

Statistical analysis

Quantitative values were expressed as mean $\pm$ SD and range. Group comparisons of baseline patient characteristics between patients with calculous cholecystitis and those with acalculous cholecystitis were performed using the Chi^2 test. Baseline comorbidities including history of cancer, multiple abdominal surgeries, morbid obesity (BMI > 40), neurological disorders, hepatic disorders, chronic obstructive pulmonary disease (COPD), pulmonary diseases other than COPD, atrial fibrillation, coronary artery disease (CAD), hypertension, hyperlipidemia, peripheral arterial disease (PAD), presence of any cardiovascular disease, diabetes mellitus, chronic kidney disease (CKD) and others of each group were compared to each other using Z-statistics. Fisher exact test was performed to detect statistically significant differences in PC treatment outcomes between patients with calculous cholecystitis and those with acalculous cholecystitis with an exception of time to interval cholecystectomy, for which Student t-test was utilized. A multi-variable logistic regression analysis was calculated to assess the influence of various comorbidities on outcome. All statistical calculations were performed using StatPlus (AnalystSoft Inc., Walnut, CA) and GraphPad Prism 6 (GraphPad Software Inc., La Jolla, CA, USA). Significance was set at $P < 0.05$.

Results

Patient population

Of 144 patients included into this study, 56 patients (38 men, 18 women) with a mean age of 65.50 ± 15.91 (SD) years (range: 25–94 years) had acalculous cholecystitis and 88 patients (58 men, 30 women) with a mean age of 75.42 ± 12.28 (SD) years, (range: 46–100 years) had calculous cholecystitis.

All patients had at least one chronic medical problem recorded at the time of PC (Table 1). The average number of comorbidities recorded per patient was 3.80 ± 1.51 (SD).