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RAPID COMMUNICATION

Ultrasound guided percutaneous cholecystostomy in high-risk patients for surgical intervention

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Abstract

AIM: To assess the efficacy and safety of ultrasound guided percutaneous cholecystostomy (PC) in the treatment of acute cholecystitis in a well-defined high risk patients under general anesthesia.

METHODS: The data of 27 consecutive patients who underwent percutaneous transhepatic cholecystostomy for the management of acute cholecystitis from January 1999 to June 2003 was retrospectively evaluated. All of the patients had both clinical and sonographic signs of acute cholecystitis and had comorbid diseases.

RESULTS: Ultrasound revealed gallbladder stones in 25 patients and acalculous cholecystitis in two patients. Cholecystostomy catheters were removed 14-32 d (mean 23 d) after the procedure in cases where complete regression of all symptoms was achieved. There were statistically significant reductions in leukocytosis, ($13.7 \times 10^3 \pm 1.3 \times 10^3$ μg/L *vs* $13 \times 10^3 \pm 1 \times 10^3$ μg/L, $P < 0.05$ for 24 h after PC; $13.7 \times 10^3 \pm 1.3 \times 10^3$ μg/L *vs* $8.3 \times 10^3 \pm 1.2 \times 10^3$ μg/L, $P < 0.0001$ for 72 h after PC), C -reactive protein (51.2 ± 18.5 mg/L *vs* 27.3 ± 10.4 mg/L, $P < 0.05$ for 24 h after PC; 51.2 ± 18.5 mg/L *vs* 5.4 ± 1.5 mg/L, $P < 0.0001$ for 72 h after PC), and fever (38 ± 0.35℃ *vs* 37.3 ± 0.32℃, P < 0.05 for 24 h after PC; 38 ± 0.35℃ vs 36.9 ± 0.15℃, $P < 0.0001$ for 72 h after PC). Sphincterotomy and stone extraction was performed successfully with endoscopic retrograde cholangio-pancreatography (ERCP) in three patients. After cholecystostomy, 5 (18%) patients underwent delayed cholecystectomy without any complications. Three out of 22 patients were admitted with recurrent acute cholecystitis during the follow-up and recovered with medical treatment. Catheter dislodgement occurred in three patients spontaneously, and two of them were managed by reinsertion of the catheter.

CONCLUSION: As an alternative to surgery, percutaneous cholecystostomy seems to be a safe method in critically ill patients with acute cholecystitis and can be performed with low mortality and morbidity. Delayed cholecystectomy and ERCP, if needed, can be performed after the acute period has been resolved by percutaneous cholecystostomy.

Key words: Percutaneous cholecystostomy; Acute cholecystitis; Ultrasound; High risk; Elderly

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INTRODUCTION

Cholecystectomy is the appropriate treatment of acute calculous and acalculous cholecystitis, and it has a mortality rate of 0%-0.8%[1,2]. However, the mortality rate of surgical treatment may be as high as 14%-30% in elderly or critically ill patients with comorbid diseases[3,4].

Percutaneous cholecystostomy (PC) has been introduced as an alternative method to treat acute cholecystitis in patients with significant comorbid diseases[5-8]. PC can be achieved with the guidance of either computed tomography (CT) or ultrasonography (USG). PC, which was initially described by Radder in 1980, has proved to be an effective treatment for acute cholecystitis in critically ill patients, and it has low morbidity and mortality rates[9].

In this study, we have retrospectively evaluated the clinical data of patients treated with PC for acute cholecystitis. The aims of the study were to investigate the efficiency of PC in the treatment of acute cholecystitis in critically ill patients, the ratio of delayed cholecystectomy, and the clinical outcome of patients who had no further interventions following PC.

MATERIALS AND METHODS

Between January 1999 and June 2003, percutaneous transhepatic cholecystostomy was performed on 27 elderly patients with acute cholecystitis and comorbid diseases. All patients received physical examination, whole blood count, biochemical analysis, and ultrasonography. Age, gender, comorbid diseases, etiology of cholecystitis, clinical and laboratory findings, morbidity associated with PC, and the clinical outcome were recorded. The diagnostic criteria of acute cholecystitis included clinical signs and symptoms (right upper quadrant pain or tenderness), leukocytosis or positive C - reactive protein (CRP) (> 5 mg/L) value, and at least one of the ultrasonographic criteria including gallbladder stones (for calculous cholecystitis), ultrasonographic Murphy's sign, gallbladder wall thickening (> 3 mm), pericholecystic fluid, and gallbladder distension. All patients were given empiric intravenous Ampicillin-sulbactam (1 g/d four times) treatment starting immediately after the diagnosis, and subsequently antibiotic therapy was managed according to the culture results of bile samples. All of the procedures were performed in the Department of Radiology. None of the patients were premedicated and the procedure was performed under local anesthesia.

Risk classification

The American Society of Anesthesiologists (ASA) physical status classification was used to define the risk for cholecystectomy. Twenty (74.1%) patients were classified as ASA Ⅲ and 7 (25.9%) as ASA Ⅳ.

Procedure

Under aseptic conditions, a USG guided transhepatic approach through the right lobe was used to access the gallbladder in all patients. After puncture of the bile duct with an 18 GA Seldinger needle, a guide-wire (Amplatz, 0.035 inch, 75 mm) was inserted into the gallbladder via the lumen of the Seldinger needle. The route was then dilated using 8F and 10F dilatators. Finally a 10F locking pigtail catheter was inserted into and locked within the gallbladder. Catheter localization was controlled by fluoroscopy (by injecting a small amount of contrast) and USG. Bile samples were obtained for cultures. The catheter was flushed with 10 mL of a saline-gentamycin (40 mg) mixture every 6-8 h to avoid obstruction, and the catheter was left for gravity drainage.

On the second day of the PC, USG was performed to check the site of the catheter, look for bile or blood leakage, and to observe the ultrasonographic findings following PC. Positive clinical response was defined as the normalization of at least two of the three clinical parameters of acute cholecystitis (abdominal pain, fever, and leukocytosis) and a decrease in CRP value within 72 h.

Statistical analysis

Demographic data are given as medians (range), whereas the other data are expressed as means ± SE. Differences were evaluated using the Wilcoxon signed ranks test. $P < 0.05$ was accepted as significant. Data were analyzed using statistical software (SPSS for windows 10.0; SPSS, Chicago, IL, USA).

Table 1 Comorbid diseases of the patients

Comorbid diseases	*n*
Cardiac disorders[1]	19
Haematological diseases[2]	2
Chronic obstructive pulmonary failure	1
Polytrauma	1
Diabetes mellitus and chronic renal failure	4
Total	27

[1]Congestive heart failure, hypertension, ischemic heart diseases, valve replacement; [2]Chronic myeloid leukemia, thrombotic thrombocytopenic purpura.

Table 2 White blood cell (WBC), C-reactive protein (CRP), and axillary temperature of the patients before and after PC

	Before PC	24 h after PC	72 h after PC
WBC × $10^3/\mu L$	13.7 ± 1.3	13 ± 1	8.3 ± 1.2
CRP mg/L	51.2 ± 18.5	27.3 ± 10.4	5.4 ± 1.5
Body temp. (℃)	38 ± 0.35	37.3 ± 0.32	36.9 ± 0.15
		$P < 0.05$	$P < 0.0001$

RESULTS

The median age of the patients was 71.4 years (range 64-93 years) and the female/male ratio was 4.4/1 (22/5). Two (7.4%) patients had acalculous and 25 (92.5%) had calculous cholecystitis. Comorbid diseases included congestive heart failure or severe ischemic heart disease in 19 (70.3%) patients, haematologic diseases [chronic myeloid leukemia (CML) and thrombotic thrombocytopenic purpura (TTP)] in 2 (7.4%) patients, renal failure in 4 (14.8%), chronic obstructive respiratory failure in one (3.7%), and polytrauma in one (3.7%) patient (Table 1). The majority (96.3%, $n = 26/27$) of the patients had pain and tenderness in the right upper quadrant.

The mean white blood cell counts (WBC) upon admission ($13.7 \times 10^3 \pm 1.3 \times 10^3/\mu L$), axillary temperatures (38 ± 0.35℃), and CRP (51.2 ± 18.5 mg/L) values were significantly decreased in the 72 h following PC [$8.3 \times 10^3 \pm 1.2 \times 10^3/\mu L$ ($P < 0.0001$), 36.9 ± 0.15℃ ($P < 0.0001$), 5.4 ± 1.5 mg/L ($P < 0.0001$), respectively] (Table 2).

The clinical and ultrasonographic findings of acute cholecystitis decreased in all patients. Bile cultures were negative in 5 (18.5%) patients. *E.coli* was the only bacteria in 17 (63%) patients and *E.coli, Enterobacter,* and *Enterococci* were identified in the remaining 5 (18.5%) patients.

The median hospitalization time was 8 d (1-20 d) and the median catheterization period was 23 d (14-32 d). Catheter dislodgement occurred in three patients on the 6^{th}, 8^{th}, and 14^{th} d. Catheters were reinserted in two patients due to prompt recurrent cholecystitis but the other patient did not need recatheterization. Unexpected bleeding from the liver parenchyma occurred in only one (3.7%) patient following catheter removal. USG guided percutaneous drainage of a hematoma in the subhepatic region was performed in this patient and no further complications occurred.

Cholecystocholangiography was performed prior to the removal of the catheter to visualize the bile tree and gallbladder in 24 (88.8%) patients. This procedure could not be performed in 2 patients due to noncompliance and difficult mobilization (polytrauma) in one patient with acalculous cholecystitis. The cystic duct was patent in 16 (66.7%) and occluded in 8 (33.3%) patients. Common bile duct stones were detected in 3 (11.1%) patients.

These 3 patients underwent sphincterotomy and stone extraction from the common bile duct with ERCP. Delayed cholecystectomy was performed in 5 (18.5%) patients within a mean period of 2 mo following PC. The postoperative outcome was uneventful in these patients. The remaining 22 patients were followed up by physical examination and USG monthly for a median of 11 (6-18) mo after the removal of the catheter. Three of these 22 patients experienced recurrent cholecystitis and recovered with medical therapy (Table 3).

The morbidity rate of PC was 25.9% [catheter dislodgement (n = 3), recurrent cholecystitis (n = 3), and bleeding (n = 1)] and there was no mortality associated with PC.

Table 3 Follow-up of the patients after PC

	Calculous cholecystitis (n = 25)	Acalculous cholecystitis (n = 2)
No further treatment	18 (72%)	2
Recurrence	3 (12%)	0
Reinsertion of the catheter	2 (8%)	0
Medical treatment	1 (4%)	0
ERCP	3 (12%)	0
Delayed surgery	5 (20%)	0

DISCUSSION

PC was defined as an alternative treatment method in patients with acute cholecystitis who were at high risk during surgery due to comorbid diseases. The morbidity and mortality associated with emergent cholecystectomy is considerably higher in such patients, 55%-66% and 14%-30% respectively[3,4]. The morbidity and mortality rates of PC were found to be much lower, less than 10% and 2% respectively[10,11]. PC resulted in successful treatment in 56%-100% of patients with acute cholecystitis and significant comorbid diseases[12-17]. The therapeutic rate of PC was significantly higher in patients with clinical signs and symptoms referred to the right upper abdomen compared to patients without clinical signs and symptoms (intensive care patients)[12]. Although unexplained sepsis regressed dramatically after PC in approximately 60% of intensive care patients, the therapeutic response to PC is lower in patients with symptoms and signs in the right upper abdomen who received open cholecystectomy[11,12]. In this study, morbidities were seen in 7 (25.9%) patients, but 3 of these complications were due to catheter squeezing as a result of patient carelessness. There was no procedure-related mortality.

PC can be easily performed under local anesthesia with USG or CT guidance. Two ways of accessing the gall bladder were defined for the procedure. Either a transhepatic or transperitoneal approach can be used. The complications related to the procedure include bile duct injury, bile leakage and peritonitis, portal or parenchymal vessel injury and bleeding, catheter dislodgement, colon injury, and vagal reactions. The transhepatic approach decreases the risk of bile leak, portal vessel injury, and colon injury but it carries a risk of pneumothorax and bleeding from the liver parenchyma[18-20]. Although the transperitoneal approach decreases the risk of bleeding and secondary liver contamination by infected bile, it increases the risk of bile peritonitis, colon perforation, portal vessel injury, and displacement of the catheter after decompression of the gall bladder[21-23]. In addition to other complications, van Sonnenberg *et al* also reported vagal reactions in the transperitoneal approach due to vagal innervation of the gall bladder wall[24]. Therefore, the transhepatic approach seems to be the best approach for PC except in the presence of severe liver disease and coagulopathy[25-27]. In this study the transhepatic approach was preferred to access the gall bladder. All procedures were completed under local anesthesia without any complications related to the procedure.

We performed cholecystocholangiography in 24 patients. The cystic duct was patent in 16 (66.7%) patients. Common bile duct stones which could not be visualized by USG, were detected in three (11.1%) of these 16 patients. These three patients underwent sphincterotomy and stone extraction with ERCP. Bleeding from the liver parenchyma was detected unexpectedly in only one (3.7%) patient following removal of the catheter. No bile leakage was detected in any patient.

The management of patients after the acute cholecystitis period is still controversial. Lebigot *et al* followed up 90% of patients for 12 mo after PC and reported only one (6.25%) endoscopic sphincterotomy and one (6.25%) delayed cholecystectomy[28]. No additional therapy was needed in the remaining 87.5% of the patients. The risk of recurrent cholecystitis was reported as 12% at 1 year in a study by Welch *et al*, and the authors mentioned PC as a possible definitive treatment in patients with acalculous cholecystitis[29]. In a recent study, the authors were able to apply delayed surgery in 56.4% of patients after the acute period[6]. In this study, we reevaluated the patients after regular medical treatment of the comorbid diseases. Five (18.5%) patients were then selected for delayed elective surgery and the remaining 22 were followed. Nineteen (86.4%) of these 22 patients required no additional therapy. Recurrent cholecystitis was detected in 3 (13.6%) patients and the symptoms regressed with medical therapy.

In conclusion, PC is a fast, easy, effective, and safe treatment method for the acute phase of cholecystitis in elderly and critically ill patients. Procedure-related morbidity and mortality is very low compared to surgery. Patient management after the acute phase of cholecystitis is still controversial. Conservative treatment for patients who are not suitable for surgery is acceptable. Delayed elective cholecystectomy is another option in patients who respond well to medical treatment of comorbid diseases.

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