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Usefulness of single and repetitive percutaneous transhepatic gallbladder aspiration for the treatment of acute cholecystitis

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Background. The aim of this study was to evaluate the safety and usefulness of single and repetitive percutaneous transhepatic gallbladder aspiration (PTGBA) for the treatment of acute cholecystitis. ***Methods.*** PTGBA was performed in patients with acute cholecystitis who showed no improvement after treatment with broad-spectrum antibiotics. PTGBA was carried out at bedside. When the bile was too thick to be aspirated through a 21-gauge needle, an 18-gauge needle was used. Aspiration of the gallbladder contents and injection of antibiotics into the gallbladder were performed without the placement of a drainage catheter. When improvement was not observed after the first attempt, PTGBA was repeated. ***Results.*** Single PTGBA achieved improvement in 32 of 45 patients. In 11 of the remaining 13 patients, the second PTGBA was effective. In the remaining two patients, repetitive PTGBA was not carried out because of advanced cancer. In two of 45 patients, 18-gauge needles were necessary for PTGBA because of the high viscosity of the bile. PTGBA was carried out in three patients with blockage of the cystic duct by a stent, and it was effective in all three. Two patients whose conditions improved with a single PTGBA experienced a recurrence at 4 and 31 months, respectively, after PTGBA. No other severe complications related to PTGBA were observed in any patients. ***Conclusions.*** For the treatment of acute cholecystitis that does not react to conservative therapies, PTGBA is a safe, simple, and effective treatment modality that can be performed at bedside without any severe complications.

Key words: acute cholecystitis, percutaneous transhepatic gallbladder aspiration, repetitive aspiration

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Introduction

Cholecystectomy is the standard treatment for the early stages of acute cholecystitis,[1–3] and emergency laparoscopic cholecystectomy is also acceptable as an effective and safe treatment modality.[4–7] Although cholecystectomy is generally safe, the mortality rate of cholecystectomy in patients at high surgical risk ranges between 14% and 30%.[2,8] Some studies have reported the efficacy of percutaneous transhepatic gallbladder drainage (PTGBD) followed by cholecystectomy for acute cholecystitis,[9–13] while other studies report percutaneous transhepatic gallbladder aspiration (PTGBA) to be a useful alternative for high-risk patients with acute cholecystitis.[14–17] Nevertheless, the usefulness of PTGBA has not yet been fully examined. Furthermore, in most reports, either PTGBD or an operation was performed after a single attempt to treat with PTGBA failed. In the present study, we evaluated the usefulness of both single and repetitive PTGBA for the treatment of acute cholecystitis.

Patients and methods

The diagnosis of acute cholecystitis in all participating patients was based on clinical findings, laboratory data, and abdominal ultrasonography (US) and/or computed tomography (CT) findings. Clinical findings included right upper quadrant or epigastric pain, tenderness, and fever. The laboratory data associated with acute cholecystitis were leukocytosis or positive C-reactive protein test results. Diagnostic US or CT findings included thickening of the gallbladder wall, gallbladder distension, and debris in the gallbladder.

Patients with acute cholecystitis were initially treated with broad-spectrum antibiotics and drip infusion without oral feeding. Those who showed no improvement with the conservative treatment were included in

the present study. Patients with severe ascites or coagulopathy were excluded from this study and were treated by other modalities such as endoscopic transpapillary gallbladder drainage. This study also excluded patients diagnosed with gangrenous cholecystitis, which was determined by significant irregularities in the gallbladder wall or the intraluminal membrane, and patients with emphysematous cholecystitis, which was diagnosed by the presence of gas in the gallbladder. These patients all underwent an emergency operation. Standard informed consent was obtained from all patients included in the study.

PTGBA was performed in 45 patients between February 1999 and September 2004. Of these 45 patients, 22 were men and 23 were women, and they ranged in age from 23 to 93 years (mean age, 70.1 years). The clinical characteristics of the patients are summarized in Tables 1 and 2.

PTGBA was carried out at bedside under local anesthesia with a 3.5-MHz ultrasound sector transducer and a 21-gauge aspiration needle. When the bile was too thick to be aspirated through a 21-gauge needle, an 18-gauge needle was used. Use of the larger gauge needle was recorded as a single attempt of PTGBA. After aspirating as much as possible from the swollen gallbladder, an antibiotic (amikacin sulfate, 100 mg) was injected into the gallbladder without the placement of a drainage catheter. When clinical improvement was not observed after the procedure, PTGBA was repeated on the following day. The aspirated contents of the gallbladder were sent to the laboratory for bacterial culture and a sensitivity test to antibiotics.

Successful therapy was defined as the achievement of pain control along with a decreased leukocyte count, fever reduction, and a reduced degree of gallbladder distension within 1 or 2 days after treatment.

Table 1. Characteristics of 45 patients with acute cholecystitis

Age, mean (range), years	70.1 (23–93)
Sex	
Male	22
Female	23
Clinical and laboratory features	
Right hypochondrial or epigastrial pain	44/45
Fever	43/45
Leukocytosis	39/45
Mean WBC	14123/μl

WBC, white blood cell count

Results

The therapeutic outcomes are shown in Fig. 1. A single PTGBA was sufficient in 32 of 45 patients with acute

Table 2. Complications of 45 patients with acute cholecystitis

Complication	No. of patients
Advanced malignancy	9
Cardiovascular disease	4
Dementia	3
Chronic renal failure	1
Neurologic disease	1
Bone fracture	1
Without severe disease	26

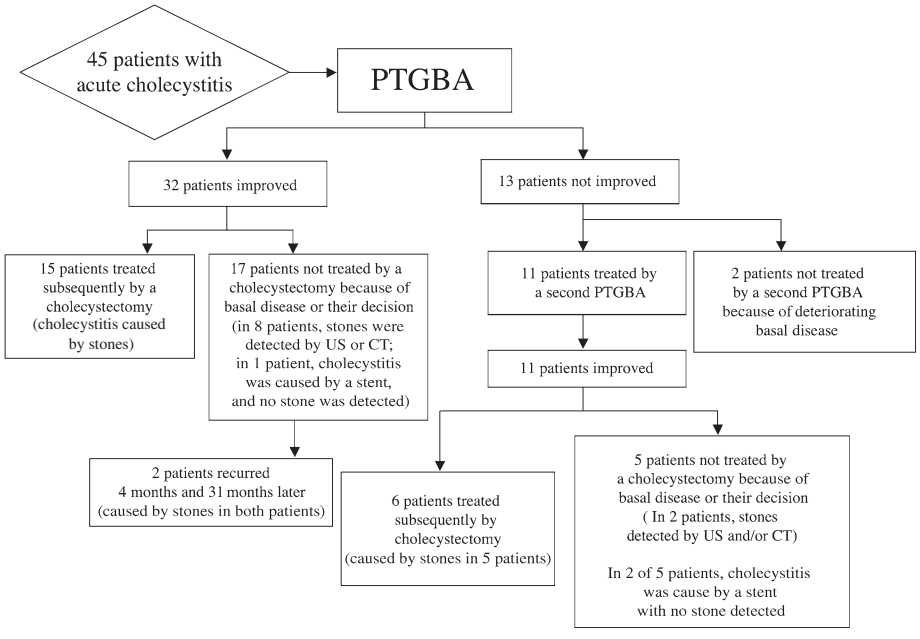

Fig. 1. Clinical outcomes of 45 patients with acute cholecystitis treated with single and repetitive percutaneous transhepatic gallbladder aspiration (*PTGBA*) and causes of acute cholecystitis. *US*, ultrasonography; *CT*, computed tomography

Table 3. Data of 43 patients[a] on the day following PTGBA

	Single PTGBA	Repetitive PTGBA
Number of patients	32	11
Age, mean (range), years	70.6 (23–93)	70.1 (46–85)
Male : female	15 : 17	5 : 6
Before PTGBA		
Mean WBC (/μl)	13059	14503
Mean CRP (mg/dl)	14.1	13.4
After first procedure		
Mean WBC	9294	15137
Mean CRP	14.4	18.0
After second PTGBA		
Mean WBC	—	9920
Mean CRP	—	15.7

PTGBA, percutaneous transhepatic gallbladder aspiration; CRP, C-reactive protein
[a]Two patients were not treated with a second PTGBA because of deteriorating basal disease

cholecystitis. Cholecystectomy was subsequently carried out in 15 of these 32 patients. The remaining 17 patients did not undergo cholecystectomy owing to underlying disease or their own decision. Single PTGBA was insufficient in 13 patients, of whom 11 responded to the second PTGBA. Six of these patients subsequently underwent cholecystectomy, and five did not receive surgery owing to underlying disease or their own decision. Two patients who did not respond sufficiently to the first PTGBA did not undergo repetitive PTGBA owing to deteriorating basal illness. One of these patients had progressive carcinomatous peritonitis related to advanced pancreatic cancer, and the other had progressive carcinomatous pleurisy related to advanced pharyngeal cancer. It was not clear whether the first PTGBA was effective in these patients, because they fell into a terminal stage immediately after the procedure.

The average volume of bile aspirated by the first and second PTGBA was 80.6 ml (range, 7–222 ml). The average volume of bile aspirated by the first PTGBA was 84.4 ml (15–200 ml) and 72.4 ml (7–222 ml) in the successful and unsuccessful cases, respectively. Although the volume of aspirated bile was larger in the successful cases than in the unsuccessful cases, the difference was not statistically significant. The average volume of bile aspirated by the second PTGBA was 81.4 ml (35–200 ml).

In 20 of 21 patients who underwent cholecystectomy, calculus was found to be the cause of cholecystitis. Stones were detected in the gallbladder by US or CT in ten of 24 patients who did not undergo cholecystectomy. In the remaining 14 patients, the presence of a calculus was not possible to ascertain.

Recurrence of cholecystitis was seen in two patients who did not undergo cholecystectomy. One patient was a woman identified as a high surgical risk patient with chronic renal failure. Cholecystitis recurred 4 months after single PTGBA, and the patient was successfully treated by repetitive PTGBA. This patient has not experienced any recurrence since the second PTGBA. A male patient refused cholecystectomy after PTGBA, and cholecystitis recurred 31 months later. The patient was treated conservatively and has not experienced any recurrence since then. There were no recurrences of acute cholecystitis in the remaining 20 patients who did not undergo cholecystectomy. The characteristics of patients treated by either single or repetitive PTGBA are shown in Table 3.

In two patients whose bile was too thick to be aspirated, PTGBA was successfully performed by increasing the gauge (from 21 to 18) of the aspiration needle. One patient with an aneurysm of the thoracic aorta required repetitive PTGBA, as did another patient with cholangiocellular carcinoma. Although we were able to aspirate the gallbladder contents with a 21-gauge needle during the first PTGBA in these two patients, there was no improvement in the cholecystitis. When the second PTGBA was performed in these two patients, bile viscosity was too thick to be aspirated by a 21-gauge needle. Therefore, repetitive PTGBA was carried out with an 18-gauge needle, and both patients improved.

PTGBA was carried out in three patients with acute cholecystitis caused by blockage of the cystic duct by a stent. In two of these patients, tube stents had been inserted to treat bile duct stenosis caused by cholangiocellular carcinoma and bile duct cancer. In the remaining patient, who also had cholangiocellular carcinoma, a tube stent had been inserted into the original metallic stent when the metallic stent was obstructed, and cholecystitis developed thereafter. Although two of these three patients required repetitive PTGBA, all three recovered after treatment by PTGBA. Except for these cases, no significant similarities were observed among the patients that did not improve after the first PTGBA.

No early complications related to single or repetitive PTGBA, such as perforation or bleeding, were observed in any patients.

Discussion

Early cholecystectomy is recognized as the standard treatment for acute cholecystitis, and emergency laparoscopic cholecystectomy is also accepted as an effective treatment modality. However, in high surgical risk patients, emergency surgical procedures sometimes cause serious trouble and cannot be performed in all hospitals. PTGBD and PTGBA are the other available percutaneous treatment modalities for acute cholecystitis. PTGBD is primarily performed in critically ill or elderly patients,[18,19] and sometimes causes complications such as bile leakage after tract dilatation, right pneumothorax, hepatic subcapsular hematoma, or misplacement of the catheter.[20,21] PTGBA is a procedure that does not require the placement of a catheter. Despite its potential advantages, PTGBA has not been widely adopted as a standard treatment modality because acute cholecystitis with infected bile is considered to require continuous drainage. However, a number of reports have described positive experiences with PTGBA.[17,22–24] These reports maintain that PTGBA can be a safe and effective treatment method for critically ill or elderly patients with acute cholecystitis.

To the best of our knowledge, only two reports to date have compared the effectiveness of PTGBA with that of PTGBD. Chopra et al.[20] state that PTGBA should be the procedure of choice in high surgical risk patients with acute cholecystitis, and that PTGBD should be reserved as a salvage procedure if PTGBA is technically or clinically unsuccessful. Using this approach, Chopra et al.[20] were able to avoid salvage PTGBD in 77% of patients. In the present study, PTGBA was the first choice of treatment even if patients were not at high surgical risk. In our opinion, further examination, for example, searching for the presence of a common bile duct stone or tumor, should be performed before cholecystectomy.

Ito et al.[25] found PTGBD to be superior to PTGBA in terms of clinical effectiveness for severe acute cholecystitis. They reported that the procedures had the same complication rate. Ito et al.[25] also found that some patients who showed no improvement with single PTGBA, and they decided that PTGBA was unacceptable when the viscosity of the bile was high. In the present study, we experienced two similar cases in which it was not possible to aspirate the bile with a 21-gauge needle because of its high viscosity. However, in these cases, we successfully aspirated the bile with an 18-gauge needle and did not observe any complications such as bleeding or local peritonitis.

In a study involving 18 patients receiving PTGBA for acute cholecystitis, Verbanck et al.[17] performed repetitive PTGBA in three patients who did not respond to single PTGBA. They reported that two of these three patients responded positively. To date, only two reports have discussed repetitive PTGBA—the study by Verbanck et al.[17] and another by Tazawa et al.[22] In our institution, PTGBA was adopted as a therapeutic modality for acute cholecystitis in 1987,[26] and in the present study, single PTGBA was effective in slightly over 70% (32 of 45) of patients with acute cholecystitis who needed gallbladder drainage. Of the remaining 13 patients, two did not undergo repetitive PTGBA owing to serious underlying illnesses (advanced pancreatic cancer and pharyngeal cancer). The other 11 (24%) received repetitive PTGBA and recovered successfully. We were able to successfully avoid PTGBD by adapting the PTGBA procedure by using a larger gauge of aspiration needle or performing multiple attempts. Acute cholecystitis is a common disease that is often treated in a general hospital setting. Emergency laparoscopic cholecystectomy is accepted as an effective treatment modality, but it cannot be performed in all hospitals due to staff shortages or inadequate equipment. The advantage of PTGBA is that it is a simple procedure that can be performed at bedside without X-rays. Our findings demonstrated that procedures such as PTGBD are unnecessary when acute cholecystitis can be improved by performing either single or repetitive PTGBA.

Bacterial infection is an important cause of acute cholecystitis. However, infection is not always present. Recent studies have reported that bile cultures were positive in only 16%–48% of cases.[14,18,27,28] In the present study, bacterial culture of the bile was carried out in 37 cases, and 29 (78.4%) were positive. We injected an antibiotic (amikacin sulfate) directly into the gallbladder immediately after aspiration. An antibiotic is effective in the gallbladder when bacterial infection is the cause of acute cholecystitis, and it will remain in the gallbladder for a while if continuous drainage is not performed. Increased intraluminal pressure due to obstruction of the gallbladder is another important cause of acute cholecystitis. PTGBA reduces intraluminal pressure; therefore, continuous drainage may not be essential to the treatment process.

In the present study, in 20 of 21 patients who underwent cholecystectomy, calculus was considered to be the cause of cholecystitis. Seventeen patients were improved by single PTGBA and were not treated by cholecystectomy either owing to the presence of an underlying disease or the patient's own choice. In eight of these 17 patients, stones were detected in the gall-

bladder. Five patients were improved by the second PTGBA, and they were not treated by cholecystectomy. Stones were detected in two of these five patients. It is thought that there was a higher prevalence of gallstones in patients who were not treated by cholecystectomy. No differences among treatment results due to the presence of gallstones have been recorded. However, PTGBA was used to treat three patients with acute cholecystitis due to blockage of the cystic duct by a stent. In these cases, a single decompression of the gallbladder does not normally result in a sufficient improvement. All three patients had bile duct stenosis resulting from advanced cancer. All three of the present cases achieved remission by PTGBA, thus indicating that PTGBA is a useful treatment modality for acute cholecystitis caused by stent placement. If PTGBD is performed in patients with advanced cancer, the drainage tube cannot be removed, resulting in impaired activities of daily living. On the other hand, PTGBA can be carried out at bedside even in patients with severe disease. In addition, PTGBD was recognized as the standard treatment for patients with acute cholecystitis at high surgical risk. However, PTGBD potentially involves risk of disseminating tumor cells from a hidden malignancy. Moreover, we did not experience any severe complications related to PTGBA. Therefore, we also recommend PTGBA as the first treatment of choice for the high surgical risk patient.

Some patients showed a dramatic improvement while undergoing PTGBA. The patients were initially treated with antibiotics and drip infusion without oral feeding. Oral feedings resumed 2 or 3 days after PTGBA if there was no increase in inflammation or recurrence of symptoms. Antibiotics were used for about a week after the last PTGBA, although it is possible that a shorter antibiotic regimen would have been sufficient.

In the patients for whom follow-up was possible, only two who had initially improved with single PTGBA experienced a recurrence. One patient was successfully treated again by PTGBA, while the other was treated conservatively. They have not experienced the recurrence since then. We did not observe any other severe late complications related to PTGBA. Because we experienced no early complications with PTGBA, we therefore recommend PTGBA as a useful treatment modality that can be used as the treatment of choice.

In conclusion, PTGBA can be carried out repeatedly if the first procedure is unsuccessful. When the bile is too thick to be aspirated, then PTGBA can be performed using an aspiration needle with a larger gauge. PTGBA is also effective in patients with blockage of the cystic duct caused by a stent. For acute cholecystitis that does not respond to conservative treatment, PTGBA is a safe and simple procedure that can be performed at bedside without any severe complications.

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