A Comparison of Direct Gallbladder Puncture with the Transhepatic Puncture Technique in Ultrasound-guided Cholecystostomy for High Surgical Risk Patients with Acute Calculous Cholecystitis

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ABSTRACT

Objective: To compare the clinical response and outcome for direct gallbladder puncture and transhepatic puncture techniques in ultrasound-guided percutaneous cholecystostomy for critically ill and non-surgically fit patients with acute calculous cholecystitis.

Patients and Methods: Twenty seven consecutive critically ill and high surgical risk patients admitted with acute calculous cholecystitis between July 2002 and May 2005 who underwent ultrasound-guided percutaneous cholecystostomy were included in the study. The technique of the procedure and clinical outcomes of these patients were retrospectively evaluated.

Results: Ultrasound-guided percutaneous cholecystostomy was performed using direct gallbladder puncture in 17 patients and transhepatic puncture in 10 patients. There was one procedural failure in transhepatic puncture due to lack of patient cooperation. No procedural failure was reported for direct gallbladder puncture. There were no procedure-related complications. Both groups had a similar clinical response rate, with fever or leucocytosis normalising within 3 days. There was no statistically significant difference in numbers of needle passage, length of hospital stay, or mortality between the two groups. Four patients died due to profound ongoing sepsis and multi-organ failure, while the remaining patients showed clinical improvement and were discharged. Three patients had catheter slippage within one week of the procedure (two following direct gallbladder puncture and one following transhepatic puncture).

Conclusion: Ultrasound-guided percutaneous cholecystostomy for high surgical risk patients with acute calculous cholecystitis is safe and effective. No significant difference in clinical response or outcome was seen between the direct gallbladder puncture or transhepatic puncture techniques in this retrospective study.

Key Words: Acute cholecystitis, Cholecystostomy

INTRODUCTION

Treatment of acute cholecystitis in critically ill patients by surgical means increases the risk of morbidity and mortality. Patients with severe underlying disease or debilitated general condition are initially treated conservatively by administration of antibiotics, decompression, and drainage of the gallbladder. Surgical cholecystostomy, first introduced by Bobbs, decompresses the gallbladder but requires laparotomy and anaesthesia. Ultrasound (US)-guided percutaneous catheter drainage for the treatment of gallbladder empyema was first reported by Radder in 1980. Percutaneous cholecystostomy is a minimally invasive method involving percutaneous placement of a catheter in the gallbladder under imaging guidance.

Drainage of the gallbladder under US guidance can be performed with direct gallbladder puncture (Figure 1) without passing though the liver, or by transhepatic puncture (Figure 2). Direct gallbladder puncture aims at entering the free peritoneal surface of the gallbladder, while transhepatic puncture is best targeted at the gallbladder immediately next to liver. The transhepatic
approach is preferable in the absence of severe liver disease and coagulopathy. Advantages of the transhepatic approach include catheter stability, earlier tract maturity and a lower risk of bile leakage. Direct gallbladder puncture, on the other hand, avoids potential liver injury and minimises potential haemorrhagic risk. However, difficulty is encountered if massive ascites or colonic interposition is present.

The objective of the current study was to determine the clinical response and outcome of US-guided percutaneous cholecystostomy for patients who had undergone gallbladder drainage via the transhepatic route or direct gallbladder puncture.

**PATIENTS AND METHODS**

From July 2002 to May 2005, 45 consecutive patients with acute cholecystitis considered unfit for emergency cholecystectomy were referred to the department for US-guided percutaneous cholecystostomy. The diagnosis of acute cholecystitis was based on combined clinical and US criteria. Clinical criteria included right upper quadrant pain and tenderness, leucocytosis or fever, and Murphy’s sign. US criteria used for diagnosis were gallstones, sonographic Murphy’s sign, gallbladder wall thickening (>3 mm), pericholecystic fluid, and gallbladder dilatation. Eighteen patients with acalculous cholecystitis were excluded from the study. Reasons for exclusion included: 1) gallbladder was not the source of sepsis; 2) recent surgery or severe underlying medical illness likely to influence outcome; and 3) equivocal clinical and imaging criteria.

Puncture of the gallbladder was either through the transeptic route or by direct gallbladder puncture without passing though the liver. Coagulopathies were corrected before procedures, maintaining international normalized ratio <1.5 and a platelet count above 50 x 10^9/L. In the majority of cases (84%), drainage was performed using a one-step diamond shape trocar head needle (Skater single step drainage set, Inter-V; PBN Medicals, Denmark). The remaining procedures were performed with a bevel cutting edge needle, and the drainage catheter was then introduced using the guidewire exchange technique.

Drainage results, complication rates, clinical outcome and other relevant data were retrospectively reviewed. Statistical analysis was carried out by performing the chi-squared test and independent Student’s t-test using the Statistical Package for the Social Sciences (SPSS) software package (Version 10.0; SPSS Inc., Chicago, IL, USA).

**RESULTS**

Twenty seven patients met the clinical and US criteria for acute calculous cholecystitis. Seventeen patients (63%) underwent direct gallbladder puncture drainage and ten patients (37%) had drainage via the transeptic route. These groups of patients did not differ statistically in terms of demographic, clinical or US characteristics (Table 1). Most patients were elderly women. The male-to-female ratio was 1:2.4. Mean age was 79 years. Mean time from onset of symptoms and signs to drainage was 2.4 days. There was one procedural failure during transeptic puncture due to lack of patient cooperation. No procedural failures were reported in the direct gallbladder puncture group. The numbers of needle passage were comparable in both groups.

All patients demonstrated clinical improvement, becoming afebrile within 3 days. In most patients, the
leucocytosis normalised within 3 days. Seventy eight percent of patients had positive culture results from the aspirated bile. The organisms identified were *Klebsiella* (n = 3), *Escherichia coli* (n = 4), *Enterococcus* (n = 3), and mixed growth (n = 4). Three patients had catheter dislodgement within 7 days of the procedure, two in the direct gallbladder puncture group and the other in the transhepatic puncture group. None of these patients had any immediate or delayed procedure-related complications, such as bile leakage or peritonitis.

Mortality and length of hospital stay did not differ significantly between the two groups. Clinical outcome variables are summarised in Table 2. Four patients died due to ongoing profound sepsis and multi-organ failure. The remaining patients made a full recovery. Cholecystostomy catheters were removed after confirmation of cystic duct patency by cholecystogram (Figure 3) or were removed during elective cholecystectomy.

**DISCUSSION**

As a well-established treatment for emergency decompression of the gallbladder in acute cholecystitis, percutaneous cholecystostomy has a response rate ranging from 56-100%. This substantial variation is due to differing patient populations. The response is usually good for cases where the acute calculous cholecystitis is the main cause of the acute problem, contrasting with a less satisfactory result obtained for patients with multiple underlying medical diseases and septic foci. Tract selection for percutaneous cholecystostomy is controversial. Our results found no statistically significant difference in clinical outcomes for patients with acute calculous cholecystitis, using either the transhepatic approach or direct gallbladder puncture technique.

There are both pros and cons for each procedure. Direct gallbladder puncture may lead to gallbladder invagination,
intraperitoneal leakage, bowel perforation; and is relatively contraindicated in cases of ascites or colonic interposition. However, it gives a shorter straight-line access to the gallbladder by rigid cholecystoscope for cholecystolithotomy.\textsuperscript{10} The main problem with the transhepatic procedure is liver trauma. It may also cause more bleeding in transhepatic electrohydraulic lithotripsy through the mature tract\textsuperscript{11} but the tract takes less time to mature with the transhepatic route, allowing earlier endoscopic intervention. Mature tract development has been reported within 2 weeks with the transhepatic route compared with 3 weeks for tract maturation with the transperitoneal approach.\textsuperscript{7}

A common cause of catheter dislodgement is patient movement during transport, or inadequate fixation of the catheter. The use of a removable anchoring device may assist in preventing catheter dislodgement.\textsuperscript{12} Other rare complications of cholecystostomy in general include pneumothorax, exacerbation of sepsis, and bile leakage resulting in peritonitis. Failure of the procedure may be related to a very thick gallbladder wall, underlying porcelain gallbladder, lack of cooperation from the patient and staff inexperience.

Percutaneous cholecystostomy should be followed by elective cholecystectomy if the patient’s condition is stable. However, if the patient is still not fit for surgery, a cholecystogram can be performed in approximately one to two weeks to assess the patency of the cystic duct. If the cystic duct is patent, the cholecystostomy catheter can be removed. If the cystic duct is obstructed, long-term catheter drainage may be continued and catheter exchange every 3 months is required. Alternatively, gallbladder stone dissolution, cholecystolithotomy and endoscopic cholecystolithotripsy are other options for gallbladder stone removal after the tract matures.

The major limitations of the current study are the small sample size and the study design (a non-randomised, retrospective study). We excluded patients with acalculous cholecystitis to avoid potential bias because these groups of patients have a more complicated clinical course. Patients who had undergone recent surgery, prolonged intensive care or who had multiple medical conditions were also excluded. In view of the limited sample size, objective paired comparison remains a difficulty. Patients presenting for these procedures usually have a poor prognosis and not uncommonly also present with coagulopathy, making transhepatic puncture less favoured and hence adding selection bias.

**CONCLUSION**

This study found US-guided percutaneous cholecystostomy for high surgical risk patients with acute calculous cholecystitis was safe and effective. No significant difference in clinical response or outcome was found between the direct gallbladder puncture technique and the transhepatic approach to US-guided percutaneous cholecystostomy.

**REFERENCES**