Abstract  Background and aims: In critically ill patients, cholecystectomy is associated with a high mortality rate. The aim of this study was to evaluate the safety, efficacy and long-term outcome of ultrasound-guided percutaneous cholecystostomy (USGPC) in critically ill patients with acute cholecystitis.

Materials and methods: Clinical records of 51 patients, all considered high-risk surgical patients, with acute cholecystitis treated with USGPC between 1987 and 1999, were retrospectively reviewed. Response was defined as improvement in clinical symptoms and signs, and/or reduction in c-reactive protein and white blood count levels within 72 h. Long-term results were evaluated by means of clinical records and written correspondence.

Results: Gallbladder stones were seen in 28 patients whereas 23 had acalculous cholecystitis. Ninety percent showed clinical improvement after USGPC. Cholecystectomy was performed in 16%, of which 6% after recurrent cholecystitis. Recurrence of cholecystitis occurred in 22%. Hospital mortality was 16%. None of the deaths was procedure related or related to acute cholecystitis alone. Major complications relating to the USGPC were rare (4%), while minor catheter-related complications were quite common.

Conclusions: USGPC is a procedure with few complications and a high success rate. In patients with acalculous cholecystitis as well as in many patients with calculous cholecystitis, no further treatment was needed.

Keywords Acute cholecystitis · Percutaneous drainage · Ultrasound · Critically ill patients

Introduction

Acute cholecystitis is a commonly occurring disease with an annual incidence in Sweden of 5.8 per 100,000 inhabitants [1]. The incidence increases with age [2], and cholecystitis is an important contributing factor to morbidity and mortality in elderly and debilitated patients. Cholecystectomy, laparoscopic or conventional, is the standard treatment for acute calculous cholecystitis (ACC), with an operative mortality rate of less than 0.8% [3, 4, 5]. However, the mortality rate of cholecystectomy among patients with ACC rises to 14–19% in critically ill patients suffering from serious underlying diseases [6, 7].

Acute acalculous cholecystitis (AAC) is an uncommon but serious condition which mainly occurs in seriously ill patients and could be a diagnostic challenge. In 1996, AAC represented 6.5% of all patients registered with acute cholecystitis in Sweden [1]. The mortality of the disease has in some reports been twice as high as for cholecystitis due to gallstones [8]. Risk factors associated with AAC include severe trauma, major surgery, sepsis, burns, long-term fasting with or without total parenteral nutrition, major cardiac infarctions, diabetes mellitus and acquired immunodeficiency syndrome among
The operative mortality rate in these critically ill patients has been reported to be as high as 30% [10].

To those considered as high-risk patients for cholecystectomy, percutaneous cholecystostomy can be a safe and simple alternative treatment. The first percutaneous cholecystostomy was reported in 1980 by Radder et al. [13]. Ultrasound-guided percutaneous cholecystostomy (USGPC) is a rapid and minimally invasive procedure requiring only local anaesthesia, and the procedure can be performed bedside. The technique has also been performed under computed tomography (CT) guidance. Reports have shown few complications and a high success rate [14, 15, 16, 17]. The patients usually present instantaneous improvement with regard to clinical appearance and laboratory values.

In seriously ill patients with ACC, USGPC is often performed as a temporary procedure, allowing the patient’s condition to stabilise prior to an elective cholecystectomy. In patients with AAC, USGPC has by many authors been advocated as being preferable to surgery [16, 17, 18, 19, 20, 21] and, in most cases, no further treatment is needed. USGPC also brings opportunities for antegrade cholangiography, which can be used for both diagnostic and evaluating purposes. Further on, the procedure facilitates sampling for bacteriologic cultures from the bile fluid.

The aim of this study was to evaluate the safety, efficacy and long-term outcome of USGPC in high-risk patients with acute calculous or acalculous cholecystitis.

**Methods**

All patients treated with USGPC between January 1987 and January 1999 were identified through a registry at the Department of Diagnostic Radiology, University Hospital, Uppsala. The registry, with consecutive registration, contains information on the patients national identification number (a unique ten-digit number for every inhabitant in Sweden), ultrasound (Us) diagnosis, referral department and any intervention. Clinical records were retrospectively reviewed. The diagnosis was based on physical examination, laboratory findings and radiological imaging. Acute cholecystitis, calculous or acalculous, was suspected upon right upper quadrant tenderness with or without local muscular rigidity, and/or elevated C-reactive protein (CRP) and leukocyte (WBC) levels. Alkaline phosphatases (ALPs) and bilirubin levels were also recorded. Diagnosis was confirmed radiologically by abdominal CT imaging or Us. The specific radiological findings suggestive of acute cholecystitis (thickness of the gallbladder wall, pericholecystic fluid, tenderness over the gallbladder) were noted as well as subsequent admission for gallbladder or bile duct diseases and surgical procedures. Response to USGPC was defined as improvement in clinical symptoms and signs and/or significant reduction (>10%) in CRP and WBC levels within 72 h. Written correspondence was performed to those patients who were still alive in April 1999 (n=14) with a response rate of 11 out of 14. Information on later symptoms of gallbladder or bile duct diseases and surgical procedures was obtained. Dates of deaths were obtained through linkage to the Swedish Population Registry. The patients were followed until cholecystectomy, date of death, or April 1999. The study was approved by the local ethics committee.

**Ultrasound**

The drainage procedures were all performed under Us guidance. A vector or linear transducer (Acuson, Mountain View, Calif.) was used depending on the depth of the gallbladder (Fig. 1). After placing a small amount of local anaesthetic subcutaneously at the site of the gallbladder, a skin incision was made through which the catheter was introduced. A 7-Fr pigtail catheter was used in all cases (TCD Set, PBN Medicals, Denmark). If possible, the catheter was introduced into the gallbladder after passing through the liver. The catheter was thereafter fixed, either by an internal locking device or by means of a suture to the skin. The catheter was rinsed with saline solution daily in order to prevent clogging.

**The patients**

In total, 51 patients with acute cholecystitis with or without gallstones were identified as having USGPC. Of these, 59% were men and the mean age (range) was 71 years (18–94 years). All patients were considered as high-risk surgical patients (ASA class 4) due to serious underlying diseases or prior severe trauma (Table 1).

**Table 1 The underlying and concomitant diagnoses among the patients**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cardiopulmonary disorder</td>
<td>25</td>
</tr>
<tr>
<td>Sepsis*</td>
<td>11</td>
</tr>
<tr>
<td>Malignancies</td>
<td>6</td>
</tr>
<tr>
<td>After surgical procedures</td>
<td>5</td>
</tr>
<tr>
<td>Trauma</td>
<td>4</td>
</tr>
<tr>
<td>Total</td>
<td>51</td>
</tr>
</tbody>
</table>

*Unrelated to acute calculous cholecystitis and acute acalculous cholecystitis