Efficiency of Percutanous Choecystostomy in Management of Acute Cholecystitis in High-Risk Patients.

A Mohamed, F Emran, A Khan, A AL Sharif, N Ghanem

Abstract

OBJECTIVES:

To evaluate the effectiveness of percutaneous cholecystostomy in management of acute cholecystitis in critically ill high-risk patients who cannot undergo cholecystectomy.

METHODS: We retrospectively reviewed the medical records of patients who underwent percutaneous cholecystostomy at KFMC, Riyadh, KSA, in the period from January 2008 to January 2010. A total of 22 patients were included, twelve were males (55%) and ten were females (45%). Age ranged between 28 and 85 years; with a mean age of 63 years.

All patients had clinical and radiological evidence of acute cholecystitis (14 calculous and 8 acalculous). The indications for percutaneous cholecystostomy in the patients with calculous cholecystitis were classified into four categories: {1} High risk for surgery due to associated severe co-morbidity, {2} Cholecystitis during late pregnancy, {3} Severe cholecystitis (not responding to conservative management) and {4} Suspected empyema of the gallbladder.

Fourteen patients (64%) had transperitoneal percutaneous cholecystostomy and 8 patients (36%) had the transhepatic procedure, under both ultrasonic and fluoroscopic guidance. Patients’ responses were monitored clinically by monitoring the vital and the abdominal signs and laboratory by series of WBCC estimations. Drainage catheters were left in situ for periods ranging between 2 and 8 weeks with a mean period of 4 weeks. Laparoscopic cholecystectomy was subsequently done in 8 patients with calculous cholecystitis (61.5%) after an interval of 4 to 6 weeks.

RESULTS: Percutaneous cholecystostomy was achieved successfully in all patients. No procedure-related mortality was observed apart from minor bile leakage in one patient of the transperitoneal approach group which resolved spontaneously. One patient with empyema of the gallbladder did not show adequate clinical response after 72 hours of percutaneous drainage and was taken for urgent cholecystectomy. Laparoscopic cholecystectomy was done in 8 patients out of the remaining 13 patients with calculous cholecystitis after an interval of 4 to 6 weeks without operative difficulties or conversion to open surgery.

CONCLUSION: Percutaneous cholecystostomy under ultrasonographic and fluoroscopic guidance is a safe, easy-to-perform and effective procedure with high success rates and low morbidity rates for management of critically ill and high-risk patients with acute cholecystitis.

INTRODUCTION

In the recent years diagnostic and therapeutic biliary intervention by percutaneous access to the gallbladder became an important new area in interventional radiology, which resulted in introduction of the technique of percutaneous cholecystectomy. Since the first report of percutaneous cholecystostomy for acute cholecystitis in 1980, it became a popular procedure as a temporary measure in critically ill patients with acute cholecystitis who cannot undergo cholecystectomy, and definitive treatment in patients with acalculous cholecystitis. We present our experience with 22 patients who underwent percutaneous cholecystectomy with special emphasis on indications, effectiveness and complications.

MATERIALS AND METHODS

This is a retrospective study of patients who underwent percutaneous cholecystostomy at King Fahad Medical City in the period from January 2008 to January 2010. The data...
was collected from patient records in predesigned data sheets which included patients’ age, sex, indications and route of the procedure, patients’ response and timing of removal of the catheter and operative findings in patients who subsequently had laparoscopic cholecystectomy. Collected data was analyzed and expressed in multiple tables.

RESULTS

Twenty-two patients had percutaneous cholecystostomy (12 males and 10 females) in the 2-year period (Table 1 and Figure 1). The age was ranging between 28 and 85 years with a mean age of 63 years.

Figure 1
Table 1 and Figure 1: Percutaneous cholecystostomy: Sex ratio

<table>
<thead>
<tr>
<th>Gender</th>
<th>Number of patients</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td>12</td>
<td>55%</td>
</tr>
<tr>
<td>Females</td>
<td>10</td>
<td>45%</td>
</tr>
</tbody>
</table>

According to the indication of the procedures, the patients were categorized into two groups: 1) patients with calculous cholecystitis (14 patients) and 2) patients with acalculous cholecystitis (8 patients) (Table 2 and Figure 2).

Figure 2
Table 2 and Figure 2: Number of patients with calculous and acalculous cholecystitis

<table>
<thead>
<tr>
<th>Cholecystitis</th>
<th>Number of patients</th>
<th>males</th>
<th>females</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calculous cholecystitis</td>
<td>14</td>
<td>6</td>
<td>8</td>
</tr>
<tr>
<td>Acalculous cholecystitis</td>
<td>8</td>
<td>6</td>
<td>2</td>
</tr>
</tbody>
</table>

The patients with calculous cholecystitis were further subdivided according to the indications of the procedure into four subgroups: 1} - High risk for surgery due to associated severe co morbidity, {2} – Cholecystitis during late pregnancy {3} - Severe cholecystitis (not responding to conservative management) and {4} - Suspected empyema of the gallbladder (Table 3 and Figure 3).

Figure 3
Table 3 and Figure 3: Indications for percutaneous cholecystostomy in patients with acute calculous cholecystitis

<table>
<thead>
<tr>
<th>Indications</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe associated co-morbidity</td>
<td>7</td>
</tr>
<tr>
<td>Pregnancy</td>
<td>1</td>
</tr>
<tr>
<td>Severe calculous cholecystitis</td>
<td>3</td>
</tr>
<tr>
<td>Empyema of gallbladder</td>
<td>3</td>
</tr>
</tbody>
</table>

The associated co-morbidities in the patients with calculous cholecystitis are shown in Table 4 and Figure 4.
Figure 7

<table>
<thead>
<tr>
<th>Co-morbidity</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Decompensated heart disease</td>
<td>3</td>
</tr>
<tr>
<td>Recent MI &amp; cardiac</td>
<td>2</td>
</tr>
<tr>
<td>Intervention</td>
<td></td>
</tr>
<tr>
<td>Uncontrolled diabetes</td>
<td>1</td>
</tr>
<tr>
<td>Coagulopathy</td>
<td>1</td>
</tr>
</tbody>
</table>

Figure 8

Table 4 and Figure 4: Co-morbidities in patients with calculous cholecystitis

Percutaneous cholecystostomy was achieved successfully in all patients. In 14 patients the procedure was done transperitoneally while in the remaining 8 patients it was done transhepatically (Table 5 and Figure 5)

Figure 9

Table 5 and Figure 5: Approaches of percutaneous cholecystostomy

<table>
<thead>
<tr>
<th>Approach</th>
<th>Number of patients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transperitoneal</td>
<td>14</td>
</tr>
<tr>
<td>Transhepatic</td>
<td>8</td>
</tr>
</tbody>
</table>

Figure 10

Patient response was monitored clinically and by repeated WBCC estimations. A positive response is considered when there is defer-vergence, resolution of symptoms and signs, reduction in white blood cell counts to normal or by at least 25%, and a capability for weaning off vasopressors, with all this occurring within 72 hours of the procedure. All patients with acalculous cholecystitis showed positive response in 72 hours as well as patients with calculous colecystitis apart from one patient with empyema of gallbladder who required urgent cholecystectomy (95.4%).

No procedure-related mortality was observed apart from minor bile leakage in one patient which resolved spontaneously (Table 6 and Figure 6).

Eight patients had laparoscopic cholecystectomy after periods ranging from 4 to 6 weeks without operative difficulties or conversion to open surgery.

Figure 11

Table 6 and Figure 6: Patient’s responses to percutaneous drainage

<table>
<thead>
<tr>
<th>Indications</th>
<th>Number of patients</th>
<th>Positive response</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Severe associated co-morbidity</td>
<td>7</td>
<td>7</td>
<td>100%</td>
</tr>
<tr>
<td>Third trimester pregnancy</td>
<td>1</td>
<td>1</td>
<td>100%</td>
</tr>
<tr>
<td>Severe calculous cholecystitis</td>
<td>3</td>
<td>3</td>
<td>100%</td>
</tr>
<tr>
<td>Acalculous cholecystitis</td>
<td>8</td>
<td>8</td>
<td>100%</td>
</tr>
<tr>
<td>Empyema of gallbladder</td>
<td>3</td>
<td>2</td>
<td>66.6%</td>
</tr>
</tbody>
</table>

Figure 12

Efficacy of percutaneous cholecystostomy in different patient groups
DISCUSSION

Cholelithiasis affects approximately 10% of the adult population in the United States. Cholecystectomy for either recurrent biliary colic or acute cholecystitis is the most common major elective surgical procedure performed by general surgeons, resulting in 600,000 hospitalizations and more than 500,000 operations each year in the United States (1).

In Saudi Arabia the prevalence of gallstone disease at the country level has not yet been determined. The common impression (depending on the scattered reports on gallstone disease from different parts of Saudi Arabia) is that gallstones are remarkably “common” (2–8). One study in the community of the Asir region of Saudi Arabia reported a prevalence of (11.7%) (9).

Laparoscopic cholecystectomy first of all performed by Erich Mühe (Germany) in 1985, has in fact revolutionized the treatment of cholelithasis (10) and established itself as the standard treatment of gallstone diseases.

The ultimate therapy for acute cholecystitis is cholecystectomy. Although cholecystectomy (open or laparoscopic) is generally safe, with an operative mortality rate of 0 to 0.8% (11), in critically ill elderly patients the mortality of emergency cholecystectomy may reach up to 30% and up to 40% in patients with acalculous cholecystitis (12).

Open cholecystostomy performed under local anesthesia was considered to be the procedure of choice for treatment of acute cholecystitis in high-risk patients. In recent years, ultrasound- or computed tomography (CT)-guided percutaneous cholecystostomy has almost replaced open cholecystostomy for the treatment of acute cholecystitis in critically ill patients (13). Although open cholecystostomy can be performed under local anesthesia in the operating room, it has the disadvantage of requiring laparotomy and heavy sedation and may be difficult to perform (14).

Historically, Bobbs of Indianapolis performed the first cholecystostomy in 1868, under the impression that he was opening a large ovarian cyst (15). He was followed 10 years later by J. Marion Sims who performed the first planned cholecystostomy in 1878 (16). Cholecystostomy remained the only treatment of gall stones since that time, until Langenbuch performed the first open cholecystectomy in early 1882 (17). The role of both open cholecystostomy and open cholecystectomy was significantly diminished with introduction of laparoscopic cholecystectomy. Even before the era of laparoscopic surgery there was reluctance to perform cholecystostomy, since it falls short of the ideal objective of extirpation of the organ responsible for the disease and represents a compromise or substitute procedure, together with the fact that it leaves the patient in some likelihood of requiring further surgery. For these reasons, its performance was somewhat regarded as a form of surgical defeat (18).

Ross and Dunphy, while strongly advocating cholecystostomy, described it as “an unwanted stepchild in the family of surgical operation. Its presence as a recognized operation is admitted, but its legitimacy is suspect.” (18, 19)

The role of cholecystostomy in the era of laparoscopic surgery was limited to poor risk or debilitated patients with an obstructed gallbladder, in whom open operation or laparoscopic interventions are considered high risk. Occasionally, both cholecystostomy and open cholecystectomy are appropriate operative options if laparoscopic cholecystectomy becomes difficult or unsafe.

Recently, diagnostic and therapeutic biliary intervention by percutaneous access to the gallbladder including percutaneous cholecystostomy became an important new area in interventional radiology (20). The introduction of percutaneous cholecystostomy has re-popularized the role of cholecystostomy in the management of gall stone diseases.

Percutaneous cholecystostomy was first described in 1921, when it was used as a diagnostic test. Ultrasound-guided cholecystostomy with placement of a catheter for therapeutic purposes was reported in 1979, when it was used for treating cholangitis in a case of obstructive jaundice (21). Radder was the first one who described percutaneous cholecystostomy for acute cholecystitis in 1980, when it was performed in a critically ill patient with empyema of the gallbladder (22).

Percutaneous cholecystostomy has greatly replaced open cholecystostomy as an effective and safer procedure with low morbidity and mortality (23). It has advantage over open cholecystostomy in that it can be done at bedside under local anesthesia without need for laparotomy.

At present, many authors consider percutaneous cholecystostomy is a cost-effective, easy and reliable procedure with low complications and high success rates for high-risk patients with acute calculous cholecystitis, and definitive treatment in patients with acalculous cholecystitis.
Efficiency of Percutanous Choecystostomy in Management of Acute Cholecystitis in High-Risk Patients.

A total of 22 patients (12 males and 10 females) were included in our study. Although gallstones are 4 times commoner in females than in males, in our study there was male predominance. The main reasons for this is the fact that there were more males than females in the acalculous cholecystitis group (6 males and 2 females) together with the fact that we generally believe that laparoscopic cholecystectomy is more difficult to perform in males than in females specially during the stage of acute inflammation and we tend to treat males with acute cholecystitis by conservative management followed by interval cholecystectomy.

The mean age of 63 years in the studied patients explains the associated co-morbidities.

Indications for cholecystostomy are relative rather than absolute. Specific indications are difficult to define, since multiple factors are often involved in the decision to perform cholecystostomy (30).

The reported indications for this procedure include calculous and acalculous cholecystitis, gallbladder perforation, malignant obstruction, percutaneous biliary stone removal, biliary duct drainage, and diagnostic imaging of the gallbladder and biliary ductal system. In addition, gallbladder access provided by percutaneous cholecystostomy may serve to carry additional procedures, such as cholangiograms, gallstone dissolution, and lithotripsy (31).

The role of percutaneous cholecystostomy as a useful temporizing measure, which allows selective patients with calculous cholecystitis to undergo elective cholecystectomy and as definitive curative procedure for management of patients with acalculous cholecystitis is well established (29); however, the role of of percutaneous cholecystostomy with early or delayed cholecystectomy in management of complicated acute cholecystitis in otherwise healthy individuals is not yet established.

In our study the procedure was used as a definitive curative procedure for 8 patients with acalculous cholecystitis and as temporal measure in 3 patients with acute severe calculous cholecystitis, 3 patients with clinically and radiologically documented empyema of gallbladder and one pregnant patient (without associated co-morbidity).

Current treatment options for acute calculous cholecystitis include either early cholecystectomy, or conservative treatment consisting of intravenous antibiotics and an interval cholecystectomy several weeks later (42). Each option has its own advantages and disadvantages.

Acute cholecystitis was once considered a contraindication to laparoscopic cholecystectomy. Growing experience has allowed the use of laparoscopic cholecystectomy in more complex procedures, (33) such as in acute cholecystitis patients (34-45).

Currently, laparoscopic cholecystectomy has been accepted as a safe and feasible approach to acute cholecystitis in the hands of experienced surgeons. Many authors advocate early laparoscopic cholecystectomy for acute cholecystitis (36, 37, 39, and 40) as it tends to shorten the total length of hospital stay and reduce the risk of repeat cholecystitis; however, the performance of laparoscopic cholecystectomy for acute cholecystitis is technically more demanding and time consuming than in elective cases. Extensive inflammation, increased bleeding and adhesions around Calot’s triangle obscure the anatomy, making dissection difficult and hazardous. Subtotal cholecystectomy or conversion may be required if the anatomy cannot be defined (41, 42, 43).

On the other hand, the conservative management followed by delayed cholecystectomy may be safer but it increases the total length of hospital stay and the risk of readmissions attributable to recurrent acute cholecystitis and pancreatitis; it is, therefore, not a cost-effective approach for the management of acute cholecystitis.

Theoretically, percutaneous cholecystostomy presents a modest solution between these two extreme options as it promotes early resolution of the inflammation that may allow early laparoscopic cholecystectomy (within days, rather than weeks) without jeopardizing patient’s safety or increasing the chance of subtotal cholecystectomy or conversion to open surgery. Unfortunately, this role was not well studied apart from few published papers about the role of percutaneous cholecystostomy in management of severe acute cholecystitis.

Winbladh et al. reviewed the literature in April 2007 to find out if there is any evidence to recommend percutaneous cholecystostomy rather than cholecystectomy for acute cholecystitis in the elderly population. They reviewed 53 studies including 1918 patients. They found that only three papers described randomized controlled trials, but none
compared the outcomes of percutaneous cholecystostomy and cholecystectomy and that all the papers reviewed were of evidence grade C. They concluded that it is not possible to make definitive recommendations regarding treatment by percutaneous cholecystostomy or cholecystectomy in elderly or critically ill patients with acute cholecystitis (44).

Berber et al. suggest that interval laparoscopic cholecystectomy can safely be performed in patients who had tube cholecystostomy, once sepsis and acute infection resolved (45). They stated that as catheter drainage of acute infection with interval appendectomy is accepted in patients with periappendiceal abscess, tube cholecystostomy with interval laparoscopic cholecystectomy should have a role in the management of selected patients with acute cholecystitis.

Kim et al. evaluated the role of preoperative percutaneous transhepatic gallbladder drainage (PTGBD) in management of patients with complicated cholecystitis by comparing patients who had laparoscopic cholecystectomy without preoperative PTGBD with patients who had PTGBD followed by delayed laparoscopic cholecystectomy (after 14 to 39 days). They found that the conversion rate to open cholecystectomy and the postoperative complication rate were lower in the second group than in the first group. They concluded that elective delayed laparoscopic cholecystectomy after PTGBD may lower the conversion and complication rates of patients with complicated acute cholecystitis (46).

Similarly, Chikamori et al. evaluated the effectiveness of early scheduled laparoscopic cholecystectomy following percutaneous transhepatic gallbladder drainage (PTGBD) for patients with acute cholecystitis, comparing three groups of patients. The first group included 31 patients with acute cholecystitis who were treated by early scheduled laparoscopic cholecystectomy (within 1-7 days) following PTGBD, the second group included 9 patients treated by early LC without PTGBD and the third group included 12 patients who were treated by delayed laparoscopic cholecystectomy following conservative therapy. They found that the success rate of intraoperative cholangiography was higher, the conversion rate to open cholecystectomy was lower, and operative time was shorter in the first group than in the second and the third group. They concluded that early scheduled LC following PTGBD is a safe and effective therapeutic option for patients with acute cholecystitis especially in elderly and complicated patients (47).

Percutaneous cholecystostomy may have a place in the future, specially in patients with initial severe cholecystitis and those who are not readily responding to antibiotic therapy or in lack of surgical experience to deal with technical difficulties during laparoscopic cholecystectomies in acute cases; however, more randomized controlled trials (RCTs) are needed to support this.

Biliary tract disorders are the second most common general surgical condition in pregnancy (after acute appendicitis), and cholecystectomy is the second most commonly performed operation during pregnancy (48).

The appropriate management of biliary tract disease during pregnancy is uncertain, although it has been classically managed conservatively and surgical intervention is usually delayed until after delivery unless conservative treatment fails or symptoms recur in the same trimester (49). Advances in minimally invasive surgery and the high recurrence rate of symptoms observed changed this management. Although laparoscopic cholecystectomy can be performed safely during pregnancy, the timing and indications for this surgical intervention have not been firmly established (50).

According to the practice/clinical guidelines published on 09/2007 by the Society of American Gastrointestinal and Endoscopic Surgeons (SAGES), several recent studies have shown that pregnant patients may undergo laparoscopic surgery safely during any trimester without any appreciated increased risk to the mother or fetus (51, 52, 53, 54). It has been suggested that the gestational age limit for successful completion of laparoscopic surgery during pregnancy is 26 to 28 weeks (55).

Our study included one female with acute cholecystitis during late third trimester of pregnancy. She presented with initial severe symptoms that were not responding to the conservative management. She had a positive response to percutaneous cholecystostomy and subsequently she had laparoscopic cholecystectomy (after delivery) without complications.

Percutaneous cholecystostomy is usually performed under ultrasonographic and fluoroscopic guidance, though it can be performed with only ultrasonographic guidance (56). It can be easily performed under local anesthesia. Two ways of accessing the gall bladder were defined, either a transhepatic or transperitoneal approach. Route selection is still controversial. Controversies still exist on the best approach of the procedure (57).

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 (58, 59, and 60).

The transperitoneal approach decreases the risk of bleeding and secondary liver contamination by infected bile but it increases the risk of bile peritonitis, colon perforation, portal vessel injury, and displacement of the catheter after decompression of the gall bladder (61, 62, 63).

Most clinicians prefer a transhepatic approach because the transperitoneal approach poses a risk of bile peritonitis. However, the transperitoneal approach can be used if the gallbladder is much distended. The transhepatic should be avoided in the presence of severe liver disease and coagulopathy (64).

In our study fourteen patients (64%) had transperitoneal percutaneous cholecystostomy and 8 patients (36%) had the transhepatic procedure, under both ultrasonic and fluoroscopic guidance. Minor bile leakage occurred in one patient from the transperitoneal approach group.

A positive response to percutaneous cholecystostomy is considered when there is defervescence, resolution of symptoms and signs in symptomatic patients, reduction in white blood cell counts to normal or by at least 25%, and a capability for weaning off vasopressors, with all this occurring within 72 hours of the procedure. Patients with ultrasound gall bladder findings as wall thickening, distention, stones, pericholecystic fluid and Murphy’s sign have a high chance of a positive response.

A negative response is defined as when the patient’s clinical course is unaltered after percutaneous cholecystostomy (65, 66, and 67). Positive response is reported to range from 59 to 93% depending on the patient’s condition. We observed positive response in all patients with calculous and acalculous cholecystitis, apart from one patient with empyema of the gall bladder who required urgent cholecystectomy (95.4%).

The patency of the cystic duct can be evaluated by clamping the tube for 48 hours before removing it. If the patient tolerates tube clamping without developing complications it can be safely removed. Tract maturation can be evaluated before the catheter is removed by injecting contrast material through the catheter while the catheter is pulled over a wire. If extravasation into the peritoneum is noted, the catheter should be reinserted to prevent bile peritonitis. A follow-up study is performed in a few weeks in a similar fashion to evaluate for tube removal.

In our study the catheters were left in situ for periods ranging between 2-8 weeks with mean period of 4 weeks. A long period of catheter drainage was observed in the pregnant patient and the patients with empyema of the gall bladder.

All patients subjected to cholecystostomy should be regarded as candidates for subsequent cholecystectomy, unless other disease clearly contraindicates further surgery. In the majority of patients undergoing cholecystostomy, it is possible to determine during the initial hospitalization whether subsequent cholecystectomy should be advised (18). It was estimated that 60 to 65 per cent of cholecystostomy patients would remain symptom-free (70). Gray and Lofgren found that 72 per cent of cholecystostomy patients over 70 years of age did well without further surgery for five years or until death (70, 71).

Percutaneous cholecystostomy is a safe and effective procedure with a technical success rate ranging from 98 to 100%. Relief of clinical symptoms varies from 59 to 93% depending on the patient’s condition. The complication rate reported for this procedure is 12% (21, 86, 72, 73). Minor complications include vagal reaction and catheter dislodgement. Major complications include hemorrhage, sepsis, bile peritonitis and perforation of the intestinal loop (74). In our study, the procedure success rate was 100%. Relief of symptoms was observed in 21 patients (95.4%). A minor complication in form of a bile leak occurred in one patient of the transperitoneal approach group and resolved spontaneously. Eight patients from the calculous cholecystitis group (61.5%) had interval cholecystectomy without complications or conversion to open surgery.

CONCLUSION

Percutaneous cholecystostomy under ultrasonographic and fluoroscopic guidance is a safe, easy-to-perform and effective procedure with high success rates and low
morbidity rates for management of critically ill and high-risk patients with acute cholecystitis. The role of percutaneous cholecystostomy as a useful temporizing measure in high risk patients with calculous cholecystitis and as a definitive treatment in patients with acalculous cholecystitis is well established but its role in management of complicated acute calculous cholecystitis in otherwise healthy patients is not well investigated. With the increasing use of the procedure and its increasing safety it may play a role in bridging the gap between the lengthy, not cost-effective conservative management and the technically demanding and sometimes unsafe immediate surgery in patients with complicated calculous cholecystitis; however, more randomized controlled trials (RCTs) are needed in this regards.

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