Clinical and operative outcomes of patients with acute cholecystitis who are treated initially with image-guided cholecystostomy

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Background: Percutaneous cholecystostomy (PC) tube placement followed by delayed cholecystectomy has been shown to be an effective treatment option in high-risk populations such as older and critically ill patients. The goal of this study was to review the short -and long-term clinical and operative outcomes of patients with acute cholecystitis initially treated with PC tube placement.

Methods: We conducted a retrospective review of patients who underwent image-guided PC tube insertion between 2001 and 2011 at the Royal University Hospital or St. Paul's Hospital, Saskatoon. Clinical outcomes, complications and elective cholecystectomy follow-up were noted.

Results: A total of 140 patients underwent PC tube insertion, 76 men and 64 women with a mean age of 68.4 (standard deviation 17.7) years. Of the 140, 94 (67.1%) had an American Society of Anesthesiologists classification score of III or IV. Percutaneous cholecystostomy tubes remained in place for a median of 21.0 days, and the median hospital stay was 7.0 days. Readmission owing to complications from PC tubes occurred in 21 patients (15.0%), and 10 (7.1%) were readmitted with recurrent cholecystitis after tube removal. Forty-four patients (31.4%) returned for subsequent elective cholecystectomy, of whom 32 (73%) underwent laparoscopic cholecystectomy, 4 (9%) underwent open cholecystectomy, and 8 (18%) underwent laparoscopic converted to open cholecystectomy.

Conclusion: Percutaneous cholecystostomy is a safe procedure that can be performed in patients who are older or have numerous comorbidities. However, less than one-third of such patients in our cohort subsequently had the definitive intervention of elective cholecystectomy, with a high rate of conversion from laparoscopic to open cholecystectomy.

Contexte : Il a été démontré que la pose d'un drain de cholécystostomie percutanée suivie d'une cholécystectomie tardive serait une option thérapeutique efficace chez les populations à risque élevé, comme les patients âgés et gravement malades. L'objectif de cette étude était de revoir l'issue clinique et chirurgicale à court et à long terme chez les patients ayant présenté une cholécystite aiguë traitée par cholécystostomie percutanée.

Méthodes : Nous avons procédé à une revue rétrospective des patients ayant subi une cholécystostomie percutanée guidée à l'aide de l'imagerie entre 2001 et 2011 à l'Hôpital royal universitaire ou à l'Hôpital St. Paul de Saskatoon. Nous avons ensuite pris note de l'issue clinique, des complications et des cholécystectomies non urgentes subséquentes.

Résultats : En tout, 140 patients ont subi une cholécystostomie percutanée, 76 hommes et 64 femmes âgés en moyenne de 68,4 ans (écart-type 17,7 ans). Sur les 140 patients, 94 (67,1 %) présentaient un score ASA (American Society of Anesthesiologists) de III ou IV. Les drains de cholécystostomie percutanée sont restés en place pendant une période médiane de 21,0 jours et la durée médiane des séjours hospitaliers a été de 7,0 jours. Vingt-et-un patients (15,0 %) ont dû être réadmis en raison de complications liées aux drains de cholécystostomie, et 10 patients (7,1 %), en raison d'une récurrence de la cholécystite après le retrait du drain. Quarante-quatre patients (31,4 %) sont revenus pour une cholécystectomie non urgente, dont 32 (73 %) ont subi une cholécystectomie laparoscopique, 4 (9 %), une cholécystectomie laparotomique, et 8 (18 %) une cholécystectomie laparoscopique convertie en cholécystectomie laparotomique.

Conclusion : La cholécystostomie percutanée est une approche sécuritaire envisageable chez les patients plus âgés présentant plusieurs comorbidités. Toutefois, dans notre cohorte, moins du tiers de ces patients ont par la suite subi la cholécystectomie non urgente définitive, et le taux de conversion de cholécystectomie laparoscopique en cholécystectomie laparotomique a été élevé.

The accepted standard for treatment of acute cholecystitis is laparoscopic cholecystectomy.[1,2] However, laparoscopic cholecystectomy in patients at high risk with multiple comorbidities, such as older people and those who are critically ill, has been associated with a postoperative morbidity rate of over 20% in some series and a mortality rate reaching 5%.[3–7] The presence of comorbidities has been shown to be a predictor of conversion to an open procedure[8] and to result in increased perioperative complications.[9] Older patients have been found to have an increase in complicated biliary tract disease, with conversion rates of laparoscopic to open cholecystectomy ranging from 5% to 37%.[4,5,10]

Image-guided percutaneous cholecystostomy (PC) tube placement has been found to be a safe and effective alternative to cholecystectomy in patients at high risk with serious comorbidities.[11–16] This procedure provides an immediate treatment option in these sick patients but is essentially a temporizing measure until the immediate emergency is treated and the patient's medical condition is optimized for an elective cholecystectomy procedure several weeks after placement of the PC tube.[17] Percutaneous cholecystostomy tube placement followed by delayed cholecystectomy has been shown to be an effective treatment option in this high-risk population.[18] There have been inconsistent results regarding the superiority of early versus delayed laparoscopic cholecystectomy. Randomized and retrospective studies favoured early cholecystectomy for acute cholecystitis owing to a lower morbidity rate, shorter hospital stay and lower cost,[19–21] whereas a systematic review did not show any significant difference in the rate of complications.[22] Improved outcomes have been shown with delayed cholecystectomy following percutaneous draining in this high-risk cohort.[23]

The resolution of the acute episode of cholecystitis after PC tube placement may itself be followed by complications, including a 1-year cholecystitis recurrence rate of up to 35% and 30-day overall mortality rate of up to 15.4%.[24,25] In most studies published after 1995, the overall mortality rate was 13.3%.[25] However, the selection bias toward patients with comorbidities and older patients in this patient population results in a mortality rate related more to underlying overall health than to PC tube placement.

We aimed to determine short- and long-term clinical and operative outcomes of patients with acute cholecystitis treated initially with PC tube placement.

Methods

We conducted a retrospective study of patients with a diagnosis of acute cholecystitis who underwent image-guided PC tube insertion from 2001 to 2011 at the Royal University Hospital or St. Paul's Hospital, Saskatoon. Patients with cholecystitis caused by malignant disease, ascending infection from common bile duct stones or pancreatic disease were excluded from the study. The study was approved by the research ethics board of the University of Saskatchewan.

We defined acute cholecystitis based on the Tokyo Criteria.[26] The general surgeon on call for the acute care service at our institution was responsible for the decision to place a PC tube. All PC tubes were placed under ultrasonography or computed tomography guidance by a consultant staff radiologist.

The chart review included a 2-year follow-up period. Patient demographic characteristics, comorbidities, laboratory findings, image findings and follow-up including readmission due to PC tube complications and elective cholecystectomy were noted. Complications after PC tube insertion included readmission to hospital secondary to tube dislodgement, site leakage and need for reinsertion. The primary outcome was the proportion of patients who subsequently underwent elective cholecystectomy. Secondary outcomes included hospital length of stay and the length of time the tube was in place.

We reviewed operative reports for patients who returned for elective cholecystectomy to identify the type of cholecystectomy performed (laparoscopic v. open), conversion to open surgery, the reason for the conversion and the American Society of Anesthesiologists (ASA) classification score.

Data are presented as median and quartile range as appropriate. We tested significance using the Pearson χ^2 test.

Results

We reviewed the charts of 140 patients who underwent image-guided PC tube placement for acute cholecystitis. Of the 113 radiology reports that described the presence or absence of gallstones, 21 (18.6%) showing acalculous cholecystitis. The study cohort included patients who were admitted to the intensive care unit. There were 76 men (54.3%) and 64 women (45.7%) with a mean of 68.4 (standard deviation 17.7) years. Patients had elevated leukocyte counts and multiple comorbidities (Table 1). Of the 140 patients, 19 were lost to follow-up.

Outcomes

In most cases, a PC tube was placed because the patient was a poor surgical candidate owing to multiple comorbidities, critical illness or advanced age. The timing of tube placement was immediately on presentation or after ongoing symptoms and elevated leukocyte count following initial intravenous antibiotic treatment in patients at high risk. Eight cases were due to gallbladder factors including gallbladder perforation and empyema.

The PC tube was eventually removed in all patients for whom follow-up data were available. The tubes remained in place for a median of 21.0 (quartile range 31.0) days, and patients remained in hospital for a median of 7.0 (quartile range 10.0) days after tube insertion (Table 2). In 11 cases, the tube remained in place until elective cholecystectomy. Home care was arranged for all patients who were sent home with PC tubes.

After discharge from hospital, 21 patients (15.0%) were readmitted to hospital because of PC tube complications (Table 2). The most common complications resulting in readmission were tube displacement from the gallbladder (9 patients), clogged tube (7) and pain at the PC site (6). Less common reasons were leaking around the tube, tube breakage and removal of the tube by the patient. After the tubes had been removed, 10 patients (7.1%) were readmitted with cholecystitis; most were managed nonoperatively, and only 3 subsequently underwent cholecystectomy.

Elective cholecystectomy

A total of 44 patients (31.4%) underwent subsequent elective cholecystectomy following initial PC tube insertion (Table 3). Three had subtotal cholecystectomy. No deaths were documented in the 30-day postoperative period.

Table 1. Baseline demographic characteristics of patients with acute cholecystitis who underwent percutaneous cholecystostomy tube placement

Characteristic	No. (%) of patients* *n* = 140
Age, mean ± SD; yr	68.4 ± 17.7
Male sex	76 (54.3)
Weight, mean ± SD; kg	84.4 ± 20.2
Laboratory values, mean ± SD	
Leukocyte count, × 10^9/L	14.4 ± 6.3
Hemoglobin level, g/L	117 ± 19.7
Comorbidities	
Respiratory	48 (34.3)
Cardiac	98 (70.0)
Metabolic	64 (45.7)
Gastrointestinal	34 (24.3)
Renal	26 (18.6)
Hepatic	10 (7.1)
Malignant disease	27 (19.3)
Steroid use	5 (3.6)
Received anticoagulant treatment	30 (21.4)
Previous abdominal surgery	53 (37.8)
Radiological findings	
Dilated gallbladder (*n* = 111)	94 (84.7)
Gallbladder wall thickness ≥ 4 mm (*n* = 122)	110 (90.2)
Pericholecystic fat stranding (*n* = 97)	79 (81.4)
Cholelithiasis (*n* = 113)	92 (81.4)

SD = standard deviation.
*Except where noted otherwise.

Table 2. Outcomes

Outcome	No. (%) of patients*
Hospital length of stay after tube insertion, median (quartile range); d	7.0 (10.0)
No. of days tube in place, median (quartile range)	21.0 (31.0)
Readmission due to tube complications	21 (15.0)
1 readmission	14 (10.0)
2 readmissions	5 (3.6)
3 readmissions	2 (1.4)
Readmission for cholecystitis after tube removal	10 (7.1)

*Except where noted otherwise.

Table 3. Outcome of delayed elective cholecystectomy

Outcome	No. (%) of patients *n* = 44
Procedure	
Laparoscopic	32 (73)
Open	4 (9)
Laparopscopic converted to open	8 (18)
ASA classification score	
I or II	24 (54)
III or IV	20 (45)
Reason for conversion to open	
Extensive adhesions	4 (50)
Severe inflammation	1 (12)
Difficult anatomy/dissection	3 (38)

ASA = American Society of Anesthesiologists.

Discussion

This cohort of 140 patients who underwent initial PC tube insertion for acute cholecystitis at our institution over a 10-year period were found to have serious comorbidities, in most cases cardiac. About one-third of patients returned for subsequent delayed elective cholecystectomy, of which 18% were converted from a laparoscopic to an open procedure. Percutaneous cholecystostomy tube insertion had minimal associated morbidity, and patients were typically in hospital for 1 week following the procedure. The tube typically remained in place for 3 weeks, during which time 15.0% of patients required readmission to hospital for tube-related complications. Following removal of the tube, 7.1% of patients were readmitted with recurrent cholecystitis.

Several investigators have reported outcomes after treatment of cholecystitis with PC.[16,27,28] These studies, however, are limited to relatively small cohorts and lack consistency regarding a delayed versus early laparoscopic cholecystectomy approach after initial PC tube insertion. Furthermore, a 2013 Cochrane review showed that these trials also were not adequately powered, with a high risk of bias and differences in patient inclusion criteria.[29] Therefore, there are no clear guidelines on the role of PC in the management of acute cholecystitis.

In a recent study, Mirzahi and colleagues[30] compared the outcome of delayed cholecystectomy in patients with and without initial PC tube insertion. They reported that delayed, elective laparoscopic cholecystectomy was a routine practice at their institution, therefore giving them a larger cohort and hence possible bias. Patients who underwent PC had a longer hospital stay and a higher rate of conversion to open cholecystectomy than the group without PC (11% v. 4%). The PC group also presented a greater rate of overall biliary-related complications and surgical site infections. Percutaneous cholecystostomy was an independent predictor of conversion to open surgery, along with presence of cirrhosis and choledocholithiasis.

Less than one-third (31.4%) of patients in our cohort returned for delayed, elective cholecystectomy; in 18%, a laparoscopic procedure was converted to an open procedure. This is in keeping with reported rates of conversion from laparoscopic to open cholecystectomy of 14%–67% in patients who have had PC tube placement.[3,10,14,28,30–33]

In our study, 15.0% of patients required 1 or more readmissions because of complications related to the PC tube, most commonly tube dislodgement or clogging, and pain at the insertion site. In a systematic review, Winbladh and colleagues[25] also reported slippage of the PC tube, in 8.6% of patients. The rate of recurrent cholecystitis after tube removal was 7.1% in our patient cohort, lower than that reported by Sanjay and colleagues,[28] 22%.

Just over half (54%) of our patients who underwent elective cholecystectomy had an ASA score of I or II. Previous studies have also confirmed the intuitive conclusion that predictive factors of eventual cholecystectomy include younger age and fewer comorbidities.[34,35] However, the ASA score calculated by anesthesia at the time of elective cholecystectomy is not always independent of observer bias and also does not necessarily reflect the clinical condition at the time of initial presentation.

A total of 18.6% of patients in our cohort had documented acalculous cholecystitis. Sicker patients with multiple comorbidities are more likely to have acalculous cholecystitis and, in turn, are more likely to be treated with PC. This is reflected in the recommendation for laparoscopic cholecystectomy for acalculous cholecystitis in more fit patients only.[36]

Limitations

Our research was limited as a retrospective study, and hence there is the possibility of selection bias. This could be remedied in future studies by assigning specific criteria for PC over laparoscopic cholecystectomy or vice versa in a prospective manner and measuring outcomes using prospective evaluation models. Another limitation of this study was the inability to accurately assign ASA scores, since it is well known that these are not always accurate, unless in the context of a prospective study.

Conclusion

There are no current guidelines based on definitive data to guide the decision as to which patients should undergo PC tube insertion on initial presentation, and, hence, this is at the surgeon's discretion. Better definitive criteria are needed for choosing one treatment (PC) over another (laparoscopic cholecystectomy) in the context of the initial presentation of patients with acute cholecystitis in order to optimize treatment selection and outcomes. Percutaneous cholecystostomy tube insertion can be performed in patients at high risk with numerous comorbidities without significant morbidity and mortality. However, less than one-third of such patients in our cohort subsequently had the definitive intervention of elective cholecystectomy. The rates of initial open cholecystectomy and conversion from laparoscopic to open cholecystectomy were quite high in this group.

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Contributors: All authors designed the study. A. Schellenberg and I. Molavi acquired the data, which all authors analyzed. All authors wrote and reviewed the article and approved the final version for publication.

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