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Research Article

Percutaneous Cholecystostomy Outcomes and Follow-up

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Abstract

Introduction: Percutaneous cholecystostomy (PC) is an important alternative to surgical intervention in managing acute cholecystitis (AC) for patients who are not surgical candidates. However, there is a lack of standardised follow-up protocols, resulting in variability in patient management. This study aims to assess outcomes following PC and adherence to a local follow-up algorithm to identify opportunities for standardisation and improvement.

Methods: A retrospective single-centre chart review of PC procedures was conducted between 2016 and 2023. Key data points included time to outpatient follow-up, timing and utilisation of Cholecystogram, biliary interventions such as endoscopic retrograde cholangiopancreatography (ERCP), drain management strategies, and patient outcomes, including recurrence and mortality. Statistical analysis was performed using IBM SPSS v.29.

Results: A total of 113 patients met the inclusion criteria. PC was a bridge to surgery in 23.8% (27/113), whereas it served as definitive management in 53.1% (60/113). Drain dislodgement occurred in 37.1% (36/97), and in patients with planned drain removal, the mean indwelling time was 74 days. Pre-outpatient Cholecystogram was performed in 67.3% (37/76). 10.6% (12/113) required repeat PC. ERCP was performed in 21.2% (24/113), and the all-cause 90-day mortality rate was 10.6% (12/113).

Conclusion: PC remains a valuable intervention for high-risk patients with AC; however, follow-up management varies significantly. The findings of this study underscore the need for standardised follow-up protocols to optimise patient care and outcomes.

Keywords: Audit; Cholecystitis; Follow-Up; Percutaneous Cholecystostomy; Outcome

Introduction

Acute Cholecystitis (AC) is the inflammation of the gall bladder most commonly caused by gallstones [1]. The standard treatment for AC is traditionally cholecystectomy – ideally performed within 72 hours of presentation. However, in patients with significant comorbidities or critical illness, percutaneous cholecystostomy (PC) has become a pivotal intervention for managing AC by allowing physicians to opt for a less invasive alternative. PC, an image-guided percutaneous drainage technique, is increasingly recognised for its efficacy in relieving symptoms of cholecystitis and stabilising patients, providing a crucial bridge to subsequent surgical or non-surgical treatments. This intervention aids in providing prompt decompression of the gallbladder to resolve sepsis and decreases risks of perforation, which is associated with significant mortality [2].

Despite its increasing use, there is no universal consensus on optimal post-PC follow-up strategies. Questions remain regarding

the ideal catheter placement duration, the need for a Cholecystogram before drain removal, and the role of biliary interventions such as ERCP. This study evaluates PC outcomes in a tertiary care setting, assessing adherence to a local follow-up algorithm and identifying areas for improvement in patient management.

Method

A retrospective review of our institution's interventional radiology database was conducted. Patients who received PC treatment were identified by using the search 'Cholecystostomy'. 197 PC cases from 2016 to 2023 were identified. The following patients were excluded:

- They underwent immediate surgery due to PC failure (n=2)
- Their procedures were incorrectly coded (n=5)
- Clinical data was incomplete (n=6)
- Repeated PC within the data collection period resulting in duplicates were considered as single cases (n=11).
- They had underlying hepatobiliary malignancy (n=19)
- Their follow-up was managed by external clinical teams with outcomes unknown (n=41)

Following exclusions, 113 cases were included in the final analysis.

Collected data included demographics, time to first outpatient follow-up, imaging (Cholecystogram, ERCP), drain management, recurrence rates, and mortality. Descriptive statistical analysis was conducted using IBM SPSS v.29.

The management algorithm for patients post-PC is presented in figure 1. Further details of follow-up can be found in supplementary material. Cholecystograms were reported by a consultant radiologist.

This audit was registered with the local quality management system; "Governance, Evidence, Knowledge and Outcome" (GEKO).

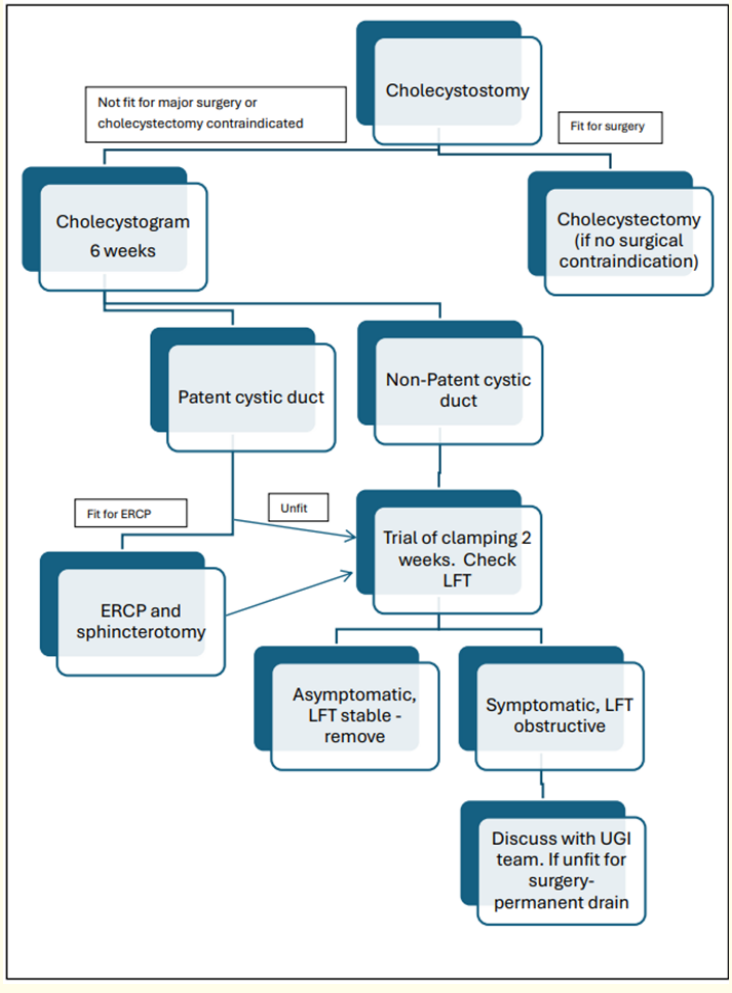

Figure 1: Cholecystostomy Follow-up algorithm.

Results

Demographics

Patients mean age was 75.8 years (SD 12.4). 68 (60.2%) were male and 45 (39.8%) were female.

Outpatient Visit

Of the 113 cases, 67.3% (76) made it to Outpatient Department (OPD) appointment. Reasons for non-attendance were: Inpatient tube dislodgment with GP-follow up in residential care [14], palliative discharge [12], readmission before OPD (10), booked directly for surgery [1].

The median time to attend OPD was 48.5 days (8-155d range). 47.3% (36/76) attended OPD within the target 6-8 weeks post PC. The earliest OPD appointments signify those with drain-related complications, whereas an expedited appointment avoided an ED presentation/readmission.

Cholecystogram

Our algorithm advises a Cholecystogram before all 1st OPD appointments to assess biliary patency and guide further management; our adherence was 64.5% (49/76). An additional 7 cases had a Cholecystogram performed shortly after (<19 days) their 1st OPD.

The non-patent cystic duct rate for all *initial* Cholecystograms, including those performed after 1st OPD (64), was 39.1% (25/64).

Follow Up Interventions

PC was used as a bridge to surgery in 23.9% (27/113) (Table 1). The mean time to surgery was 153.7 days (range 17-516 days), excluding one case as surgery was planned several years later following recurrence. Seven of the cholecystectomies were performed in an emergency/unplanned setting.

ERCP was used post-PC in 21.2% (24/113). Only 9 of the 24 ERCPs had a patency of cystic duct confirmed with Cholecystogram beforehand, as our algorithm advises. 8/24 of ERCPs had cystic duct non-patency confirmed with Cholecystogram beforehand. It is not clear why these patients proceeded with ERCP. 3 of the ERCP cases went on to have cholecystectomy.

In cases of dislodgment or recurrence, a repeated PC was performed in 12 (10.6%). The mean time for initial to repeat PC was 102 days (range 4-480 days). 3 cases received an additional (3rd) PC.

Circumstance of Drain Removal	Cases (n = 113)	Duration (Mean Days)
Planned Removal	61 (54%)	74 +/- 39 S.D.
Dislodged†	36 (32%)	12 +/- 9 S.D.
Indwelling-Palliated IN Hospital	6 (5%)	
Indwelling-Palliated OUT of Hospital	4 (4%)	
Permanent‡	2 (2%)	
Undocumented Removal	4 (4%)	

Table 1: Circumstances of PC Drain removal.

Drain duration is measured in whole days with Standard Deviation. †Mean for Dislodged excludes 9 cases where dislodgment was identified at clinic or Cholecystogram as the exact date of dislodgment is not known.

PC was the definitive management for 60/113 (53.1%) who required no further biliary interventions (cholecystectomy, repeat PC or ERCP).

Clamping

In total, 22 cases underwent clamping, with 7 reaching the target duration of 2 weeks. One case did not tolerate clamping but was subsequently treated with ERCP.

Our follow-up algorithm advises clamping to confirm cystic duct patency following 3 scenarios: 1) Post ERCP, 2) Patent Cystic Duct and Unfit for ERCP, 3) Non-patent cystic duct (no ERCP performed)

- ERCP = 24, 5/24 had clamping post ERCP.
- Cholecystogram showing patent cystic duct and unfit for ERCP = 25, 8/25 went on to have clamping.
- Cholecystogram showing non-patent cystic duct (and no ERCP) = 15, 3/15 underwent clamping.
- Outside of our follow-up algorithm, 6 cases had clamping performed as workup preceding ERCP.

PC Drain Removal

The drain removal date was recorded, as well as the circumstance of removal. 12 cases lacked a removal date due to an indwelling drain at the time of in-hospital death [6], indwelling drain at the time of out-of-hospital death [4], Permanent Percutaneous Cholecystostomy [2], defined here as survival >180days with an indwelling drain. 4 cases had missing data on when drain removal occurred and if it was intentional or dislodged.

The drain removal date was documented for 97 cases (Table 2). These 97 cases were analysed separately when assessing drain duration and whether removal was planned.

Follow-up Interventions	Cases (n = 113)
Cholecystectomy†	27 (24%)
ERCP	24 (21%)
Repeat PC	12 (11%)
No further biliary interventions	60 (53%)

Table 2: lists the interventions following PC.

ERCP: Endoscopic Retrograde Cholangiopancreatography; PC: Percutaneous Cholecystostomy.

Cholecystectomy, ERCP and Repeat PC are not mutually exclusive hence total is > 100%. † 7 Cholecystectomies were performed in an emergency/unplanned manner due to recurrence.

Excluding indwelling drains and undocumented removal, Planned Drain Removal occurred in 63% (61/97) with a mean duration of 74 (17-177) days. 17 cases had planned removal without a trail of clamping or Cholecystogram for the following reasons: Drain removed intraoperatively [6], directly booked for ERCP (6), and other [5].

Dislodgement of Drain occurred in 37% (36/97) with a mean duration of 12 (0-28) days. 9 cases were excluded from this calculation as dislodgment was only identified at planned OPD/Cholecystogram.

Mortality and Recurrence

For all causes of mortality, 6.2% (7/113) died within 30 days, and 10.6% (12/113) died within 90 days. 18.6% (21/113) 1-year mortality rate. The recurrence rate of AC was 19.2% (20/104), excluding all patients who died or underwent surgery within 30 days of PC insertion.

Discussion

PC offers an alternative treatment for AC in those critically unwell or unfit for cholecystectomy. Unlike cholecystectomy, there are no widely accepted guidelines on PC follow-up pathways. Hence, there is ongoing research to optimise when PC catheters are removed, how biliary patency is best confirmed, and when can PC be used as definitive therapy. This study seeks to assess our own PC follow-up algorithm (Figure 1) and describe adherence challenges.

Our 1st OPD follow-up target is in 6 weeks, which allows PC-tract maturation. 47.3% of our patients attended within 6-8 weeks, with earlier attendance reflecting complications in the community where an expedited OPD appointment avoided a readmission. Our mean duration for intentionally removed drains was 74 days, which is beyond the 4-6 weeks typically recommended. The timing of drain removal is multifactorial, balancing recurrence risk, patient comfort and goals, access to imaging and suitability for further procedures.

Emerging evidence has challenged the target of 6 weeks for tract maturation. For example, PC drain removal after 21-day duration has been shown to be sufficient to decrease the risk of AC recurrence post-removal. Even shorter indwelling times have been explored, with a large retrospective study advocating for PC drain removal at 7-10 days. provided a transhepatic approach was used. Rather than based on time, their criteria for safe removal were 1) Subsiding inflammation, 2) Biliary patency on Cholecystogram during the index admission, and 3) Absence of intraperitoneal leak. If future guidelines endorse earlier drain removal, and thus earlier 1st OPD, this would likely improve 1st OPD attendance rate.

Cholecystogram visualises the biliary tree and stone location; thus, it is a high-yield investigation to have at 1st OPD as it guides further management such as ERCP or to proceed with clamping trial. Our 64.5% adherence to pre-1st OPD Cholecystogram is high compared to larger multicentre audits (51.7%) (MacCormick et al.) but there is room for improvement in this area as evidenced by 7 cases having the test ordered shortly after their 1st OPD.

Clamping after a Cholecystogram is determined after assessing cystic duct patency. Only 7 cases had cystic duct patency confirmed with a Cholecystogram followed by clamping. This reflects the discordant pathways many patients take compared to the ideal follow-up algorithm, i.e. early readmission before pre-OPD Cholecystogram. Our data collection did not specifically collect on the decision-making behind whether a patient received clamping. Clamping is worthwhile, with other authors reporting that clamping was correlated with decreased AC recurrence.

Our AC recurrence rate was 19.2%, in keeping with others who reported a recurrence rate of 20.6% (Park et al.) and 24%, where GPs were called to confirm if recurrence occurred at 12-month follow-up. The risk of recurrence is the rationale for interval cholecystectomy, we report 23.9% proceeded to cholecystectomy which is less than other Australian and UK cohorts, 28.9%-32.9%. The decision to proceed with cholecystectomy was based on patient's fitness for surgery, age and patient choice. The variable thresholds between centres for proceeding with PC over index cholecystectomy will be reflected when comparing our interval cholecystectomy rate.

The role of ERCP and endoscopic sphincterotomy (ES) is yet to be established. We have previously demonstrated its value in patients not fit for surgery but fit for ERCP to reduce the recurrence of cholecystitis in patients with patent cystic ducts. We find ES a useful adjunct in preventing future recurrence and reducing reliance on a permanent PC. ES serves to decompress the biliary tree, reduce stasis and reduce the passive filling of the gallbladder, thereby limiting cholecystitis. ES allows ongoing gallbladder decompression, which PC initially achieves; hence, ES removes reliance on a long-term PC, in itself, a morbid process for the patient.

This study is inherently limited by its retrospective design. Patients whose follow-up was coordinated by another team were not included. This was due to inaccessible external patient records and as well as other teams using different follow-up pathways. Our design also underestimates AC recurrence rates as those who were represented at another centre would have been missed by our data capture.

Conclusion

To our knowledge, this is the largest audit of percutaneous cholecystostomy in an Australian population. We have characterised the outpatient follow-up for these patients, particularly the reintervention rate, usage of clamping and Cholecystogram and adverse events such as drain dislodgment and all-cause mortality.

Supplementary material

Local Follow-up Algogirthm

Local cholecystostomy follow-up algorithm (Figure 1) requires

- Daily flushes of 10ml Saline with wound and drain review by a community nurse
- Booking Cholecystogram for 6 weeks' time
- Booking surgical outpatient appointment for after the Cholecystogram

The algorithm does not elaborate on the course for patients who undergo cholecystectomy, this has resulted in variable practice, for example whether PC was removed intra- or preoperatively. MRCP has not included in the algorithm however it was used variably during diagnosis and sparingly during follow-up.

Our fist OPD visit is planned for 6 weeks to allow tract maturation with a Cholecystogram preformed beforehand to determine need for ERCP. Where the cystic duct is found to be patent on Cholecystogram we proceed with sphincterotomy as an adjunct to decompress the biliary tree, reduce stasis and reduce passive filling of the gallbladder to limit recurrence of cholecystitis. In the case of a non-patent cystic duct, we proceed with a trial of camping. In this scenario the gallbladder is ideally contracted, and any remaining infection or bile has been adequately drained through the cholecystostomy over the previous weeks. Clamping will test if bile flows from the liver into the duodenum without refluxing into the gallbladder and causing symptom recurrence. If clamping results in no symptoms recurrence or derangement in liver function the cholecystostomy may then be removed. If symptoms recur after clamping, then the Upper Gastrointestinal team may then consider permanent cholecystostomy or other inventions depending on patient factors.

Bibliography

1. Mencarini Lara., *et al.* "The diagnosis and treatment of acute cholecystitis: a comprehensive narrative review for a practical approach". *Journal of Clinical Medicine* 13.9 (2024): 2695.

2. Date, Ravindra S., *et al.* "Gallbladder perforation: case series and systematic review". *International Journal of Surgery* 10.2 (2012): 63-68.

3. Park Jae Keun., *et al.* "Long-term outcome and recurrence factors after percutaneous cholecystostomy as a definitive treatment for acute cholecystitis". *Journal of Gastroenterology and Hepatology* 34.4 (2019): 784-790.

4. MacCormick Andrew., *et al.* "Nationwide outcomes following percutaneous cholecystostomy for acute calculous cholecystitis and the impact of coronavirus disease 2019: results of the Multicentre Audit of Cholecystostomy and Further Interventions (MACAFI study)". *Journal of Vascular and Interventional Radiology* 34.2 (2023): 269-276.

5. Kayaoglu Sevcan Alkan and Metin Tilki. "When to remove the drainage catheter in patients with percutaneous cholecystostomy?". *Revista da Associação Médica Brasileira* 68.1 (2021): 77-81.

6. Kamezaki Hidehiro., *et al.* "Safety and efficacy of early tube removal following percutaneous transhepatic gallbladder drainage: an observational study". *Surgical Laparoscopy Endoscopy and Percutaneous Techniques* 30.2 (2020): 164-168.

7. Corbetta Machado., *et al.* "Short-and long-term outcomes of percutaneous cholecystostomy in an Australian population". *ANZ Journal of Surgery* 90.9 (2020): 1660-1665.

8. Watanabe Yuki., *et al.* "Cholecystostomy tube: a review of recent experience in Fremantle Hospital". *ANZ Journal of Surgery* 82 (2012): 93.

9. Kao Chia-Hung. "Nonvisualization of gallbladder after endoscopic retrograde sphincterotomy". *Seminars in Nuclear Medicine* 29.1 (1999).

10. Desa, L. A., *et al.* "Gall bladder function after endoscopic sphincterotomy". *BMJ: British Medical Journal* 300.6732 (1990): 1111.