

## US-GUIDED CHOLECYSTOSTOMY: A RETROSPECTIVE STUDY OF INDICATIONS, COMPLICATIONS AND OUTCOME

### COLECISTOSTOMIA GUIADA POR ECOGRAFIA: UM ESTUDO RETROSPECTIVO DAS INDICAÇÕES, COMPLICAÇÕES E RESULTADOS

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#### Abbreviations / Abreviaturas

PC- percutaneous cholecystostomy /  
CP – colecistostomia percutânea  
CT – computed tomography /  
TC – tomografia computadorizada  
US - ultrasound

#### Abstract

We aimed to review the use of US-guided percutaneous cholecystostomy (PC) in our hospital: the indications, complications and outcomes.

We retrospectively reviewed consecutive PC procedures performed at our institution from January 2010 to December 2012.

Sixty-five patients (36 male, 29 female; mean age 75 years) underwent 70 US-guided PC, mainly in the context of acute cholecystitis (62/65 – 95,4%). The diagnosis of acute cholecystitis was confirmed just by US in 32/62 (51,6%). The main indications for PC were the persistence of clinical and/or laboratory findings after antibiotherapy institution and the presence of comorbidities.

The transhepatic procedure was considered technically successful in 69/70 (98,6%) cases. We had 2/70 (2,8%) major complications (1 biliary peritonitis; 1 fatal abdominal wall abscess with sepsis) and 7/70 (10,0%) minor complications (6 dislodgements; 1 phrenic nerve irritation). Thirty-day mortality was 6,2% (4 patients, 1 procedure related). The average duration of catheter drainage was 21,4 days (range, 2-60 days). Subsequently, 24/65 (36,9%) patients underwent elective cholecystectomy (mean 4 months, range 1,5-10). Recurrent acute cholecystitis occurred in 8/65 (12,3%) patients during the follow-up.

US-guided PC is a viable option for treating acute cholecystitis in some specific clinical settings.

#### Key-words

Acute cholecystitis, percutaneous cholecystostomy, ultrasound

#### Resumo

O objetivo deste trabalho foi avaliar o uso da colecistostomia percutânea (CP) guiada por ecografia no nosso hospital: as indicações, complicações e resultados.

Foram analisados retrospectivamente todos os procedimentos de CP realizados na nossa instituição de Janeiro de 2010 a Dezembro de 2012.

Sessenta e cinco pacientes (36 sexo masculino, 29 sexo feminino; idade média 75 anos) foram submetidos a 70 CP guiadas por ecografia, principalmente no contexto de colecistite aguda (62/65 – 95,4%). O diagnóstico de colecistite aguda foi confirmado por ecografia em 32/62 (51,6%). As principais indicações para CP foram a persistência de achados clínicos e/ou laboratoriais após instituição de antibiotherapia e a presença de co-morbilidades. O procedimento trans-hepático foi considerado tecnicamente bem sucedido em 69/70 (98,6%) casos. Tivemos 2/70 (2,8%) complicações *major* (1 peritonite biliar; 1 abscesso da parede abdominal com sepsis, fatal) e 7/70 (10,0%) complicações *minor* (6 expulsões do catéter; 1 irritação do nervo frênico). A mortalidade a trinta dias foi de 6,2% (4 pacientes, 1 relacionado com o procedimento). A duração média do catéter foi de 21,4 dias (intervalo de 2-60 dias). Posteriormente, 24/65 (36,9%) pacientes foram submetidos a colecistectomia eletiva (média de 4 meses, intervalo 1,5-10). Colecistite aguda recorrente ocorreu em 8/65 (12,3%) dos pacientes durante o *follow-up*.

A CP guiada por ecografia é uma opção viável para o tratamento da colecistite aguda em algumas situações clínicas específicas.

#### Palavras-chave

Colecistite aguda, colecistostomia percutânea, ecografia

## Introduction

Acute cholecystitis is one of the most common conditions for which emergent imaging is indicated. The role of imaging in this clinical setting was emphasized by the recently revised Tokyo Guidelines for diagnostic criteria and severity assessment of acute cholecystitis. These stated that the definitive diagnosis implies local and systemic signs of inflammation and also imaging findings [1]. Imaging can also be important in the assessment of severity grade of the disease (i.e. detection of gangrenous or emphysematous cholecystitis, pericholecystic or

hepatic abscess, etc), which will determine the type and timing of treatment [2].

Although early cholecystectomy is considered to be the standard management for acute cholecystitis, it has substantial mortality rates related to advanced age and comorbidities. The complication rate may reach 33% with a mortality rate of 14-19% in elderly patients [3,4]. Therefore, management with antibiotics and decompression of the gallbladder with percutaneous cholecystostomy (PC) is being increasingly employed. It has become a feasible alternative treatment for patients with significant comorbidities, and it has low morbidity

and mortality rates. It allows subsequent elective cholecystectomy with minimal mortality [5] and in some cases may be the definitive treatment for gallstone disease [6].

The concept of decompression of the gallbladder to drain a potential empyema was first described in 1980 by Radder [7]. The role of PC is still controversial for the treatment of acute cholecystitis [8], and has currently expanded to other clinical scenarios: gallbladder perforation, malignant obstruction, biliary duct drainage, diagnostic imaging, and to carry additional procedures (stone dissolution or extraction) [9].

PC consists of percutaneous catheter placement in the gallbladder lumen under imaging guidance. Literature is diverse in terms of technique employed, clinical outcome and complication rate [10]. The response rates to PC intervention, with clinical and laboratory improvement in 72 hours, are around 85,6% in the literature, but wide variable among studies [10]. Complications associated with PC include sepsis, abscess or biloma formation, peritonitis, hemorrhage, transgression of adjacent structures, death within 30 days of the procedure, catheter dislodgment, vagal reactions, pneumothorax, secondary infection or colonization of the gallbladder, and recurrent cholecystitis [11,12].

Here we report 3 years of our institution experience in PC.

## Material and Methods

### Study group

This retrospective analysis was conducted in consecutive patients who underwent PC at our institution, from January 2010 to December 2012. Sixty-five patients were included.

### Diagnosis of acute cholecystitis and indications for PC

Diagnoses of acute cholecystitis were reviewed according to the Tokyo guidelines [1]. Indications for PC in acute cholecystitis were onset of symptoms for more than 72 hours, moderate or severe acute cholecystitis, medical treatment failure, and the presence of a severe comorbidity[1]. External decompression of the biliary tract (by an obstructing carcinoma) were other indications for PC.

### Percutaneous cholecystostomy

Ultrasound-guided PC was performed under 1% lidocaine local anesthesia. A 7 or 10-F pigtail catheter (Fig. 1) was inserted by transhepatic route. The tip of the needle was continuously monitored. Technical success was defined as placement of catheter in the lumen of the gallbladder, with aspiration of bile (Fig. 2).

### Complications

Complications are classified as major or minor. Major complications include sepsis, hemorrhage requiring transfusion

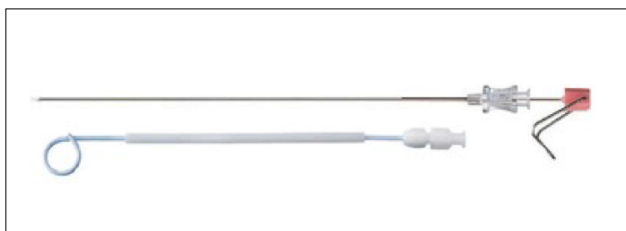


Fig. 1 - Pigtail catheter for percutaneous cholecystostomy.



Fig. 2 - Tip of the needle inside the lumen of the gallbladder.

or treatment, abscess or biloma formation, transgression of adjacent structures, or death within 30 days of the procedure. Minor complications are hemorrhage not requiring transfusion or treatment, and catheter dislodgment [13].

### Outcome and clinical improvement

A successful intervention was defined as clinical improvement within 72 h after insertion of the PC indicated by symptoms improvement, fever resolution, and reduction of leucocytosis. Complications, ITU admission, hospitalization time and recurrence rate of acute cholecystitis, were parameters also taken in account for outcome evaluation.

### Review of medical records

Information was acquired regarding demographic parameters (age, gender, comorbidities), indications, radiological diagnostic modality and bacteriologic results of the bile aspirated, and median time from admission to PC and length of time drain remained *in situ*. We also considered the outcome and subsequent progression to cholecystectomy.

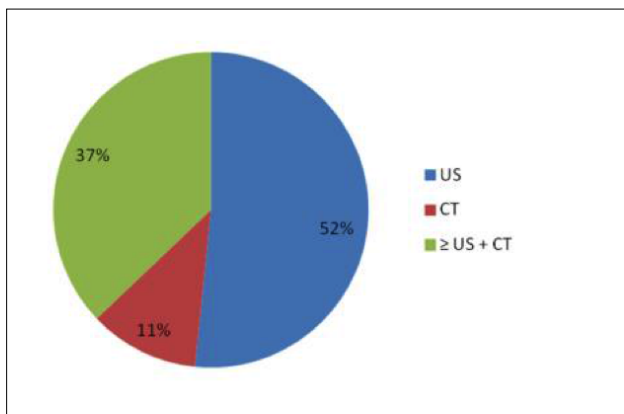
## Results

A total of 70 US-guided PC were performed on 65 patients because 2 patients had catheter dislodgement requiring placement of a new one and 3 patients had recurrent acute cholecystitis during the follow-up period, needing another PC. The mean age of the patients was 75 years (range 33-98 years), including 36 males and 29 females. Sixty of 65 patients (92,3%) had one or more comorbid disease (mean 3, range 1-10).

Indications for PC were acute cholecystitis in 62/65 (95,4%) patients, of which 53/62 (85,5%) had calculous cholecystitis and 9/62 (14,5%) had acalculous cholecystitis. The remaining 3/65 patients (4,6%) had some kind of obstructing carcinoma. The diagnosis of acute cholecystitis was made with US alone in 32/62 (51,6%) patients, with CT alone in 7/65 (10,8%) and 23/65 patients (35,4%) required 2 or more radiological modalities (Fig. 3).

The median time from admission to PC was 3 days (range 1-18 days) and the average duration of catheter drainage was 22 days (range, 2-86 days).

The procedure was considered technically successful in 69/70 (98,6%) cases. In 61/65 patients (93,8%), there were clinical and laboratory improvement in the first 72 hours, with decrease of



**Fig. 3** - Imaging modality used for definitive diagnosis of acute cholecystitis

abdominal pain, body temperature, and white blood cell counts. In the four patients whose condition failed to be resolved after the initial cholecystostomy, two died meanwhile (mentioned below) and the other two needed treatment in the intermediate and/or intensive care unit. The findings of complications were as follows: 2/70 (2,8%) cases had major complications, of which 1 biliary peritonitis, which corresponds to the same case of unsuccessful technique, after three attempts, and 1 procedure related death due to an abscess of the abdominal wall, further complicated with sepsis (Fig. 4); we had 7/70 (10,0%) minor complications, with 6 catheter dislodgements (2/6 needed new PC) and 1 phrenic nerve irritation.

Thirty-day mortality was 4/65 (6,2%), 1 iatrogenic death (already mentioned) and 3 deaths related to comorbidities (2 patients with pancreatic neoplasm and 1 patient with septic shock and terminal colorectal carcinoma). No other complications were reported.

Sixty-one of 65 patients (87,1%) had gallbladder aspirates sent for microbiological analysis, of whom 13/61 (21,3%) had negative cultures, 24/61 (39,3%) had only one growing organism (most common *Clostridium species*) and 24/61 (39,3%) had multiple organisms (Fig. 5).

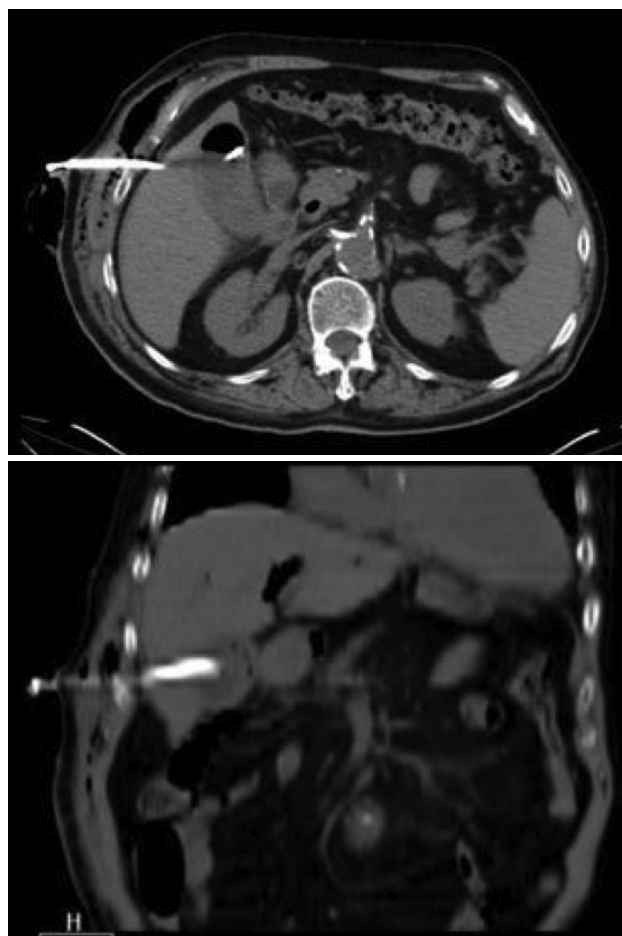
The overall mean hospitalization time was 10 days (range 2-60 days), and 9/65 (13,8%) patients required management on the high dependency or intensive care unit, 7/9 (77,8%) with septic shock and 2/9 (22,2%) with terminal pancreatic neoplasm.

Eight of 65 (12,3%) patients had recurrent acute cholecystitis during the follow-up period, of whom 3/8 (37,5%) needed a new PC.

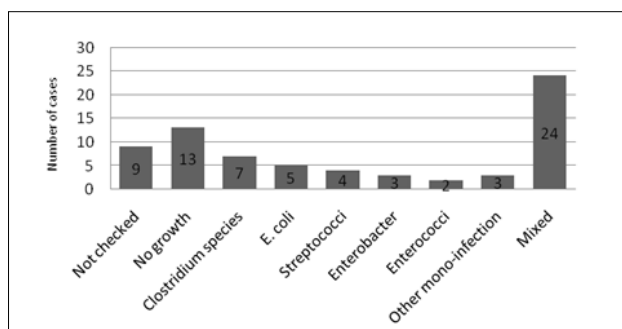
Subsequently, 24/65 (36,9%) patients underwent elective cholecystectomy (mean 4 months, range 1,5-10), 5/65 (7,7%) are still waiting for it, 20/65 (30,7%) refused and/or didn't have surgical conditions, and 9/65 (13,8%) died meanwhile.

## Discussion

The incidence of gallbladder disease increases with age and acute cholecystitis in the elderly is related to a high mortality rate of emergency cholecystectomy in critically ill patients. Percutaneous cholecystostomy enables adequate resolution of the acute phase of cholecystitis. In our institution, PC in moderate or severe acute cholecystitis is reserved for patients who are poor candidates for immediate surgery (commodities), after medical treatment failure and if symptoms are present for longer than 72 hours.



**Fig. 4** - a) Axial and b) Coronal abdominal reformatted CT scan in a 82 years-old male patient with acute calculous cholecystitis in the 4<sup>th</sup> day post cholecystostomy, showing spreading of infection along the catheter with formation of abscess in the abdominal wall. The patient developed sepsis and died four days later.



**Fig. 5** - Growing pathogens from gallbladder aspirate.

Percutaneous cholecystostomy is an easy procedure to perform. We had a technically successful intervention rate of 98,6% and 65/69 patients (94,2%) showed clinical improvement within 72 hours, in accordance with the reported rate of 85,6% in recent systematic review of cholecystostomy as a treatment option in acute cholecystitis [10].

PC is carried out under local anesthesia with radiological guidance, and the procedure itself is usually uncomplicated. There is still debate as to whether the transhepatic route is preferable to the transperitoneal route, but the former approach decreases the risk of bile leak, portal vessel injury, and colon

injury, although it carries a risk of pneumothorax and bleeding from the liver parenchyma. As so, the transhepatic approach seems to be the best approach for PC except in the presence of severe liver disease and coagulopathy. All of the cholecystostomy tube placements in our series were done transhepatically, with complication rates (7,1% and 10% for major and minor complications, respectively), in line with similar studies (major complications in 3-8%, minor complications in 4-13%) [11]. The two major complications of our study deserve mention here: 1 case of biliar peritonitis emphasizes that even using the transhepatic approach, which decreases the risk of bile leakage, it remains a potential complication; one probably iatrogenic death of a 82-years-old male patient, with multiple comorbidities and no surgical conditions, who developed an abdominal wall abscess, probably secondary to contamination, and sepsis hereafter.

The overall mortality rate reached 6,2%, mainly due to underlying medical conditions, in ¾ patients. The mortality rate related to the procedure was lower, which had occurred in only one patient (1,6%). These results are lower than overall reported mortality

rates as high as 36% and similar to reported procedure-related mortality rates in a range of 0%–2% [13].

Bile culture infection was present in 78,7%, superior to the frequency reported by other authors [13], providing a guide to antibiotic therapy in most cases.

Recurrence rate of acute cholecystitis was 12,3%, in agreement with published articles (10 to 20%) [14].

The limitations of our study are mainly related with its retrospective nature, which resulted in incomplete data acquisition for some of the patients.

In our cohort of patients, US-guided PC has a high technical success rate and provides a positive culture to guide antibiotic therapy.

## Conclusion

PC is a cost-effective, easy to perform and reliable procedure with low complication and high success rates for critically ill patients with acute cholecystitis who are not fit to undergo emergency surgery.

## References

1. Yokoe, M.; Takada, T.; Strasberg, S. M.; Solomkin, J. S.; Mayumi, T.; Gomi, H.; Pitt, H. A.; Gouma, D. J.; Garden, O. J.; Buchler, M. W.; Kiriya, S.; Kimura, Y.; Tsuyuguchi, T.; Itoi, T.; Yoshida, M.; Miura, F.; Yamashita, Y.; Okamoto, K.; Gabata, T.; Hata, J.; Higuchi, R.; Windsor, J. A.; Bornman, P. C.; Fan, S. T.; Singh, H.; Santibanes, E.; Kusachi, S.; Murata, A.; Chen, X. P.; Jagannath, P.; Lee, S.; Padbury, R.; Chen, M. F. - *New diagnostic criteria and severity assessment of acute cholecystitis in revised Tokyo guidelines*. J Hepatobiliary Pancreat Sci., 2012, 19:578-585.
2. Miura, F.; Yokoe, M.; Takada, T.; Kawarada, Y.; Nimura, Y.; Wada, K.; Hirota, M.; Nagino, M.; Tsuyuguchi, T.; Mayumi, T.; Yoshida, M.; Strasberg, S. M.; Pitt, H. A.; Belghiti, J.; Santibanes, E.; Gadacz, T. R.; Gouma, D. J.; Fan, S. T.; Chen, M. F.; Padbury, R. T.; Bornman, P. C.; Kim, S. W.; Liao, K. H.; Belli, G.; Dervenis, C. - *Flowcharts for the diagnosis and treatment of acute cholecystitis: Tokyo guidelines*. J Hepatobiliary Pancreat Sci., 2007, 14:27-34.
3. Huber, D. F.; Edward, W.; Cooperman, M. - *Cholecystectomy in elderly patients*. Am J Surg., 1983, 146:719-722.
4. Escarce, J. J.; Shea, J. A.; Chen, W.; Qian, Z.; Schwartz, J. S. - *Outcomes of open cholecystectomy in the elderly: a longitudinal analysis of 21,000 cases in the prelaparoscopic era*. Surgery, 1995, 117:156-164.
5. Akyürek, N.; Salman, B.; Yüksel, O.; Tezcaner, T.; İrkörücü, O.; Yücel, C.; Oktar, S.; Tatlıciođlu, E. - *Management of acute calculous cholecystitis in high-risk patients: percutaneous cholecystostomy followed by early laparoscopic cholecystectomy*. Surg Laparosc Endosc Percutan Tech., 2005, 15(6):315-320.
6. Shirai, Y.; Tsukada, K.; Kawaguchi, H.; Ohtani, T.; Muto, T.; Hatakeyama, H. - *Percutaneous transhepatic cholecystostomy for acute acalculous cholecystitis*. British Journal of Surgery, 1993; 80(11):1440-1442.
7. Radder, R. W. - *Ultrasonically guided percutaneous catheter drainage for gallbladder empyema*. Diagn Imaging, 1980, 49(6):330-333.
8. Lorenz, J. M. - *Evaluating the controversial role of cholecystostomy in current clinical practice*. Semin Intervent Radiol., 2011, 28:444-449.
9. Ginat, D.; Saad, W. E. - *Cholecystostomy and transcholecystic biliary access*. Tech Vasc Interv Radiol., 2008, 11(1):2-13.
10. Winblad, A.; Gullstrand, P.; Svanvik, J.; Sandstrom, P. - *Systematic review of cholecystostomy as a treatment option in acute cholecystitis*. HBP, 2009, 11(3):183-93.
11. Akhan, O.; Akinci, D.; Ozmen, M. N. - *Percutaneous cholecystostomy*. Eur J Radiol., 2002, 43(3):229-36.
12. Saad, W. E. A.; Wallace, M. J.; Wojak, J. C.; Kundu, S.; Cardella, J. F. - *Quality improvement guidelines for percutaneous transhepatic cholangiography, biliary drainage, and cholecystostomy*. J Vasc Interv Radiol., 2010, 21:89-795.
13. Sosna, J.; Kruskal, J. B.; Copel, L.; Goldberg, S. N.; Kane, R. A. - *US-guided percutaneous cholecystostomy: Features predicting culture-positive bile and clinical outcome*. Radiology, 2004, 230:785-791.
14. Skillings, J. C.; Kumai, C.; Hinshaw, J. R. - *Cholecystostomy: a place in modern biliary surgery?* Am J Surg., 1980, 139(6):865-869.