

COLECISTOSTOMIA PERCUTÂNEA NO TRATAMENTO DA COLECISTITE AGUDA LITIÁSICA

PERCUTANEOUS CHOLECYSTOSTOMY IN THE MANAGEMENT OF CALCULOUS ACUTE CHOLECYSTITIS

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ABSTRACT

Background: Laparoscopic cholecystectomy is the gold-standard treatment in acute cholecystitis. However, percutaneous cholecystostomy stands as an alternative therapeutic approach among the elderly or patients with several comorbidities. **Objective:** The aim of this study is to clarify the role of percutaneous cholecystostomy in calculous acute cholecystitis treatment and to elucidate about its association with the surgical treatment. **Methods:** In December 2016, a systematic database search on PubMed, Scopus and Web of Science was conducted to identify articles on percutaneous cholecystostomy published from January 2013 to November 2016, using the query “(acute cholecystitis OR severe cholecystitis) AND (cholecystostomy OR percutaneous cholecystostomy OR cholecystostomy tube)”. In total, 290 articles were found and then submitted to inclusion and exclusion criteria. **Results:** A total of 13 records involving 1130 patients from 10 different countries met all inclusion criteria and were therefore included in this systematic review. All studies found eligible concluded percutaneous cholecystostomy is a potentially safe and effective therapeutic approach among high-risk surgical patients in the setting of acute cholecystitis. Percentage of patients undergoing percutaneous cholecystostomy followed by cholecystectomy varied between 7.2% and a maximum of 66.7%, with a conversion rate fluctuating between 0.0% and 66.7%. Complication and mortality rates ranged from 2.2% to 41.7% and 0.0% and 43.2%, respectively. **Conclusions:** Percutaneous cholecystostomy is generally considered safe and effective among high-risk surgical patients diagnosed with acute cholecystitis.

Keywords: *Acute Cholecystitis; Cholecystostomy; Cholecystectomy.*

RESUMO

Introdução: A colecistectomia laparoscópica é considerada gold-standard no tratamento da colecistite aguda. Contudo, a colecistostomia percutânea surge como alternativa terapêutica em doentes idosos ou com várias comorbilidades. **Objetivo:** O objetivo deste estudo é clarificar o papel da colecistostomia percutânea no tratamento da colecistite aguda litiásica, bem como

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esclarecer a sua associação com o tratamento cirúrgico. **Métodos:** Em dezembro de 2016, foi realizada uma pesquisa sistemática nas bases de dados PubMed, Scopus e Web of Science, no sentido de identificar artigos sobre colecistostomia percutânea publicados entre janeiro de 2013 e novembro de 2016, com recurso à query “(acute cholecystitis OR severe cholecystitis) AND (cholecystostomy OR percutaneous cholecystostomy OR cholecystostomy tube)”. No total, foram encontrados 290 artigos, os quais foram submetidos a critérios de inclusão e exclusão. **Resultados:** No total, 13 artigos envolvendo 1130 pacientes de 10 países diferentes cumpriram todos os critérios de inclusão, tendo sido incluídos na presente revisão sistemática. Todos os estudos considerados elegíveis concluíram que a colecistostomia percutânea é uma abordagem terapêutica potencialmente segura e eficaz em pacientes de alto-risco cirúrgico no contexto de colecistite aguda. A percentagem de pacientes que receberam colecistostomia percutânea e subsequente colecistectomia variou entre 7.2% e um máximo de 66.7%, com uma taxa de conversão entre 0.0% e 66.7%. As taxas de complicações e mortalidade variaram entre 2.2% a 41.7% e entre 0.0% a 43.2%, respetivamente. **Conclusões:** A colecistostomia percutânea é um procedimento considerado, na generalidade, seguro e eficaz em pacientes de alto-risco cirúrgico diagnosticados com colecistite aguda.

Palavras-chave: Colecistostomia; Colecistite Aguda; Colecistectomia.

INTRODUCTION

Acute cholecystitis, an inflammatory condition affecting the gallbladder, mainly associated to lithiasis, stands as one of the most relevant surgical causes of emergency hospital admissions^{1,2}.

Laparoscopic cholecystectomy has been defined as the gold-standard therapeutic approach, with recommendations highlighting the importance of an early surgical intervention as soon as the diagnosis is established³.

While very common, acute cholecystitis in the elderly and comorbid populations may have an atypical symptomatic presentation and further complicate, prompting difficult surgical treatment⁴. Agnieszka Popowicz et al. point out early cholecystectomy in high-risk patients might be associated with significant morbidity and mortality⁵. In fact, the intrinsic vulnerability of patients of an advanced age and several comorbidities may negatively impact on surgical outcomes, with perioperative morbidity and mortality rising up to 41% and 18%, respectively¹.

Pioneered by R.W. Radder in the 80s⁵, ultrasound-guided percutaneous cholecystostomy consists of a minimally invasive procedure under local anaesthesia, and is generally considered safe^{5,6}.

According to Wang et al., symptomatic relief up until 72 hours has been registered among more than 80% of patients submitted to cholecystostomy, as well

as a procedure-associated mortality being inferior to 3%¹. Therefore, percutaneous cholecystostomy may play an increasingly important role in treating severe acute cholecystitis diagnosed in high-risk surgical patients, with substantial co-morbidities⁶. Moreover, performing percutaneous cholecystostomy in patients not eligible for surgery at the time of diagnosis may not only serve as bridging therapeutic approach between medical treatment and surgery, but also as a potentially definitive treatment measure⁵. Indeed, Ye Rim Chang et al. indicate 88.3% of high-risk surgical patients who underwent percutaneous cholecystostomy showed no relapse during a follow-up period of almost two years⁷.

Notably, the procedure has been applied to decreasingly co-morbid patients recently^{1,8}. In fact, comparing trends of percutaneous cholecystostomy use, Travis Smith et. al reveal only ASA III and IV patients were submitted to drainage the decade before 1995, whereas only 80% were received such high ASA classifications when receiving the procedure the decade after⁸, with mortalities having dropped from 22.1% to 13.3% since that time⁸. Such improved mortality rate may put in evidence the importance of patient selection when deciding on cholecystostomy indication⁸.

However, the role of cholecystostomy as an alternative treatment option to early cholecystectomy remains poorly established⁵. Campanile et al.



enhance the need of further investigation on the field in order to clarify its importance and indication criteria, given the heterogeneity in defining high-risk surgical patients³. Besides, literature is not consensual regarding performance of an elective laparoscopic cholecystectomy subsequently to percutaneous cholecystostomy, nor as far as the precise time interval between drainage and surgery is concerned³.

According to the widely used 2013 Tokyo Guidelines, severe acute cholecystitis cases treated with percutaneous cholecystostomy must be only submitted to cholecystectomy three months later⁶. Yet, different studies highlight the advantages of early surgery even in patients of worse surgical profiles. In a systematic review published in 2009, Windbladh et al. describe higher post-cholecystostomy mortality when compared to early cholecystectomy in non-surgical patients, again emphasizing the need of clinical trials on the subject⁹. Moreover, Campanile et al. claim in-hospital mortality associated with cholecystostomy is said to vary between 4 and 50%, signalling study limitations on this matter and how each investigation might define high-risk surgical individuals in divergent manners³. Also, need for surgery has been less investigated than conservative management, particularly in high surgical risk patients³.

Given the absence of consistent evidence in literature on how and when to recommend percutaneous cholecystostomy in the treatment of acute cholecystitis, this systematic review aims to help validate this procedure as a therapeutic approach, to precise its potential indications and to clarify its association with the surgical treatment.

METHODS

In December 2016, a literature search was performed to identify studies focusing on the role of percutaneous cholecystostomy as a treatment option for acute cholecystitis.

A systematic search on PubMed, Scopus and Web of Science was conducted spanning from January

2013 to November 2016. Studies were identified using the following query: “(acute cholecystitis OR severe cholecystitis) AND (cholecystostomy OR percutaneous cholecystostomy OR cholecystostomy tube)”. Only studies in humans were considered.

A total of 290 articles were initially retrieved, 110 from PubMed, 25 from Scopus and 155 from Web of Science. Repeated articles among different databases were excluded, remaining 167 records for assessment. Reference lists of eligible articles were hand-searched.

All articles written in languages other than Portuguese or English were excluded, as well as reviews, clinical cases, editor letters or video articles. Additionally, articles about acute acalculous cholecystitis or other conditions other than acute cholecystitis or associated with a malignant etiology were also excluded. Finally, studies involving less than thirty patients were considered small unrepresentative sample populations, having been set aside too. Therefore, from 167 records assessed, 36 full-text articles were assessed for eligibility.

Inclusion criteria were as it follows: populations which were fully characterized according to gender, mean age and American Society of Anaesthesiologists (ASA) physical status classification system, further including information on percutaneous cholecystostomy indication, outcomes of percutaneous cholecystostomy, outcomes of an eventual procedure of cholecystectomy following percutaneous cholecystostomy, procedure-associated complications, global mortality and eventual re-admissions.

Following these criteria, 23 from 36 studies were excluded, and the remaining 13 papers were included in this systematic review. All sequential steps comprising the abovementioned process are depicted in Figure 1.

RESULTS

Among 13 articles found eligible, all studies stressed the effectiveness and safety of percutaneous cholecystostomy as a symptomatic therapeutic



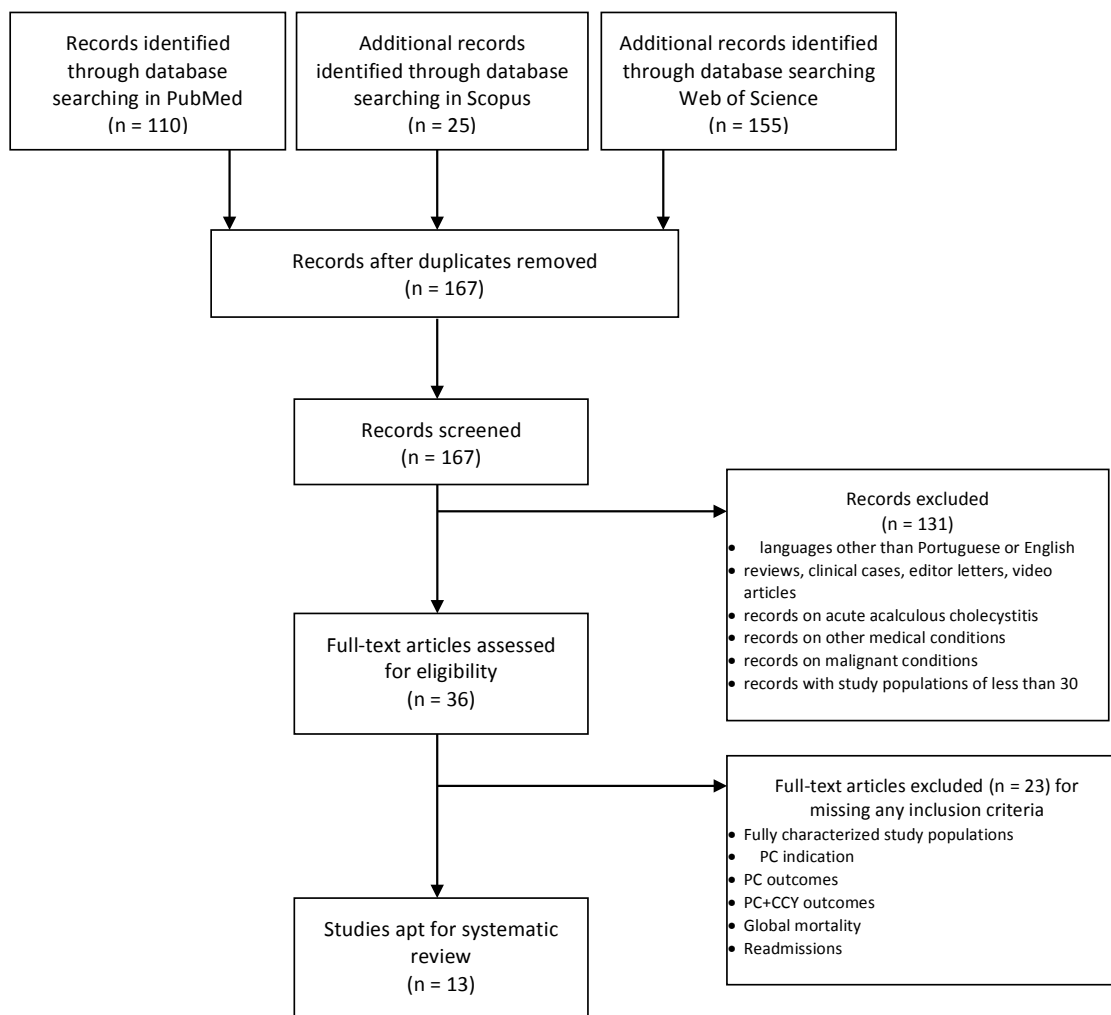


FIGURE 1 – Flow diagram representing methods for data analysis throughout all phases of this systematic review. Above-mentioned are discriminated all articles found, included and excluded, and exclusion criteria applied. PC, percutaneous cholecystostomy; PC+CCY, percutaneous cholecystostomy followed by cholecystectomy.

approach among high-risk patients, as in bearing less favourable surgical profiles.

A total of 1130 patients prevented from 10 different countries were counted. Characterization of all 13 study populations is depicted in Table 1.

Reported outcomes are covered by Table 2 and specific considerations made about each study were as it follows.

Travis J. Smith et al. described an association between percutaneous cholecystostomy tubes placement and elderly age and increased number of comorbidities⁸, namely cardiovascular disease

(66% vs 26%, $p = 0.001$), diabetes (27% vs 13%, $p = 0.001$), and mean Charlson comorbidity index (3.27 vs 1.07, $P = 0.001$). Retrospectively comparing trends of cholecystostomy performance during the 90s versus the 00s, authors also observed global decreasing mortality rates⁸, with mortality at 30-day follow-up lowering from 36% to 12% among patients submitted to drainage ($p = 0.001$).

According to Chung-Kai Chou et al., patients diagnosed with acute severe cholecystitis who were considered unfit for surgery and underwent early percutaneous cholecystostomy showed declining



TABLE 1 – Characterization of all 13 study populations according to year of publication, country of origin, design of study (R – retrospective; P – prospective), number of patients included, female to male ratio (F:M), mean age of patients (in years) and number of patients corresponding to an American Society of Anaesthesiologists (ASA) score equal or superior to 3.

Study	Year	Country	Design	Number of patients	F:M	Mean age, years	Number of patients with ASA ≥ 3
<i>Qingming Ni et al.</i>	2015	China	R	62	34:28	72.1	44 (71.0%)
<i>Charleen Shan Wen Yeo et al.</i>	2015	Singapore	R	103	46:57	80 (43-105)	88 (85.4%)
<i>Chung-Kai Chou et al.</i>	2015	Taiwan	R	209	60:149	74.54	200 (95.7%)
<i>Asgaut Viste et al.</i>	2015	Norway	R	104	47:57	73.5 (22-96)	44 (42.3%)
<i>Won Seok Janga et al.</i>	2014	South Korea	R	93	52:41	73.8 ± 12.1	48 (51.6%)
<i>Enver Zerem et al.</i>	2014	Bosnia and Herzegovina	R	36	24:12	75 ± 9.7	25 (72.2%)
<i>E. Atar et al.</i>	2014	Israel	R	81	33:48	82 (47-99)	81 (100%)
<i>Byung Hyo Cha et al.</i>	2014	South Korea	R	82	39: 43	72.1 ± 13.7	82 (100%)
<i>Mehrdad Nikfarjam et al.</i>	2013	Australia	P	32	16:16	78 (45-97)	32 (100%)
<i>Khang Wen Pang et al.</i>	2016	Singapore	R	71	28:43	73 (38-96)	71 (100%)
<i>Wei-Chen Lin et al.</i>	2016	Taiwan	R	61	30:31	80.3 ± 9.3	58 (95.1%)
<i>Pandanaboyana Sanjay et al.</i>	2013	New Zealand	R	53	21:32	74 (14-93)	49 (92.5%)
<i>Travis J. Smith et al.</i>	2013	EUA	R	143	50:93	72.0 ± 13.5	117 (81.8%)

TABLE 2 – Outcomes of all 13 studies included, i.e. number of patients who underwent percutaneous cholecystostomy only (PC only), number of patients who underwent percutaneous cholecystostomy followed by cholecystectomy (PC+CCY), conversion rate to open cholecystectomy, number of all complications recorded, global mortality observed and number of readmissions registered. Symbol – stands for no information available.

Study	PC only	PC+CCY	Conversion rate	Complications	Mortality	Readmissions	
<i>Qingming Ni et al.</i>	36	26 (41.9%)	19.2%	3 (4.8%)	0 (0.0%)	4 (6.4%)	
<i>Charleen Shan Wen Yeo et al.</i>	61	42 (40.7%)	15.0%	10 (9.7%)	13 (12.6%)	7 (6.8%)	
<i>Chung-Kai Chou et al.</i>	101	95 (45.5%)	-	26 (12.4%)	13 (6.2%)	20 (9.6%)	
<i>Asgaut Viste et al.</i>	70	30 (28.8%)	7.7%	13 (12.5%)	4 (3.8%)	0 (0.0%)	
<i>Won Seok Janga et al.</i>	31	62 (66.7%)	3.2%	2 (2.2%)	2 (2.2%)	6 (6.5%)	
<i>Enver Zerem et al.</i>	23	6 (16.7%)	16.7%	15 (41.7%)	7 (19.4%)	5 (13.9%)	
<i>E. Atar et al.</i>	10	36 (44.4%)	11.1%	6 (7.4%)	35 (43.2%)	2 (2.5%)	
<i>Byung Hyo Cha et al.</i>	47	35 (42.7%)	0.0%	2 (2.4%)	2 (2.4%)	0 (0.0%)	
<i>Mehrdad Nikfarjam et al.</i>	21	9 (28.1%)	0.0%	6 (18.8%)	3 (9.4%)	14 (43.8%)	
<i>Khang Wen Pang et al.</i>	33	32 (45.1%)	11.5%	20 (28.2%)	23 (32.4%)	7 (9.9%)	
<i>Wei-Chen Lin et al.</i>	Group 1 (non-elderly)	7	23 (7.2%)	8.7%	5 (15.6%)	2 (6.2%)	2 (6.2%)
	Group 2 (elderly)	19	34 (55.7%)	17.6%	16 (26.2%)	8 (13.1%)	8 (13.1%)
<i>Pandanaboyana Sanjay et al.</i>	23	18 (34.0%)	66.7%	7 (13.2%)	12 (22.6%)	13 (24.5%)	
<i>Travis J. Smith et al.</i>	67	59 (41.3%)	14.0%	21 (14.7%)	17 (11.9%)	0 (0.0%)	



hospital length of stay (15.8 ± 12.9 vs 21.0 ± 17.5 days in patients with late procedure) and procedure-related bleeding (0.0% vs 5.0%, $p = 0.018$)¹⁰.

Asgaut Viste et al. highlight only minor complications related to the procedure (reported among 12.5% patients) with predominant successful tube insertion and rapid symptom relief experienced in 97% of individuals who enrolled in the study¹¹. E. Atar et al. put in evidence very satisfying rates of technically successful procedures, with effective tube insertion among all 81 critically ill patients and no reports of major complication events¹².

Furthermore, cholecystostomy showed to improve survival among high-risk individuals included in a study led by Charleen Shan Wen Yeo et al., with emphasis on the importance of early procedure for outcome improvement. Indeed, authors describe that cholecystostomy was performed at a median of 2 days after establishing acute cholecystitis diagnosis, avoiding high failure rates mentioned in literature¹³.

As far as how cholecystostomy might be related with subsequent surgery, a Norwegian retrospective analysis conducted by Asgaut Viste et al. concluded that only one-third of 104 patients submitted to percutaneous biliary drainage were later cholecystectomized¹¹. Moreover, Enver Zerem et al. affirm high-risk surgical patients might not even need further treatment once percutaneous cholecystostomy is performed¹⁴. E. Atar et al. also focus on the efficacy of conservatively treating critical patients with acute cholecystitis, stating that surgical outcomes after percutaneous cholecystostomy are superior to those of cholecystectomy only¹². Dividing and comparing patients in two subsets according to their age (group 1 corresponding to non-elderly patients, age ≤ 70 years, and group 2 including all elderly patients, age > 70 years), Wei-Chen Lin et al. conclude high-risk elderly and substantially comorbid patients should be early identified as such and submitted to cholecystostomy, as they may benefit not only from better clinical outcomes, with a decrease in hospital length of time and associated

morbidity, but also from better eventual surgical outcomes, enabling effective performance of delayed laparoscopic cholecystectomy¹⁵. Byung Hyo Cha et al. further define percutaneous cholecystostomy as the best definitive therapeutic option for those with acute cholecystitis who are not eligible for surgery at diagnosis, adding that certain cases may be appropriate for safe drainage tube removal¹⁶.

When investigating which post-drainage clinical circumstances might predict eventual later surgery, Won Seok Janga et al. found advanced patient age, higher increased American Society of Anaesthesiologists (ASA) score and history of cerebrovascular accident (CVA) to be statically significant risk factors¹⁷.

Despite all defending cholecystostomy as safe and effective in treating severe cases of acute cholecystitis, five of thirteen studies made remarks on possible conflicts concerning the procedure.

Qingming Ni et al. enhanced the fact that emergent cholecystectomy should be performed in patients eligible for surgery as soon as acute cholecystitis is diagnosed, despite recognizing the role of percutaneous drainage in case of deteriorated clinical status¹⁸.

Even though only a minor part of all patients retrospectively reviewed by Pandanaboyana Sanjay et al. underwent later surgery, authors noted higher risk of conversion to open cholecystectomy among patients who had been submitted to percutaneous cholecystostomy¹⁹. Also, acute cholecystitis recurrence was registered in one in each four patients during study follow-up¹⁹. The study has also put in evidence the correlation between percutaneous cholecystostomy and high mortality rate due to sepsis at hospital admission, as well as 1-year mortality due to other causes unrelated to cholecystostomy¹⁹.

Mehrdad Nikfarjam et al. additionally observed that a substantial proportion of patients required later surgery, with 9 out of 32 patients undergoing surgery at a median of 73 days since drainage²⁰. This particular study also found hypotension and absence of common bile duct filling on initial cholangiography



to be independent prognostic factors, associated with long-term survival reduction²⁰.

Further prognostic factors were detected by Khang Wen Pang et al.²¹. In fact, authors predicted an increased cholecystitis recurrence risk among patients presenting with higher alkaline phosphatase (ALP) at hospital admission and patients with acute cholecystitis complicated with acute myocardial infarction (AMI). Therefore, investigators state that these specific groups of patients might benefit from definitive cholecystectomy, while taking part in the consensual opinion that surgical profile should persevere as the major predictive factor for clinical decision²¹.

DISCUSSION

Widely recognized Tokyo Guidelines, recently revised in 2013, have recommended emergent percutaneous cholecystostomy and subsequent interval cholecystectomy for cases of severe acute cholecystitis, classified as grade III and moderate cases, or grade II, only for when patients appear to be refractory to conservative treatment¹³.

All studies included in this review have recognized a global beneficial use of cholecystostomy in selected patients, particularly among those considered non-eligible for cholecystectomy. Indeed, thorough search has put in evidence an historical belief that correlates populations of an advanced age, in critical clinical condition or with several comorbidities with an inappropriate surgical profile. L.R. Jenkinson et al. have previously associated cholecystectomy performed in an elderly subset of patients with morbidity rates of up to 46%^{19,22}. Further claims have reported surgical procedures in acute settings among high-risk individuals lead to up to 4.5% mortality rates along with 41% morbidity cases mainly due to anaesthetic interurrences and intrinsic severe comorbidities^{15,23}.

In this demanding clinical context, cholecystostomy emerges as a potentially safe treatment choice for challenging patients, seemingly able to improve

both prognosis as a single approach and outcome among cases requiring later cholecystectomy. In fact, symptomatic relief and sepsis treatment have been previously described among 86% of patients submitted to percutaneous drainage^{9,20}. Included in this review, the investigation led by Mehrdad et al. further attest symptomatic treatment and hospital discharge among 91% of patients who underwent cholecystostomy after having been considered unfit for general anaesthesia²⁰. As mentioned before, all remaining records included corroborate the advantageous indication for this purpose. Moreover, Byung Hyo Cha et al. obtained successful results when focusing on the role of percutaneous cholecystostomy as definitive management of individuals in critical condition, with no recurrences to register and tubes effectively removed in 75.6% of patients¹⁶.

Despite the optimistic outlook, lengthy database searching for this review has revealed several papers which, despite not qualifying for inclusion criteria and therefore having been excluded, demonstrated conflicting evidence on whether percutaneous cholecystostomy or cholecystectomy should be recommended for better outcomes. A decade long retrospective analysis comprising more than 300 000 patients, conducted in the University of California, San Diego²⁴, found that patients submitted to cholecystostomy displayed lower risk of procedure-associated complications than patients who underwent surgery; however, mortality was reported to be significantly increased among cholecystostomy patients (odds ratio of 5.2, $p < 0.001$), as well as total hospital length of stay and charges associated. Abi-Haidar et al. have also described not only association of percutaneous cholecystostomy with statistically significant longer hospital length of stay ($p < 0.001$), but also increased complication ($p = 0.01$) and hospital readmission rates ($p = 0.006$) when compared to early cholecystectomy, with 21.4% patients having been eventually readmitted²⁵. Researchers add that even laparoscopic cholecystectomy conversion to open procedure, traditionally correlated with quite poor outcome scenarios, showcased better clinical



performance, with decreased number of systemic (25.0% vs 43.1%), hepatobiliary (52.8% vs 68.6%) and other (2.8% vs 7.8%) complications comparing to percutaneous cholecystostomy²⁵.

Originally, a table comprising results systematically collected from all thirteen articles was created. However, multiple discrepancies were extensively detected as far as study designs were concerned. In fact, articles differed greatly in patient selection for procedure indication criteria, data collected, clinical outcomes sought and follow-up time. This has occasioned hazardous comparison between results found, thereby impairing further statistical analysis and weakening potential conclusions for cholecystostomy validation in acute cholecystitis treatment.

As it has been previously stated in literature²⁰, only randomized controlled trials may effectively clarify whether percutaneous cholecystostomy should be relied on to achieve safe and successful acute

cholecystitis treatment. If so, clinical criteria should be formally established so as patients benefit from this procedure. Dutch CHOCOLATE (percutaneous cholecystostomy versus laparoscopic cholecystectomy) multicentre randomized controlled trial on acute cholecystitis treatment among surgical high-risk populations may provide the awaited evidence based guidelines on the best therapeutic approach²³.

CONCLUSIONS

All studies included in this review affirm percutaneous cholecystostomy is as a safe procedure with largely successful outcomes when performed in high-risk surgical patients with acute cholecystitis, especially those of an advanced age or who bear significant comorbidities. However, further investigation is needed to strengthen evidence on the role of this procedure.

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