REVIEW

Technique and indications of percutaneous cholecystostomy in the management of cholecystitis in 2014

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Summary The gold standard in treatment of acute cholecystitis is cholecystectomy associated with antibiotics. In certain circumstances, percutaneous cholecystostomy is an interventional alternative. Percutaneous cholecystostomy is usually performed under local anesthesia by the radiologist using ultrasonographic or CT guidance. A drain can be inserted either through a trans-hepatic or a trans-peritoneal approach. Complications occur in nearly 10\% of cases including hemorrhage, hemobilia, pneumothorax or bile leaks, depending on whether the approach was trans-hepatic or trans-peritoneal. The main indications for percutaneous cholecystostomy are resistance to medical treatment or severely-ill patients in intensive care. Drains should be maintained 3 to 6 weeks before removal. In patients with good general condition (ASA score I–II), secondary cholecystectomy can be recommended to avoid recurrence.

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Introduction

Acute cholecystitis is one of the most frequent reasons for admission to surgical services in the Western world. The recent recommendations emanating from the French High Authority (Haute Autorité de santé) and the French National Society of Gastroenterology (Société Nationale française de gastroentérologie) \cite{[1]}, based on the Tokyo Guidelines \cite{[2,3]}, recommend early cholecystectomy (<7 days), associated with antibiotic therapy \cite{[1]}. This treatment of reference can, however, be fraught with non-negligible morbidity and mortality, reaching 30\% in certain subgroups \cite{[4]}. Moreover, emergency cholecystectomy is not always recommended, in particular, for severe (grade III) calculous acute cholecystitis \cite{[1]}. Alternative techniques, such as percutaneous cholecystectomy, have been developed. Initially described via a surgical approach, in 1859 \cite{[5]}, cholecystostomy has been performed percutaneously by interventional radiologists starting in 1980 \cite{[6]}. The goal of this update is to describe the techniques, the indications and the outcomes of percutaneous cholecystostomy via interventional radiology.
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Figure 1. Cholecystostomy performed under sonographic guidance. The puncture needle (whith linear structure) can be seen inside the gallbladder.

**Technique**

Percutaneous cholecystostomy is usually performed under local anesthesia by an interventional radiologist.

Two approaches have been described: trans-hepatic and trans-peritoneal. The trans-hepatic route is used preferentially by most authors because it reduces the risk of biliary leak, allows the drain to be left in place for longer periods and leads to quicker maturation of a drainage tract [7,9].

The trans-peritoneal route can be used when the trans-hepatic route is impossible for anatomical reasons, or in case of liver disease or coagulation disorders, as long as the gallbladder is distended, and abuts the abdominal wall [7,9].

There are two possible guidance modalities: sonography and computerized tomography (CT) scan. Sonography alone can be used in bedridden patients with multivisceral failure and who are difficult to mobilize. The procedure can be complemented with fluoroscopy to better control the position of the drain by injecting a small quantity of contrast material once the drain has been placed [9]. When sonography is impossible (Fig. 1), CT scan can be used for guidance (Fig. 2).

Two techniques have been described for percutaneous cholecystostomy [7,9]. The Seldinger technique consists of inserting a fine needle into the gallbladder under local anesthesia. A guide wire is then inserted, over which increasing diameters of dilators can be inserted until a sufficient size is reached to allow insertion of an 8 French pig-tail catheter. The caliber of the drain should be adapted to bile viscosity. Bile is withdrawn for bacteriologic culture and the drain is connected to gravity drainage. The advantage of this technique is the use of a fine needle, which reduces the potential risk of an involuntary perforation of a nearby organ and it becomes necessary to reposition the needle. The disadvantage is the multiplicity of maneuvers that make the procedure long. The other technique is the "trocar" technique, which allows direct insertion of an 8 French pig-tail. The trocar and the drain have the same diameter, which increases the risk of bleeding from the liver. Nonetheless, this technique is used preferentially by several teams because it limits the number of maneuvers.

Several complications are possible during these maneuvers including vasovagal syncope, particularly when the puncture is performed under local anesthesia [7]. Moreover, the incidence of more severe complications is approximately 3.4% [10,11]: mainly hemobilia and pneumothorax for the trans-hepatic route [12], and bile leak for the trans-peritoneal route, which can lead to biliary peritonitis, especially when bile is infected [9].

**Indications and contra-indications**

The indications for percutaneous drainage depend on the patient, the severity of cholecystitis and/or the type of cholecystitis:

- one of the major indications is to decompress and drain the infected gallbladder in the surgically high-risk patient (ASA III-IV) [1,3];
- the other major indication for percutaneous cholecystostomy, especially recommended by the HAS, is directly related to the severity [1]. Thus, severe acute cholecystitis (Stage III according to the Tokyo Guidelines) should be treated in this manner [2,3]. Likewise, according to severity criteria, some Stage II cholecystitis can equally be treated in the same way, even if surgical treatment should be preferred [3]. These two stages of acute cholecystitis are described in Table 1 [2,3,13];
- lastly, percutaneous drainage can be proposed to the patient hospitalized in intensive care for suspected acalculous cholecystitis [14]. This diagnosis is often difficult because of the absence of signs (absence of stones) or because of the non-specific character of gallbladder distention in intensive care patients [14].

No true consensus exists as to the indications for percutaneous cholecystostomy. All but one of the studies in the literature are retrospective [15]. In the latter, the authors compared medical treatment alone to medical treatment associated with percutaneous cholecystostomy in surgical high-risk patients (APACHE score ≥ 12). The authors concluded that percutaneous cholecystostomy was beneficial in patients in intensive care who had not improved within three days of well-conducted medical treatment [15]. The current HAS recommendations state that medical treatment should be pursued 72 hours before resorting to percutaneous cholecystostomy [1].

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Description of grades II and III acute cholecystitis according to the Tokyo Guidelines [2,3].</th>
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<tbody>
<tr>
<td>Mild acute cholecystitis (grade II)</td>
<td>Severe acute cholecystitis (grade III)</td>
</tr>
<tr>
<td>Leukocytosis &gt; 18,000/mm³</td>
<td>Cardiovascular dysfunction</td>
</tr>
<tr>
<td>Palpable gallbladder</td>
<td>Neurological dysfunction</td>
</tr>
<tr>
<td>Pain &gt; 72 hours</td>
<td>Respiratory dysfunction</td>
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<tr>
<td>Marked local inflammation</td>
<td>Renal dysfunction</td>
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<tr>
<td>Gangrenous cholecystitis</td>
<td>Liver dysfunction</td>
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<tr>
<td>Perivesicular abscess</td>
<td>Hematological dysfunction</td>
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<td>Hepatic abscess</td>
<td>Disturbance of consciousness</td>
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<tr>
<td>Biliary peritonitis</td>
<td>PaO₂/FIO₂ ratio &lt; 300</td>
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<td></td>
<td>Oliguria</td>
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<td>PT-INR &gt; 1.5</td>
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<td></td>
<td>Platelet count &lt; 100,000/mm³</td>
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<td></td>
<td>Hypotension requiring</td>
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<td>dopamine or dobutamine</td>
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</table>

1. Cholecystostomy performed under sonographic guidance. The puncture needle (whith linear structure) can be seen inside the gallbladder.
Percutaneous cholecystostomy seems useful for certain categories of patients: patients in intensive care (where the prevalence of acalculous cholecystitis can be as high as 10%) and in pregnant women where medical treatment alone for cholecystitis is often not successful [16]. In dialysis patients, laparoscopic cholecystectomy seems to be a better option than percutaneous cholecystostomy [17].

A recent study published in 2012 identified five predictive criteria for successful non-operative management of acute cholecystectomy (antibiotic therapy with eventual percutaneous cholecystostomy) [18]: admission in a medical ward rather than a surgical ward, admission in intensive care, patients with dementia, patients who do not live at home, and increased alkaline phosphatase.

There are three contra-indications to percutaneous cholecystostomy:
• interposition of gastrointestinal segments between the point of puncture and the gallbladder;
• coagulation disorders [19];
• biliary peritonitis, because it is necessary to clean the peritoneal cavity and treat the cause of peritonitis (usually ruptured cholecystitis).

In the presence of contra-indications, two alternatives are possible:
• surgical cholecystectomy that can be performed under local anesthesia [1];
• endoscopic gallbladder drainage, especially in patients with ascites or hemostasis disorders [20].

Results

Technical success is defined as satisfactory placement of the drain in the gallbladder, the rate of which reaches 90% in the literature [21]. The causes for failure include a small gallbladder lumen, a thin gallbladder wall, and porcelain gallbladder [22].

Clinical success is defined by the French Society of Interventional Radiology as the disappearance of fever and pain as well as reduction of leucocytosis and C-reactive protein (CRP) [23]. One literature review reported a clinical success rate at 86% after a median interval of 3 days [24].

Several complications have been reported after the procedure. In an American registry study [25], the authors reviewed the records of 306,747 patients treated for acute cholecystitis, calculous or not, between 1998 and 2010. Percutaneous cholecystostomy represented the treatment chosen for 1.5% of patients with calculous cholecystitis and 7.4% of those with acalculous cholecystitis. The mortality rate ranged from 11.5 to 14.2% (calculous and acalculous cholecystitis combined) whereas 30-day morbidity ranged from 4.1% to 6.9%.

In the literature, 30-day mortality ranges from 6 to 50%, and seems to be higher for patients treated in intensive care units [8,26]. Of note, the patients in these series were often older and had more co-morbidities than patients who underwent cholecystectomy. Death was more often related to sepsis or underlying co-morbidity than to the procedure itself, suggesting that there was a selection of patients, with surgeons operating on healthier patients.

The complication rate was low, around 10% [8]: mainly bile leaks, nearly always after trans-peritoneal drainage [8], or bleeding requiring transfusion or not [27], drain migration (8.6%), and more rarely, digestive tract perforations or pneumothorax.

Follow-up

The patient is followed in the radiology department. Drain dependency seems to facilitate bile flow [7]. While negative pressure does not seem to be necessary, conversely, rinsing the drain with 10 mL of saline daily or twice daily should suffice to avoid obstruction.

There are no specific recommendations for antibiotic therapy in association with gallbladder drainage. Nonetheless, in patients with cholecystitis, antibiotics active against Gram negative bacilli are recommended before surgery [1]. Bacteriologic culture and sensitivity of the bile samples or blood cultures are therefore necessary [1]. Lastly, in case of severe cholecystitis, antibiotics should be continued even after cholecystectomy [1]. It appears therefore licit to administer antibiotics adapted to the bacteriology after drainage.

The duration of drainage ranges from three to six weeks, one month on the average [18]. This corresponds to the mean interval necessary for maturation of the tract. Certain conditions such as uncontrolled diabetes, long-term steroid therapy, malnutrition, the presence of ascites or tract infection (deep organ space surgical site) may hinder tract maturation; in such cases, the drain should be left in place longer [28,29]. The drain can be removed generally after temporarily clamping of the drain has been shown to be well-tolerated. Certain authors favor performing a cholangiography via the drain (Fig. 3) before withdrawal to ensure the absence of leak or obstructed cystic duct (to ensure that the gallbladder is not "excluded"), but this policy is not systematic [9].

Last, as concerns secondary cholecystectomy, the results in the literature are discordant: certain studies have...
reported a low rate of recurrent acute cholecystitis after drain ablation, around 4% [18] to 8% [30], which does not seem to justify secondary cholecystectomy. Conversely, other series [8] seem to indicate that the rate of new hospitalizations for acute cholecystitis could be as high as 22%. Even if these relapses can be treated by repeat percutaneous cholecystostomy, such a high rate pleads in favor of secondary cholecystectomy.

One controlled randomized study published in 2005 [31] compared early versus late laparoscopic cholecystectomy after percutaneous cholecystostomy. Early cholecystectomy was possible in 29 out of the 31 patients in this arm.

A recent Cochrane Library meta-analysis by Gurusamy et al. concluded that there were no statistically significant differences in terms of morbidity when late cholecystectomy after cholecystostomy was compared to simple conservative treatment (P = 0.49) [32]. The Tokyo Guidelines recommend routine cholecystectomy after acute calculous cholecystitis [3].

The secondary cholecystectomy rates ranged from 57% to 88% [33,34], and this operation is usually performed in patients initially classed ASA 1 or 2 [8], with morbidity rates similar to those after emergency cholecystectomy. The median interval before secondary cholecystectomy was 63 days (range 3 to 1055 days) [33].

Conclusions

Percutaneous cholecystectomy is technically feasible and has been validated for the management of acute cholecystitis, whether calculous or acalculous, in association with antibiotic therapy. The procedure is usually performed trans-heapatically, under sonography and fluoroscopic guidance. The drain should be placed and retained for at least 4 weeks. The success rate for this technique is approximately 85% and the complication rate approximately 10%. This technique is essentially intended for patients with temporary or permanent contra-indications to general anesthesia, most often aged, hospitalized in intensive care and having several co-morbidities.

The place of percutaneous cholecystectomy versus laparoscopic cholecystectomy remains poorly defined. This is why a prospective randomized study was initiated in 2012 to compare percutaneous cholecystostomy to laparoscopic cholecystectomy in high-risk surgery patients. The inclusion period was set for two years [35].

**STRONG POINTS**

- Cholecystectomy is the standard treatment for management of acute cholecystitis
- Percutaneous cholecystostomy is recommended for patients with grade III severity or at high risk for surgery.
- The usual techniques for percutaneous cholecystostomy are radiologic (trans-hepatic or direct trans-peritoneal).
- An interval of 72 hours after well-conducted medical treatment is recommended before proposing a cholecystostomy.
- Two alternatives to the percutaneous route are possible: surgical and endoscopic.
- There are no recommendations as concerns specific antibiotic therapy but it seems licit to pursue antibiotic therapy and to adapt it to the antibiotic sensitivities after cholecystostomy.
- Secondary cholecystectomy should be discussed case by case according to patient status.

Disclosure of interest

The authors declare that they have no conflicts of interest concerning this article.

References

Cholecystitis and cholecystostomy


