Gallbladder drainage and cystic duct stenting

Background
Acute cholecystitis (AC) is one of the commonest presentations to the surgical ward in developed countries. Clinical features, blood analysis and imaging usually lead to an early diagnosis and prompt initiation of antibiotic and supportive medical therapy. Although the clinical course is often self-limiting, complications related to gallbladder perforation, fistula formation and disseminated sepsis can occur. The current management guideline for AC is cholecystectomy during the acute admission where possible, typically within 72 hours. In those with a delayed presentation many surgeons advocate postponing the operation for six weeks which reduces the complexity of the procedure related to adhesions. Similarly those patients who are acutely decompensated secondary to the sepsis may go on to have a delayed cholecystectomy; these patients can be stabilised with medical therapy. Although the clinical course is often self-limiting, complications related to gallbladder perforation, fistula formation and disseminated sepsis can occur. The current management guideline for AC is cholecystectomy during the acute admission where possible, typically within 72 hours.

Management
Formal guidelines on assessing the severity of AC have been published and these provide an important role in determining the most appropriate treatment option for each patient. As described, an in-patient cholecystectomy in the acute phase is regarded as the preferred treatment option. For the remainder of this article we will concentrate on those patients that may require gallbladder drainage in the form of image-guided cholecystostomy as part of their management plan. These patients fall into three broad categories: Late presentation Acutely decompensated patients Multiple co-morbidities. Ideally the first two groups of patients will go on to have an interval cholecystectomy procedure, usually about six weeks after the acute presentation. These patients will be optimised with medical management in the interim; some will also require gallbladder drainage depending on the severity of the AC and their response to antibiotics, fluid support etc. For these patients a cholecystostomy is indicated as complications related to external drainage will be minimal – the drain will stay in place for a short time period only. A cohort of patients with multiple co-morbidities is unlikely to be well enough to undergo surgery despite the best medical support. This last group of patients provide the greatest challenge in the management of AC. Patients with gallstone related AC are at risk of recurrent episodes and, although most cases will be self-limiting, the possibility of complications must be borne in mind. The pre-existing illnesses may also reduce the chances of recovery from these complications or at least increase the time to recovery. A permanent minimally invasive cholecystostomy is a viable management option in these patients. However, long-term external drainage, particularly in elderly patients, can be problematic and this select group of patients may benefit from internal biliary drainage such as that offered by a cystic duct stent.

External drainage
Those patients requiring a cholecystostomy will invariably have one placed by a radiologist using US guidance. CT guided drainage is possible but is more time consuming and cumbersome and seldom employed.

Patient preparation includes a recent blood profile (full blood count and clotting screen), allergy status and consent.

Diagnosis
Clinical presentation
Typical presentation includes an acute history of right upper quadrant or epigastric pain, nausea, vomiting and fever. On examination a positive Murphy’s sign (pain to deep palpation in the subcostal area on inspiration) has a specificity of 79%-96% for acute cholecystitis. A previous medical history of gallstones, biliary strictures and/or biliary stenting increases the likelihood of AC.

Blood tests
Although no specific blood test exists for AC, the presence of infection and inflammation denoted by a raised white cell count and C-reactive protein respectively are extremely useful markers both for supporting the diagnosis and assessing its severity. In addition, renal and liver function tests including a clotting profile help assess the general status of the patient.

Imaging
The most useful first line imaging investigation in suspected AC is ultrasound (US). Figure 1 shows some of the typical findings on US which include the following:

• Distended gallbladder
• Thickened gallbladder wall >4mm
• Debris within the gallbladder
• Stones within the gallbladder, cystic duct or common bile duct
• Fluid/abscess around the gallbladder
• A positive sonographic Murphy’s sign.

Computerised tomography (CT) imaging of the abdomen and pelvis with or without intravenous contrast is seldom required to diagnose AC. CT can be useful in identifying some of the complications of AC such as perforation and fistulae formation (figure 2).
Local practice varies but in our institution we require a platelet count of above 50 x 10⁹/L, haemoglobin above 9g/dL, and an INR below 1.4. The presence of ascites is a relative contraindication to cholecystostomy as the risk related to bleeding is increased. These patients can have an ascitic drain placed initially and proceed to cholecystostomy at a later date. Patients do not have to be kept nil by mouth for this procedure. Consent must include the risk of the following:

- Pain/discomfort
- Bleeding
- Infection
- Perforation of bowel
- Pneumothorax
- Failure.

Once the patient has been adequately prepared, the radiologist using US will identify the safest route into the gallbladder. Two possible methods can be employed, the trans-hepatic route which involves going through the liver, and the trans-peritoneal route which avoids the liver. The practice in our institution is to proceed with the route that gives the easiest access to the gallbladder. Advocates of the trans-hepatic approach cite the potential advantage of greater anchorage of the drain, thereby reducing drain displacement and the reduced risk of bile leak. In the latter complication, infected bile is less likely to irritate the peritoneum as the liver acts as a 'shield'. Infected bile in the peritoneum is extremely painful and runs the risk of causing bile peritonitis which can be difficult to manage. There is, however, an increased risk of bleeding if the liver is to be crossed.

Once the route has been decided the patient is cleaned and draped. Local anaesthetic is applied to the skin, the gallbladder and to the liver capsule if the approach is to be trans-peritoneal.

Once suitably anaesthetised, an 8Fr locking drain is inserted into the gallbladder using one of two techniques, the trocar or Seldinger approach. The first approach is a single step process with the insertion of a standard three part drain into the gallbladder (figure 3). The inner trocar and needle are then removed and the pigtail of the drain forms within the gallbladder (figure 4). This is a simple, quick technique that is favoured in our institution.

The Seldinger technique uses a fine needle to first puncture the gallbladder, a wire is then fed through the needle into the gallbladder and the needle is then removed. Over the wire a drain with a trocar is advanced until its tip is in the gallbladder. The wire and trocar are then removed allowing the pigtail to form in the gallbladder. Sometimes the 8Fr drain will not pass over the wire and plastic dilators of increasing size need to be used in order for the drain to advance into the gallbladder. This is a more cumbersome procedure with multiple steps but has the advantage of a smaller sized initial puncture which may reduce the risk of bleeding. The drain is then sutured into the skin and a suitable dressing applied. This is left on free drainage and a sample taken for microbiology, culture and sensitivity. In infected systems it is almost always frank pus that is aspirated (figure 5). The patient is monitored in the department for approximately 30 minutes before being returned to the ward.

The external drain requires little in the way of management. The bag needs emptying as and when required and care needs to be taken by both patient and staff to not dislodge the drain. As the drain is a potential source of bacterial entry the area around the insertion site needs to be kept clean. This can be difficult to manage, especially in frail patients, although most patients will have the drain in place for a short time period only. Flushing daily with 10ml of sterile saline may help reduce drain blockage.

Technical success defined as satisfactory placement of a drain in the gallbladder is close to 90% with a clinical success rate defined by a reduction in inflammatory markers and resolution of symptoms being as high as 86%.[9,10] Complication rates are low at approximately 10%. Drain migration is the commonest problem (8.6%) followed by bile leaks and bleeding. Bowel perforation and pneumothorax are rare.[11,12]

**Internal drainage**

In those select patients who need permanent gallbladder drainage, the problems with external drainage relating to displacement, blockage and infection can be difficult to overcome. Routine replacement of the drain at three-month intervals helps but has a cost implication and is inconvenient for the patient. These patients can benefit from definitive internal drainage of the gallbladder. Endoscopically placed stents between the gallbladder and bowel have been described, as have fluoroscopic cystic duct stents. This latter technique performed by interventional radiologists places a stent between the gallbladder and duodenum via the cystic duct.

Using fluoroscopy a wire is placed via the existing cholecystostomy into the gallbladder. Using a catheter, a hydrophilic wire is then manipulated through the cystic and common bile duct into the duodenum. A double pigtail stent is then placed such that one end is in the duodenum and the other is in the gallbladder (figure 6). A covering cholecystostomy is left in place for a few days. Once internal drainage has been confirmed the external drain can be removed. Technical success rates as high as 91% have been demonstrated. Difficulties include passing a wire through the cystic duct which can be extremely tortuous in some patients, and crossing strictures of the common bile duct.[13]

**Summary**

Minimally invasive percutaneous cholecystostomy is a valid alternative as a bridge to surgery or as a definitive treatment plan in those with multiple co-morbidities. The latter group of patients may benefit from internalisation of the drain with a cystic duct stent procedure.

**References**

5. Troubridge R L, Buluowski N K, Shojania K G. Does this patient have acute cholecystitis? JAMA 2003;289:80-86.
Figure 1
Ultrasound image showing a thick walled gallbladder (large arrow) with surrounding fluid (small arrows). A positive sonographic Murphy’s sign was demonstrated.

Figure 2
Corresponding unenhanced CT image. Thick walled gallbladder (large arrow) and surrounding fluid (small arrow) again demonstrated. The CT showed a perforated gallbladder – not seen on this image.

Figure 3
Ultrasound image showing the insertion of a three-part drain (arrow) using the trocar method.

Figure 4
Removal of the inner trocar and needle allows the pigtail (arrows) of the drain to form within the gallbladder.
Figure 5
Typical appearance of frank pus aspirated from an infected gallbladder.

Figure 6
Double pigtail stent deployed with one end in the duodenum (small arrow) and the other in the gallbladder (large arrow).