Biliary surgery in the dog and cat

Surgery of the biliary system is uncommonly performed in the dog and cat, but the commonly indicated techniques should be familiar to the small animal practitioner. The most important are cholecystectomy and cholecystoduodenostomy and this article focuses on the indications for these, together with their application. Although minimally invasive and interventional radiological techniques are becoming established as alternatives to open surgery for some of these patients, they will not be discussed here as they are currently rarely used.

Key words: Surgery, Gall bladder, Biliary, Cholecystectomy, Cholecystoduodenostomy

Overview

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Surgical anatomy (Figure 1)

Within the liver, bile canaliculi coalesce into lobar bile ducts which in turn form the hepatic bile ducts outside the liver. The hepatic ducts enter a single structure, the common bile duct (CBD), which runs within the mesoduodenum, through part of the head of the pancreas, and enters the duodenum at the major duodenal papilla. The gall bladder is a reservoir that is connected to the common bile duct by the cystic duct. The gall bladder lies within the fossa of the liver and is intimately associated with the quadrate and right medial lobes of the liver. The liver capsule of these lobes is reflected over the gall bladder and is therefore continuous with the serosal surface of the gall bladder. It is important to appreciate that the gall bladder is a “cul de sac”, and that the correct removal of the gall bladder does not affect the continuity of the biliary ducts. Similarly, obstruction to the cystic duct, or other disease processes restricted to the gall bladder alone, do not generally cause obstruction to bile flow (obstructive jaundice). A significant minority of dogs

![Figure 1: Schematic illustration of canine biliary anatomy, seen as if at midline laparotomy.](image-url)
with biliary mucocoele have jaundice, either due to bile deposits within the common bile duct or obstruction of the common bile duct by kinking at the junction with the cystic duct.

The vascular supply to the gall bladder is via a discrete cystic artery, but practically, this is intimately associated with the cystic duct and is variably apparent during surgery.

Common surgical biliary diseases

These can conveniently be separated into those affecting the gall bladder alone, extraluminal obstruction of the common bile duct, intraluminal biliary obstruction (rare) and biliary duct rupture (also rare).

Gall bladder diseases

of note include biliary mucocoele (Figure 2), bacterial cholecystitis, necrotising cholecystitis and cholelithiasis (gall stones). Of these, biliary mucocoele is the most common reason for removal of the gall bladder (cholecystectomy).

Biliary mucocoele is distension of the gall bladder by accumulated mucus and dehydrated bile. Causative factors are speculated to include reduced gall bladder contractility, altered water uptake across the wall, decreased bile flow and bile sludging. Genetic factors may play a part, since there is a breed predisposition in Shetland sheepdogs (Aguirre et al. 2007) and Border terriers (author’s personal observations in the UK clinical population). A relationship to hyperadrenocorticism has also been postulated (Hottinger 2009). It may be helpful to recognise sludging and hyperplasia of the gall bladder lining as precursors to mucocoele formation.

Bacterial cholecystitis is less common. It is considered to be due to ascending infection of the biliary tree and may occur concurrently with a more widespread cholangiohepatitis. In cats, it may be associated with so-called triaditis: concurrent pancreatitis, cholangiohepatitis and inflammatory bowel disease.

Necrotising cholecystitis is rare. It is generally not recognised before gall bladder rupture occurs and animals present with bile peritonitis and associated systemic signs. Although surgical exploration and cholecystectomy is recommended, progressive necrosis of the cystic duct may lead to continuing biliary leakage.

Gall stones are generally uncommon in dogs and cats, whether they are found in the gall bladder or biliary ducts. In the gall bladder they may be an incidental finding, or associated with either biliary mucocoele or cholecystitis. There is little information on their chemical composition although most are probably inspissated bile pigment. Their radiodensity is variable and many are not radio-opaque and may not be particularly echogenic.

Extraluminal biliary obstruction is most commonly due to pancreatic disease, occurring where the common bile duct passes through the head of the pancreas. Associated pancreatic diseases are acute or chronic pancreatitis and pancreatic neoplasia (typically adenocarcinoma). These animals present with jaundice and often other signs referable to pancreatic disease, such as vomiting and abdominal pain. Ultrasonography is useful to confirm biliary obstruction, as well as pancreatic disease, with distension of the bile ducts becoming apparent within a few days of obstruction. Distinguishing the types of pancreatic disease that cause this presentation is beyond this article, although some general points might be considered. Acute pancreatitis causing an obstruction generally results in overt clinical signs of pain and vomiting but may be self-limiting with obstruction (and degree of jaundice) reducing after a few days. Chronic pancreatitis and pancreatic neoplasia causing obstruction will lead to ongoing jaundice persisting for days, although signs other than jaundice may be limited. Regardless, if laparotomy is performed, biopsies of the pancreas are indicated at the time of surgery.

Occasionally, cases of extraluminal obstruction due to narrowing of the terminal common bile duct are encountered and these include congenital biliary obstruction and severe inflammatory bowel disease. In these rare cases, other surgical options (including incision into the bile duct (choledochotomy) or stent placement) may be considered but are not presented here.

Intraluminal biliary obstruction is rare. Equally, occasionally gall stones within the extrahepatic bile ducts are sometimes found (on ultrasound, at surgery or on computed tomography (CT)/magnetic resonance imaging (MRI)). These rare cases are managed by choledochotomy or cholecystoduodenostomy depending on the site of obstruction, diameter of the bile duct affected and surgical skill of the veterinarian.

Bile duct rupture is a rare but challenging clinical presentation. It results in leakage of bile into the peritoneal cavity (bile peritonitis) and can be usefully separated into septic and non-septic presentations. Septic bile peritonitis has an acute development of clinical signs including pyrexia and shock as well as ascites and jaundice. It may follow an existing cholangiohepatitis. Early surgical intervention is required but the prognosis is poor. Non-septic biliary peritonitis presents, often days to weeks, after abdominal trauma. Ascites and jaundice, rather than evidence of bacterial infection, dominate the clinical picture. Ludwig et al. (1997) reported only 27% survival of septic biliary peritonitis but all those (6/6) with aseptic biliary peritonitis survived in their hands.

Definitive surgical management of biliary leakage will be by:

- Cholecystectomy - if the gall bladder or cystic duct is affected
- Closure of the ruptured duct - if this can be localised and the tissue is viable
- Ligation of the common bile duct and cholecystoduodenostomy - if the rupture is between the cystic duct and the duodenal papilla.

In all these scenarios, local inflammation and bile staining of the intraperitoneal structures make identifying the site of rupture and successfully managing it a real challenge for the surgeon.

Biliary Surgical Procedures

Cholecystotomy

The author believes the indications for this are limited. In most situations where it might be considered (e.g. biliary mucocoele,