Introduction

Biliary tract diseases in domestic carnivores and in particular in cats are still little described rare diseases. They group together congenital anatomical anomalies, inflammatory affections (cholangitis, cholecystitis), tumors, cholelithiasis, inflammatory or traumatic stenosis, sphincter of Oddi dysfunctions. All these affections lead secondarily to a cholestasis which may be responsible for serious hepatobiliary affections. They may also be the result of a chronic intestinal, pancreatic or hepatic inflammation. There is in cats a real pathological trilogy associating the digestive tract and its ancillary glands. This article describes different pathological situations of the extrahepatic biliary tract and provides a bibliographic synthesis on current data pertaining to these affections.

Keywords : cat - biliary tract - gallbladder - cholestasis.

Extrahepatic biliary tract diseases in cats. Case reports and bibliographic synthesis

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SUMMARY

Biliary tract diseases in domestic carnivores and in particular in cats are still little described rare diseases. They group together congenital anatomical anomalies, inflammatory affections (cholangitis, cholecystitis), tumors, cholelithiasis, inflammatory or traumatic stenosis, sphincter of Oddi dysfunctions. All these affections lead secondarily to a cholestasis which may be responsible for serious hepatobiliary affections. They may also be the result of a chronic intestinal, pancreatic or hepatic inflammation. There is in cats a real pathological trilogy associating the digestive tract and its ancillary glands. This article describes different pathological situations of the extrahepatic biliary tract and provides a bibliographic synthesis on current data pertaining to these affections.

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RÉSUMÉ

Affections des voies biliaires extrahépatiques du chat. Description de quelques cas cliniques et synthèse bibliographique. Par P. LECOINDRE et M. CHEVALLIER.


Mots-clés : chat - voies biliaires - vésicule biliaire - cholestase.

Case No. 1

A 12-year-old Burmese cat was presented to us for chronic vomiting that had been developing for three months. The animal had been worn out and anorexic for three days. The clinical examination showed an animal in good condition. Abdominal palpation resulted in a defense reaction of the animal and seemed to be painful in the lower front area. The cardiorespiratory auscultation was normal and the palpation of the cervical region showed no abnormalities. The hematochemical assessment revealed a significant leucocytosis (22,000 leukocytes/mm³ N 5,000-18,900) with mature polymorphonuclear leucocytes (19,600 PMNs/mm³ N 2,500-12,500), and showed a disturbance in hepatic parameters (bilirubin 8mg/L N 0-4, alkaline phosphatase PAL 145 IU/L N 14-111, gamma-glutamyl transferase GGT 27 IU/L N 1-5, alanine aminotransferase AAT 147 IU/L N 20-85), aspartate aminotransferase AST 98 IU/L N 1-37).

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An echography of the liver showed no masses or notable alterations in the echogenicity of the hepatic parenchyma, but one clearly observed an anechogenic cystic formation whose lumen seemed to be in continuity with the cystic duct (figures 1 and 2). The gallbladder seemed to be dilated, its echogenic wall may slightly increased with respect to the content of the gallbladder. No parietal alterations of the digestive tractus and no adenopathy were observed.

The endoscopic examination of the upper digestive tract and the histology of the perendoscopic biopsies revealed no abnormalities at the level of the stomach and of the proximal small intestine.

A celiotomy confirmed the presence of a cystic formation that had developed at the expense of the cystic duct. The gallbladder wall was obviously thickened. A cholecystectomy with ablation of the cystic duct and of the cyst was performed.

The histology of an hepatic biopsy performed during the intervention confirmed moderate lesions of supplicative cholangiohepatitis. The examination of the cyst and gallbladder contents showed a very thick bile. However, a bacteriological examination remained negative. The postoperative treatment included a fluidtherapy and an antibiotherapy (metronidazole 30mg/kg SID, amoxicilline 10mg/kg BID) which was set up for a 2-month period. The animal showed a satisfactory recovery with normalization of its biochemical parameters within 4 weeks.

Case No. 2

This eight-year-old neutered male cat had been presenting a history of chronic digestive disorders for approximately two years, dominated by chronic vomiting occurring in more or less spaced-out crises and disappearing spontaneously. The diarrhea had appeared recently. The animal was presented to us for weight loss associated with anorexia that had been persisting for 4 days. During the clinical examination, one noted moderate thinness and dehydration. Abdominal palpation showed significant rigidity of the small intestine. Mesenteric lymphatic node could not be palpated. The examination of the ventral cervical region was normal.

The hematological assessment revealed a moderate leucocytosis. In addition, one observed a significant increase in bilirubin (10mg/L) and in the serous activity of alkaline phosphases (215 IU/L), gamma-glutamyl transferase (48 IU/L) and of hepatic transaminases (ALT 186 IU/L, AST 75 IU/L). The other biological parameters explored (total proteins, albumin, cholesterol, urea, creatinine) were within the usual values. A coproscopic examination (flotation, direct staining) did not allow to reveal a parasitosis. In particular, the search for Giardia was negative.

During the endoscopy, the esophagus and the stomach looked normal (figure 3). The examination of the duodenum showed an hyperemia and a suspect friability of the mucosa. The significant rigidity of the small intestine prevented the progress of the probe toward the jejunum. Biopsies of the duodenal mucosa were performed and complemented with biopsies of the gastric mucosa during retraction of the endoscope. The histology of gastric biopsies revealed nothing abnormal. On the five biopsies of the small intestine, one observed a diffuse infiltration of the mucous chorion by a population of inflammatory cells of the lymphocytic and plasmocytic type. There was a major exocytosis through the surface epithelium. The villosities were not atrophic.

A diagnosis of Chronic Intestinal Inflammatory Disease of the lymphoplasmocytic type localized to the small intestine was proposed. According to the intensity of the histological lesions, this lymphoplasmocytic enteritis was classified in the moderate to severe grade (stage 2/3 in a grading that includes 3 stages).

Treatment was based on a corticotherapy (prednisone) at a dose of 1 mg/kg twice a day for three weeks. Spiramycine and metronidazole in association (Stomorgyl® 10, Merial) at the rate of one tablet a day (which amounts to a dose of 25 mg of metronidazole and of 150,000 IU/kg/day of spiramycine) complemented this corticotherapy. While the improvement had been significant ever since the first week of treatment, the owner suddenly noted a worsening of the condition of his animal which was quite worn out, anorexic, and presented significant vomiting. The clinical examination showed an icterus which was particularly visible at the level of the palatine mucosa. The bilirubin level was high (35mg/L). An abdominal echographic examination showed a significant dilatation of the extrhepatic biliary tract that appear tortuous (the diameter of the common bile duct was bigger than 5 mm) with an normally thickened aspect of the duodenal papilla (figures 4 and 5). The examination of the right lobe of the pancreas showed decreased echogenicity giving cause for suspecting a pancreatic inflammation. A surgical exploration confirmed a dilation of the biliary tract and a very marked reflux of the bile at the level of the pancreatic ducts (figure 6). In addition, the pancreas showed a significant edema. An enterotomy performed on the opposite of the duodenal papilla allowed to perform a sphincterectomy of this papilla which looked highly fibrosed and stenosed. This surgical intervention appeared to be effective at first, but a new increase in serum bilirubin made it necessary to perform a cholecystodudenedostomy. The anastomosis was performed using the EndoGIA® 30 Autosuture stapler.

The histology of an hepatic biopsy performed during the intervention confirmed the existence of moderate-grade lymphocytic cholangiohepatitis lesions. An antibiotherapy and a prolonged corticotherapy have allowed to date to obtain clinical stability in the animal.

Case No. 3

A 12-year-old European cat was presented for extensive vomiting (watery vomiting more than 10 times a day) that had appeared 2 weeks earlier and was developing in crises that looked very painful. The clinical examination showed an animal in good condition. However, the abdominal palpation was painful. An abdominal radiographic examination revealed the presence of a bone density mass 2 mm in diameter whose location gave cause to suspect a gallstone (figure 7). An abdominal echography confirmed the pre-
sence of this gallstone and showed a dilated gallbladder, though its wall appeared to be moderately thickened (figure 8). The extrahepatic biliary tract was not dilated. The hematobiochemical assessment was normal and showed no cholestasis. Surgery was motivated by the appearance of these more and more frequent and painful vomiting crises and by the possibility of occurrence of an acute biliary tract obstruction caused by this stone. A cholecystectomy was performed to prevent any recurrence. The animal quickly improved and showed no relapse 3 months after the intervention. An hepatic histology revealed no hepatobiliary disease known to promote the appearance of choleoliths. The stone contained calcium bilirubinate and carbonate (figure 9).

**Case No. 4**

A 3-year-old queen had been presenting for 6 months a progressive weight loss, periods of anorexy associated with the appearance of vomiting crises. Hematobiochemical assessments performed regularly over the last two months allowed to reveal a progressive rise in the serum activity of hepatic transaminases and bilirubinemia. The clinical examination of the animal confirmed a subicterus, an abnormally thin condition. The abdominal palpation was normal. An abdominal echography showed a liver that had increased in size, an homogenous but increased echogenicity. The intrahepatic biliary tract was not visible. The gallbladder showed a very abnormal aspect with a bilobed structure and significant dilatation (figure 10). A biopsy under echographic guidance allowed to perform an histopathological examination of the liver that revealed a periporal lymphoplasmocytic infiltrate and a fibrosis characterizing a chronic cholangiohepatitis. The surgical decision was based on the chronic evolution of the disease in spite of the treatments undertaken and on the possibility of existence, described by several authors, of an anatomical abnormality of the biliary tract, in particular of the gallbladder, which may induce a chronic cholestasis and the appearance of chronic inflammatory lesions of the infrahepatic biliary tract. A cholecystectomy was therefore performed and allowed to confirm an abnormality in the conformation of the gallbladder which was quite clearly bilobed (figures 11 and 12). The animal had a satisfactory response to the treatment which associated antibiotics, corticoids and ursodesoxicholic acid over a 6-week period.

**Discussion**

**CONGENITAL ABNORMALITIES OF THE EXTRAHEPATIC BILIARY TRACT IN CATS**

The best described congenital abnormalities of the biliary tract in man are cystic dilations of the choledoch (common bile duct) which for certain authors are the consequence of a junction abnormality of the common bile duct and of the duct of Wirsung forming an abnormally long biliopancreatic joint duct. Congenital anatomical abnormalities of the extrahepatic biliary tract in cats are rare but not exceptional. HIRSCH has described a suppurrative cholangiohepatitis associated with a bilobed gallbladder [13]. We have described two cases of malformation of the gallbladder (a bilobed gallbladder-case no. 4 and a diverticulum of the cystic duct-case no. 1) in cats suffering from chronic cholangiohepatitis. It is likely that these abnormalities induce a chronic cholestasis predisposing to the infection and inflammation of the biliary ducts.

**ACQUIRED AFFECTIONS OF THE EXTRAHEPATIC BILIARY TRACT**

They are numerous. An inflammation of the extrahepatic biliary ducts (cholangitis), of the gallbladder (cholecystitis), an obstruction of the extrahepatic biliary tract, a cholelithiasis, a tumor of the gallbladder or of the biliary tract are the extrahepatic biliary tract diseases in cats described in the literature [2, 7, 8, 12, 19]. All these affections induce a cholestasis and promote inflammation and infection. However, they may themselves be the consequence of a transitory cholestasis resulting from an enteritis, a pancreatitis, a dysfunction or a stenosis of the sphincter of Oddi or of the lower choledocian section [2, 4, 6, 13]. One can then observe, like in the case no. 2, a reflux of pancreatic secretions into the biliary tract or of the bile into the pancreatic ducts. This is the direct consequence of the particular anatomical conformation of the common bile duct which joins the major pancreatic duct to form the ampulla of Vater limited by the sphincter of Oddi. Furthermore, the lower section of the choledoch is adjacent to the pancreatic parenchyma and an edema, an inflammation or a fibrosis of the gland may result secondarily in an extrinsic obstruction of the biliary duct. It is suggested today by several authors that, in cats, cholangiohepatitis and pancreatitis would be extraintestinal manifestations of a chronic intestinal inflammatory disease promoting a pancreatic and hepatobiliary reflux [1, 4, 6, 11, 20]. This theory seems conceivable by reason of the anatomical particularities of the pancreatic and biliary ducts which we have mentioned above.

**CHOLECYSTITIS**

The non-specific inflammation of the gallbladder may evolve in an insidious, chronic way probably inducing clinical disorders which are not very specific. It is likely that this inflammation of the gallbladder comes within the framework of the suppurative or chronic cholangiohepatitis and cholangitis well described in the feline species [6, 7, 13]. The role of bacterbilia in the aetiology of cholecystitis is not very well known in cats. Five cats in the study of MAYHEW [17], had bile cultures performed and were positive for bacterial growth. The infection may be hematogenic in origin, but more probably of an ascending origin because of the above-mentioned reasons involving anatomical conformation [6, 20]. E. coli, Klebsiella, enterococci, Pseudomas, Proteus, streptococci or anaerobes are the types of bacteria found. The cholestasis associated with a cholecystitis promotes the formation of cholelithiasis and extrahepatic biliary obstruction. But the cholecystitis can occur due to the proinflammatory effects of bile stasis or irritant effects of choleliths present in the gallbladder [17]. The echography may reveal a...
FIGURES 1 AND 2.—Case No. 1 - Echography. One clearly observes an anechogenic cystic formation whose lumen seems to be in continuity with the cystic duct. The gallbladder seems to be dilated, its echogenic wall is maybe slightly increased with respect to the content of the gallbladder.

FIGURE 3.—Case No. 2 - Endoscopy. The endoscopic exam shows inflammatory lesions of the duodenal mucosa: abnormal granularity, friability, rigidity of the bowel wall.

FIGURES 4 AND 5.—Case No. 2 - Echography. An abdominal echographic examination shows a significant dilation of the extrahepatic biliary tract (the diameter of the choledoch is bigger than 5 mm) with an abnormally thickened aspect of the duodenal papilla.

FIGURE 6.—Case No. 2 - Surgery. A surgical exploration confirms a dilation of the biliary tract and a very clear reflux of the bile at the level of the pancreatic ducts.
thickening of the gallbladder wall which may be hyperecho-
genic with respect to the content of the gallbladder and the
liver [13, 14]. Indirect signs of extrahepatic cholestasis with
the presence of an abundant biliary mud, of a dilation of the
gallbladder, of the cystic duct, of the choledoch, of altera-
tions in the hepatic echogenicity and signs of intrahepatic
cholestasis are elements to be looked for, especially in the
feline species in which cholecystitis are most often associa-
ted with the cholangiohepatitis complex [4, 6, 15, 18].

**Figure 7.** — *Case No. 3 - Radiography.* An abdominal radiographic
examination has revealed the presence of a bone density mass 2
mm in diameter whose location allows to suspect a gallstone.

**Figure 8.** — *Case No. 3 - Echography.* An abdominal echography has
confirmed the presence of this gallstone and has shown a dilated
gallbladder whose wall seems, however, to be moderately thicke-
ned.

**Figure 9.** — *Case No. 3 - Gallstone.* The cholelith analysed is com-
posed entirely of calcium carbonate.

**Figure 10, 11, 12.** — *Case No. 4 - Echography and surgery.* The gall-
bladder shows a very abnormal aspect with a bilobed structure and
a significant dilation.

**Figure 9.** — *Case No. 3 - Gallstone.* The cholelith analysed is com-
posed entirely of calcium carbonate.
CHOLELIITHIASIS

Cholelithiasis is a frequent clinical problem in man. In cats, several cases of cholelithiasis or of choledolithiasis have been reported by different authors, although this affection remains rare [7, 8, 12]. There is probably several factors which may induce the formation of choledolith. A biliary stasis, an alteration in the bile composition, a cholecystitis, a cholangiohepatitis, dietary factors are often mentioned as causes predisposing to the formation of gallstones [12, 13]. The infection of the biliary tract, especially when caused by bacteria producing the β glucuronidase, is also at the origin of choledolith formation. These bacteria are indeed capable of decombining bilirubin. Once free, bilirubin can then precipitate with calcic salts and induce cholediths. A study on 5 cases of suppurative cholangiohepatitis has shown two cases of cholelithiasis [13]. A case of cholelithiasis has been described in a cat suffering from hyperthyroidism [8]. For the author, cholelithiasis in that case would be the consequence of a disturbance in the motricity of the gallbladder induced by the hyperthyroidism. Any biliary stasis results in a severe inflammation by reason of the cytotoxic agents it contains (lysozymin). This inflammation increases the secretion of cholesterol which quickly results in a precipitation of cholesterol crystals, the production of a thick viscous bile and the formation of cholediths.

In a series of 9 cats that suffered from cholelithiasis, 7 cats presented multiple cholediths, 6 cats suffered from cholecystitis, 7 had lesions of cholangiohepatitis and 2 suffered from hepatic lipidosis [7]. The prognosis after a cholecystectomy is good, but darkened when an hepatic lipidosis occurs. These gallstones are mainly composed of biliary pigments or calcium derivatives [12]. In that series, various types of aerobic and anaerobic bacteria had been isolated. A cholelithiasis is more frequently observed in old cats of the male sex. Clinical signs appear only when the cholediths are sufficient in size to cause an obstruction. These clinical signs are not very specific and dominated by vomiting, an anorexia, an adynamia. In our case, the cat suffered from real crises of hepatic colic] with intense vomiting and pain. Most of the cats suffering from cholestasis caused by an obstruction are icteric, present an hyperbilirubinemia and a rise in hepatic transaminases, gamma-glutamyl transferase and alkaline phosphatase [17]. When the stone(s) induces (induce) no obstruction, there are few alterations in the hepatic parameters unless if the formation of stones is the consequence of an underlying hepatic disease. A leucocytosis is less constant than in dogs. Although there is potentially a deficiency in vitamin K1 with a biliary obstruction, cats presenting a cholelithiasis show no coagulation disorders [7]. The confirmation of a cholelithiasis in cats is often echographic [15, 18]. A diameter of the choledoch bigger than 5 mm is significative of an extrahepatic biliary obstruction. Some calculi are visible on a radiography (presence of calcium) and very frequently detectable in an echography, like in the case described here.

TUMORS OF THE EXTRAHEPATIC BILIARY TRACT

A recent study (cystadenoma) has described 5 cases of tumors of the gallbladder in cats [19]. These tumors were benign cystadenomas which were all revealed during the echographic examination. A cholecystectomy was performed in all these cats with no postoperative complications and no tumoral recurrence. Three cases of carcinoma of the biliary tract were reported by Feldman in 1976 [10].

OBSTRUCTION OF THE EXTRAHEPATIC BILIARY TRACT

A study by Mayhew et al. describes 22 cases of obstruction of the extrahepatic biliary tract resulting in 15 cases from a pancreatitis, a cholangiohepatitis, a cholelithiasis or a cholecystitis, and in 6 cases from a biliary or pancreatic adenocarcinoma [17].

In our experience, stenosis of the intrapancreatic common bile duct section are the main biliary tract diseases that we have had to treat. In our observations, stenosis of the choledoch appear to be the consequence of a chronic inflammation of the duct resulting of duodenal refluxes or recurrent pancreatic inflammations. Although the mechanism is still imprecise, stenosing lesions of the extrahepatic biliary tract and in particular of the choledoch are probably frequent complications of the Chronic Inflammatory Bowl Diseases-Chronic Panreatitis-Cholangiohepatitis complex, as Mayhew reports in his study [17].

A case of obstructive cholangiohepatitis has been described in a cat [2]. This obstruction was caused by a cyst of the choledoch associated with lesions of fibrosing pancreatitis. It must be noted that in dogs the first cause of extrahepatic cholestasis is a pancreatic pathology [5, 9, 16].

An increase in hepatic parameters (ALAT, ALP, AST, GGT, Bilirubin) in nearly 90% of cases is observed in obstruction cases, but is not specific and appears in the majority of hepatobiliary affections. A dilatation of the gallbladder, a dilated and tortuous aspect of the biliary tract observed during an echographic examination are highly suggestive of an obstruction of the biliary tract [14, 18]. The treatment is surgical (cholecystoduodenostomy or jejunostomy), but the perioperative mortality and morbidity are high.

LOWER CHOLEDCHAN OBSTRUCTIONS AND OBSTRUCTIONS OF THE SPHINCTER OF ODDI

Obstructions of the ampulla of Wirsung or of the sphincter of Oddi by a tumor, a cyst or a fibrosis are, in our opinion, more frequent than obstructions of a litiastic origin, but may be not well known. They result in an acute cholestasis as well as a pancreatitis caused by biliary reflux into pancreatic ducts (case no. 2) [4]. Personally, we have observed several cases of stenosis of the sphincter of Oddi in cats that suffered from chronic inflammatory bowel diseases and chronic cholestasis that resulted in the appearance of a suppurrative cholangiohepatitis. A sphincterotomy was attempted in several cats, but did not always allowed to obtain a restoration of the biliary flow. A cholecystoduodenostomy was performed several times by second intention. The dysfunctions of the sphincter of Oddi with no true anatomical stenosis are suspected by many authors of being a cause of cholestasis and
of cholangiohepatitis [1, 20]. In man, disturbances in the motricity of the biliary tract and of the sphincter of Oddi or «biliary and Oddian dyskinesis» are an indisputable reality, even though they are difficult to explore with no surgical intervention. It may be that these dyskinesis occur in relation with a dysfunction of the neurovegetative system and they are difficult to quantify in animals.

While many cases of cholelithiasis or of choledolithiasis in cats have been described in the literature even though these affections remain rare, there are other extrahepatic biliary tract diseases in cats which may result in an acute cholestasis with major clinical consequences. These biliary tract diseases in cats fit in with a pathological complex that groups together chronic intestinal inflammatory diseases, pancreatitis and cholangiohepatitis.

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References