Acute Pancreatitis in Psittacine Birds

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Abstract

Pancreatitis in parrots should be suspected in birds showing clinical signs attributable to abdominal pain or gastro-intestinal dysfunction. Serum amylase levels greater than 1,500 U/L can be suggestive of pancreatitis, and pancreatic biopsy can be used to confirm a diagnosis. Treatment of acute pancreatitis in birds follows protocols similar to those used in small animal medicine.

Introduction

Although acute pancreatitis is a commonly diagnosed condition in mammalian medicine, its ante-mortem diagnosis and treatment in birds is relatively poorly documented.[1] Birds are frequently presented to veterinarians with clinical signs referable to gastro-intestinal dysfunction or abdominal pain, but little work has been done linking these signs with pancreatitis.

This paper presents four case reports to discuss the aetiology, clinical signs, diagnosis and treatment of acute pancreatitis in parrots. The use of serum amylase determination and pancreatic biopsy to achieve a diagnosis is also highlighted.

Materials and Methods

Case Report 1

An eight year-old female Red-Collared Lorikeet (*Trichoglossus haematodus rubritorquis*) was presented for vomiting. On examination, her crop was flaccid and distended, and she was markedly underweight at 101g (the previous normal weight for this bird was 158g). A gram stain of crop contents showed high numbers of gram-negative bacilli, but no yeast were detected. The bird was started on enrofloxacin, metoclopramide and fluids. After two days with little improvement the owner consented to a biochemistry panel. The only abnormal finding was an elevated amylase level (>2,500 U/L). Based on this, a provisional diagnosis of pancreatitis was made. Treatment was continued with enrofloxacin and cisapride. After one week a secondary candidiasis was detected, the enrofloxacin suspended and oral amphotericin B started. The bird started gaining weight, but was still dull and occasionally vomited. Amylase assay was repeated two weeks after initial presentation, and was still elevated (>2,500 U/L). Two days of intensive fluid therapy failed to alter this, and so an exploratory coeliotomy was performed. No gross abnormalities were seen during surgery, and the pancreas was biopsied. The biopsy showed a local area of acinar disruption, associated with marked infiltration by lymphoid cells, heterophils and mild fibroplasia, thus confirming the diagnosis of pancreatitis. A mixture of Omega 3 and Omega 6 fatty acids was added to the treatment, and the amphotericin B replaced with fluconazole. Pancreatic extract in powder form was added to the bird's diet. The candidiasis infection cleared, and

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the bird gradually gained weight, until two months after the initial presentation it had returned to its normal weight.

Case Report 2

A five year old male Sulphur Crested Cockatoo (*Cacatua galerita*) was presented for feather picking and mild lethargy. Physical examination showed the bird was slightly overweight (870g) and was feather picking across the back and the dorsal wings. As part of a routine work up, a biochemistry profile was performed. The only significant abnormality was an elevated amylase (5600 U/L). Faecal and crop gram stains were normal. A pancreatic biopsy was performed, and histopathology showed occasional foci of acinar degeneration associated with mixed leucocytic infiltrates, amongst which lymphocytes, histiocytes and heterophils were identified. This infiltrate was particularly noticeable in periductal locations. Treatment was begun with dietary changes, enrofloxacin and Omega 3 and Omega 6 fatty acids, and although the bird stopped feather picking, the amylase remained elevated. At the time of writing this bird was still under treatment.

Case Report 3

A seven year-old female Scarlet Macaw (*Ara macao*) was presented for vomiting and crop stasis. Physical examination showed the bird to be slightly underweight, as indicated by moderate pectoral muscle wastage. The crop was slightly distended with fermenting fruit, vegetables and seed. Gram stains of the crop and faeces were normal, and faecal smears and flotation were negative for parasites. Radiographs demonstrated a slightly enlarged proventriculus, and barium contrast studies showed a delayed gastro-intestinal transit time. The blood lead level was <0.1 umol/L (normal = <0.7 umol/L) The bird was treated with enrofloxacin and cisapride, and appeared to improve over the next few days. One week later it was re-presented with crop stasis and vomiting. A crop biopsy was performed and histopathology indicated a chronic bacterial infection. A culture grew a heavy growth of *E. coli.* Enrofloxacin was re-commenced for 2 weeks. One week after finishing the antibiotics, the bird started vomiting again. A biochemistry profile at this time showed a hyperamylasaemia of 2,548 U/L and a leucocytosis of 22.5×10^9/L. A presumptive diagnosis of pancreatitis was made. As macaws are reported to be predisposed to zygomycotic infections (Speer, pers com), the bird was treated with fluconazole for 1 month. It was converted to a pelleted diet and psyllium was added to its vegetables. The condition has not recurred one year after treatment.

Case Report 4

A six month-old female Black Capped Lory (*Lorius lory*) was presented for polyphagia and a wide-legged stance. Physical examination showed the bird to be underweight at 120g (normal 200g), but no other abnormalities were detected. No skeletal abnormalities were noticeable. Faecal and crop smears were negative for parasites, and gram stains were normal. Serum biochemistries were normal except for a hyperamylasaemia (2,260 U/L) and a mildly elevated white cell count (16.6×10^9). A provisional diagnosis of pancreatitis was made, and a pancreatic biopsy was performed. This revealed multifocal areas of oedema, slight haemorrhage and exocrine acinar degeneration associated with minimal mixed leucocytic infiltration, suggesting an acute to sub-acute pancreatic necrosis. Treatment was started with oral enrofloxacin and pancreatic enzyme extract. The high fat nectar mix was restricted, and the amount of fruit and vegetables offered was increased. Unfortunately this bird was accidentally killed four days after biopsy. The owner reported though that the bird was alert and eating well prior to its unfortunate demise.

Determination of normal amylase levels.

In order to ascertain normal levels for amylase in psittacines, biochemistry panels for 21 birds were reviewed. Blood was collected from a range of patients of different species undergoing treatment for a wide variety of conditions, and serum amylase measured on a Reflotron® dry-chemistry analyser. The results are shown in Table 1:

Common name	**Scientific Name**	**Amylase levels (U/L)**
Lorikeet	Trichoglossus spp	570
Lorikeet	*Trichoglossus spp*	1020
Galah	*Eolophus roseicapillus*	915
Galah	*Eolophus roseicapillus*	493
Galah	*Eolophus roseicapillus*	1020
Galah	*Eolophus roseicapillus*	313
Galah	*Eolophus roseicapillus*	923
Galah	*Eolophus roseicapillus*	1110
Galah	*Eolophus roseicapillus*	817
Sulphur Crested Cockatoo	*Cacatua galerita*	1260
Sulphur Crested Cockatoo	*Cacatua galerita*	1260
Sulphur Crested Cockatoo	*Cacatua galerita*	1260
Red-Tail Black Cockatoo	*Calyptorhynchus magnificus*	378
Red-Tail Black Cockatoo	*Calyptorhynchus magnificus*	179
Red-Tail Black Cockatoo	*Calyptorhynchus magnificus*	561
Cockatiel	*Nymphicus hollandicus*	722
Cockatiel	*Nymphicus hollandicus*	545
Cockatiel	*Nymphicus hollandicus*	656
Cockatiel	*Nymphicus hollandicus*	690
Alexandrine Parrot	*Psittacula eupatria*	1020
Indian Ring-necked Parrot	*Psittacula krameri*	260

Table 1. Amylase values obtained from twenty-one psittacine birds

Pancreatic biopsy technique.

The pancreas can be exposed by either a transverse or a ventral midline approach. In the author's experience, a transverse coeliotomy offers better exposure and faster access to the pancreas. With the bird in dorsal recumbency, the skin between the sternum and cloaca is plucked and disinfected for surgery. A transverse incision through skin and muscle is made midway between the sternum and the cloaca. If using a ventral midline approach the skin and linea alba are incised in a cranio-caudal direction. Care must be taken when entering the abdomen not to damage underlying viscera. The duodenal loop is visualised and gently exteriorised. Unless obvious lesions are visible elsewhere on the pancreas, the distal edge of the ventral lobe of the pancreas, at the apex of the duodenal loop, is carefully reflected to reveal underlying vasculature. Once these blood vessels have been located, the end of the ventral lobe can be removed with iris scissors or biopsy forceps. Minimal or no bleeding results. The duodenum is then replaced into the abdomen, and the skin and muscle closed routinely.

Results

From the results obtained, it would appear that the normal range of amylase in psittacine birds in this sample is 179 – 1,260 U/L, with an average value of 760 U/L. Two birds with pancreatitis confirmed by biopsy had serum amylase levels in excess of 2,000 U/L.

Pancreatic biopsy appears to offer a highly specific and sensitive diagnostic tool for the diagnosis of pancreatic disorders.

Discussion

The avian pancreas consists of three lobes. The dorsal and ventral lobes are supported and separated by the pancreatic artery within the duodenal loop, and the splenic lobe runs more laterally up to the spleen. The pancreas has two functions, endocrine and exocrine. While the endocrine tissue is proportionally greater than that of mammals[2], over 99% of the pancreatic mass has an exocrine function[3]. The exocrine pancreas consists of compound tubuloacinar glands divided into lobules. These glands secrete amylase, lipase, proteolytic enzymes and sodium bicarbonate into the ascending duodenum via pancreatic ducts.[4] Pancreatic secretion, which is at a higher rate than mammals, is controlled by both nervous and hormonal mechanisms. Immediately a bird starts eating, pancreatic secretion begins via an apparent vagal reflex. Distension of the proventriculus stimulates a hormonal response that results in pancreatic secretion. Diet can also affect the rate of secretion, with diets high in fat and carbohydrates increasing the activity of amylase and lipase[4].

Pancreatitis develops when there is activation of the digestive enzymes (trypsin, protease and phospholipase amongst others) within the gland, with resultant pancreatic autodigestion. Damage to the cell walls within the pancreas allows the release of these enzymes and their subsequent activation into the intracellular space and ducts, and this in turn causes the production of unopposed free radicals, which cause even more damage. This again releases more enzymes, and the cycle continues. Plasma protease inhibitors are vital in inhibiting this cascade[5].

As with mammals, the initiating aetiology is often difficult to pinpoint. Possible aetiological agents include:

- obesity, often when combined with high fat diets or fatty meals[1,5]
- toxicity, particularly zinc[1,3,6]
- trauma[5]
- viral infection – Paramyxovirus type III, adenovirus, avian influenza A, infectious bronchitis, herpesvirus[1,3]
- Chlamydophila infection[1,3]
- Bacterial infection[5]
- Egg yolk peritonitis[1,3]
- Neoplasia[1,3,5]

All three of the birds described above were on high fat diets and two of the birds (the lorikeet and the cockatoo) had been overweight prior to, or at the time of, the onset of clinical signs. These may have been predisposing factors in the development of pancreatitis in these birds.

Clinical signs shown by birds with pancreatitis reflect gastro-intestinal dysfunction and pain, and include vomiting, diarrhoea and ileus, as seen in two of the birds described above. Speer (1998) lists clinical signs including anorexia, lethargy, “colic” or signs of abdominal pain and discomfort, weight loss, polyuria, polydypsia and abdominal distension. Abdominal pain is a feature of pancreatitis in mammals. Signs of abdominal pain in birds include kicking, falling off the perch, picking towards the abdomen, feather picking, sudden flight attempts, aggression, and obsessive chewing on the cage and other items.[7]. It is possible that abdominal pain may have accounted for the feather picking displayed by the cockatoo described above (Case report 2) and the wide-legged stance of the fourth bird. These birds showed no other signs directly attributable to pancreatitis, a point also emphasised by Speer (1998). The reason for the polyphagia in the fourth bird was unclear, as histopathology revealed no evidence of pancreatic insufficiency.

Determination of serum amylase and lipase levels is frequently used in mammalian medicine to diagnose pancreatitis. Amylase is secreted in saliva, intestinal fluid and pancreatic juices.[4] In the normal animal, pancreatic-derived amylase makes up only a small part of serum amylase, but with acute pancreatitis and leakage of pancreatic-derived amylase, total amylase levels rise significantly. Other causes of hyperamylasaemia include renal disease, small intestinal obstruction, other alimentary disorders, and glucocorticoid administration.[8] However, the rise in serum amylase in these conditions is usually more moderate, in the range of a two- to three-fold increase.[5,8] Fudge (2000) described birds with hyperamylasaemia that had histological evidence of intestinal disease but no pancreatic lesions. This confirms that not all birds with hyperamylasaemia have pancreatic disease. However, he did not comment on the magnitude of the rise. Clinicians need to interpret amylase levels with care. In one study on birds affected with suspected PMV III[1], there were inconsistencies between amylase levels and pancreatic lesions. However, both Speer (1998) and Fudge (2000) agree that serum amylase levels greater than 1,000 U/L are elevated. This is reflected in the results shown above. Although there are some levels above 1,000 U/L, these may indicate non-pancreatic sources of mild hyperamylasaemia, bearing in mind that the birds assayed were clinical cases, presented for varying complaints. On the whole though, the average level shown above, 760 U/L, corresponds closely with other recorded averages.[3] Therefore, it would appear that significant rises in serum amylase should lead the clinician to consider acute pancreatitis as a differential diagnosis in birds showing signs consistent with gastro-intestinal dysfunction or abdominal pain. Pathology laboratories offering avian biochemistries should consider adding amylase to their avian profiles.

If acute pancreatitis is suspected, the diagnosis can be confirmed by a pancreatic biopsy. This can be done via a coeliotomy, or endoscopically through the right thoracic air sac.[9] Coeliotomy and pancreatic biopsy is a simple procedure with little apparent risk or complications. Histological evaluation of the pancreas allows the clinician to not only confirm a diagnosis, but also to more accurately evaluate the likely prognosis and required treatment.

At this time there have been no treatment protocols developed for avian pancreatitis. However, treatment should follow the guidelines used in treating pancreatitis in mammals. These include:

fluid therapy to correct dehydration and improve perfusion of the pancreas
fasting should not be used as a treatment in birds, because of their high metabolic rate and energy requirements. However, conversion to a low fat pelleted diet is likely to be of benefit

if gastro-intestinal ileus develops, the use of motility modifiers such as metoclopramide or cisapride may be warranted if abdominal pain is suspected, analgesia should be provided. Butorphanol and carprofen have been used in birds for analgesia, and may play a role in the treatment of avian pancreatitis parenteral antibiotics should be given. Enrofloxacin penetrates the canine pancreas well[5], and could be expected to do the same for the avian pancreas. If possible, identify and treat/eliminate inciting causes of pancreatitis eg zinc

Recently attention has been focused on the use of Omega-3 Fatty Acids (N-3 FA's) for their anti-inflammatory, lipid-stabilising, anti-neoplastic and other potential qualities. N-3 FA's have also been shown to reduce hyperlipidaemia in dogs. [10] Speer (pers com) uses a mix of 24mls Corn oil and 6mls Flax Seed oil, dosed at 0.11ml/kg, for treating nephritis. This author has used this dose rate for birds with acute pancreatitis, but it is difficult to assess its efficacy in clinical cases. Based on work done with canine renal disease, treatment would be required for a minimum of 2 - 4 weeks. The use of N-3 and N-6 FA's in acute pancreatitis in birds presents an area for future research.

Work in dogs has shown that whole blood or plasma transfusions may replace protease inhibitors cleared from the circulation during severe pancreatitis. This may be lifesaving in some cases, stopping the cycle of pancreatic cell damage. [5] This may be of benefit in severe cases of pancreatitis in birds.

The use of pancreatic enzyme therapy may decrease the pain that accompanies chronic pancreatitis in human beings, probably by an inhibitory feedback on endogenous pancreatic secretions.[5] This therapy may be worth pursuing in cases of acute avian pancreatitis, as chronic pancreatitis may be a sequel to acute bouts.

Birds that survive a bout of acute pancreatitis should be regularly monitored for evidence of pancreatic insufficiency and diabetes mellitus, both well-recognised sequelae to acute pancreatitis in mammals. Regular weight checks and annual blood screening may detect complications before they become life-threatening.

In summary, acute pancreatitis is poorly documented in birds. It should be suspected in birds showing evidence of gastro-intestinal dysfunction and / or abdominal pain. Hyperamylasaemia should alert the clinician to the possibility of pancreatitis, and a pancreatic biopsy can be used to confirm a diagnosis. Treatment should follow similar lines to that for mammals. Patients diagnosed and treated for pancreatitis should be monitored on a regular basis to detect any sequelae such as diabetes mellitus or pancreatic insufficiency.

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