Nobody Puts Kaly in the Corner!

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History

Kaly is an approximately 16-year-old Domestic Shorthair that presented to MSU-CVM for vomiting and lethargy on April 8th, 2019. Kaly's owner just returned the previous night from a four-day trip and caretaker of Kaly did not notice any abnormalities. When Kaly did not greet her owner home, and was found lying in the bathroom sink, her owner knew something was wrong. Her owner looked around the home for anything to suggest Kaly's behavior. Around the litterbox there were a few urine spots and one large pile of undigested food was also found in the floor. Worried about Kaly, her owner monitored her throughout the night and syringe fed her water to keep her hydrated. She was also offered multiple types of food and treats, only eating the occasional treat. The following morning, she did have a normal bowel and urination movement. Still worried about Kaly's health, her owner decided to make an appointment for Kaly to be examined. Her owner describes her as a playful cat at home. She is strictly indoors and eats wet food in the morning and free feed indoor dry blend. Before the trip she was eating Sheba wet mix, but the owner said she switched to meow mix while she was on her trip. Her litterbox is cleaned about every five days. Kaly is not current on any prevention. On Kaly's most recent visit, she was recommended to be placed on a diet due to being overweight.

Physical Examination

On Kaly's previous presentation, about 7 months ago, where she was apparently healthy and received vaccinations, multiple trips were made. Kaly had an aggressive behavior where the basic physical examination was unsuccessful. Kaly was sent home with Gabapentin and asked to return the following day for her vaccinations. While a physical examination was limited, she was deemed apparently healthy, given her vaccines and was sent on her way.

Now let's fast forward to Kaly on April 8th, 2019. A Feliaway towel and catnip were waiting for Kaly in the exam room, since the owner was not successful at administering Gabapentin prior to the visit. Kaly presented bright, alert and responsive. She seemed nervous but not aggressive. Her vitals were on the low end of normal for a nervous cat at the vet, with a heart rate of 180 beats per minute and a respiratory rate of 48 breaths per minute. She had a thin body condition of 3/9 (5 being ideal), weighing 7.9 pounds. There was bilateral muscle atrophy in the hind limbs and when she tried to walk, she was very unstable in the hind limbs. No nystagmus was noted in the eyes. Her ears, nose and eyes were all free of discharge and debris.

Considering she previously had to be medicated with Gabapentin to be examined and had changed in body condition score from a 7/9 to a 3/9 in just seven months, Kaly needed to be further worked up to find the source of her illness. We recommended starting with diagnostic imaging of the abdomen and bloodwork such as a Complete Blood Count, Chemistry, and a Thyroid panel.

Current Problem List:

- Lethargy
- Vomiting
- Dehydration
- Weight loss

Diagnostic approach

Complete Blood Count (CBC), Chemistry and a urinalysis were performed. The CBC revealed a slightly decreased packed cell volume of 26% (normal range is 30-46%), which could indicate anemia or possibly even error with processing. The chemistry values had multiple

abnormalities such as; hyperglycemia at 373mg /dl (Normal range is 70-160 mg/dl), hypercholesterolemia at 399mg/dl (normal range is 95 -200 mg/dl), elevated BUN at 50mg/dl (normal interval is 10-40 mg/dl), and severely elevated CK at 26,035 U/L (normal interval is 50 – 225 U/L). Hyperglycemia can be the result of multiple issues, such as diabetes or stress. Her elevated creatine kinase was most likely due to her severe loss of muscle mass. Urine obtained via cystocentesis had a specific gravity of 1.016, pH of 6.5, no ketones, 2+ protein, 4+ glucose, large amount of blood (approximately 10-25 cells per field), too many to count white blood cells and many bacteria. All of these indicated a likely urinary tract infection. A thyroid panel was indicated for Kaly because of her older age and sudden change in weight. The T4 panel was lower than reference interval which indicates euthyroid sickness from not eating and an underlying illness. At this point, a definitive diagnosis cannot be determined for Kaly, so our next step was to recommend diagnostic imaging.

Abdominal radiographs revealed a mass measuring approximately 4.3 x 4.1 x 4.3 cm located in the cranial abdominal space just caudal to the stomach. The mass is described as a large, irregularly shaped, smoothly marginated, soft tissue opaque mass. The mass can be visualized in all three views (Images A-C below). There are many organs this mass could be associated with such as the pancreas, spleen, lymph node, stomach, pedunculated liver, or mesentery. The differentials for the mass range from abscess to neoplasia. To further investigate the mass, an abdominal ultrasound was performed.

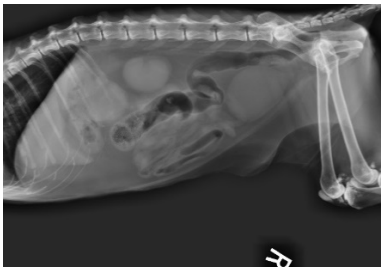


Image A: right lateral abdominal radiograph

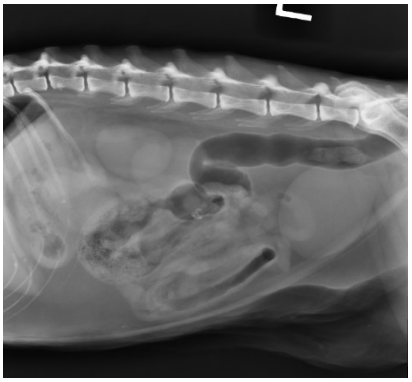


Image B: Left lateral abdominal radiograph

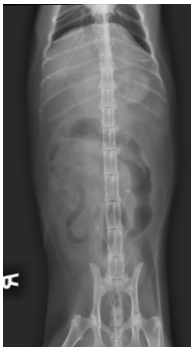


Image C: Ventrodorsal radiographic view of Kaly's abdomen

Ultrasound results revealed several smoothly marginated, round hyperechoic nodules within the body of the spleen. There was a large amount of hyperechoic debris within suspension in the urinary bladder. Within the body of the pancreas, there was a smoothly marginated, ovoid, approximately 2.85 cm in thickness hyperechoic mass. Images of the mass via ultrasound imaging can be visualized in images D – F. Within this mass there is a large anechoic region with hyperechoic debris within suspension causing acoustic enhancement, as seen in image D. After identifying the mass was located on the pancreas, a fine needle aspirate was performed to further investigate the type of mass.

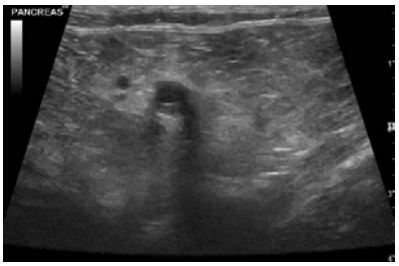


Image D: shows the acoustic shadowing / enhancement from the anechoic region of the pancreatic mass

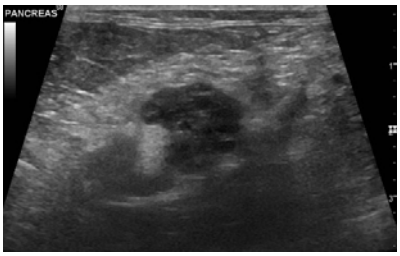


Image E: the pancreatic mass is centered in this image and shows the hyperechoic and anechoic regions

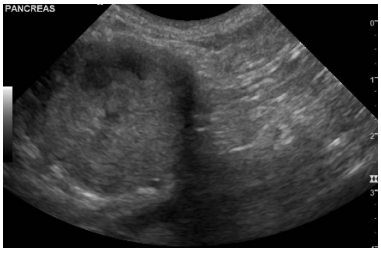


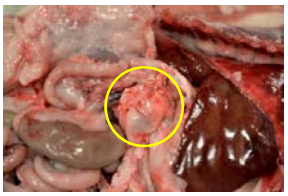
Image F: Pancreatic mass

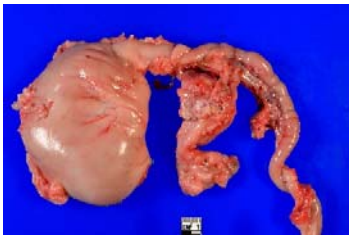
Cytology can be very beneficial in identifying the type of cells. Certain cells are more likely to exfoliate while performing a fine needle aspirate than others. However, there is always a risk when sticking a needled into a mass with unknown contents, such as rupture or leakage of the contents into the abdominal cavity that results in seeding of neoplastic cells and even a septic abdomen. It is also crucial to have a very calm or sedated patient while preforming the procedure to ensure the correct site is punctured with the needle. Kaly was sedated for this procedure and the ultrasound guided fine needle aspirate was performed with no complications.

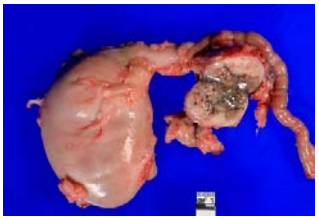
Findings from the cytology of the pancreatic mass included, debris, cellular remnants and on some of the slides, significant amounts amorphous necrotic debris. Cells visualized were degenerated neutrophils, increased numbers of macrophages that were vacuolated/reactive both individually and in aggregates. Small lymphocytes and eosinophils were also observed in low numbers. A population of cells was present in moderate numbers that occurred in haphazardly arranged cohesive clusters. They exhibited mild to moderate amounts of anisocytosis and anisokaryosis. The nuclei had a round to oval shape that were centrally to eccentrically located, having a stippled to clumped chromatin pattern and occasionally having prominent nucleoli. In some of the clusters you can see the transition from blue cytoplasm to essentially colorless. The mass is described as severe suppurative inflammation with evidence of necrosis, with the most likely etiology being neoplasia. It was recommended, if further diagnostics were to be continued a culture and biopsy would be the next diagnostic steps.

After giving the news to Kaly's owner that the likelihood of the mass was neoplastic, she decided to take Kaly home for the night to spend time with her and attempt palliative care with maropitant and allowing any food she would eat. The following day, Kaly's owner did not notice any improvement with the palliative care and she decided to euthanize Kaly on 4/9/19. Her remains were submitted for necropsy late in the evening on 4/9/19 with the necropsy subsequently occurring on April 10th, 2019. Grossly the mass on the pancreas was tan to white, firm, well-demarcated, with irregular margins as seen in Images G and H, measuring 6 x 4 x 3 cm, and located inside the mass was a dark green to black thick material seen in Image I. Histologically the mass appears to be an infiltrative epithelial neoplasm arranged in vague acini, tubules and irregular small glands subdivided into lobules by a moderate to marked fibrovascular stroma (desmoplasia). Cells have indistinct borders, moderate, finely granular to globular

eosinophilic cytoplasm a round vasiculated nucleus, open chromatin and a single large nucleolus. There is marked anisocytosis and anisokaryosis. Mitotic figures are 4 in ten 400x fields. Multifocal areas of coagulative necrosis are present. The necropsy results definitively diagnosed Kaly with exocrine pancreatic adenocarcinoma.

 Image G: the yellow circle outlines the pancreatic mass seen on necropsy.

 Image H: This image contains the stomach, proximal duodenum, pancreas, and pancreatic mass

 Image I: on cut surface of the mass green to black material is visualized.

Pathophysiology

The pancreas is a very complex organ that has multiple functions in maintaining a healthy cat. The function of the exocrine pancreas is to aid in digestion and protect the body from auto-digestion by secreting its enzymes into the proximal duodenum. Companion animal pancreatic diseases have only recently become areas of interest for research due to its frequent diagnoses.

The most common neoplastic tumor of the pancreas is the pancreatic adenocarcinoma (Hect). It is a challenge to diagnose before the animal reaches late stages of pancreatic disease and is usually not diagnosed definitively until necropsy. It is believed that the neoplasm arises from the duct system but can also originate from the acinar tissues (Jôrg). Clinical signs are usually non-specific or even misleading. The most common clinical signs are anorexia leading to weight loss, lethargy, vomiting, and abdominal pain (Seaman, Jôrg, Linderman). Abdominal effusion at the time of presentation will have a negative prognostic indication (Dedeaux). Common bloodwork abnormalities are neutrophilia, anemia, hypokalemia, bilirubinemia, azotemia, hyperglycemia and elevated liver enzymes (Jôrg). This neoplasm is described as highly metastatic and locally invasive (Dedeaux). Pancreatic adenocarcinoma can lead to secondary illnesses such as pancreatitis and exocrine pancreatic insufficiency. The damage caused by the neoplastic tissue causes necrosis, inflammation, hemorrhage, fibrosis, or mineralization of the affected pancreatic tissue. All of these will result in abnormal pancreatic function that may hinder accurate diagnosis. In case reports, ultrasonography has been the best indication of pancreatic mass. 75% of patients affected will have a diffusely effected pancreas (Seaman). By the time of clinical signs, the neoplasia has usually metastasized to one of the following locations: liver, lung, regional lymph nodes, spleen, diaphragm, peritoneum, and kidneys. Unfortunately, prognosis is grave for cats diagnosed with pancreatic adenocarcinoma (Jôrg). There is no known environmental risks, etiologies, or mutations known to cause pancreatic adenocarcinoma in cats (Seaman). Recent studies have noticed about 14% of cats with pancreatic neoplasia are diabetic, which is currently under further investigation as a possible predisposing factor (Linderman).

Treatments:

Palliative care, chemotherapy, surgery and radiation treatments and even combinations of treatments have not been effective in case studies (Jôrg). With these efforts, less than 10% will survive over 1 year (Dedeaux). Treatments to be further explored are medical therapies such as toceranib phosphate. There is only one case report available at this time where toceranib phosphate was used successfully to extend the patient's lifespan by 792 days post initial presentation (Dedeaux). Toceranib phosphate is a tyrosine kinase inhibitor approved for multiple uses in canine neoplasms. It should not be administered if the patient is anorexic, which is often the underlying cause for the veterinary visit. More research is needed to study this drug and its effects on neoplasms particularly pancreatic adenocarcinomas.

Other considerable therapies for pancreatic adenocarcinomas include surgical resection. Surgical removal of the mass (partial pancreatectomy) if metastasis has not occurred yet is a possible surgical option, but due to the nature of the cancer being highly metastatic clean margins are unlikely (Jôrg). Other possible surgical interventions exist but have very high risks involved. Such surgical interventions would include total pancreatectomy or pancreaticoduodenectomy. In animals and humans where theses have been performed, a high rate of morbidity and mortality has been reported (Jôrg). In humans multimodal therapy including surgery, radiation, and chemotherapy still leads to poor survival rates of less than or equal to 18% survival at 5 years (Seaman). Only one case has been reported in a cat that received surgical excision resulting in 18 weeks of remission prior to reoccurrence (Seaman). According to Seaman, majority of patients are euthanized or die within 7 days post diagnosis due to poor quality of life and clinical signs are not managed appropriately. While we all love our pets and want them to live forever, it is important to remember quality of life with such ill patients.

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