Treatment of hemorrhagic hepatic cysts with omentalization in a serval

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Abstract

A 2 year old, spayed female African serval was evaluated for a history of abdominal distention. Physical examination findings were consistent with cranial abdominal masses and anemia. Abdominal imaging revealed soft tissue opacity masses in the cranial abdomen and hypoechoic cysts arising from the liver parenchyma. Conservative management failed to improve clinical signs, and a midline exploratory laparotomy was performed. Three large hemorrhagic cysts were visualized occupying a significant amount of the liver parenchyma. The cysts were drained, omentalized and partially closed with a surgical stapler and suture. Histopatological evaluation of the resected tissue was consistent with a chronic hepatic hematoma. The patient recovered well and was discharged 3 days postoperatively. Two years later, the patient was readmitted with the same clinical signs and large multiple hepatic cysts involving most of the liver lobes. These were surgically omentalized similarly to the previous surgery and the patient recovered well postoperatively. Two years later, return to normal life and no recurrence of the cysts was reported.

Keywords: Hemorrhagic cysts, Liver, Omentalization, Serval.

Introduction

Hepatic cysts have been reported in humans, and can be due to trauma, vascular malformation, coagulopathy or neoplasia (Hagiwara *et al*., 2001). They have also been reported in a small number of cats, and they can be congenital or acquired (Friend *et al*., 2001; Proverbio *et al*., 2008). They usually do not cause clinical signs and are found during routine physical examination as a cause of abdominal distention.

Although non-surgical treatment is possible, surgical treatment is generally recommended when there is recurrence of the cyst or compression of the liver parenchyma by the cyst is significant (Washizu *et al*., 1992; Proverbio *et al*., 2008). This is the first time this condition has been reported in a serval as well as the first report of liver cyst omentalization in this species. It is an atypical case due to not only the species but also the hemorrhagic and recurrent nature of the hepatic cysts.

Case details

A 2 year old, spayed female African serval cat presented to the zoological medicine service with a history of abdominal distention. The patient was bright, alert and responsive with a heart rate of 240bpm and was panting. Body weight was 7.55Kg. Oral mucous membranes were sligthly pale and capillary refill time was within normal limits. The abdominal cavity appeared tense and distended, and two large masses could be palpated in its cranial aspect. Physical examination was otherwise unremarkable. Orthogonal radiographs of the abdomen were taken, showing soft tissue opacity masses in the cranial abdomen displaced gastrointestinal structures caudally (Fig. 1a and 1b). An abdominal ultrasound was performed revealing 3 hypoechoic cysts, arising from the liver and measuring respectively 11, 9 and 6 cm in diameter. A small amount of free abdominal fluid was also detected. Sterile hemorrhagic fluid was retrieved from the cystic structures. Initial bloodwork showed a PCV of 17% (normal range for servals: 26.6-55%).

At this stage, a decision was made to treat the patient conservatively given the stable clinical presentation. The clinical and laboratorial progression of the serval was rechecked frequently. During the following week the peripheral PCV progressively increased (20, 22 and 26%). Complete bloodwork performed one week after initial presentation showed improving anemia (PCV 26%), and increased activity of Alanine Transaminase (ALT=264IU/l, normal range for servals: 38-205 IU/l). Three weeks later, the patient was reevaluated because the abdominal distention had not resolved. Bloodwork and abdominal ultrasound were repeated to evaluate the progression of the anemia and hepatic cysts. Increased ALT (ALT=334IU/l) was slightly worse than the previous bloodwork, and hyponatremia (Na+=143mEq/l, normal range for servals: 144-163 mEq/dl) was also found. Anemia was still present (PCV=26%).

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Fig. 1. (A and B): Orthogonal radiographs of the abdomen, showing soft tissue opacity masses in the cranial abdomen displacing gastrointestinal structures caudally.

Abdominal ultrasound performed showed relatively unchanged hepatic cysts/hematomas with mild increase in peritoneal effusion. Treatment options (conservative vs. surgical), including potential complications and outcome, were discussed with the owner, who elected to pursue surgical treatment. Ventrodorsal and lateral thoracic radiographs were taken under general anesthesia preoperatively and were within normal limits. Coagulation times and platelet count were also

performed and were within normal limits. Preoperative PCV was 17%, so a decision was made to perform a blood transfusion perioperatively. After cross-match and typing, the patient received 90ml of type A domestic feline Packed Red Blood Cells intravenously over a 3-hour period.

The serval was premedicated with 0.1mg/kg of Diazepam and 2mg/kg of Ketamine intramuscularly, and induced by mask administration of isoflurane in oxygen. Maintenance was by isoflurane inhalation in oxygen through endotracheal intubation. Buprenorphine (0.03 mg/kg IM) was used for further intraoperative analgesia and glycopyrrolate (0.01mg/kg IM) for its vagolytic effects. Ampicillin (5mg/kg IV) was given perioperatively after acute bradycardia was observed when initiating slow IV administration of 22mg/Kg cefazolin.

The serval was placed in dorsal recumbency and the ventral abdomen was clipped and aseptically prepared. A midline celiotomy was performed. Serous fluid was suctioned from the abdomen as the linea alba was opened and two big cysts with hemorrhagic content were visualized protruding toward the abdominal incision (Fig. 2).

Fig. 2. Intraoperative view of the abdomen after midline celiotomy. Two big cysts with hemorrhagic content were visualized protruding toward the abdominal incision.

The peritoneal cavity was thoroughly explored and it was confirmed that the cysts were originating from the liver. The right medial and lateral liver lobes were joined to form an 11 cm spherical cyst. The quadrate lobe also contained a 9 cm spherical cyst. The left medial and lateral liver lobes were joined and contained a 6 cm cyst bordered by 1 cm of liver parenchyma. The gallbladder was adhered to the cyst on the quadrate lobe and the cystic duct and common bile duct were distended. Approximately 70% of liver parenchyma was occupied by these cysts. The rest of the abdominal exploration was normal. Hemorrhagic fluid was aspirated from all three cysts. The fluid in the right

hepatic lobe cyst had a PCV of 10%. The cysts were drained and most of the cystic wall removed, trying to avoid the liver parenchyma. Hemostatic cellulose sponges (Surgicel: Ethicon, Johnson & Johnson, Somerville, NJ, USA) were placed inside the cystic cavities, which were omentalized and partially closed with a thoracoabdominal surgical stapler (TA stapler: Covidien, Minneapolis, MN, USA) and absorbable suture (3/0 PDS). The removed tissue was placed into a buffered formaldehyde solution to be histologically analyzed. The abdomen was lavaged with warm sterile saline and the midline approach routinely closed in three layers using absorbable suture in a simple continuous pattern in the muscular (2/0 PDS) and subcutaneous (3/0 polyglecaprone 25) layers, and non-absorbable suture (3/0 polyamide) in a Ford interlocking pattern for the skin.

Postoperatively the PCV had increased to 28%. Isotonic fluids (Normosol, 30 ml/Kg/day) and colloids (Pentastarch, 10ml/Kg/day) were administered intravenously for 24 hours. Intravenous ampicillin administration (5mg/Kg TID) was continued postoperatively for 3 days. For postoperative analgesia, the patient was administered an opioid (buprenorphine 0.01mg/Kg orally) every 8 hours for 3 days and then every 12 hours at home for 5-7 days.

The patient remained stable and started eating the day after surgery. Recheck bloodwork performed during the following days showed severe hypoalbuminemia (0.8g/dl, normal range for servals: 1.6-4.5 g/dl) and improving ALT (307IU/L and 201IU/L). The anemia (PCV= 18% and 17%) and hypoproteinemia (TP= 4.7g/dl and 5.0 g/dl, normal range for servals: 4.9-7.8 g/dl) remained low but stable. The patient improved clinically during the 3 days postoperatively and was discharged. In a follow-up examination 2 weeks postoperatively, the anemia and hypoalbuminemia were improving, and the serval was also clinically improving, showing increased activity and appetite. Further rechecks (6 weeks and 3 months postoperatively) showed clinical recovery of the patient (resolution of abdominal distention and return to normal serval behaviour) but the owner elected not to perform any further diagnostics.

Histopathology of the biopsied tissues was characterized by large clumps and long strands of interwoven fibrin interspersed with pools of erythrocytes necrotic debris. These areas were multifocally infiltrated by large macrophages and rimmed by a dense fibrous connective tissue capsule. No signs of malignancy or infection were visualized. These results were consistent with chronic hepatic hematomas.

Almost two years after this surgery, the patient presented again with abdominal distension and lethargy. Orthogonal radiographs of the abdomen were performed and they revealed soft tissue opacity masses in the cranial abdomen displacing gastrointestinal structures caudally. The radiopaque surgical staples placed during the previous surgery were also visualized. A large 10x8 cm single hepatic cyst was visualized by ultrasonography originating from the liver – a specific lobar origin could not be determined. Cytology of the cystic fluid was of low cellularity, showing rare nucleated cells with a predominance of macrophages consistent with cystic fluid. Fluid culture was negative. An exploratory laparotomy was performed and the cyst, which involved most liver lobes but the papillary process of the caudate lobe, was partially resected, drained and omentalized similarly to the first surgery. Recovery was uneventful and the patient was discharged 3 days later.

At a recheck performed 2 years after the second surgery, the patient was reported to have normal life and activity. Bloodwork performed at that time showed normal complete blood count values. Abdominal radiographs were repeated, which showed the presence of the radiopaque surgical staples with no recurrence of the hepatic cysts.

Discussion

This is the first report of surgical omentalization of hemorrhagic hepatic cysts in a serval. It is an atypical case due to not only the species but also the hemorrhagic and recurrent nature of the hepatic cysts. Hepatic cysts in humans have been reported to usually be benign and asymptomatic. In most cases, the causes of intracystic hemorrhage are unclear, but surgical treatment and histological examination is generally recommended because it is difficult to differentiate this type of lesion from cystic neoplasms (Hagiwara *et al*., 2001; Kitajima *et al*., 2003).

Hepatic cysts have been described in cats and can be congenital or acquired. Acquired cysts are usually solitary and congenital cysts are often multiple and can affect other organs, such as the kidneys (Friend *et al*., 2001; Proverbio *et al*., 2008). Although it is possible to drain them percutaneously, they may recur, and the authors recommended surgical resection when the cysts are large enough to compress the liver because the hepatic tissue may undergo atrophy, resulting in hepatic failure (Proverbio *et al*., 2008). Resection and omentalization has also been described in cats (Washizu *et al*., 1992; Friend *et al*., 2001). Non-surgical treatment of hepatic and renal cysts has been described by means of alcoholization of the cystic cavity. Mild abdominal bleeding was encountered in 3/22 patients, resolution of abdominal pain was observed 24 hours after the procedure and improvement of the clinical signs noted within 3-4 weeks following the alcoholization (Zatelli *et al*., 2007).

In the present case, the owner did not witness any traumatic episode that could have caused hepatic

trauma, hemorrhage and cyst formation. Preoperative bloodwork and histopathology of the cystic tissue removed surgically did not reveal any coagulopathy, neoplasia or hepatic malformation. However, because of the only partially tame nature of this species and their behavior, a traumatic episode that was not observed by the owner cannot be ruled out. However, recurrence of congenital hepatic cysts has been previously described in a ragdoll cat (Proverbio *et al*., 2008) so it cannot be ruled out this recurrence could be due to the nature of the cyst and not to external factors, such as trauma. In a previous report, it was found that primary hepatic disease in non-domestic cats is not a common cause of death (only 6 out 90 cats), but 78% of the feline individuals had one or more hepatic lesions at necropsy. Biliary cysts were 6 times more likely to occur in lions than other non-domestic cats, but no hemorrhagic cysts were encountered (Bernard *et al*., 2015). A lion with peribiliar cysts and severe liver disease was also described to have a fatal outcome after a rapid clinical deterioration (Chi-Ho *et al*., 2007).

The liver is an organ with great regeneration capabilities, restoring its mass by the sixth week after 70% hepatectomy in dogs, by means of compensatory hypertrophy and hyperplasia of remaining hepatocytes (Martin *et al*., 2003). In this serval, approximately 70% of hepatic parenchyma was missing due to space occupying cysts. Although there was concern regarding the outcome of such as small amount of remaining liver, the patient recovered clinically fast and the ALT enzyme activity decreased over time. This would make us think the cysts were big enough to significantly compress the liver tissue and affect its function. If this pressure had not been relieved, with time the liver could have suffered from irreversible damage. Pavia *et al*. (2014) described the outcome of liver lobectomy using thoracoabdominal surgical staplers in cats. In this study, it was found that the use of this surgical stapler was a safe technique to perform liver lobectomy in cats. In conclusion, when hepatic cysts are encountered in a serval, hemorrhagic liver cyst should be included in the differential diagnosis. If the cysts are big enough and causing clinical signs, such as anemia or abdominal discomfort, surgical resection and omentalization is recommended to prevent further deterioration of clinical signs and irreversible damage to the remaining liver. Recurrence should be considered as a potential long-term complication.

Conflict of interest

The authors declare that there is no conflict of interest.

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