Case Report

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Successful minimally invasive simple hepatic cyst ablation via ethanol sclerotherapy in a cat

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Abstract

Case summary A 12-year-old neutered male domestic shorthair cat was evaluated at the Michigan State University Veterinary Medical Center (MSU-VMC) for an abdominal cyst that was initially noted on ultrasound 1 year prior by the referring veterinarian. The cystic mass was causing clinical signs, including vomiting, diarrhea, hyporexia and abdominal pain. Cyst drainage had originally been performed every few months, but by referral, the required frequency of drainage had increased to every 2 weeks for a total of eight drainage events; therefore, a more definitive curative option was sought. CT evaluation revealed a large simple hepatic cyst – largest diameter 7.2 cm – likely associated with the right medial liver lobe. Minimally invasive ethanol sclerotherapy was performed. A locking-loop catheter was placed percutaneously and transhepatically into the cyst using ultrasound guidance. The cyst was drained, and contrast injected under fluoroscopic guidance to ensure no communication between the cyst and liver. Sclerotherapy was performed using a volume of 99.5% ethanol calculated from the volume of cyst fluid removed. The patient was discharged on the same day and had complete resolution of clinical signs. At a 6-month follow-up, the cyst had decreased in volume by an estimated 95%. The patient remains asymptomatic more than 1 year postoperatively.

Relevance and novel information To our knowledge, this is the first report of a feline hepatic cyst treated via percutaneous transhepatic ethanol ablation. Minimally invasive simple hepatic cyst ablation is a viable treatment option in cats that could avoid the need for a more invasive surgical intervention.

Keywords: Liver cyst; simple hepatic cyst; ethanol; sclerotherapy; minimally invasive

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Introduction

In cats, hepatic cysts are most commonly reported in Persian cats concurrently with congenital polycystic kidney disorder.[1,2] Cysts may also be acquired through neoplasia, inflammation or trauma.[2] Reports of large solitary hepatic cysts, as seen in this case, are few. Cystic liver structures are presumed to be biliary in origin in cats.[3,4] Within the veterinary medical literature, there is nomenclature discrepancy, and a lack of consensus on the pathogenesis of such lesions. Classification of liver lesions based on imaging appearance and fluid cytology was recently described within the human medical literature by Chenin et al.[5] The imaging appearance and contents of the solitary large hepatic cyst is consistent with the description of a 'simple hepatic cyst'.[5,6] Simple hepatic cysts can be incidental findings with patients being asymptomatic and not necessarily associated with elevated liver enzymes;[1,3] however, in certain cases, a simple hepatic cyst may grow and impede hepatobiliary function.[1,3] When this occurs, clinical signs may develop. These can include abdominal pain or distention, jaundice, vomiting or anorexia due to

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the space occupying nature of the cyst.[3] Although it is not a histopathologic diagnosis, because the reported patient's clinical signs, imaging findings and contents of the cystic structure are consistent with that of a simple hepatic cyst,[5,6] it will be so described in this report. Treatment options for simple hepatic cysts in symptomatic patients include partial liver lobectomy, excision of the cystic membrane, cystotomy and omentalization, or repeated abdominocentesis and cyst drainage.[1,4] To our knowledge, this is the first report of a feline simple hepatic cyst that has been treated via percutaneous transhepatic cyst drainage and ethanol sclerotherapy under fluoroscopic guidance with a locking-loop pigtail catheter.

Case description

A 12-year-old neutered male domestic shorthair cat weighing 4.92 kg presented for evaluation of an abdominal cyst first noted on ultrasound 11 months prior by the primary care veterinarian. The patient had originally presented for vomiting several times per week, anorexia and intermittent diarrhea. The cyst was drained and repeatedly refilled several times over the course of the 11 months before referral. At the time of referral, the patient's clinical signs of vomiting and inappetence had reoccurred. On presentation, the patient was bright, alert and responsive, and its vital signs were within normal limits. A pain score of 1/4, based on the Colorado State University Feline Acute Pain Scale, was noted with mild discomfort on cranial abdominal palpation. A large, rounded, firm mass was appreciated from the right and left side of the cranial abdomen, but was more pronounced on the right side. The left kidney was palpated and subjectively normal; however, the right kidney was not palpable.

The patient's hematology and serum biochemistry did not reveal significant abnormalities. Under sedation, an abdominal CT scan with intravenous contrast was performed. This revealed a large solitary fluid-filled structure within the right side of the liver, associated with the right medial liver lobe (Figures 1 and 2). The structure measured 7.2 cm × 6.2 cm × 5.5 cm and displaced the gallbladder and stomach to the left. Furthermore, the common bile duct was mildly dilated, measuring 4 mm, and the hepatic lymph nodes were slightly enlarged, measuring 7 mm in thickness.

Treatment recommendations offered at referral included exploratory laparotomy and liver lobectomy, open cyst drainage and omentalization, and minimally invasive cyst drainage and ethanol sclerotherapy. The owner was cautioned that though commonly performed in people with a reported low recurrence rate, the latter option had not been reported in cats; therefore, a prognosis could not be estimated. The owner ultimately elected to pursue percutaneous ethanol sclerotherapy 1 month later.

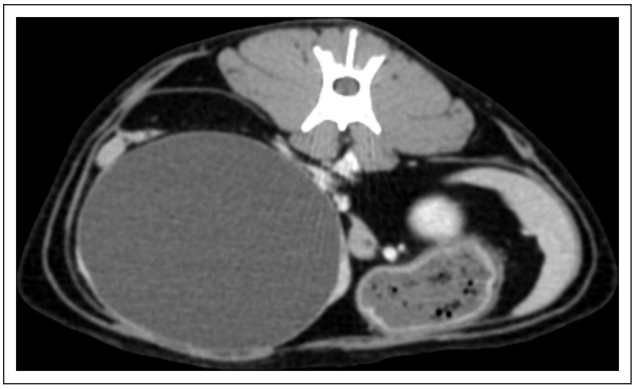

Figure 1 Axial view of the cystic mass seen in the cranial abdomen at the level of L1 vertebra taking up approximately 7 cm of abdominal cavity to the level of L4

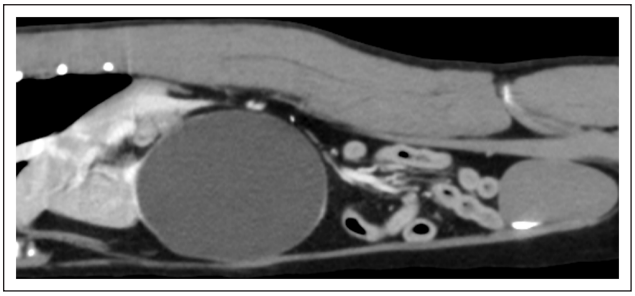

Figure 2 Sagittal view of the cystic mass seen in the cranial abdomen at the level of L1 vertebra taking up approximately 7 cm of abdominal cavity to the level of L4

At the time of the procedure, no palpable change in cyst size was appreciated. The cat was anesthetized, and the right cranial abdomen was clipped and aseptically prepared for placement of a locking-loop catheter with ultrasound guidance. A 25 cm 8.5 Fr locking-loop catheter (ReSolve; Merit Medical Systems) was placed percutaneously traversing the right side of the liver before entering the hepatic cyst (Figure 3). The loop was then locked within the cyst. After transfer to the interventional radiology suite, the cyst was drained under fluoroscopic guidance, collecting a total of 120 ml of clear straw-colored fluid. The fluid was submitted for cytology and bacterial culture with susceptibility testing. The same volume – 120 ml – of a 1:1 dilution of 0.9% saline and non-ionic iodinated iohexol contrast (Omnipaque; GE Healthcare) was then injected via pigtail catheter into the cyst to ensure no communication between the peritoneum, hepatic parenchyma or hepatic vasculature from the placement of the locking-loop catheter. This affirmation would serve to prevent damage to visceral organs due to ethanol exposure. Contrast was then drained from the cyst and 99.5% anhydrous pharmaceutical grade ethanol was injected into the cyst. The volume of ethanol injected was equivalent to 10% of the

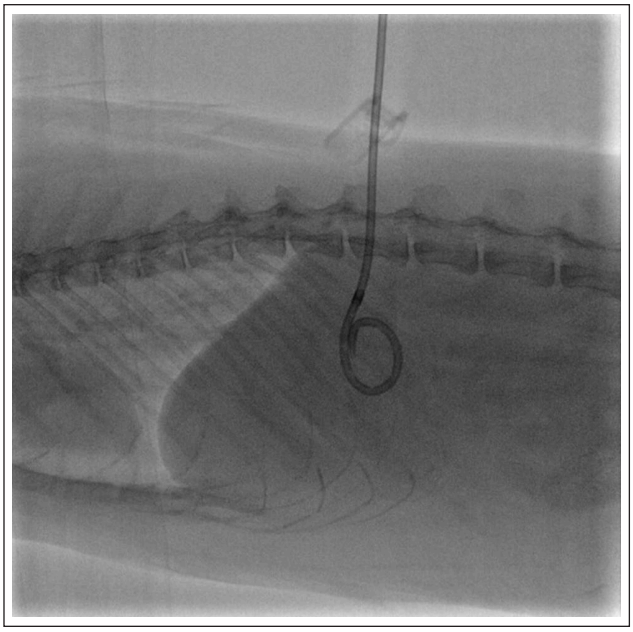

Figure 3 Fluoroscopic appearance of the pigtail catheter in the lumen of the simple hepatic cyst during the ethanol sclerotherapy procedure

volume that was drained – 12 ml of ethanol. The lumen of the cyst was exposed to ethanol for 10 mins, and the patient was rotated every 2.5 mins to expose and devitalize the entire cystic lining.[4] After 10 mins, the ethanol was drained and the cyst was lavaged with 200 ml of 0.9% NaCl flush, divided over 60 ml flush and drain cycles, to remove remnant ethanol. The locking-loop catheter was then uncoiled and removed. A single staple was placed for skin closure where pigtail catheter was removed. The patient recovered uneventfully and was discharged the same day with 3 days of buprenorphine (PAR Pharmaceuticals) to be given buccal mucosally for analgesia. The fluid submitted for cytology revealed clear, acellular fluid with rare erythrocytes and leukocytes, consistent with the contents of a simple hepatic cyst. There was no growth on aerobic or anaerobic bacterial cultures. The patient recovered well at home and the owner reported a cessation in all clinical signs when re-evaluated 2 weeks later.

A follow-up ultrasound (Figure 4) was performed 6 months after treatment to re-evaluate the size of the hepatic cyst. The owner noted that the patient continued to do well with no return of any clinical signs. On examination, the cat had no pain and no abdominal mass was appreciated. On ultrasound, a hypoechoic fluid-filled structure with a volume of 8 cm^3 was present in the region of the previous cyst, an estimated 95% reduction in volume.

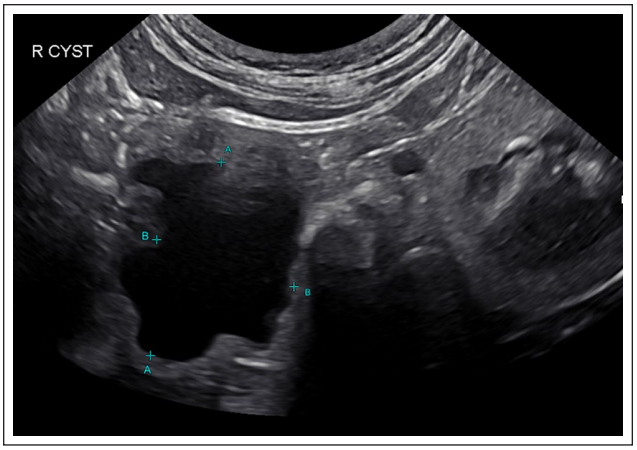

Figure 4 Hepatic mass seen on ultrasound 6 months after treatment. The volume of fluid at this time was 8 cm^3, an estimated reduction of 95%

Discussion

Ethanol is a sclerosing agent used to inhibit the secretory capabilities of epithelial cells lining a cystic capsule.[7] In a retrospective study, nine cats with hepatic cysts ranging in size from 15 to 26 mm were treated with ultrasound-assisted drainage and alcoholization. These patients had clinical signs of lethargy, vomiting and inappetence. All had resolution of clinical signs within 3–4 weeks, and a smaller cystic lesion on ultrasounds 1 month after the procedure.[6–8] The patients of this study were not followed further in their recovery; therefore, the long-term outcome is unknown.[7] Although associated with an unknown prognosis in cats, this procedure is common practice in humans with reported success.[9–11] In one human trial by Larssen et al,[9] 47 patients with benign symptomatic liver cysts were followed for a minimum of 24 months and up to 16 years. These patients showed a reduction in median cyst volume of 99.7% and a hepatic cyst recurrence rate of 0%.

The patient in this report had its cyst exposed to ethanol for a total of 10 mins. In the only other published case of feline hepatic cyst ethanol ablation,[7] the cysts were exposed to ethanol twice in one treatment for 3 mins each.[7] The human trial by Larssen et al[9] exposed hepatic cysts to ethanol for 10–20 mins each. The duration of cyst exposure to the sclerosing agent varied depending on the doctor performing the treatment. Another study in humans evaluated the difference in cyst reduction rates between 31 human patients who underwent ethanol exposure for 2 h compared with 4 h.[12] This study determined that there was no difference in cyst reduction rate depending on exposure time. Both groups had a cyst

reduction of over 97.7%.[12] This study, along with the success rates of numerous other cases with varying cyst exposure times, indicates that a longer exposure time does not equate to a greater reduction in cyst size.[8,9,12] Further, the longer that ethanol is left in the body, the greater risk there is for ethanol toxicity.[8,12]

Hepatocellular carcinomas are one of the most common primary hepatic neoplasm in dogs and cats.[4] Patients with symptomatic hepatocellular carcinomas have similar signs to patients with simple hepatic cysts, exhibiting vomiting, lethargy and inappetence. The preferred treatment option for this tumor in small animals is complete liver lobe resection.[4] Ethanol ablation of hepatocellular carcinomas has been performed successfully in humans, resulting in similar survival rates as liver lobectomies for patients with hepatic compromise.[10,13,14] Given the positive outcomes in humans having received treatment for solid hepatic neoplasms, ethanol ablation may have further applications for the treatment of liver diseases beyond simple hepatic cysts. With sufficient investigation, this may prove to be an additional treatment option for solid hepatic neoplasms in small animals.

Post-procedure volume reduction at the 6-month follow-up in our patient was estimated to be only 95%. However, the efficacy rate is reported to increase over time after the procedure.[7,9,15] Ethanol dilution may have occurred due to remaining cystic fluid or saline/contrast, rendering it less effective. The monitoring of ethanol concentrations has been reported in humans.[16] The evaluation of Houndsfield units on CT to monitor ethanol concentration was reported to be 16 times greater than that with no monitoring. Finally, cystic lining topography may have prevented all aspects of the cystic lining from being appropriately exposed to intraluminal ethanol. When too little ethanol has been utilized, the inward collapse of luminal epithelium may result in folded positions that are difficult for the ethanol to penetrate.[8,9]

The cat's owner in this case report was offered multiple treatment options and the risks and benefits of each were discussed. The partial liver lobectomy was recommended over other options due to the ability to visualize the structure, obtain samples for histopathological examination, and the opportunity for complete removal, resulting in no risk of recurrence. The limitations of percutaneous ablation, including the inability to perform a full abdominal exploration, evaluation of liver parenchyma and collection of tissue sample for histology, were discussed with the owner. Although in cats the side effects of ethanol sclerotherapy reported in humans – ethanol intoxication and transient pain[11,15,17] – have not been reported, the owner was informed of these risks, as well as the previously stated procedural limitations. Ultimately, percutaneous ablation offered a more acceptable risk profile compared with open surgery for this owner, at a significantly reduced cost, and a quicker, less painful recovery for the patient.

Conclusions

Cats diagnosed with hepatic cysts have a variety of treatment options. In simple hepatic cysts, percutaneous alcohol sclerotherapy should be considered due to its non-invasive nature, easier recovery for patients, lower cost for owners, decreased risk of complications and optimistic prognosis.

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Ethical approval The work described in this manuscript involved the use of non-experimental (owned or unowned) animals. Established internationally recognized high standards ('best practice') of veterinary clinical care for the individual patient were always followed and/or this work involved the use of cadavers. Ethical approval from a committee was therefore not specifically required for publication in *JFMS Open Reports*. Although not required, where ethical approval was still obtained, it is stated in the manuscript.

Informed consent Informed consent (verbal or written) was obtained from the owner or legal custodian of all animal(s) described in this work (experimental or non-experimental animals, including cadavers) for all procedure(s) undertaken (prospective or retrospective studies). For any animals or people individually identifiable within this publication, informed consent (verbal or written) for their use in the publication was obtained from the people involved.

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