Clinical presentation, diagnosis, and treatment of cholelithiasis in a pet Guinea Pig (Cavia porcellus)

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Abstract: A 2.5-year-old female guinea pig (Cavia porcellus) presented for reduced appetite, signs of abdominal pain, increased respiratory effort, and a distended abdomen. Cholelithiasis was diagnosed by radiography and ultrasonography. The cholelith was surgically removed using cholecystectomy. After surgery the animal recovered quickly and clinical signs resolved. Stone analysis revealed a composition of 20% weddellite (calcium oxalate dehydrate) and 80% apatite (calcium phosphate). Histologic examination of the gallbladder revealed no significant pathologic changes. Three months after the surgical procedure the patient continued to do well and diagnostic imaging revealed no abnormalities. Surgical therapy was straightforward and effective.

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Abstract

A 2.5-year-old female guinea pig (*Cavia porcellus*) was presented for reduced appetite, signs of abdominal pain, increased respiratory effort and a distended abdomen. Cholelithiasis was diagnosed by radiography and ultrasonography. The cholelith was surgically removed with cholecystectomy. After surgery the patient recovered quickly and clinical signs resolved. Stone analysis revealed a composition of 20% weddellite (calcium oxalate dehydrate) and 80% apatite (calcium phosphate). Histologic examination of the gall bladder revealed no significant pathologic changes. Three months later the guinea pig was doing very well and diagnostic imaging revealed no abnormalities or new stone formation in the bile duct. This is the first reported case of naturally occurring cholelithiasis in a guinea pig. Surgical therapy was straightforward and effective.

Keywords

Cholelithiasis, gall stone, guinea pig, *Cavia porcellus*, cholecystectomy

Case Report

A 2.5-year-old female guinea pig (*Cavia porcellus*) was presented as an emergency for signs of abdominal pain and reduced appetite for several hours. The owner reported unusual behaviors such as repeated turning of the head to the left side of the abdomen, sitting in the same spot, occasionally falling or lying on the side, and intermittent vocalization. Also noted were increased respiratory effort and a distended abdomen. The owner administered 1mg/kg meloxicam PO (without the advice of a veterinarian) for perceived discomfort.

The animal was kept in a group of eight guinea pigs in an indoor enclosure. Diet included hay (different dried grasses and herbs) *ad libitum*, fresh vegetables (lettuce, cucumber, fennel, sweet pepper, various fresh herbs) offered daily, and a small amount of a commercial guinea pig diet of mixed grains once weekly. There was free access to water. During the summer the owner additionally offered common dandelion (*Taraxacum officinale*). Branches of the Norway spruce (*Picea abies*) or apple tree (genus *Malus*) were provided throughout the year for enrichment.

During initial clinical examination the patient was moderately depressed and body condition was good to obese (body condition score 4/5). Body weight was 1305 grams (g). The animal was observed to defecate and urinate. Examination of the oral cavity revealed no abnormalities. Although the owner reported increased respiratory effort, this was not noted at the time of examination and auscultation of heart and lungs was unremarkable. The abdomen was moderately enlarged and rounded. Upon palpation, the caudal borders of the stomach were not detected, and large ingesta-filled intestinal loops were present. Due to moderate signs of discomfort (vocalization and defensive movements), a more complete palpation of the abdomen was not performed. Blood analysis including chemistry and hematology revealed no clinically significant abnormalities.

Survey lateral and ventrodorsal radiographs were taken with manual restraint. Radiographs revealed minor loss of serosal detail, a small, ovoid (3.3 mm x 4.3 mm), slightly irregular mineralized structure in the area of the gallbladder and mildly rounded liver margins (Fig. 1). Radiographic diagnoses

included cholelithiasis, hepatomegaly, and abdominal effusion. Abdominal ultrasound was recommended for further evaluation, including localization and characterization of the mineralized foreign body.

Transabdominal ultrasound (Aloka ProSound F75; linear probe 5411 at 13MHz, Hitachi Medical Systems Europe AG, Zug, Switzerland) showed a small amount of anechoic fluid accumulating between the liver lobes and around the gallbladder. The liver appeared slightly enlarged with slightly rounded margins, but showed normal architecture and intrahepatic bile ducts. The gallbladder was moderately filled with bile of mildly increased echogenicity. An ovoid, somewhat irregular, strongly echogenic structure with distal acoustic shadowing was lodged in the neck of the gallbladder. Small mucosal proliferations reduced the luminal definition of the gallbladder wall. The cystic and common bile ducts were normal (Fig. 2). Ultrasonographic diagnosis was cholelithiasis, cholecystitis, hepatomegaly and mild abdominal effusion. The free fluid was of insufficient quantity for aspiration.

Initial treatment consisted of meloxicam, 1mg/kg, subcutaneously, SID (Metacam, Boehringer Ingelheim, Basel, Switzerland), 1:1 Ringer´s acetate and 5% Glucose, 30ml/kg, subcutaneously, SID,(Fresenius Kabi, Oberdorf NW, Switzerland), ranitidine, 2mg/kg, subcutaneously, SID (Zantic 50mg/5ml, GlaxoSmithKline, Münchenbuchsee, Switzerland), and Fibreplex paste, one unit/scale line, orally, SID (Probiotics International Ltd., Somerset, United Kingdom). The guinea pig was assist fed with Critical Care formula CCF for herbivores, 10ml, tid (Oxbow Animal Health, Murdock, NE, USA). The following day buprenorphine, 0.01mg/kg, subcutaneously, bid (Temgesic, Reckitt Benckiser, Wallisellen, Switzerland) was added to the therapy, due to continued signs of abdominal pain. Surgery was scheduled for the next day.

On the day of the surgery meloxicam, crystalloids, ranitidine and buprenorphine were administered as described for the previous day. The guinea pig was then premedicated with ketamine, 20mg/kg, subcutaneously (Ketanarkon 100, Streuli Pharma, Uznach, Switzerland) and medetomidine, 0.10mg/kg, subcutaneously (Dorbene, Dr. E. Graeub AG, Bern, Switzerland). Fifteen minutes later, anesthesia was induced with 3% and maintained with 1.5-2.5% isoflurane (IsoFlo, Abbott AG, Baar,

Switzerland) in oxygen, 1L/min using a facemask. An intravenous catheter was placed in the right cephalic vein and crystalloids were given at a rate of 10ml/kg/h. During anesthesia, the heart rate was monitored via auscultation and the respiratory rate via observing of chest movement. Both remained stable around 165/min and 40/min, respectively.

A ventral midline celiotomy incision was made extending from the xiphoid process of the sternum to 2 cm caudal to the umbilicus. The gall bladder appeared visually normal without any signs of inflammation; however the mineralized mass was palpable (Fig. 3). The common bile duct did not appear distended and the bile was readily expressed through the bile duct. After expression, the gall bladder was bluntly dissected free from the liver using sterile cotton tipped swabs. The cystic duct and the cystic artery were double ligated using nonabsorbable monofilament suture material (Prolene 3/0, Ethicon, Johnson & Johnson, Schaffhausen, Switzerland) and the gall bladder was resected. The abdomen was flushed using warm Ringers Solution (Fresenius Kabi, Graz, Austria) and closed routinely in three layers using monofilament absorbable suture material (Monosyn 2/0 and 3/0, Braun Melsungen AG, Melsungen, Germany), finishing with an intradermal continuous suture pattern.

The surgical procedure lasted approximately one hour. At the end of surgery atipamezole, 0.4mg/kg, subcutaneously (Alzane, Dr. E. Graeub AG, Bern, Switzerland) was administered to antagonize the effect of medetomidine. One hour post-operatively, the guinea pig began to eat on its own. Postoperative care included supplemental feeding, subcutaneous fluid administration, meloxicam, ranitidine, probiotics and buprenorphine at the doses described earlier for 48 hours. The cholelith was submitted for stone analysis, and gall bladder for histopathology.

Patient condition was good the day after surgery, and the guinea pig was released from the hospital the next day with instructions to continue meloxicam, 1mg/kg, orally, SID for another six days, and to keep the animal on dry and clean substrate for additional 7 days.

Stone analysis by X ray diffraction method revealed a composition of 20% weddellite (calcium oxalate dehydrate) and 80% apatite (calcium phosphate). Histologic examination of the gall bladder revealed mild edema of the lamina propria mucosa.

Three months after the surgery the guinea pig was presented again for routine follow-up ultrasound of the abdomen and repeat radiographs. The patient was bright and alert and in a very good general condition. Weight was 1250 g, 55 g less than at initial presentation. Clinical examination was unremarkable. Ultrasound of the liver showed a normal size, shape, and architecture with normalization of the previously mentioned changes. No signs of dilatation or abnormalities of the bile ducts were identified. Repeated radiographs were unremarkable.

Discussion

This case report presents the clinical findings and treatment in a pet guinea pig with cholelithiasis. Although spontaneous cholelithiasis in pet guinea pigs is anecdotally reported, it is not described in the literature. The guinea pig has been used extensively as a research model, and cholelithiasis is triggered by high-cholesterol diets and biliary stricture[1-8].

The patient presented with signs of abdominal discomfort, and clinical examination suggested pain was localized in the cranial abdomen. In humans, cholelithiasis can cause visceral pain, but in some cases clinical symptoms can also be absent. [9, 10] In this patient periodic obstruction of the cystic duct may have produced intermittent pain. Because there is no information in the literature about the clinical occurrence of gallstones in pet guinea pigs, it is not known how many might have choleliths without apparent clinical signs. In the studies on experimentally induced choleliths in guinea pigs, clinical signs suggesting pain were not reported. [1-8]

The combination of meloxicam and buprenorphine helped to alleviate the signs of pain, but the patient did not begin to eat on its own until after surgery. During the subsequent 3 months after cholecystectomy no further episodes were observed and the general condition of the patient was excellent.

Diagnostic imaging was a very useful method to detect the mineralization representing the cholelith, and to help rule out other conditions of the abdomen. The sonographic examination helped confirm cholelithiasis and visualized the stone in the gallbladder neck. Hepatomegaly and mild abdominal effusion were also present. Abdominal effusion could be a sequela to inflammation of the gall bladder, although histologic examination of the gall bladder did not confirm cholecystitis.

The underlying cause of cholelithiasis in this patient is not known. Guinea pigs on a cholesterol-supplemented diet not only developed hypercholesterinemia and fatty infiltration of the liver, but also mild anemia, which were not observed in this patient. [1, 6] The guinea pig had a slight hepatomegaly, which could possibly represent a fatty infiltration or storage disease. Since hepatomegaly was not evident 3 months after treatment, it is possible it was caused by an ascending hepatitis or biliary stasis induced by the gallstone. Bacterial culture of the excised gall bladder was not performed; however, the guinea pig improved rapidly after surgery without antibiotic treatment.

Stone analysis in the current case revealed 20% weddellite (calcium oxalate dehydrate) and 80% apatite (calcium phosphate). Nothing is known about the mechanism of this particular stone formation. Apatite gallstones were found in 3 hamsters, but the exact chemical constitution of the apatite was not determined. [11] Hydroxy- and carbonate-apatite are the two most common biological forms of apatite. In humans apatite gallstones are uncommon.[12]

In humans, there is an increased incidence of cholelithiasis in females and in obese patients. [10, 12] Both features were present in this case but no further conclusions can be made.

Treatment of cholelithiasis in this case was straightforward and uneventful. In guinea pigs with intermittent gastrointestinal symptoms, anorexia or reduced appetite and cranial abdominal pain, cholelithiasis should be considered as a differential diagnosis. This case demonstrated that surgical removal was feasible, well tolerated, and appeared to benefit the patient.

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Figures

Figure 1:

A: Ventrodorsal and B: right-to-left lateral radiographs of the abdomen of a guinea pig with cholelithiasis. Note a small, irregular, ovoid, mineral opaque structure in the area of the gallbladder (black arrow). Mild, patchy loss of serosal detail reduced the definition of the mildly rounded caudoventral liver margin.

Figure 2:

Transabdominal ultrasound image of the gallbladder of a guinea pig with cholelithiasis. A small amount of free fluid accumulated around the gallbladder and the liver margins (white arrow heads). Mild mucosal proliferations (small white arrows) reduced the luminal definition of the gallbladder wall. An ovoid, strongly echogenic structure with distal acoustic shadowing was present in the neck of the gallbladder (large white arrow). The mesentery had an increased heterogeneous echogenicity.

Figure 3:

Surgical image of the gall bladder of a guinea pig after gentle emptying of the contents. Note the dark, round structure, which represents the cholelith within the gallbladder. Black arrow: cystic duct with adjacent cystic artery. Black arrow head: adhesions of gallbladder wall and liver.