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Olgu Sunumu / Case Report

Polycystic Liver Disease in a Golden Syrian Hamster

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Abstract: Polycystic liver disease (PLD) has been reported in humans, dogs, cats, hamsters, rats, deer and some farm animals such as goats and pigs. PLD is observed in hamsters over 1 year old and is similar to congenital polycystic disease in humans. The material of the present case was consisted of 2-year-old, male, Golden Syrian hamster. Physical examination revealed enophthalmos, rapid breathing and bilateral abdominal distension. Ascites and intraabdominal fluctuant structures in the cranial abdominal region were detected. In the ultrasonographic examination, anechogenous and multiple cystic structures were detected in the liver. In serum biochemistry, hyperbilirubinemia and hypoalbuminemia were determined. In microscopic examination of cyst fluid, large quantities of eosinophilic materials were remarkable. As a result, the hamster with anorexia and abdominal distension complaints; PLD, which is generally asymptomatic and incidental is diagnosed based on clinical, ultrasonographic and cytological findings. It was determined that transabdominal ultrasonographic examination is useful in the diagnosis of PLD cases, ultrasound-guided cystic and peritoneal fluid aspiration contributes significantly to the diagnosis. As the interest in hamster care has been increasing day by day it is considered that the present case will provide useful information in veterinary practice on the clinical symptoms and diagnosis of PLD disease.

Keywords: Hepatocellular disease, Polycystic liver disease, Syrian hamster, Ultrasound

Altın Suriye Hamsterında Polikistik Karaciğer Hastalığı

Özet: Polikistik karaciğer hastalığı (PKH) insanlarda, köpeklerde, kedilerde, hamsterlarda, ratlarda, geyiklerde ve keçi ve domuz gibi bazı çiftlik hayvanlarında bildirilmiştir. PKH, 1 yaşın üzerindeki hamsterlarda gözlenir ve insanlardaki konjenital polikistik hastalık ile benzerdir. Sunulan bu vakanın materyalini 2 yaşında, erkek Altın Suriye ırkı hamster oluşturdu. Fiziksel muayenede enoftalmi, hızlı soluma ve bilateral abdominal gerginlik belirlendi. Asites ve kranial abdominal bölgede intraabdominal fluktuan yapılar tespit edildi. Ultrasonografik muayenede, karaciğerde anekoik, multiple kistik yapılar gözlendi. Serum biyokimyasında hiperbilirubinemi ve hipoalbüminemi belirlendi. Kist sıvısının mikroskobik muayenesinde çok sayıda eozinofilik materyal dikkat çekiciydi. Sonuç olarak, anoreksi ve abdominal gerginlik şikayetleri bulunan hamsterda genellikle asemptomatik olan ve tesadüfi olarak tespit edilen PKH tanısı; klinik, ultrasonografik ve sitolojik bulgular temelinde konuldu. Transabdominal ultrasonografik muayenenin PKH vakalarının tanısında faydalı olduğu, ultrason rehberliğinde yapılan kistik ve peritoneal sıvı aspirasyonunun tanıya önemli katkı sağladığı belirlendi. Hamster bakımına olan ilgi her geçen gün arttığından, mevcut vakanın, PKH'nin klinik semptomları ve teşhisi konusunda veteriner hekimlik uygulamalarında faydalı bilgiler sağlayacağı düşünülmektedir.

Anahtar Kelimeler: Hepatoselüler hastalık, Polikistik karaciğer hastalığı, Suriye hamsteri, Ultrason

1. Introduction

Hamster is a rodent from the *Cricetidae* family. The most preferred type of hamsters raised for pet or experimental purposes is the Syrian hamster. Syrian hamster (*Mesocricetus auratus*) was bred in 1930 at Hebrew University in Jerusalem. It is called "Golden Syrian Hamster" because of its fur. Hamsters are nocturnal animals and hibernate at room temperature below 10 °C (1,2).

Syrian hamsters have limited information on disease incidences, spontaneous disease occurrences and the importance of these diseases compared to other rodents such as mice and rats. Common diseases in hamsters include; hepatitis, cirrhosis, hepatic lipidosis, multiple focal necrosis, sentral periportal vascular inflammation and amyloidosis (3). In clinical practice, the specific diagnosis of liver diseases is rarely made. The findings are usually subclinical, non-specific, and further diagnostic assessments are needed for a definitive diagnosis. According to the American Zoo/Exotic Pathology Service records between 1998-2004; in the examination of 850 rabbits, 338 guinea pigs, 253 rats, 117 hamsters, 60 chinchilla and 15 gerbil, the most common diseases have been reported as 9-12% parasitic (nematode, protozoa), 20-60% bacterial (enteritis, hepatitis, pneumonia, nephritis), 50-80% tumoral (vacuolar/polycystic

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hepatopathies, adenoma/adenocarcinoma) and cardiomyopathies (4).

Polycystic liver disease (PLD) has been reported in humans, dogs, hamsters, white-tailed deer and some farm animals. It is a challenging research topic in terms of its clinical course, genetic and pathological features, classification, origin and development (5). Liver cysts can be congenital or acquired. Acquired cysts are usually parasitic cysts, and the microscopic analysis of cystic fluids may detect the parasite itself or scolex. Another reason is biliary cystadenoma (6). In cases of congenital liver cysts identified in dogs, 3 single/solitary cysts, 3 PLD and one congenital bile duct dilatation have been identified and it has been reported that the majority of cysts do not have an intrahepatic biliary duct system involvement and there is no bile acid and bilirubin in the cyst content (7). Congenital PLD was diagnosed with the presence of multiple cysts of 0.2-0.4 cm in diameter on the surface of all lobes of the liver in 3 6-week-old puppies with abdominal distention, nephromegaly and hepatomegaly, and was found to be similar to PLD in children (8). A large number of liver cysts were identified in a 10-year-old cat's liver, with less than 1 mm wall thickness, 1-4.5 cm in diameter, filled with a slightly mucoid clear fluid, exceeding the capsular level of the liver (9). PLD diagnosis was made in wild goats with numerous non-parasitic cysts with hepatomegaly, subcapsular, uni-/multilocular, thin-walled, 0.5-0.8 cm in diameter, filled with 1-15 ml serous and amber-colored fluid (10). Also, autosomal dominant polycystic kidney and liver disease in humans has been described in rats (11). In PLD cases in hamsters, the localization of cysts is reported as multiple parenchymal (between 0.25-0.30 cm) and extrahepatic (in the abdominal cavity, balloon-like, 3 cm). Liver cysts are defined as thin-walled, pale, varying color ranging from brown to red, filled with 0.1-3 ml of fluid depending on the size, and soft compared to liver tissue. Generally, small cysts are unilocular and large cysts are multilocular. A homogeneous eosinophilic material which is detectable in hepatic parenchymal damage and necrosis of the liver can be observed in the cyst lumen (6,12). The thin cyst wall consists of cubic or flat epithelial cells. It is reported that liver parenchymal damage due to cysts varies between 5-60% (6,10).

In this report, the diagnosis of PLD case in a hamster with complaints of abdominal distension and ascites was discussed on the basis of clinical, laboratory and ultrasonographic findings utilizing the PLD cases seen in humans and other animals.

2. Case Presentation

The material of this case was consisted of 2-year-old, male, Golden Syrian hamster brought to Selcuk University Veterinary Faculty Small Animal Hospital. It was learned from the anamnesis that he had complaints of anorexia, eye discharge and abdominal distention, which had been ongoing for a week. It was learned that the hamster is living in a cage with 2 separate floors connected to each other, in an aquarium-like cage with plastic connection tubes, is fed with hamster diet (crude protein: 16.2%, crude fat: 5.1%, crude cellulose: 8.1%, inorganic substance: 5%), and its daily consumption before the disease was around 10 g.

In the physical examination of the hamster, it was noted that he had irritation and often tried to bite during handling. Enophthalmos, conjunctival discharge, rapid breathing, bilateral abdominal distension (Figure 1a and 1b) and gait abnormality were detected. No enteritis sign (wet tail) was observed. Presence of abdominal fluid, thickening of the abdominal wall and intraabdominal fluctuant structures in the cranial abdominal region were detected during abdominal palpation. Mucous membranes were pale, but icterus was not present. For laboratory analysis, blood samples were taken without any sedation from the vena jugularis in the dorsal position, extending to the ear in the manubrium at a 30 degree angle. Urine sample was taken during micturition, ultrasound-guided aspiration of abdominal fluid and cyst fluid were made with a 28 gauge needle. Complete blood count (CBC), urinalysis, serum biochemistry, peritoneal and, cyst fluid analyses were made. Microcytic hypochromic regenerative anemia was determined in CBC (Table 1). In serum biochemistry analysis, increased alkaline phosphatase and amylase enzyme activities, hyperbilirubinemia and hypoalbuminemia were detected (Table 2).

Table 1: Blood gases and hemogram findings

Parameters	Findings	Reference
pH	7.45	7.35 - 7.45
K mmol/L	4.8	3.8 – 6.3
Na mmol/L	153	141 - 172
Cl mmol/L	114	93 - 118
Lactate mmol/L	2	0 – 2
WBC m/mm^3	8.76	8.1 – 9.9
RBC m/mm^3	**6.03** ↓	8.4 – 8.8
MCV fl	**54.1** ↓	57.8 – 60
Hct %	**32.6** ↓	48.9 – 51.7
MCHC g/dl	**28.8** ↓	33.5 – 33.9
Hb	**12.7** ↓	16.6 – 17.4
RDW	16.4	15.6 – 17.3

pH= Hydrogen ion concentration, K= Potassium, Na= Sodium, Cl= Chloride, Hct= Hematocrit, WBC= White Blood Cell, RBC= Red Blood Cell, MCHC= Mean Corpuscular Hemoglobin Concentrarion, Hb= Hemoglobin, RDW= Red cell distribution width

Table 2: Serum biochemistry findings

Parameters	Findings	Reference
BUN mg/dL	19.7	17 - 27
Creatinin mg/dL	0.6	0.6 – 1.4
AST U/L	37	20 - 150
ALT U/L	31	20 - 128
ALP U/L	**198** ↑	50 - 186
Amylase U/L	**1066** ↑	154 - 196
Glucose mg/dL	63	37 - 198
LDH U/L	277	100 - 300
Total bilirubin mg/dL	**0.7** ↑	0.2 – 0.6
Phosphorus mg/dL	3.8	3.8 - 7
Cholesterol mg/dL	193	112 - 210
Albumin mg/dL	**1.0** ↓	1.8 – 5.5
Calcium mg/dL	3.8	3.7 – 6.2
Triglycerid mg/dL	183	27 - 350
Protein g/dL	4.8	4.3 – 12.5
CPK U/L	298	0 - 300

BUN= Blood Urea Nitrogen, AST= Aspartate Aminotransferase, ALT= Alanine Transaminase, ALP= Alkaline Phosphatase, LDH= Lactate Dehydrogenase, GGT= Gamma Glutamyl Transferase, CPK= Creatinin Phosphokinase

Radiographic and ultrasonographic examinations were performed to the differential diagnosis of abdominal distention (ileus, gas in the intestines, change of pathological status, obesity, etc.). Ascites was confirmed on radiographic examination (Figure 1c). In the ultrasonographic examination (Mindray®, DC-6, 6.5 MHz) which was performed in the ventro-dorsal position, thin-walled, sizes ranging from 0.25-3 cm, multi-loci, anechogenic, multiple cystic structures in the liver (Figure 2a) and abdominal effusion (Figure 2b) were detected. The aspirate taken from large cysts was serosanguinous and watery, pale reddish in color (Figure 3a). No parasites or scolex were observed during the microscopic examination of aspirates. In microscopic examination of cyst fluid; a number of neutrophils, lymphocytes and a large number of eosinophilic materials were observed (Figure 3b). Aspirates of the cyst (protein <2.5 g/L; SpG 1010; pH 7) and peritoneum (protein <2.5 g/L; SpG 1015; pH 7.35) fluid were found to be transudate according to dipstick analysis. In the stool test, enteric parasites (Giardia, Spironucleus, Coccidia, Hymenolepis nana, etc.) were not observed.

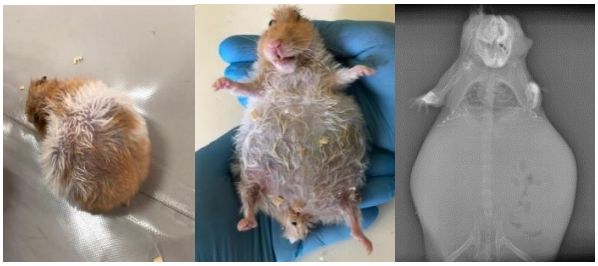

Figure 1: Abdominal distention and ascites

Hamster was hospitalized in an intensive care unit with adjustable temperature (25 ° C) and oxygen support and fluid treatment (5 ml, 0.9% NaCl, S.C.), vitamin and mineral supplements (2 ml, S.C., Duphalyte®, Zoetis) were administrated. It was weighed daily and fed with commercial baby food enterally (gavage) to prevent weight loss. On the request of the owner, hospitalization was terminated and it was learned from the owner that the hamster died 2 days later. Necropsy could not be performed due to the emotional status of the owner.

3. Discussion and Conclusion

Polycystic diseases are incidentally diagnosed congenital diseases. Cysts are usually found in the liver and may be asymptomatic. Polycystic disease of hamsters is similar to congenital polycystic disease in humans (2). PLD is often observed in hamsters over 1 year old. Cysts localized in the liver, epididymis, ovary or adrenal glands, cystic dilatations of the seminal vesicles, renal pelvis, endometrium, pancreas and esophagus are defined as thin-walled sacs filled with amber-colored fluid. Among these organs, the liver has the highest incidence of occurrence of cysts. Multiple cysts are more common in male hamsters (1). In the presented case, thin-walled multiple cystic structures (uni-/multi-loci) sizes ranging from 0.25-3 cm, suitable for the previous definitions of PLD (6-11,13) were observed in the ultrasonographic examination of the liver (Figure 2). Along with ultrasonographic examination findings, the patient was diagnosed with PLD based on the microscopic examination (Figure 3b) and characteristics of the cyst fluid (Figure 3a) and analysis of serum and peritoneal fluid.

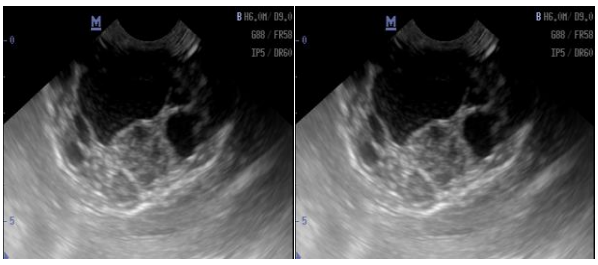

Figure 2: Ultrasonographic appearance of multiple polycystic structures in liver

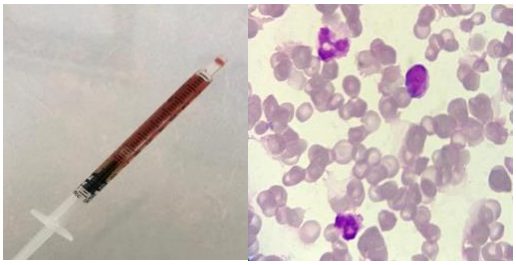

Figure 3: a) Macroscopic view of cyst fluid. **b)** Neutrophil, lymphocyte, and many homogeneous eosinophilic materials and in cyst fluid (Wright-Giemsa stain, x100 HPF)

In hamsters, ALT, AST and ALP enzyme activities are evaluated as markers of oxidative stress. Low AST and ALT enzyme activities are directly associated with dilatation of hepatic vessels and disruption or necrosis of hepatocytes (14). Increased ALP enzyme activity is known as a sensitive indicator of chronic liver diseases, virally induced hepatitis and biliary diseases (15). Increased serum bilirubin concentration indicates a biliary obstruction or stasis due to liver inflammation or damage (14-16). Increased amylase enzyme activity is observed in pancreatitis, peptic ulcer disease, mesenteric ischemia, cholecystitis, intestinal obstruction, renal failure and diabetic ketoacidosis. Whether hyperamylasemia is caused by pancreatitis should be confirmed by a pancreatic specific test such as lipase or pancreatic isoamylase. Plasma amylase concentration above 1000 U/L is associated with pancreatitis and concentration ranging between 300-1000 U/L are associated with other abdominal pathologies (17). In patients with alcoholic hepatitis, it has been reported that there is a relationship between hyperamylasemia and hyperbilirubinemia and increased ALP and GGT enzyme activities (18). The main causes of hypoproteinemia are protein-loss diseases such as malabsorption, maldigestion, low protein intake, decreased protein synthesis, nephropathy or enteropathy (16). The magnitude of liver parenchymal damage due to cysts is between 5-60% (6); also it has been reported that the severity of PLD cases in humans is positively correlated with liver enzyme levels and negatively with serum albumin levels (19). In the presented case, all findings including normal leukogram, the increase of serum ALP and amylase enzyme activities, hyperbilirubinemia, hypoalbuminemia, and abdominal effusion in transudate feature, were interpreted as an indicator of non-infectious liver damage and/or failure. Slight increases in ALP enzyme activity and bilirubin concentration were associated with bile duct damage, stasis, and/or obstruction (14-16). The hyperamylasemia with hyperbilirubinemia and increased ALP enzyme activity detected in this case was interpreted in the development of bile duct injury or subclinical pancreatitis (17,18). By peritoneal fluid (Table 3), BUN and Cr levels findings; abdominal effusion in transudate feature (20) were linked to a decrease in the oncotic pressure of blood due to hypoalbuminemia and disruption of liver protein synthesis. In the presented PLD case, the severity of liver damage was evaluated as mild according to liver enzyme activity changes and magnitude of hypoalbuminemia (6,19).

Chandler et al. (21) reported that adult hamsters developed anemia as a result of feeding for 10 weeks with 10 mg/kg iron, and weight loss and high mortality in pregnant hamsters may occur when iron intake is below 3 mg/kg. The microcytic hypochromic regenerative anemia detected in our case was attributed to nutritional and metabolic causes such as disruption of hematopoiesis due to liver damage, low protein intake and decreased albumin synthesis.

Cyst fluid analysis in polycystic liver disease provides information about the origin of cysts. Cubic epithelial cells which form the bile ducts can be detected in the fluid analysis of cysts originating from the bile ducts. In addition, the salt-independent fraction can be detected (22). In the presented case, a number of neutrophils, lymphocytes and a large number of eosinophilic materials were observed, and no epithelial cells or parasitic materials were detected in the microscopic examination of cysts fluid. Neutrophils and eosinophilic materials observed in cyst and peritoneal fluid were evaluated as signs of hepatic parenchymal damage and inflammatory response (6,12). The serosanguinous appearance of the cyst fluid and the erythrocyte presence were associated with possible capillary damage during aspiration (Figure 2).

Transudative effusions develop in serous cavities due to circulatory disorders caused by low oncotic pressure and increased vascular hydrostatic pressure. The main causes of transudate formation in domestic mammals include hypoproteinemia/hypoalbuminemia, overhydration, lymphatic or venous congestion, cardiac insufficiency, portosystemic shunts, and hepatic cirrhosis. Transudates are generally characterized by low density (<1.017), low cell number (<1000 cells/mL), low protein (<2.5 g/dL), and color varying from transparent to straw/amber. The main cells found in transudates are macrophages, sometimes mesothelial cells, lymphocytes, and non-degenerated neutrophils (20). In the presented case, abdominal effusion with transudate characteristics was due to liver injury and insufficient albumin synthesis.

Abdominal ultrasonography is used frequently in human and veterinary medicine for the diagnosis of hepatocellular diseases, determination of its prognosis, and disease screening. It is a reliable tool in the evaluation/progression of tumoral and cystic cases such as cholangiosarcoma, PLD, and liver parenchymal changes (23). In the presented case, the heterogeneous structure of the liver parenchyma and multi-loci, anechogenic, multiple polycystic structures of different sizes were determined. Ultrasound-guided cystic and peritoneal fluid aspiration was performed. It was determined that ultrasonographic examinations were useful

for the diagnosis/differential diagnosis of patients with abdominal tension and identification of PLD.

Treatment of liver diseases in hamsters depends on the cause, but as in other rodents, it usually consists of supportive treatments. It is recommended to evaluate and maintain hydration status and provide nutritional support in anorexic cases (24). Stabilization of the hamster was achieved in this case with short-term supportive treatments, but could not be resumed due to the owner's decision to terminate treatment for economic and emotional reasons. In such cases, it was observed that the temperature-adjusted and oxygen-supported intensive care unit hospitalization together with fluid and electrolyte and nutritional support could provide sufficient stabilization.

In conclusion, PLD which is usually asymptomatic was diagnosed in a hamster with complaints of anorexia and abdominal distension, based on clinical, ultrasonographic, and cytological findings. The limitations of this case report were a lack of experimental laparotomy and necropsy. According to laboratory findings, the increase of ALP and amylase enzyme activities along with hyperbilirubinemia, hypoproteinemia, and ascites were evaluated as indicators of bile duct damage, and liver failure. It has been determined that transabdominal ultrasonographic examination is useful in the diagnosis of PLD cases and also, cystic and peritoneal fluid aspiration can be performed safely under ultrasound guidance and contributes significantly to its diagnosis. The increasing interest in hamster care as a pet animal also increases the need for information about hamster diseases. It is considered that the presented case will provide useful information in veterinary medicine practice regarding clinical symptoms and diagnosis of PLD.

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