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Investigation the histopathological condition of the liver in stray dogs

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Abstract

Chronic hepatitis (CH) is the most common liver disease of dogs. Histopathology is necessary for distinguishing different stages of hepatitis. This study aimed to examine the liver histological status of stray dogs. Seventy stray mixed dogs that died from a road accident between 2017 till 2020 in Tehran, Iran were necropsy for liver status. Prevalence of CH in studied dogs was 31.4%, including 12 random hepatitis, 9 cholangiohepatitis, and one bridging hepatitis. CH may be more likely to occur in stray dogs because they are less likely to visit veterinary clinics than pet dogs.

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Introduction

Chronic hepatitis (CH) is considered a chronic disease with multiple etiologies. The severity of CH varies in different cases, and progression to cirrhosis is observed in severe cases (Poldervaart *et al.,* 2008; Bensignor, 2009). CH in dogs (Canis lupus familiars) is classified in two categories based on the histological degree of activity to chronic persistent and chronic aggressive (active), which can be cirrhotic or non-cirrhotic stage (Belgica, 1997). The etiology of CH is poorly understood in dogs compared to humans. Infectious agents (viral and bacterial), drug-induced diseases (corticosteroids and anticonvulsants), immunotherapy, autoimmune diseases, toxins, metabolic diseases (copper accumulation), and familial predisposition factors are some etiologies of CH in dogs (Bunch, 1993; Boomkens *et al*., 2004). In the first stages of CH, the clinical signs are non-specific, including weight loss, weakness, anorexia, vomiting, polyuria, and polydipsia, and most cases are not diagnosed during these stages. Unlike the first stages, the clinical signs in the late stages are more specific, like hepatic encephalopathy, icterus, and ascites (De Groote *et al*., 1968). In most of the affected dogs, hematological changes are not specific. In serum biochemistry, simultaneous increasing serum alanine aminotransferase (ALT), alkaline phosphatase (ALP), and serum bile acid indicates a hepatobiliary disease but not necessarily hepatitis (Watson, 2004). Histopathology seems necessary for a definitive diagnosis, etiology, and distinguishing different stages of hepatitis. Various researchers collected sufficient information about the CH in pet dogs but, not much information is available about the liver status in stray dogs. This study aimed to study the pathology of the liver of stray dogs.

Materials and Methods

Case selection

Seventy stray mixed dogs (31 females, 39 males) that died from a road accident between 2017 till 2020 in Tehran, Iran.

Histopathology

Samples were obtained from both the lesions and the normal parts of the livers during necropsy (John *et al*., 2014). Entire liver samples were fixed in 10% buffered formalin. Microscopic evaluation of multiple selected areas was performed from 4- to 6-µm sections of paraffin-embedded tissue fixed on glass micro slides and stained with hematoxylin and eosin (Patterson, 2008). The microscopic study was done using a light microscope. (Canon transmitted light microscope OBL-12). The histopathologic criteria used for this study described the degree of activity or distribution of the inflammatory cells and the stage of fibrosis or chronicity (Ishak, 2000) (Table 1).

Statistical analysis

The statistical analyses were done with SPSS 18.0 software (SPSS Inc., Chicago, IL, USA) and using the chi-square test (χ^2). Differences were considered significant at the $p < 0.05$ level.

Results

The histopathological results revealed that the prevalence of CH in studied dogs was 31.4% (22 from 70 dogs), including 12 random hepatitis (54.54%), 9 cholangiohepatitis (40.9%), and one bridging hepatitis (4.54%). The grade of CH in the studied dogs was 18.2% (mild), 45.5% (moderate), 27.3% (marked), and 9.1% (very marked). Thirty-seven cases had diseases other than CH (Table 2). The liver of five dogs had concomitant lesions, of which two had lipidosis and telangiectasia, and three had chronic hepatitis and lipidosis. Statistical analysis showed a statistically significant difference between dogs with CH and their age ($p < 0.05$). However, there was no statistically significant difference between CH and the sex of dogs.

Table 1. Degree of activity in chronic hepatitis (CH) and degree of fibrosis in CH.

Degree of activity in chronic hepatitis (lesions and degree of injury)				
Category	**Portal area inflammation**	**Periportal necrosis**	**Spotty necrosis**	**Bridging and/or multiacinar necrosis**
Mild	Mild patchy	Absent/mild	Mild	Absent
Moderate	Moderate	Moderate	Moderate	Absent
Marked	Marked	Marked	Marked	Absent
Very marked	Marked	Marked	Marked	Present
Degree of fibrosis in CH (component lesions)				
Category	**Fibrous expansion of portal areas**	**Bridging fibrosis (portal to portal, portal to central, central to central)**		**Bridging with nodules (cirrhosis)**
Mild	Absent/Mild	Absent		Absent
Moderate	Moderate	Absent(occasional)		Absent
Marked	Marked	Marked		Absent (occasional nodule)
Very marked	Marked	Marked		Present

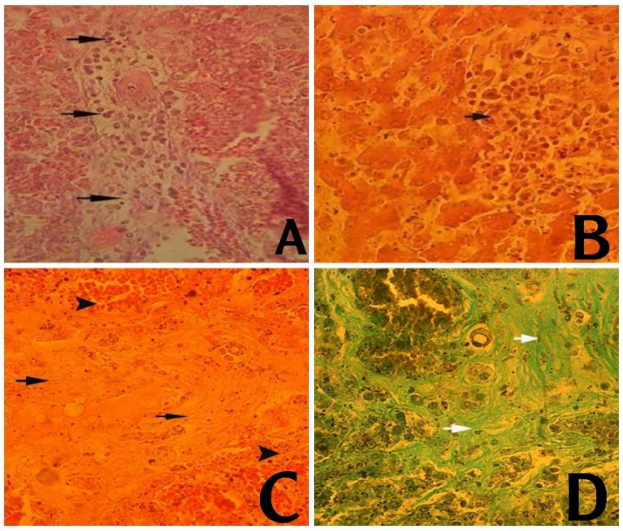

Fig. 1. **A**. Infiltration of mononuclear inflammatory cells with connective tissue between hepatocytes (random hepatitis- H&E*100) / **B**. Infiltration of mononuclear inflammatory cells between the centrilobular space around the central vein and portal space (bridging hepatitis- H&E*100) / **C**. Infiltration of connective tissue and destruction of hepatocytes around the portal space (periportal cirrhosis - Masson's trichrome*100) / **D**. Connection of hepatocytes and destruction of hepatocytes was observed around the portal space (periportal cirrhosis – Masson's trichrome*100).

Table 2. Liver lesions based on age.

Age / Lesions	Normal	Chronic hepatitis	Telangiectasia	Lipidosis	Congestion	Vasculitis	Cirrhosis
Under 1 year old	3	0	0	0	0	0	0
1- to 5-year-old	6	5	8	8	2	1	0
More than 5-year-old	2	17	9	6	1	1	1
Total	11	22	17	14	3	2	1

Discussion

Various studies have been done on CH in dogs. Compared to pet dogs, stray dogs seem to be more susceptible to different types of CH due to their habitant and feeding. Studies on the relationship between age, sex, and breed of pet dogs with CH have been conducted.

Poldervaart *et al*. (2008) showed that the prevalence of CH in different breed of dogs was 66.3%. In a study by Fuentealba *et al*. (1997), the highest incidence of CH among pure breed dogs was for Doberman pinscher breed, with a frequency of 17.6%. We only studied mixed breed-stray dogs, and the prevalence of CH in this study was 31.4%. Mandigers *et al*. (2004) revealed females in the Doberman pinscher breed are more likely to develop CH than males, and the disease is more common in dogs aged 4-7 years. Also, Bexfield *et al*. (2012) showed no association between sex and CH in the Skye terrier breed. Webb *et al*. (2002) believed that there isn't a relation between sex and CH in the Dalmatian breed. In this study, there was no statistically significant difference between the sex of stray dogs and CH, but there was a statistically significant difference between age and CH. In current study, 24.2% of stray dogs had telangiectasia which more than half of them were over five years old. On histopathological examination, the hepatic sinusoids of these dogs were dilated and hyperemic. According to studies, poisoning and metabolic factors can lead to telangiectasia (Moore and Thornton, 1983). Telangiectasia is also more common in older animals. In addition to telangiectasia, some dogs of this study had age-related lesions such as lipidosis and chronic cholangiopathy. Jubb *et al.* (2012) proved no relationship between the simultaneous occurrence of telangiectasia and these lesions. Lipidosis was also diagnosed in 14 dogs of this study which half of them were between one to five years old. Lipidosis is associated with age, toxic and metabolic damages. There were also cases in the study which simultaneously suffered from hepatic lipidosis and CH.

Also, Jubb *et al*. (2012) reported a relationship between chronic liver changes and fatty liver in older dogs. According to his study, the Yorkshire Terrier, Chihuahua, and Fox terrier were more susceptible to lipidosis than domestic dogs. However, no studies have been conducted on the susceptibility of stray dogs to lipidosis. Sterczer *et al.* (2001) showed that multiple factors could induce the development of CH. Many pet dogs are vaccinated against infectious agents causing CH such as leptospirosis and infectious canine hepatitis. It seems that these dogs are less likely to be infected with this infectious agent than stray dogs. It appears that stray dogs are more exposed to toxins such as aflatoxins than domestic dogs. Poulderveart *et al*. (2008) believed that the factors contributing to the development of CH in dogs are unknown.

In this study, three dogs suffered from chronic liver congestion. On histopathological examination of these specimens, the hepatic veins were dilated, and in some of them, red blood cells were observed on the plates of the liver cells. According to studies, congestive heart failure can be one of the causes of chronic liver congestion in dogs and cats. CH can progress to cirrhosis if left untreated, which is an irreversible stage of liver damage. In this study, one case had mild cirrhosis. Poldervaart *et al*. (2008) proved that CH progress to cirrhosis in 8.1% of untreated studied dogs at the next visit. As a result, the importance of determining the cause of CH becomes more apparent. Based on the history of dogs, finding the cause of CH in pure breed dogs seems to be much easier than in stray dogs.

There is less information about stray dogs' liver status than pet dogs. It is the first study of CH in stray dogs as author information. Pet dogs are more likely to visit veterinary centers, and they may have a lower incidence and progression of liver disease than stray dogs. Since the only definitive way to diagnose liver disease is liver biopsy, it is recommended that it should be performed in veterinary clinics in addition to clinical and laboratory examinations in cases of suspected liver disease. In future studies, the prevalence of all types of CH in pet dogs can be investigated compared to stray dogs.

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Conflicts of Interest

None declared.

References

Belgica, VDA (1997). Gastro-enterologica, undefined. (n.d.). Histological classification of chronic hepatitis. Europepmc. Org.

Bensignor, E (2009). Chronic hepatitis in dogs. Pratiq. Vet., 62: 20–22.

Bexfield, NH; Buxton, RJ; Vicek, TJ; Day, MJ; Bailey, SM; Haugland, SP and Watson, PJ (2012). Breed, age and gender distribution of dogs with chronic hepatitis in the United Kingdom. Vet. J., 193: 124–128.

Boomkens, SY; Penning, LC; Egberink, HF and Rothuizenl, J (2004). Hepatitis with special reference to dogs. A review on the pathogenesis and infectious etiologies, including unpublished results of recent own studies. Vet. Q., 26(3): 107–114.

Bunch, SE (1993). Hepatotoxicity associated with pharmacologic agents in dogs and cats. Vet. Clin. North Am., 23: 659–670.

De Groote, J; Desmet, V; Gedigk, P; Korb, G; Popper, H; Poulsen, H and Wepler, W (1968). Systematik der chronischen Hepatitis. Deutsche Medizinische Wochenschrift., 93: 2101–2102.

Fuentealba, C; Guest, S; Haywood, S and Horney, B (1997). Chronic hepatitis: A retrospective study in 34 dogs. Can. Vet. J., 38: 365–373.

Ishak, KG (2000). Pathologic Features of Chronic Hepatitis A Review and Update. Am J. Clin. Pathol.,. 113(1): 40-55.

John, KL; Roth-Johnson, DC and Dodd MEN (2014). THE NECROPSY BOOK: A Guide for Veterinary Students, Residents, Clinicians, Pathologists, and Biological Researchers.

Jubb, K; Kennedy, P and Palmer, N (2012). Pathology of domestic animals. retrieved from https://books.google.com/books?hl=en&lr=&id=qjFfJ8pcttMC&oi=fnd&pg=PP1&ots=oB3peLLGo&sig=G6qyyUVhqpW1z1HZExAVOnu4zvg

Mandigers, PJJ; Ingh, TSGAM; Bode, P; Teske, E and Rothuizen, J (2004). Association between liver copper concentration and subclinical hepatitis in Doberman Pinschers. J. Vet. Int. Med., 18: 647–650.

Moore, FM and Thornton, GW (1983). Telangiectasia of Pembroke Welsh Corgi Dogs. Vet. Pathol., 20: 203–208.

Patterson, JS (2008). Book review: pathologic basis of veterinary disease. Vet. Pathol., 45: 110–110.

Poldervaart, JH; Favier, RP; Penning, LC; Van Den Ingh, TSGAM and Rothuizen, J (2008). Primary hepatitis in dogs: A retrospective review (2002-2006). Wiley Online Lib., 23: 72–80.

Sterczer, Á; Gaál, T; Perge, E; and Rothuizen, J (2001). Endocrinology: Chronic hepatitis in the dog-a review. Vet. Q., 23: 148–152.

Watson, PJ (2004). Chronic hepatitis in dogs: A review of current understanding of the aetiology, progression, and treatment. Vet. J., 167(3): 228–241.

Webb, CB; Twedt, DC and Meyer, DJ (2002). Copper-associated liver disease in Dalmatians: A review of 10 dogs (1998-2001). J. Vet. Int. Med., 16: 665–668.