Van Vet J, 2019, 30 (3) 159-161

Van Veterinary Journal

http://dergipark.gov.tr/vanvetj

ISSN: 2149-3359 **Original Article** e-ISSN: 2149-8644

Morphologic and Histologic Observation of Red-Legged Partridge's (*Alectoris Chukar*) Liver

Zekeriya ÖZÜDOĞRU[1] Hülya BALKAYA[2] Hülya KARA[2] Derviş ÖZDEMİR[2]

[1] *Aksaray University, Faculty of Veterinary Medicine, Department of Anatomy, Aksaray, Turkey*
[2] *Ataturk University, Faculty of Veterinary Medicine, Department of Anatomy, Erzurum, Turkey*

Received: 01.04.2019 Accepted: 04.10.2019

ABSTRACT This study was aimed to investigate the liver of red-legged partridge in regards of morphologic and histologic features. In this study, the liver tissues of healty ten red-legged partridges were removed and fixed into 10% formaldehyde solution for 72 hours. After fixation, the liver tissues were dehydrated through a graded alcohol series to xylene and embedded in paraffin blocks. Obtained sections 5-7 µm thickness of sections from paraffin blocks were stained with Crossman Modified Triple staining and examined for histologic structures. In morphologic examining, the liver of red-legged partridges consisted of two lobes. In addition, histologic analysis showed that liver tissue was covered with a thick connective tissue and this connective tissue made up of many smaller units of liver cells called lobules. Hepatocytes were seen radially round and located around central vena, which consists of remark cords. The squamous cells and Kupffer cells were observed in the sinusoidal lining. In conclusion; the results from this study indicated that there were some structural differences from other bird species, but not functionally.

Keywords: *Liver, Morphology, Red-legged partridge*

ÖZ

Kınalı Keklik (*Alectoris Chukar*) Karaciğerinin Morfolojik ve Histolojik Yönden Incelenmesi

Bu çalışma ile kınalı keklik karaciğerinin morfolojik ve histolojik yönden araştırılması amaçlanmıştır. Çalışmada sağlıklı on adet kınalı keklikten karaciğer dokuları çıkarıldı ve 72 saat boyunca %10 formaldehit çözeltisinde fiksasyonları sağlandı. Fiksasyon işleminden sonra, karaciğer dokuları dereceli alkol ksilol serilerinden geçirilerek dehitratasyonları sağlandıktan sonra parafin bloklara gömüldü. Elde edilen parafin bloklardan 5-7 µm kalınlıkta kesitler alındı ve akabinde Crossman Modified Triple boyası yapıldıktan sonra histolojik yapılar incelendi. Morfolojik incelemede kınalı keklik karaciğerinin iki lobdan oluştuğu gözlendi. Histolojik analizde ise kınalı keklik karaciğer dokusunun kalın bir bağ doku ile çevrildiği ve bu bağ dokunun karaciğer hücrelerinden oluşan lobules adı verilen birçok küçük birimler şekillendirdiği belirlendi. Hepatositlerin yuvarlak oldukları ve central ven etrafında yerleşerek remark kordonlarını oluşturdukları görüldü. Sinozoid boşluklarda tek katlı yassı epitel hücreleri ve Kupffer hücreleri belirlendi. Sonuç olarak çalışma bulguları kuş türleri arasında bir takım yapısal farklılıkların bulunduğunu fakat fonksiyonel değişikliklerin olmadığını göstermiştir.

Anahtar Kelimeler: *Karaciğer, Kınalı keklik, Morfoloji*

INTRODUCTION

Liver is the largest gland in the body and it can be regarded as the central organ in the maintenance of energy supply (Dellman and Brown 1979; Katz 1992; Dursun 1994; Bahadır and Yildiz 2005). It consists of two lobes as known right liver lobe and left liver lobe (Dursun 2002). The liver is digestive system organs and located in right hypochondriac region upper abdomen, which plays many vital functions. The liver is one of the most important organs gland and largest intestine gland. Many vital functions are performed in the liver, like red blood cells production, glycogen storage, plasma and protein synthesis, hormone production and detoxification. Many enzymes are also made, intensified, stored, released and mixed into the blood in case of damage in the liver in hepatocytes (Mert 1997; Dolar 2002; Sarkarati and Douster 2012; Guyton and Hall 2013). Also, it has many functions in the body including metabolism of proteins, fats, carbohydrates and digestive functions, producing secretion of bile (Dibner and Richards 2004; Klein and Enders 2007; Hunigen at al. 2016). The vasculogenesis of

Corresponding author: Hülya KARA
Atatürk Üniv., Veteriner Fak., Anatomi AD, Erzurum, Türkiye. e-mail: h.goktas@atauni.edu.tr

avian liver appears throughout differentiation of the portal vein, the hepatic artery, and the sinusoids (Deruiter et al. 1993).

The liver of avian is surrounded with a peritoneal layer of mesothelium and it has some differences from mammalian's liver such as absent connective tissue septa between lobules except in portal area (Schmidt et al. 2003). Also, avian hepatocytes are polyhedral cells with a large rounded, oval and centrally located nucleus, the sheets of hepatocytes are separated by sinusoids (Dyce at al. 2002; Faraj and Al-Bairuty 2016).

Normal gross anatomy and histology of red-legged partridge's liver is necessary for revealing of structural and functional differences between species. Therefore, the present research has been designed to understand morphologic and histologic features of red-legged partridges.

MATERIALS and METHODS

In this study, materials (liver tissues of ten red-legged partridges) from the thesis study which name is "Comparative Macroanatomical Study on the Lumbosacral Plexus of the Magpie (Pica pica) and Chukar partridge (Alectoris chukar)", which were obtained from Amasya Chukar Patridge Hutchery, were used.

Abdominal cavity of killed birds was opened and liver tissues were removed and fixed into 10% formaldehyde solution for 72 hours. After fixation period, all liver tissues were washed under tap water and dehydrated through a graded alcohol series to xylene and embedded in paraffin blocks. Obtained sections 5-7 µm thickness of sections from paraffin blocks were stained with Crossman Modified Triple staining and examined for histologic structures and imagined with a light microscope (Nikon Eclipse i50, Japan).

RESULTS

In the anatomic examining, the liver of red-legged partridges consisted of two lobes as right and left liver lobes (Figure 1-C), replaced in right hypochondriac region. Proventriculus, gizzard, duodenum, gall bladder and spleen were in the neighborhood (Figure 1-A, B). The left liver lobe was divided by incisura interlobaris as lobus hepatis sinister lateralis and lobus hepatis sinister medialis. On the other hand, right liver lobe was bigger than the left liver lobe (Figure 1-C). It was observed that there were traces (impressio proventricularis, impressio ventricularis, impressio duodenalis, fossa vesical fellae, impressio lienalis) of proventriculus, gizzard, duodenum, gall bladder on visceral surface of liver (Figure 1-D). In addition, histologic analysis showed that liver tissue was covered a thick connective tissue and this connective tissue made up of many smaller units of liver cells called lobules (Figure 2-A). Hepatocytes were seen radially round and located around central vena, which consists of remark cords, which were usually arranged as two cell thickness between the liver sinusoids (Figure 2-B). The squamous cells and Kupffer cells were observed in the sinusoidal lining. The parenchyma tissue covered all central zones which narrowed towards the peripheries. The portal area consisted of the inter lobular connective septa which composed the branches of the portal vein, branch of hepatic artery and usually bile ducts (Figure 2-C, D). The inter-lobular capillaries penetrate the lobule and pass through the sinusoidal vessels, which are positioned between the liver's lobules (Figure 2-E). The bile duct was lined by simple cuboidal epithelium, while the hepatic artery lined by endothelial cells of the simple squamous epithelium (Figure 2-F). Also, hepatocyte diameter is twenty-five microns in histomorphometric measurements.

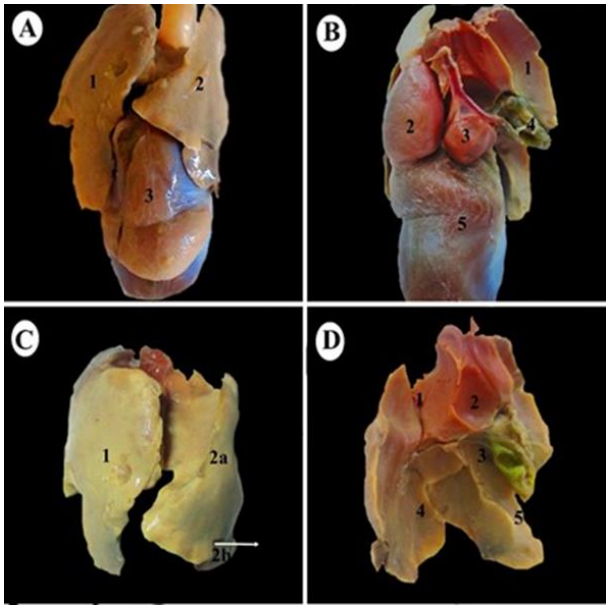

Figure 1. Macroskobic views of red-legged partridge's liver. A: Parietal surface of red-legged partridge's liver, (1); right liver lobe, (2); left liver lobe, (3); gizzard. B: Neighbor organs of red-legged partridge's liver, visceral surface, (1); right liver lobe, (2); proventriculus, (3); spleen, (4); gall bladder, (5); gizzard. C: Lobes of red-legged partridge's liver, parietal surface, (1); right liver lobe, (2a); lobus hepatis sinister lateralis, (2b); lobus hepatis sinister medialis, (Arrow) (ok); incisura interlobaris. D: Traces of organs on the red-legged partridge's liver, visceral surface, (1); impressio proventricularis, (2); impressio lienalis, (3); fossa vesicae fellae, (4); imperssio ventricularis, (5); impressio duodenalis.

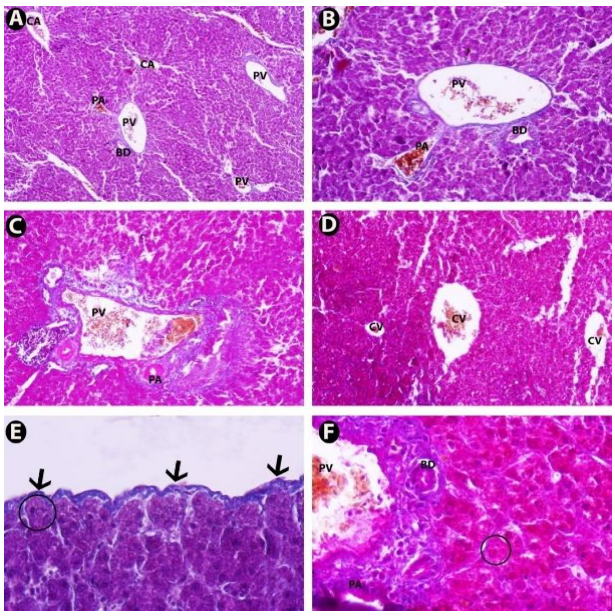

Figure 2. Histologic wiec of red-legged partridge's liver, Crossman Modified Triple staining. A: lower magnification view of liver, (BD); bile ducts, (CA); central artery, (PA); portal artery, (PV); Portal vena. B: Portal area of red-legged partridge's liver, (BD); bile ducts, (PA); portal artery, (PV); Portal vena. C: Interlobular septa of liver

tissue, branches of the portal vein, (PA); portal artery, (PV); Portal vena. D: Central vena of red-legged partridge's liver, (CV); Central vena. E: Capsule of red-legged partridge's liver, (Arrows); liver capsule, (Circle); hepatocyte as polyhedral in shape. F: Higher magnification of portal area in red-legged partridge's liver, BD); bile ducts, (Circle); hepatocyte as polyhedral in shape, (PA); portal artery, (PV); Portal vena.

DISCUSSION and CONCLUSION

Although many studies carried out on this avian species, the liver is still a new topic in the histomorphological field, in order to better understand the histomorphology of the avian species. The present study had revealed that the histologic and morphologic structure of red legged partridge's liver were similar in many avian species reported previous studies (Akiyoshi and Inoue 2004; Dibner and Richards 2004; Iqbal et al. 2014). However, there were some differences among species such as species-specific metabolic activities, and adaptation changes. The anatomical analysis showed that the liver of the red legged partridge positioned in the right and left hepatoperitoneal cavity and consisted of two lobes. This result similar with previous reports (Dyce et al. 2002; Al-Aaraji 2015) which attributed that liver position, sizes and circumference of right and left lobe of liver in red legged partridges were due to differences in age, breeds, quality of feeds and environment conditions. Similar with previous poultry studies (Whitlow 2000; Iqbal et al. 2014; Tasci et al. 2018), our results were confirmed that the right liver lobe of the poultry liver was bigger than the left liver lobe, which were composed of incisura interlobaris as lobus hepatis sinister lateralis and lobus hepatis sinister medialis. Also, left liver lobe was a large lobed gland and coved by a thin capsule of continuous connective tissue, this tissue was subdivided the liver into lobes and provide physical support.

In our histologic analysis, the red legged partridge's liver covered by a thin connective tissue that made up smaller hepatic lobes and hepatocytes were seen round and centrally replaced nuclei. Although, this results showed the similar structure with chicken (Iqbal et al. 2014) and quail (Deruiter et al. 1993), turkey (Al-Aaraji 2015) and domestic fowl (Akiyoshi and Inoque 2004), the hepato-sinusoidal arrangement has been largely attributed metabolic functions including synthesis of bile, plasma proteins, fibrinogen and prothrombin and the regulation of blood glucose and lipids. Although, similar to our results, Quentin (Quentin et al. 2005) has showed that the reticular fiber supported the liver cords and elastic fibers supported in capsule and vessels in the chickens, Das et al. (2018) reported that the hepatic lobules were unclear (except the hilum) due to a lack of periobular connective tissue. The general histological structure of the legged partridge's liver was mainly similar to those of other avian species. In conclusion, the comparative histomorphological study of avian species was less carried out by previous research. This type of researches provides various data about differences or similarities in the many fields. This analysis has demonstrated many similarities and some functional variations in the avian of liver histologic architecture. The results indicated that there were some structural differences from other bird species, but not functionally, contributing to different studies about the histomorphology of liver in the avian species.

REFERENCES

Akiyoshi H, Inoue A (2004). Comparative histological study of teleost livers in relation to phylogeny. Zool Sci, 21, 841-850.

Al-A´Aaraji AS (2015). Study of some anatomical and histological characteristics in liver of male indigenous turkey (Meleagris gallopavo). Bas J Vet Res, 14, 150-157.

Bahadır A, Yıldız H (2005). Veteriner Anatomi II, İç Organlar. 1st ed., 51-53, Ezgi Kitabevi, Bursa.

Das S, Dhote BS, Sinha S (2018). Micrometrical studies on the gizzard of Kadaknath fowl. Int J Avian Wildlife Biol, 3, 259-260.

Dellman HD, Brown ES (1979). Textbook of Veterinary Histology. 985, Lea and Fibger, Philadelphia.

Deruiter MC, Poelmann RE, Mentink MM, et al. (1993). Early formation of the vascular system in quail embryos. Anat Rec, 235, 261–274.

Dibner JJ, Richards JD (2004). The digestive system: Challenges and opportunities. Missouri J Appl Poult Res, 13, 86–93.

Dolar E (2002). Klinik Karaciğer Hastalıkları. 1st ed., 133-146, Nobel&Güneş Tıp Kitabevi, Ankara.

Dursun N (1994). Veteriner anatomi II. 10th ed., 63-69, Medisan Yayınevi, Ankara.

Dursun N (2002). Evcil Kuşların Anatomisi. 3rd ed., 68-70, Medisan Yayınevi, Ankara.

Dyce K, Sack WO, Wensing GJG (2002). The digestive system. In "Textbook of Veterinary Anatomy". 5th ed., 806-811, WB Sounders Co USA.

Faraj SS, Al-Bairuty GA (2016). Morphological and histological study of the liver in migratory starling bird (Sturnus vulgaris). MSJ, 27(5), 11-16.

Guyton AC, Hall JE (2013). Tıbbi Fizyoloji. 12th ed., 937-942, Nobel Tıp Kitapevi, İstanbul.

Hunigen H, Mainzer K, Hirschberg RM et al. (2016). Structure and age-dependent development of the turkey liver: a comparative study of a highly selected meat-type and a wild-type turkey line. Poult Sci, 95(4), 901-911.

Iqbal J, Bhutto AL, Shah MG et al. (2014). Gross anatomical and histological studies on the liver of broiler. J Appl Environ Biol Sci, 4, 284-295.

Katz NR (1992). Metabolic heterogeneity of hepatocytes across the the liver acinus. J Nutr, 122, 843-849.

Klein RM, Enders GC (2007). In "Anatomy, Histology, And Cell Biology Pretest Tm Self-Assessment and Review", 3rd ed., 29-31, McGraw-Hill Companies, New York.

Mert N (1997). Veteriner Klinik Biyokimya. 230-240, Ceylan Matbaacılık, İstanbul.

Quentin M, Bouvrel I, Picard M (2005). Effects of crude protein and lysine contents of the diet on growth and body composition of slow-growing commercial chickens from 42 to 77 days of age. Anim Res, 54, 113-122.

Sarkarati F, Doustar Y (2012). The frequency of liver lesions of broilers slaughtered in Tabriz abattoir. Ann of Biol Res, 3, 3439-3443.

Schmidt RE, Reavill DR, Phalen DN (2003). In "Pathology of pet and aviary birds". 1st ed., 67-68, Blackwell Publishing Company, Lowa State Press, Lowa.

Tasci SK, Deprem T, Bingol SA, Akbulut Y (2018). The anatomical and histological structures of Buzzard's (Buteo buteo) small intestine and liver, and immunohistochemical localization of catalase. Kafkas Üni Vet Fak Derg, 24.

Whitlow GG (2000). In "Gastrointestinal Anatomy and Physiology (Avian Physiology)". 5 th ed., 299-304, Academic Press, Honoiula, Hawaii.