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Histological Study of the African Ostrich liver and Anatomical Comparison of it with Poultry Liver

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ABSTRACT: The histological and anatomical structure of the livers of twenty ostrich and anatomical structure of twenty poultry were checked. The liver of ostrich is situated further cranially than in poultries and extends cranial to the heart, lying mainly on the sternum and it is light brown colored. Our results regarding the liver of ostrich revealed the presence of two lobes: a left lobe, subdivided into three lobes: caudodorsal lobe, caudoventral lobe, left intermediate lobe and a right undivided lobe. The poultry liver has two lobes. The right lobe is larger than the left lobe. It is positioned ventral and caudal to the heart (as there is no diaphragm). It is almost associated to the proventriculus and spleen. It has a thin capsule and unclear lobation. It is dark brown colored (except just after hatching where it is yellow).

Keywords: African Ostrich, caudodorsal lobe, caudoventral lobe, left intermediate lobe.

INTRODUCTION

The ostrich are used principally for the production of meat of highest protein value (Aarons, 1994), and lowest cholesterol level (Anon, 1998) as well as ostrich are used for the production of leather and feather (Horbanczuk *et al.,* 1998). Papers dealing with the comparison of the ostrich and poultry liver were found to be rare (Bezuidenhout, 1986). Compared with those carried on comparison of the poultry and many other domestic birds liver for example goose and turkey (Hassouna *et al.,* 2001), pigeon and fowl (Ibrahim et al., 1992), ducks (Lakshmi *et al.,* 1975) as well as quail (Zayed *et al.,* 2004 and El-Zoghby, 2005). Therefore this study was done as a trial to comparison of the ostrich and poultry liver and to establish a basic data that might be required for further studies in the field.

MATERIALS AND METHODS

Twenty ostrich liver and twenty poultry liver were collected from slaughterhouse of the city of Zabol. In first the ostrich livers were examined separately.

Length, width and thickness of the livers were measured by caliper and ruler and results were recorded and liver weight was measured. Then the ostrich liver lobes were examined attentively.

Also the ostrich livers in terms of the presence of gallbladder and histologically were evaluated. And all the above steps to check the anatomy and morphology of poultry liver were done. Then all the results obtained were compared together.

RESULTS

The liver was the largest gland in the ostrich body. The average weight of ostrich liver was 1490 gr. It was coated by a thick CT capsule. The ostrich liver was limited by the heart, gizzard, sternum and oesophagus and proventriculus cranially, caudally, ventrally and dorsally, respectively. The caudal vena cava ran through the dorsal part of the right lobe of the liver. Four hepatic lobes were recognized. The left lobe was divided into a small caudodorsal lobe, a large caudoventral lobe and a small left intermediate lobe.

Table 1: Dimensions of the ostrich liver.

Name	Length (cm)	Width (cm)	Thickness (cm)
Left lobe	24	14.5	6
Right lobe	23	14.2	7
Caudoventral lobe	14.4	13	6.9
Intermediate lobe	9	10	5.5
Caudodorsal lobe	10.4	7	4.4

The right lobe was larger than the left, but undivided. There was no gall bladder observed in the ostrich. The liver is the largest gland in the poultry body. The poultry liver consists of two lobes: right lobe and left lobe, right lobe undivided and is the larger than left lobe but the left lobe is divided into two parts. Right lobe of the liver in the chicken has a gallbladder but left lobe no gallbladder. Therefore comparison of ostrich liver and poultry liver show differences in three levels: size, lobulation and presence of gallbladder.

DISCUSSION

The ostrich liver was a large gland in this birds body (Bezuidenhout, 1986). this gland coated by a thick CT capsule and its parenchyma was formed of two cells thick hepatic cords as that of other birds (Elias *et al.*, 1952, Purton, 1969, Kapp *et al.*, 1970 and Fukuda, 1976). The capsule coated by thin sheet of mesothelial cells with acidophilic cytoplasm and basophilic nucleus. This capsule called Glisson's capsule as that of the poultry liver (Bacha *et al.*, 2000).

The lobulation of the ostrich liver was latent because the ill distinct hepatic septa as that of most mammals except camel and pig and whole domestic birds (Purton, 1969, Hodges, 1972, Hodges, 1974, Verma *et al.*, 2000 and El-Zoghby, 2005).

The classic hepatic lobule in poultries, which is centered on the terminal branch of the hepatic vein (central vein), and is surrounded by the portal tracts is not sharply separated off from neighboring hepatic lobule as that of the pig and camel. So the hepatic lobules are tough to identify histologically (King *et al.*, 1979).

The cytoplasm of the hepatocytes was emerged foamy. This offer may be due to deposition of lipid globs which also was recorded in the hepatocytes of the quail liver (Zayed *et al.*, 2004 and El-Zoghby, 2005). These lipid globs in addition to the hepatocytes glycogen could be considered as source of the energy for the bird in case of starvation or early pre hatching life (BreaziIe, 1971, Fanesi *et al.*, 1980 and Zayed *et al.*, 2004).

The internal organization of the liver of poultries closely adheres to the typical vertebrate pattern (Elias *et al.*, 1952 and Purton, 1969). Hepatic parenchyma was combined of clusters and cords or tubules of polyhedral cells separated by a sinusoidal grate. The hepatic cells organization is mainly similar in most mentioned bird species (Elias, 1955). Hepatocytes had spherical, euchromatic nuclei with one or more nucleus.

The vonkupffer cells located between the endothelial cells of the sinusoids between the hepatic cords with acidophilic cytoplasm and large basophilic nucleus. Kupffer cells are macrophages that are attached to the luminal surface or inserted in the endothelial lining of hepatic sinusoids. In this site, Kupffer cells play a key role in host defense by removing foreign, toxic and infective substances from the portal blood and by releasing beneficial mediators. Under some situations, toxic and vasoactive substances also are released from Kupffer cells which are thought to play a role in a variety of liver diseases (McCuskey *et al.*, 1990).

Kupffer cells, morphologically different from the endothelial cells, bulged strongly into the sinusoidal lumen. while with many microvillus pseudo pods, they were stellate in appearance. They were fixed to the endothelial lining by small junctional areas which occurred between the Kupffer cell body and the "cytoplasmic processes" of the endothelium.(Tanuma *et al.*, 1978).

The portal triad were consisted of hepatic artery, portal vein, bile duct also lymph vessels as that of the other domestic birds, however its distribution are less numerous in comparative to other poultries and mammals (Elizabeth *et al.*, 2001). Both of the hepatic vein and hepatic artery increase through the liver in opposite directions to each other between the center and periphery of the organ.

Fig. 1. Position of liver in ostrich body.

Fig. 2. African ostrich liver and measuring device.

From these vessels two system of branching portal and hepatic veins arising. The terminal portal veins inosculate with the terminal hepatic veins and linked to the hepatic veins by short grate of sinusoids. Branch of hepatic artery and bile duct transmission alongside the terminal portal veins. (King *et al.*, 1979).

The lining epithelium of the blood sinusoid was endothelial and vonkupffer cells, this finding was similar in all poultries. These cells were originated from the liver mesothelial cells which differentiated to both endothelial and vonkupffer cells that lining the blood sinusoid (Mclelland, 1975).

Numerous patches of lymphocytes were noticed between the hepatic cords and around the portal triad which consisted of small and large lymphocyte cells and surrounded by reticular fibers. This may attribute to a focal area of lymphocytes as immune patches as that recorded in the fish kidney (Mclelland *et al.*, 2001).

Between the species in which the gall bladder has been reported to be absent are the majority of pigeons, many parrots and the ostrich (King *et al.*, 1984).

Fig. 3. Absence of gallbladder in ostrich liver.

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