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Research Article

HISTOMORPHOLOGY OF SPLEEN IN NON IMMATURE IRANIAN CAMEL *CAMELUS DROMEDARIUS*

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ABSTRACT
Spleen is one of the largest lymphoid organ in the body, and the most important organ of immunological defense for blood invasion. In this research the histological structure of spleens from 5 females and 5 males non immature Iranian camels was studied. Paraffin sections after dehydration, clearing, embedding and blocking stained with haematoxylin and eosin (H&E). The trabeculae extended from the capsule and branched, it divided the spleen area to many parts. Microscopic studies showed white pulp area was large, irregular shape, and the (PALS), lymph follicles and the marginal zone were very clear. The average thickness of splenic capsule thickness, splenic trabeculae thickness, white pulp and lymphoid follicles was (131.43±6.24µm), (113.5±6.33 µm), (691.33±5.21 µm), (245.19±3.82 µm). This research showed that histomorphology of the spleen in non immature Iranian camel had some similarity and differences with another camel species that studied by another researchers and reported.

Keywords*: Histomorphology, Spleen, Iranian Camel*

INTRODUCTION
Iranian camel (*Camelus dromedarius*) also lives in Arabian countries dessert and Africa. Spleen is one of the largest lymphoid organ in the body, and the most important organ of immunological defense for blood invasion (Pabst, 1993). The blood parasite, *Trypanosoma evansi*, is the most important disease to affect the Camel (Ngeranwa *et al*., 1993). Generally, blood parasites are removed and phagocytosed in the spleen (Chen & Weiss, 1973). Immunohistochemical characterization of the splenic compartments has been performed in humans (Inderbir, 2006), bovine (Deleverdier *et al*., 1996; Keresztes *et al*., 1996), sheep (Gupta *et al*., 1998) and rats (Brown and Dellmann, 1976). Detailed information about the splenic cellular composition is important for the understanding of its immunological role and for the analysis of several diseases, especially trypanosomosis in camels which causes their main health disorders (Ngeranwa *et al*., 1993; Usende *et al*., 2014). The aim of this study was to examine the different histological compartments and developmental biology in the spleen of non immature Iranian camel (*Camelus dromedarius*).

MATERIALS AND METHODS
The histological structure of spleens from 5 females and 5 males non immature Iranian camels was studied. Fresh spleens were collected on the animals directly after slaughter at the slaughter house of Sosangerd city in Iran and were fixed in 10% formalin buffer. All specimens were prepared for paraffin sections as dehydration, clearing, embedding and blocking and stained with haematoxylin and eosin (H&E) (Bacha& Linda, 2000), The histological work was achieved in our Laboratory of Physiology and Histology at the College of Veterinary Medecine, Ahvaz University of Shahid Chamran. The histological structure of spleens was examined, the splenic white pulp diameter, the lymphoid follicles diameter, thickness of the capsule and trabeculae of all samples were measured under a microscopy using micrometer eye piece (Onkar and Govardhan, 2013).

RESULTS
In external layer of spleen, there was a capsule made of connective tissue surrounded the spleen around and it was variable in its thickness outer layer, inner layer with smooth muscles cell and trabeculae. The outer layer, consisted mainly of connective tissue including collagen and smooth muscle cells. The inner

layer was composed predominantly of smooth muscle cells which seem parallel along in the longitudinal section. The capsule was variable in its thickness between the different areas. The trabeculae extended from the capsule and branched, it divided the spleen area to many parts.The white pulp area was large, irregular shape, and the (PALS), lymph follicles and the marginal zone were very clear.The lymphoid follicles were spherical in shape. The cross section of the PALS contained arteries that branched in PALS. The average thickness of splenic capsule thickness, splenic trabeculae thickness, white pulp and lymphoid follicles was (131.43±6.24µm), (113.5±6.33 µm), (691.33±5.21 µm), (245.19±3.82 µm).

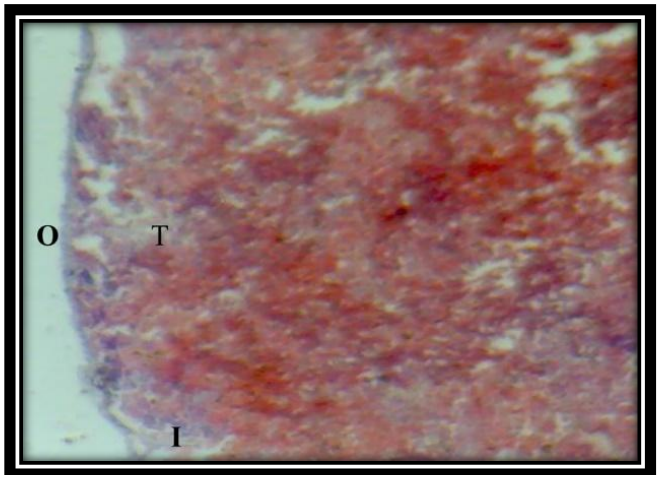

Figure 1: Capsule was variable in its thickness outer layer (o), inner layer (I) with smooth muscles cell and trabeculae (T) (H&E, 4X).

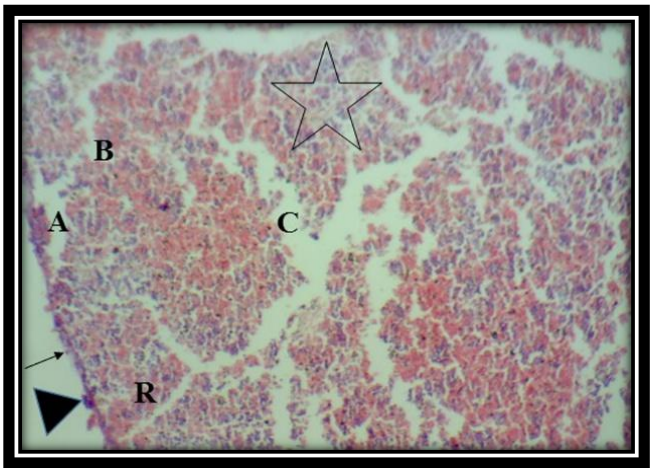

Figure 2: Partially thick capsule surrounding the spleen around (arrow), mesothelial cells (arrow head), sub capsular space (A); cortical space (B), medullar space (C), Red pulp (R), white pulp (star) and splenic follicle (F) (H&E, 4X).

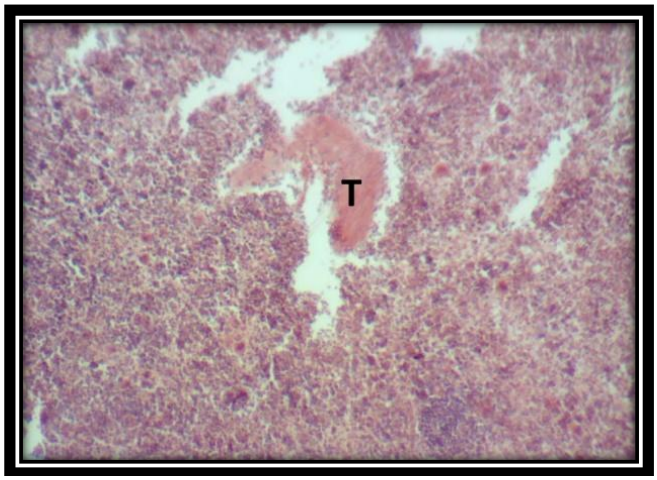

Figure 3: Trabeculae (T) in splenic parenchyma (H&E, 4X).

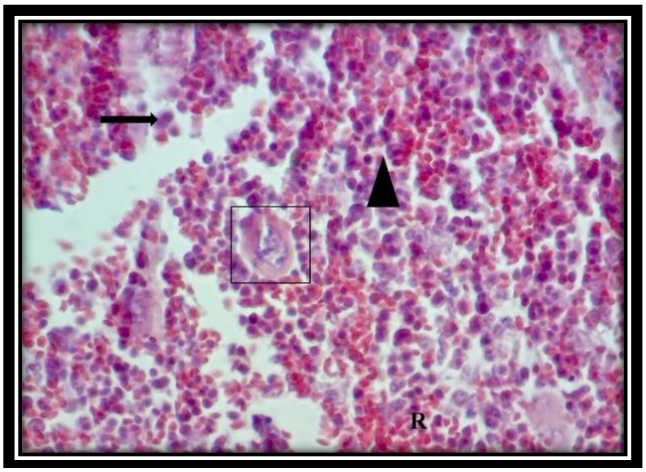

Figure 4: White pulp containing RBC (R), macrophage (arrow), plasma cell (squar) and lymphocytes (arrow head) (H&E, 4X).

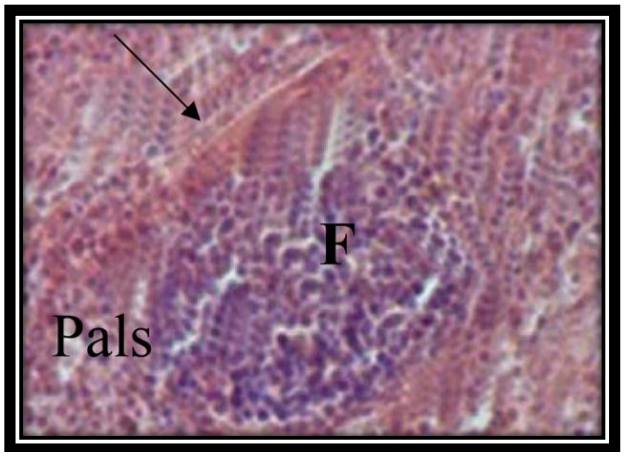

Figure 5: White pulp composed of PALS , a lymph follicle (F) and artery(arrow) (H&E, 4X).

DISCUSSION

This study showed spleen of non immature camel is sinusal type that can store blood and the thick muscular capsule and trabeculae pumped the stored blood according to the body's need. Also the capsule of the camel spleen was thick and divided into an outerconnective tissue layer and an inner parallel smooth muscle layer. Cesta (2006) described that the capsule is composed of dense fibrous tissue, elastic fibers, and smooth muscle and showed that the outer most layer of the splenic capsule is composed of mesothelial cells, While in cow and hours they have only 2-3 layers of smooth muscle cells are oriented perpendicular to each other (Khalel, 2010). Mebius and Kraal (2005) showed that the capsule of spleen in horse consists of an outer thick connective tissue and an inner thinner smooth muscle layer. In the pig, the capsule is formed mainly from smooth muscle, while in the dog and cat smooth muscle cells make up about 2/3 of the capsule thickness. In human spleen, the capsule is composed of connective tissue with little smooth muscle cells (Cesta, 2006; Ikpegbu *et al*., 2014). The thickness of the capsule layers, trabeculae and concentration of smooth muscles are very important to make strong contraction when the body need the blood. The white pulp of spleen is sub divided into the PALS, the follicles, and the marginal zone. It is composed of lymphocytes, macrophages, dendrite cells and plasma cells, arterioles, and capillaries in a reticular framework similar to that found in the red pulp (Samuelson, 2007). In the camel the white pulp was demarcated by reticular fibers that is clearly divided the compartments of the white pulp into PALS and lymphoid follicles (Zidan *et al*., 2000). In a study about spleen, it has been showed that PALS harbored T lymphocytes, and the marginal zone contained few macrophages and the per arterial macrophages sheath contained many more macrophages than the marginal zone (Samuelson, 2007). AL-Busadah (2007) showed that lymphocytes were the predominant leucocytes in blood of three breeds of Arabian camel. Therefore, the large area of white pulp and entity of the tortuous of artery which that supply the PALS area by blood may be play essential role in production blood antibodies.

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