HISTOLOGICAL STUDY OF THE SPLEEN IN GUINEAFOWL (NUMIDA MELEAGRIS)

Lamees Ezaldeen Mohammed, Nuha Ibrahim Mohammed and Abdulkarim Jafar Karim

Department of Anatomy, Histology and Embryology, College of Veterinary Medicine, University of Baghdad, Baghdad - Iraq.

Corresponding author; karimjafar59@yahoo.com

Abstract

Spleen plays a crucial role in immunity. The current investigation was performed on the spleen of guineafowl to study its histopathological changes in spleen morphology and activity (John, 1994).

The splenic paranchyma plays a crucial role in immune responses such as exposure to blood-born antigen (Brendolan, 2007; Zhang et al., 2015). Following an antigen penetration, an array of functional and morphological changes occurs in the white pulp. Conspicuous changes in the germinal centers are among the most variable structures in the spleen (Graczyk et al., 2003). The ellipsoids may act as an antigen trapping zone of the spleen (Biro et al., 2011). The ellipsoid, or Schweigger-seidel sheath, is a specialised capillary segment in the spleen of chicken (Kasai et al., 1995). These ellipsoids may act as an antigen trapping zone of the spleen (Biro et al., 2011). The presence of reticular cells and macrophage helps the ellipsoids to regulate the movement of cells and antigens between the blood vessels and the white pulp (Colombatti et al., 1989).

Immunity of birds varies towards various diseases, e.g. Salmonellosis (Al-Khatib and Al-Quitby, 2005). Lymphocyte depletion accompanying stress is a predisposing factor for many diseases (Pope 1991). Spleen plays a crucial role in humoral and cellular immunity. Spleen hist-architecture is the first view for the availability of lymphocytes that are mainly resposable for immunity (Yabe et al., 2017). Therefore, the present study aimed to investigate the cytoarchitecture of spleen in Guineafowl.

Materials and Methods

Ten adult clinically healthy female guineafowl (12-15) months, obtained from Baghdad local markets were used in this investigation. The study was carried out during April 2019 in the Department of Anatomy and Histology, Faculty of Veterinary Medicine, University of Baghdad, and approved by the Animal Care and Use Committee (ACUC approval no. 1901/26 March 2019). The birds were euthanized by slaughtering and the spleen was examined and collected. Around 1 cm² of spleen was fixed in 10% neutral buffered formaldehyde solution, dehydrated in graded series of alcohols, cleared in xylene and embedded in paraffin. The tissues were sectioned at 6 µm with rotary microtome, mounted on glass slides and stained with Haematoxylin and Eosin, Masson Trichrome and Van Gieson stains. Slides were examined by light microscope (Bancroft and Stevens, 2007).

Result and Discussion

The present study revealed that spleen of guineafowl was surrounded by a thick connective tissue capsule that was composed of collagen bundles and few elastic fibers with muscle cells at the inner most part of the capsule. The external surface of the capsule was covered by a thin layer of flattened mesothelium. Trabeculae extended from the capsule through parenchyma (Fig. 1, 2, 3). Similar findings were reported in chicken (Kannan et al., 2015a; Reshag and Hamza, 2017) and in guineafowl (Onyeanusi (2006)).

The paranchyma of the spleen was observed to have white pulp and red pulp. The white pulp appeared as islands enclosed by red pulp (Fig. 2, 3, 4). Similar finding was reported by Zhang et al. (2015) in chicken and Baishya and Bhattacharyya (2012) in adult indigenous fowl. The white pulp was made up of network of reticular cells and reticular fibers within which small, medium and large lymphocytes and plasma cells were diffusely distributed. It contained sheathed arteries and lymphatic nodules (Fig. 2, 4). The lymphoid tissue surrounded the arteries and arterioles as sheaths of small lymphocytes or as clusters of large and small lymphocytes, lymphoblasts and reticular cells. Round or oval lymphoid nodules were also observed (Fig. 4, 5). This finding concurs with Kannan et al. (2012) in chicken and Hamza and Balash (2005) in quail.

The periarterial lymphatic sheath (PALS) was observed as a diffuse lymphatic sheath adjacent to the central artery (Fig. 5, 6). This finding is similar to that stated by Kannan et al. (2015 b) in chicken. It consists of closely packed small lymphocytes with reticular cells. The arterioles and capillaries form the peripheral of the white pulp. The red lymphocytes with reticular cells. The arterioles and capillaries form the peripheral of the white pulp. The red
pulp were found to be surrounded by a meshwork of reticular cells, muscle cells and macrophages with reticular fiber which continued into the red pulp and formed the ellipsoids or sheathed capillaries (Fig. 6, 7). The sleeve sheath, schweigger-seidel sheath, run over the entire length of the penicillar capillary from the central artery including the branching area at the red pulp. Similar observation was reported by Biro et al. (2011) in chicken.

The red pulp of the spleen composed of anastomosing sinuses lined by endothelial cells. These sinuses were found to be separated from each other by the pulp cords. The network of the sinuses filled with erythrocytes, lymphocytes and granulocytes (Fig. 4, 5). Similar finding was recorded by Kasai et al. (1995) in chicken. The pulp cords consisted of reticular cells, lymphocytes of various size, erythrocytes, macrophages, granulocytes with plasma and mast cells. This finding is similar with that of Onyeanusi (2006) in guineafowl, Hamza and Balash (2005) in European quail, and Venkatesan et al. (2005) and Kadam et al. (2019) in Japanese quail.

**Conclusions**

It was concluded that spleen of guineafowl resembles the criteria of spleen in other birds with no any variation.

**Author Contributions:** All authors have been involved in Conceptualization, methodology, developing, writing, and commenting on the manuscript. All authors read and approved the final manuscript.

**Funding:** This research was funded by the College of Veterinary Medicine, University of Baghdad.

**Acknowledgments:** The authors are grateful to Dr Dhiya A. Abood for the technical support.

**Conflicts of Interest:** The authors declare no conflict of interest.

---

Fig. 1: Photomicrograph of the spleen (Guineafowl) showing: (a) Capsule, (b) Connective tissue trabeculae (Van Gieson, 40x).

Fig. 2: Photomicrograph of the spleen (Guineafowl) showing: (a) Capsule, (b) Trabeculae, (c) White pulp, (d) Red pulp, (e) Lymphatic nodule (H&E, x40).

Fig. 3: Photomicrograph of the spleen (Guineafowl) showing: (Sm) smooth muscle fibers, (T) trabeculae, (arrow) mesothelial cells (Masson Trichrome, x100).

Fig. 4: Photomicrograph of the spleen (Guineafowl) showing: (a) Capsule, (b) red pulp & venous sinus, (c) white pulp, (d) arterioles (H&E, x100).

Fig. 5: Photomicrograph of the spleen (Guineafowl) showing: (a) White pulp, (b) Red pulp, (c) Sheathed artery, (d) erythrocyte, (e) granulocyte (H&E, x400).

Fig. 6: Photomicrograph of the spleen shows: (a) Central artery, (b) Ellipsoidal lymphatic tissue (H&E, x400).
Fig. 7: Photomicrograph of the spleen shows; Red pulp and ellipsoidal lymphatic tissue with arterial vessel inside lined with endothelium (Arrow) (H&E, x400).

References


