Full Length Research Paper

Post-natal development of prescapular lymph node in One-Humped Camel (Camelus dromedarius): A Histological study

Bello, A.*1, Umaru, M.A.3, A. Shehu, S.A.1, Suleiman, M. H.2, Baki, A.S.4 and Muhammad, S.5

1Department of Veterinary Anatomy, Usman Danfodiyo University, Sokoto.
2Department of Veterinary Anatomy, Ahmadu Bello University Zaria.
3Department of Theriogenology and Animal production, Usman Danfodiyo University, Sokoto.
4Department of Microbiology, Faculty of Science, Usman Danfodiyo University, Sokoto.
5Veterinary Teaching Hospital, Usman Danfodiyo University, Sokoto.

ABSTRACT

A histomorphometric study was conducted on the prescapular lymph nodes of thirty camels (15 each from male and female) collected from Sokoto metropolitan abattoir over a period of three weeks at different post-natal ages. The approximate age of the camels was estimated using rostral dentition. Histologically, the lymph nodes were surrounded by a connective tissue capsule which increases in thickness with advancement in age in both male and female animals. Thick trabeculae passed from the capsule to the substance of the node and divide the node into many lobes. From the inner surface of the capsule and the thick trabeculae, thin trabeculae originated and passed into the parenchyma dividing the lobes into many lobules. Blood and lymphatic vessels pierced through the capsule into the nodes in all ages but are larger and more numerous in the adult animals. Lymphocytes form a variable number of discrete spherical or ovoid areas of tightly packed lymph nodules in all ages, but more prominent in females and diminish with advancement in age. Areas of a nodular lymphoid tissues and diffuse lymphoid tissues were also noted in all ages and both sexes.

Key words: Post-natal, histomorphometric, Lymph node, one-humped camel.

INTRODUCTION

The one-humped camel is a typical desert animal that has developed sophisticated physiological adaptation for coping with heat, feed and water scarcity in its dry and rough habitat (Al-Haj et al., 2007). According to FAO statistics, there are about 19 million camels in the world, of which 15 million are found in Africa and 4 million in Asia. Of this estimated world population, 17 million are believed to be one-humped dromedary camels and two million two-humped bactrian camels (Z. Farah, 2005).

The habitat of dromedary is Northern Africa and the near East and Central Asia (Wilson 1984). Approximately 11 million dromedaries representing two-third of the world’s camel population are in the arid areas of Africa particularly North East Africa i.e Somalia, Ethiopia and Kenya (Z. Farah 2005). The dromedarian camel is one of the most economically important domesticated species in Arabian Peninsula, North Africa and Middle East.

The lymphatic system is responsible for the immunological defense of the body. It protects the body from exogenous (foreign) and abnormal endogenous macromolecules and from viruses, bacteria, and other invasive microorganisms. It includes all the lymphatic organs: thymus, tonsils, spleen, lymph nodes and hemal nodes, and the diffuse lymphatic tissue and lymphatic nodules present in many mucous membranes. The circulating lymphocytes, as well as the lymphocytes and plasma cells that are widely disseminated throughout the organism, also participate in this protective system.
MATERIALS AND METHODS

Study area

The study was carried out in Sokoto metropolis, the capital city of Sokoto state, Nigeria. The state is situated on latitude 12° 15’ and 5° 12E, and is 300m above the sea level (Sokoto, 2001). Sokoto state occupies an area of short grass savannah in the south and thorn shrub in the north. It shares boundaries with Zamfara state to the east, Niger republic to the north and Kebbi state to the west and south-west.

Sample collection

A total number of thirty prescapular lymph nodes were collected from both male and female camels. Three lymph nodes each were obtained from male and female camels of 0-6 months, 6 months-2 year, 2-4 years, 4-7½ years and above 7½ years respectively. The camels were aged using rostral dentition. The lymph nodes were collected through daily visits to Sokoto modern abattoir according to Bello et al., 2013. The abattoir is located within sokoto metropolis. The lymph nodes were collected after the camels were slaughtered and were labelled and transported to the Department of Veterinary Anatomy Laboratory of Usmanu Danfodiyo University, Sokoto for analysis.

Topography

The positions of the lymph nodes were determined prior to removal from six camels (Three from each sex).

Histological Study

For histological study, ten small slices of tissue (about 10mm in length and 5mm thick) were taken using sharp (new) razor blade. Slices of tissue were fixed by immersion in 10% formalin for 24 hours. After fixation the samples were dehydrated in ascending grades of ethanol (70%, 90% and absolute). The specimens were cleared in xylene and were then transferred to molten paraffin (mp.60° C) in an embedding oven. The samples were blocked in paraffin wax. The blocks were trimmed and thin sections, 5-7µm thick, were cut on a rotary microtome and mounted on clean glass slides.

Sections were stained with hematoxyline and eosin (HandE) for general histology in following sequence; absolute alcohol, 90% ethanol, 70% ethanol, 50% ethanol, hematoxyline, 35% ethanol, acid alcohol, alkaline alcohol, eosin, absolute alcohol, alcohol + xylene and then xylene. The slides were then covered with cover slip and mounted with DPX (Canada balsam mountant) and viewed under light microscope for histologic evaluation.

RESULT

The lymph nodes were surrounded by a connective tissue capsule. There was increase in thickness of the capsule with advancement in age in both male and female animals. The capsule was thickest at the hilus where more blood and lymphatic vessels were present. The hilus was easily distinguishable with advancement in age.

Thick trabeculae passed from the hilus or internal surface of the capsule to the substance of the node, dividing the node into many lobes. From the inner surface of the capsule and the thick trabeculæ thin trabeculæ originated and passed into the parenchyma dividing the lobes into many lobules. Blood and lymphatic vessels were observed piercing through the capsule into the nodes (probably at the hilar region). The blood vessels are present in all ages but are larger and more numerous in the adult animals.

The parenchyma of the lobule consisted of the cortex and medulla, although it was very difficult to distinguish probably due to absence of silver impregnation. The cortex was organized inofrm of lymph nodule and diffuse lymphoid tissues.

In young camels, majority of the lymph nodules have large germinal centres and a narrow corona. The germinal centres are more pronounced in female than in male camels. With age, the germinal centres smaller and completely surrounded by a wide corona.

The medulla was found to be surrounded by cortex or trabeculae and contained blood vessels. In the parenchyma, lymphocytes formed a variable number of discrete spherical or ovoid areas of tightly packed lymph nodule. They were seen in all ages, more prominent in females and diminish with advancement in age. Areas of anodular lymphoid tissues and diffuse lymphoid tissues were also noted in all ages and both sexes.

DISCUSSION

The qualitative and quantitative analysis of prescapular lymph nodes of camel in this study suggested that the topography of the node in camel resembles that of ruminants as described by Dyce and Wensing (1971), Sisson and Grossman (1975) and May (1970). The only difference lies in their anatomical relations.

Different structural variations of the lymph node were noted, these seems to be related to the degree of differentiation by age and/or sex. The progressive increase in biometrics of the nodes agrees with the reports of Dyce and Wensing (1971) and Sisson and Grossman (1975).

A well-developed capsule and trabeculæ which increase in thickness with advancement in age in both male and female were noted. The trabeculæ originated from the inner wall of the capsule and divide the node...
Figure 1: Photomicrograph of Camel lymphnode (Group A male) showing clearly differentiated zones of cortex (A) with less pronounce germinal center (lymphatic nodules) and medullar (B) zone with developing trabeculae connective tissue fibers (Red arrow) at the hilus (H) and thick connective tissue capsule (Yellow arrow) HandE x200.

Figure 2: Photomicrograph of Camel lymphnode (Group A female) showing clearly differentiated zones of cortex (A) with pronounce germinal center (lymphatic nodules) and medullar (B) zone with developing trabeculae connective tissue fibers (yellow arrow) and thick connective tissue fibers capsule (Red arrow) at the hilus (H) HandE x200.
Figure 3: Photomicrograph of Camel lymphnode (Group B male) showing differentiated zones of cortex (A) with less pronounce germinal center (few lymphatic nodules) and medullar (B) zone with developing trabeculae connective tissue (Red arrow) and thick connective tissue fibers capsule (Yellow arrow) HandE x200.

Figure 4: Photomicrograph of Camel lymphnode (Group B female) showing differentiated zones of cortex (A) with well differentiated germinal center (lymphatic nodules) and medullar (B) zone with developing trabeculae connective tissue fiber (yellow arrow), blood vessels (black arrow) and thick connective tissue fibers capsule (yellow arrow) HandE x200.
Figure 5: Photomicrograph of Camel lymphnode (Group C male) showing differentiated zones of cortex (A) with less pronounce germinal center (few lymphatic nodules) and medullar (B) zone with developed trabeculae connective tissue fibers(Yellow arrow) and blood vessels (BV) HandE x200.

Figure 6: Photomicrograph of Camel lymphnode (Group C female) showing clearly differentiated zones of cortex (A) with well differentiated germinal center (lymphatic nodules), lymphatic follicle (Green arrow) and medullar (B) zone with developed trabeculae connective tissue fibers (yellow arrow), thick connective tissue fibers capsule (Black arrow) and blood vessels (BV) at the hilus (H) HandE x200.
Figure 7: Photomicrograph of Camel lymphnode (Group D male) showing clearly differentiated zones of cortex (A) with pronounce germinal center (few lymphatic nodules), lymphatic follicle (Yellow arrow) and medullar (B) zone with developed traberculae connective tissue fibers (Green arrow) and thick connective tissue fibers capsule HandE x200.

Figure 8: Photomicrograph of Camel lymphnode (Group D female) showing clearly differentiated zones of cortex (A) with well differentiated germinal center (lymphatic nodules), lymphatic follicle (Green arrow) and medullar (B) zone with developed traberculae connective tissue fibers connective tissue (yellow arrow), thick connective tissue fibers capsule (Black arrow) and blood vessels (BV) at the hilus (H) HandE x200.
**Figure 9:** Photomicrograph of Camel lymphnode (Group E male) showing clearly differentiated zones of cortex (A) with less pronounce germinal center (lymphatic nodules), NOlymphatic follicle and medullar (B) zone with poorly developed trabeculae connective tissue fibers and blood vessels (BV) HandE x200.

**Figure 10:** Photomicrograph of Camel lymphnode (Group E female) showing clearly differentiated zones of cortex (A) with less pronounce germinal center (lymphatic nodules), NOlymphatic follicle and medullar (B) zone with poorly developed trabeculae connective tissue fibers and blood vessels (Yellow arrow) HandE x200.
**Figure 11:** Photomicrograph of Camel lymphnode (Group A) showing clearly differentiated zones of cortex (A) with less pronounce germinal center (lymphatic nodules) and medullar (B) zone with NO developing trabeculae connective tissue fibers connective tissue and MILDLY thick connective tissue fibers capsule (TC) at the hilus (H) HandE x200.

**Figure 12:** Photomicrograph of Camel lymphnode (Group B) showing clearly differentiated zones of cortex (A) with less pronounce germinal center (lymphatic nodules) and medullar (B) zone with POORLY developing trabeculae connective tissue fibers connective tissue (Red arrow) and MODERATELY thick connective tissue fibers capsule (Red arrow) at the hilus (H) HandE x200.
**Figure 13:** Photomicrograph of Camel lymphnode (Group C) showing clearly differentiated zones of cortex (A) with less pronounced germinal center (lymphatic nodules) and medullar (B) zone with POORLY developing trabeculae connective tissue fibers connective tissue (Green arrow) and developed thick connective tissue fibers capsule at the hilus (H) HandE x200.

**Figure 14:** Photomicrograph of Camel lymphnode (Group D) showing clearly differentiated zones of cortex (A) with less pronounced germinal center (lymphatic nodules) and medullar (B) zone with developing trabeculae connective tissue fibers connective tissue (TC) and WELL developed thick connective tissue fibers capsule (Red arrow) at the hilus (H) HandE x200.
Figure 15: Photomicrograph of Camel lymphnode (Group D) showing clearly differentiated zones of cortex (A) with less pronounce germinal center (lymphatic nodules) and medullar (B) zone with developed trabeculae connective tissue fibers connective tissue (TC) and WELL developed thick connective tissue fibers capsule (Red arrow) at the hilus (H) HandE x200.

Figure 16: Photomicrograph of Camel lymphnode (Group E) showing clearly differentiated zones of cortex (A) with less pronounce germinal center (lymphatic nodules) and medullar (B) zone with developing trabeculae connective tissue fibers connective tissue (TC) and HIGHLY developed thick connective tissue fibers capsule (Red arrow) at the hilus (H) HandE x200.
into many lobes. These results were in agreement with those of Osman (1998) and Sharfee (1989) in the same species. The increase in thickness of the capsule with advancement in age confirms the reports of Furuta (1949) in hamster and rats and Sugimura (1962) in cats. The result of this study partially agrees with the reports of Abdel-magied et al., 2001 that in camel the parenchyma, consist of lymph nodules, anodular dense lymphoid tissue and diffuse lymphoid tissues.

The lymph nodules were found to be situated below the capsule and on either side of the trabeculae. This is in partial agreement with the reports of Osman (1998). Moreover the nodules were found to be more prominent in females than in males but tend to decrease (diminish) with advancement in age. But the population of diffuse lymphoid tissues increases.

In the present study, there are small blood vessels in the capsule the size and number of which increase with advancement in age in both sexes. This suggests high blood supply to the nodes and possibly high antigen response.

Camel has long being known for its ability to withstand diseases (Leease, 1927) and these unique lymph nodes may play a part in this phenomenon because of the relatively high proportion of diffuse lymphoid tissues in both ages and sexes seen in this study. This reflect the ability of camel to produce T-lymphocytes as it was reported by Abbas et al., 1999 that diffuse lymphoid tissue is the site of lymphocytes production.

CONCLUSION

The lymph nodes in camel are elongated and palpable. Topography of lymph nodes of camel resembles that of ruminants. Lymph nodes are larger and heavier in male than in female of the same age. The biometrics of lymph nodes increase with advancement in age.

The lymph nodes show clear lobulations. Thick capsule covers the lymph node in both sexes and increase in thickness with advancement in age in both male and females. Numerous blood vessels are found on the nodes which reflects high blood supply and intum increase in response to antigens. The parenchyma has areas of dense and diffuse lymphoid tissues and lymph nodules. Lymph nodules are more pronounced in female than in male and decrease with advancement in age.

RECOMMENDATIONS

There is a need for pre-natal study of prescapular lymph nodes in camel. Further research on other superficial lymph nodes is recommended as they are also important in disease diagnosis.

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