

FEATURES TOPOGRAPHY AND MACROSTRUCTURE OF LYMPH NODES IN CAMELS (*Camelus dromedarius*)

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ABSTRACT: This study was conducted to investigate the special features of topography and macrostructure of some somatic and visceral lymph nodes of the dromedary (*Camelus dromedarius*). The result of the study demonstrated that the arrangement and the morphometric characteristics of some lymph nodes of camel correspond to the analogical indices of cattle. At the organ level, the lymph nodes of camel congregate; they are partially fused. A pattern of spatial orientation of these nodes is not established. Lymph nodes of dromedary (*Camelus dromedarius*) according to their topography and linear characteristics in general correspond to the similar nodes of cattle. The architecture of the lymph node dromedary (*Camelus dromedarius*) differs from that shown in the conventional patterns of other mammalian animals, generally formed of a plurality of aggregates, the latter are surrounded by a connective tissue which extends over the whole area surface lymph node and each cluster is a node itself. Vascular distribution in these lymphoid aggregates is relatively abundant and each node receives one or two afferent lymphatic's and is drained by four or five efferent lymphatic's. In approximately half of nodes examined, there was extra nodal communications between the lymphatic vessels (afferent and efferent), allowing to bypass the lymph node. Lymph nodes are characterized by their dromedary lobule appearance and size.

Key words: Lymph Nodes, Dromedary, Topography, Macrostructure.

INTRODUCTION

Single-humped Camel (*Camelus of dromedarius*), is one of the basic forms of productive mammals in the countries of North Africa and Near East (Yagil et al., 1994). The adaptation of this species of animals to the extreme desert living environment contributed to the appearance of a whole series of structural-functional special features in the life-supporting systems of organism (Zine Filali and Shaw, 2004; Kamoun et al., 1989). In many works, they are noted the high adaptive properties of the organs of the immune system of camel, which is manifested, above all, by significant resistance to a variety of infections and infestations (Kayouli et al., 1995). In the literature to the present day, they are encountered the contradictions, which are concerned the special features of the structural-functional organization of the blood and immune protection of camel. In this case one of the basic contradictions is the assertion about the uniqueness of the structure of the lymph nodes, in parenchyma of which lack a clear zonation, typical of all other mammal species which demonstrated by AbdelMagied et al., 2001). There is no single point of opinion about the special main intra site features in the lymph nodes of the camel (Soliman and Mazher, 2005; Taher et al., 1979). For the explanation of all existing contradictions conducting a comprehensive study of the lymph nodes of camel at the different levels of structural organization from the organ to the sub cellular is necessary. This work is dedicated to a study of the special features of topography and macrostructure of the basic somatic and visceral lymph nodes of dromedary (*Camelus of dromedarius*)

MATERIALS AND METHODS

Work is executed in the laboratory of histology, immunology-cytology chemistry and pathology-morphology of the scientific research bio-safety center and ecological control of resources, with the department of the general and pathologic anatomy of agricultural animals of Dnepropetrovsk DNAY. We have Investigated the somatic lymph nodes (parotid, sub-mandibular, superficial cervical, axillary, popliteal) and visceral (medial retropharyngeal, caudal mediastinal, portal, jejunal, medial iliac) lymph nodes (Ln) of mature dromedaries (*Camelus dromedarius*). The selection of material was produced on healthy animals, in the slaughter house of Ouargla city, Algeria. They were Determined the topographic and the macroscopic characteristics, the morphometric parameters indices of lymph nodes. Length and the width of organs were measured with the aid of the rule with accuracy to 0,01 cm. The

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absolute mass of organs was determined with the aid of the analytical balance KERN-440-35A. Numerical data were processed with the use of a standard program packet “statist SF”.

RESULTS AND DISCUSSION

The results of our studies demonstrate the lymph nodes congregate, formed as a result of the partial union of smaller units, which gives to units' characteristic lobulation (Figure 1). In our studies we did not reveal any specific regularity in the arrangement of the separate nodes (small units) within the limits of the congregate. The forming congregate units grow together predominantly by their sides. In this case in each lymph node unit, we can see thickenings of capsule, oriented in different directions, and clearly are distinguished.

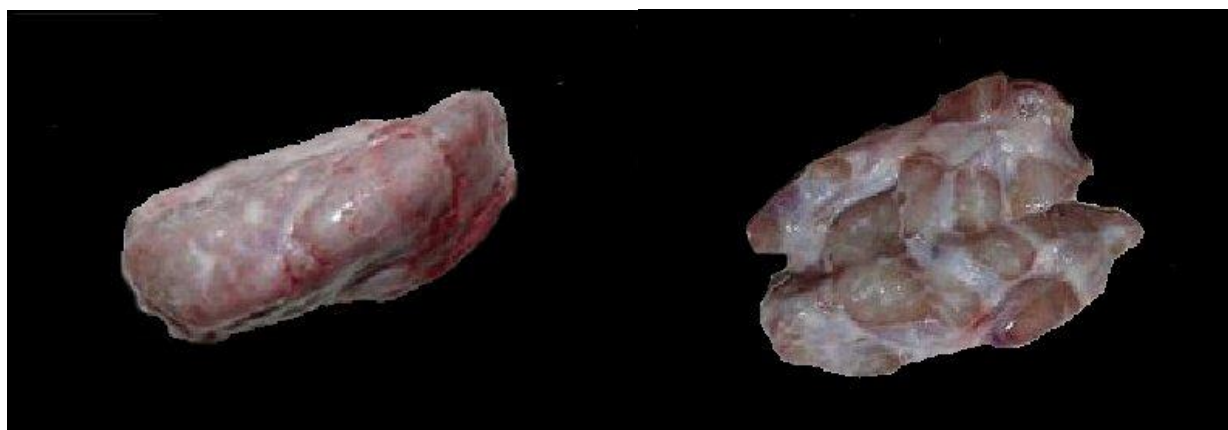


Figure1. Sub mandibular lymph node of mature dromedary (*Camelus dromedarius*): Common form (tuberosity of surface); View of section (lobulation).

Among the somatic units studied, Smaller sizes among the somatic lymph nodes relative have superficial cervical and sub-mandibular nodes. Superficial cervical lymph nodes are constant, oval- elongated form. These lymph nodes are located cranioventrally, from the humeral joint, covered with brachio-cephalic and brachio-atlantum muscles (Table1).

Table 1 - Absolute and relative mass of some somatic and visceral lymph nodes in mature camel (M±m)

Somatcal Lymph nodes	N°	Absolute mass, g	Mass ratio, %
Parotid	12	4,20±0,30	0,011±0,006
Sub-mandibular	8	8,47±0,51	0,021±0,001
The superficial cervical	13	8,66±0,31	0,020±0,001
Axillary	6	5,53±0,43	0,015±0,001
Popliteal	11	6,43±0,31	0,016±0,001
Visceral Lymph nodes	N°	Absolute mass, g	Mass ratio, %
The medial retropharyngeal	12	10,02±0,26	0,025±0,001
Caudal mediastinal	11	20,45±1,70	0,052±0,003
Portal	8	8,15±0,24	0,020±0,001
Jejunal	7	4,99±0,46	0,013±0,001
The medial iliac	8	7,15±0,50	0,018±0,001

Outside the units of congregates, covered with capsule consist of dense fibrous connective tissue, and the space between their separate units (lobules) filled with friable cellulose tissue (friable unformulated connective tissue), that gives to the lymph nodes of camel the similarity to the grooved multi-papillary kidney of the mammals or the salivary gland. In general, the lymph nodes of camel have sufficiently dense consistency (dense texture), and their lobulation isperceived even through the skin during the palpation.

Sub-mandibular lymph nodes are sharply lobed (Figure 1). They are Located in the corner of the lower jaw on its medial surface. Dorsally it borders on the mandibular salivary gland, and ventrally with the sublingual and facial veins (Figure 1). The absolute mass of superficial cervical lymph node is: 8,66±0,31 g, sub mandibular: 8,47±0,51 g, mass ratio 0,020±0,001% and 0,021±0,001% respectively. The superficial cervical lymph nodes length reaches7,83±0,34 cm, sub-mandibular: 6,88±0,61 cm, the width 4,71±0,27 cm and 4,53±0,27 cm respectively (Figure 2).

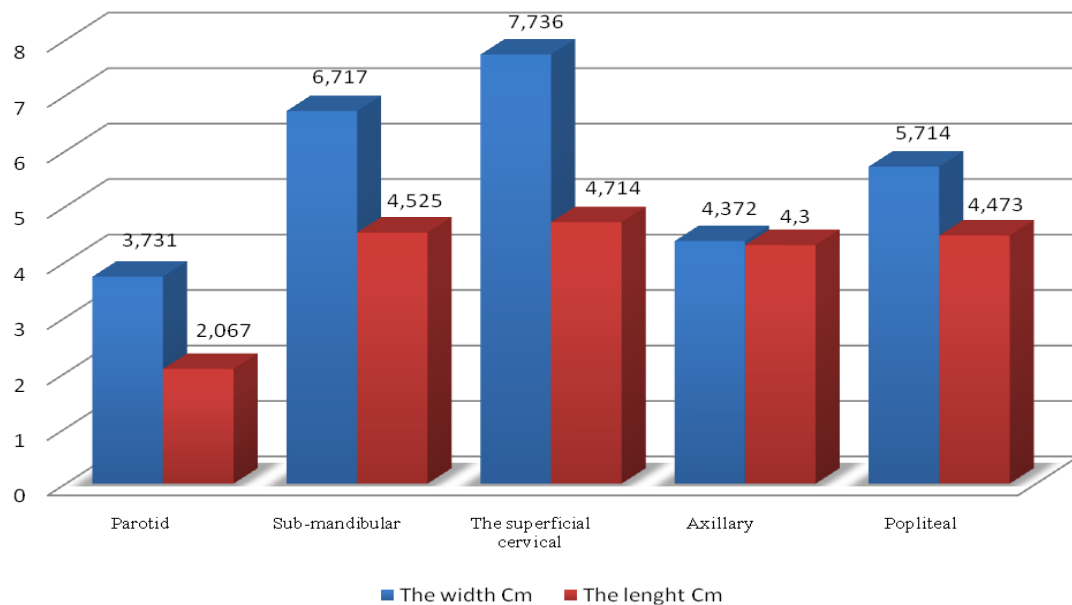


Figure 2. Morphometric indices of some somatical lymph nodes nodes of the camel

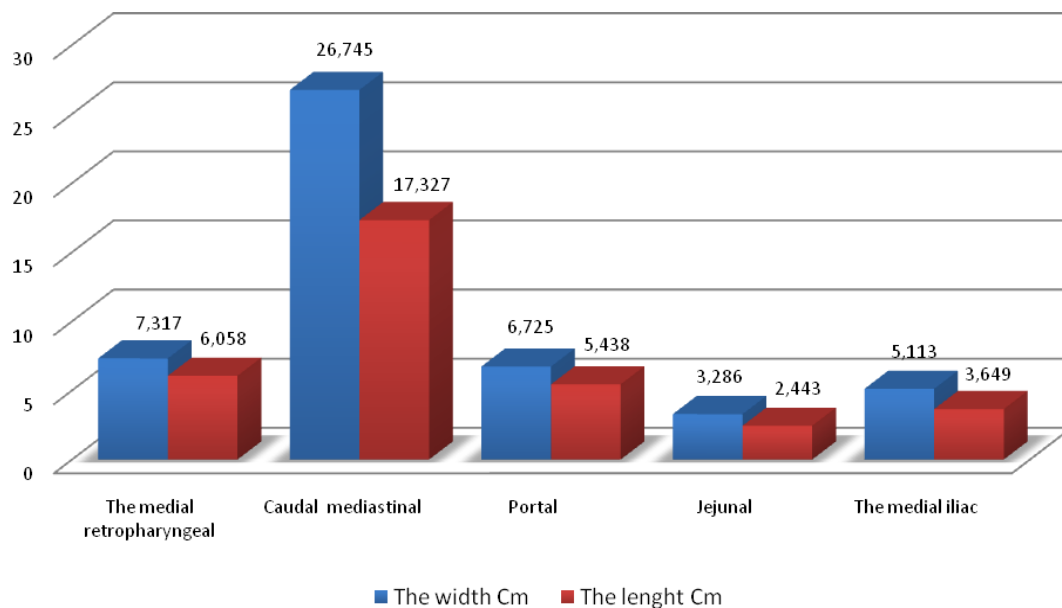


Figure 3. Morphometric indices of some visceral lymph nodes of camel (Camelus dromedaries)

Parotid lymph node has the smallest morphometric indices among the somatic nodes of the camel. Its absolute mass reaches $4,20 \pm 0,30$ g, with mass ratio - $0,011 \pm 0,006\%$. The length is $3,53 \pm 0,21$ cm, but width does not exceed $2,07 \pm 0,26$ cm. Among the camel visceral lymph nodes studied, the maximum size being investigated has the caudal mediastinal lymph node. Its sizes and morphometric characteristics more than twice exceeding the analogous indices of the largest somatic lymph nodes (see tables).

Caudal mediastinal lymph node large, unpaired, has a form of the curved triangle. It is located in the caudal mediastinal on the latero-dorsal surface of oesophagus and the ventral surface of the thoracic aorta. Caudally it reaches the tenth thoracic vertebra, but due to the significant size of some animals may it can be up to the first lumbar vertebra. The absolute mass of caudal mediastinal lymph nodes, reaches $20,45 \pm 1,70$ g, with mass ratio - $0,052 \pm 0,003\%$. Average length reaches $26,75 \pm 1,58$ cm, width exceed $17,33 \pm 1,26$ cm (Figure 3).

The largest of lymph nodes in camel appears medial retropharyngeal. It's the paired, lobule, divided into two parts. It will be Stir in the cranial section of neck, along the sides of the lower part of the pharynx. The dorsal surface of lymph nodes is divided by the groove, in which passes the carotid artery. The medial retropharyngeal lymph nodes absolute weighs: $10,02 \pm 0,26$ g with relative weight $0,025 \pm 0,001\%$.

The morphometric indices vary between $7,32 \pm 0,29$ cm in length and $6,06 \pm 0,28$ cm in width. Average values of mass and linear measurements are characteristic of lymph nodes of organs and walls of abdominal cavity

(hepatic and medial iliac nodes). The hepatic lymph nodes, which can be inconstant, the extra hepatic and the additional lymph nodes are located in the site of attachment to the small gland in the groove, around the portal vein; it is partially hidden in the pancreas.

The medial iliac lymph node of the camel consists of two assemblies (large and small). This relatively large, with the bumpy surface, they lie on the small lumbar muscle at the corner formed by external and internal iliac arteries. Left medial iliac lymph node sometimes merges with the sacral lymph node. The absolute mass of the hepatic of lymph nodes reach $8,15 \pm 0,24$ g and of the medial iliac: $7,15 \pm 0,50$ g, which composes $0,020 \pm 0,001$ and $0,018 \pm 0,001\%$ respectively from the mass of the body of animal. The length of the hepatic of lymph nodes reaches $6,73 \pm 0,16$ cm, and the medial iliac of $5,11 \pm 0,32$ cm, the width vary respectively $5,44 \pm 0,08$ and $3,65 \pm 0,28$ cm.

The jejunum lymph nodes are most numerous among the nodes of the abdominal cavity of camels. These groups are circular or oval lymph nodes, which are located along the attachment of the mesentery to the small intestine. Absolute mass of largest jejunum lymph nodes reach $4,99 \pm 0,46$ g, which corresponds to $0,013 \pm 0,001\%$ of the mass of the body of camel. Length does not exceed $3,29 \pm 0,29$ cm, but the width of $2,44 \pm 0,21$ cm. The results of our study obtained, suggest that the topography of the investigated lymph nodes of dromedary (*Camelus dromedarius*), generally corresponds to the same in cattle (Анатомія свійських тварин, 2001; Цюнская et al., 1965). Some differences touch the medial retropharyngeal lymph nodes. These nodes are connected with the head and the neck in this species of mammals. As a result, the lymph nodes are not located on the dorsal wall of the pharynx, as in other mammals, but on its latero-ventral surface in the cranial division of the cervical region.

Some special features touch the typical arrangement of the popliteal lymph nodes of camel, in comparison with similar lymph node in cattle; they are displaced distally and are located on the caudal surface of the tendon of gastrocnemius muscle. Caudal mediastinal lymph node in camel is much more developed than that of cattle. This node is clearly delimited from middle mediastinal of lymph nodes. Macroscopically, the structure of the lymph nodes of camel largely similar degree analogous to the nodes in horses, the findings of this study are in agreement with the one shown in Анатомія свійських тварин (2001). Unlike horses in which small units within particular central nodes are absolutely isolated independent organs, in camel, they grow into different degree together between themselves forming conglomerate of lymph node; In this case, in spite the fusion of the individual sections of parenchyma of nodes, their gates remain in the majority of the cases isolated. This result is in agreement with Taher et al. (1979) and Soliman and Mazher (2005).

Some author indicates the similarity of the macroscopic structure of the lymph nodes of camel with the relevant domestic pigs, these lymph nodes are also formed as a result the consolidations of separate small units. However, it should be noted that the degree of fusion of nodes in a single organ of pig is more expressed, in consequence of which they greater resemble to tuberos conglomerations, than conglomerate, which is characteristic for the lymph nodes of camel (Тішкіна, 2007; Гаврилин et al., 2007).

We also know that because of the special arrangement of the efferent lymph nodes and lymph movement in pigs occurs in the "opposite" direction from the portal sinus to the boundary (Тішкіна, 2007). The data about the nature of the dynamic of lymph in the nodes of the camel are contradictory. Information about the fact that the bearing and efferent lymphatic vessels in the lymph nodes of camel were found in one and the same section of their capsule, on the convex surface of nodes, will not be coordinated with the current ideas brought by Taher (1963) and Soliman and Mazher (2005). About the principles of the circulation of lymph in the organism of mammals and require conducting the additional studies.

The linear characteristics of the lymph nodes of camel (*Camelus dromedarius*) mostly vary in the same limits, as the lymph nodes of cattle with an appropriate body weight, the result agree with Гаврилін (2000). According to the data of Шыпа И.В, some visceral lymph nodes of camel (caudal mediastinal, medial iliac) are developed to greater extent, which is probably caused by the higher degree of the functional activity of unites under the conditions of the living environment of characteristic for the dromedaries.

CONCLUSIONS

The lymph nodes of dromedary (*Camelus dromedarius*) according to their topography and linear characteristics in general correspond to the similar nodes of cattle and macroscopic structure- they occupy the intermediate position between the corresponding lymphatic organs of horse and pig. Macroscopically, the lymph nodes of camel conglomerate; they are partially fused, structural-functional units (small units) without evidence of the specific attitude.

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REFERENCES

- Abdel-Magied EM, M-Taha AA, Al-Qarawi AA (2001). Parotid, mandibular and lateral retropharyngeal lymph nodes of the dromedary (*Camelus dromedarius*) /Anatomy, Histology, Embryology (August 2001), 30 (4): 199-203.



- Gahlot TKAS, Saber. SK (1992). Anatomy and Histology of Camels Ed. Nagpal and Jianlin Wang. 1965. Kamoun M. Bargaoui R. Et Girard P). Alimentation et croissance du chamelon: étude de la phase D'adaptation à un système de production intensive. Options Méditerranéennes. Pp. 159-161. 1989.
- Kayouli C, Jouany JP, Dardillat C, Tisserand JL, Particularités physiologiques du dromadaire: conséquences Pour son alimentation. Options Méditerranéennes. Pp. 143-155.
- Junqueira L, Carneiro J, Long, J (1986). Basic Histology. A text book Librairie du Liban 5th ed. Nopajaroosri, C. Luch, S. C. and Simon.
- Osman DI (1988). Morphological observations on the supramammary lymph node of the dromedary camel. J. Vet. Sci. Anim. Husbandry, 27, 38-53.
- Popesco P (1962). Atlas d'Anatomie topographique des mammifères domestiques. Vanders Ed. Paris, Saley M. (1986). Topographie ganglionnaire et inspection des carcasses de dromadaire (Camelus dromedarius) au Niger. Thèse de Doct. Vet. N° 15. EISMV Da-kar, Senegal, pp. 111.
- Soliman SM. Mazher KM. (1995). Light and electron microscopic studies on some lymph nodes of The adult one-humped camel (Camelus dromedarius) / Beni-Suef Vet Med J., Egypt, 15 (2): S. 9-13. Montpellier.
- Taher ES (1963). Study of lymph nodes of camel. Ph. D. Thesis, Fac. Vet. Med. Cairo Univ. Taher, E. S.; Kandil, M. H. and Mosallam, E. S.: The medial retropharyngeal lymph node of camel. Egypt. J. Histol., 2 (1): 63.-1979.
- Yagil R, Zagorski O, Van Creveld C 1994. Science and camels milk production (some keys for nutrition and Marketing/Dromadaires et chameaux, animaux laitiers. Actes du colloque, (24-26 octobre 1994), Nouakchott, Mauritania, CIRAD.
- Zine Filali R and Shaw R (2004). Water Balance in the Camel (Camelus dromedarius)/Journal of Camel science/the Camel Applied Research and Development Network (CARDN), 1(1): 66-71.
- Анатомія свійських тварин Підручник / С.К. Рудик, Ю.О. Павловський, Б.В. Криштофорова та ін. за ред. С.К. Рудика. – К: Аграрна освіта, 575 с. 2001.
- Гаврилин ПН, Тишкіна НН, Лещева МА. Морфологические аспекты функциональной специализации паренхимы лимфатических узлов у зрелорождающих продуктивных млекопитающих / Проблемизооинженерії та ветеринарної медицини / Збірник наукових праць Харківської державної зооветеринарної академії. – Харків, Вип. 14 (39), ч.2., – Т.1 – С.26–30. 2007.
- Гаврилін П.М. Особливості динаміки маси лімфоїдних органів у телят неонатального і молочного періодів // Аграрний вісник Причорномор'я. - Одеса, Вип.4 (9). - С.24-29. 2000.
- Тішкіна НМ (2007). Структурно-функціональні особливості лімфатичних вузлів порослят неонатального і молочного періодів: Автореф. дисканд. вет. наук: 16.00.02 / Білоцерківський державний аграрний університет. – Біла Церква, 23 с.
- Цюнская ТА, К вопросу морфологии и топографии лимфатических узлов крупного рогатого скота и свиней: Автореф. дис...канд. вет.наук: 16.00.02 / Московский технол. ин-т мясн. и молочн. пром. –М. 22с.1965.
- Шура И.В. Руководство по ветеринарно-санитарной экспертизе и гигиене переработки животных продуктов: Учебник. /Глава IX/ – «Колос» М., 112-130.