

ANATOMICAL AND HISTOLOGICAL STUDY OF THYMUS GLAND IN THE LOCAL BREED OF TURKEY "*Meleagris gallopavo*" IN IRAQ

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Abstract

Thymus gland in turkey bird and its distinctive anatomical and histological features were highlighted with paying special attention to the anatomical location, shape, boundaries and the blood supply as well as the histological structure in the Iraqi local breed turkey (*Meleagris gallopavo*). Ten healthy birds from the local breed of Turkey were taken and divided into two equal groups: five birds for anatomical study and five birds for histological study. The gross description including the shape, color, location and blood supply as well as the histological structure of thymus gland were recorded. The anatomical results showed that thymus gland in turkey located along either side of the neck, lying close to the jugular vein, common carotid artery and the brachial plexus and in contact with thyroid gland in the base of the neck at the thoracic inlet on each sides of the body, it consisted of a long chain on each side having (6-8) lobes with whitish-yellowish to pinkish color and irregular to flattened shape. Thymus gland in turkey was supplied with blood by direct and indirect branches of the following arteries: the cranial thyroid, the caudal thyroid and the ascending esophageal arteries which almost derived from the common carotid artery. Histologically the gland consisted of numerous lobes and covered by connective tissue capsule which sent numerous septa and divided it into lobules, each lobule was organized into outer darkly stained cortex and inner lightly stained medulla, cortex was enriched with densely packed lymphocytes with small size and darkly stained while medulla was consisted of many epithelial cells and appeared lightly stained because it occupied by large size lymphocytes with acidophilic cytoplasm. The epithelial reticular cells might be arranged together with the lymphocytes to form the Hassal's corpuscles.

Key words: Turkey thymus gland, Anatomical study of thymus, Histological structure of thymus, Blood supply of thymus, *Meleagris gallopavo*.

Introduction

Turkey bird which known commonly as wild turkey is a large bird in the genus *Meleagris*, species *gallopavo*, the farmers of north and south America the first who interesting and breeding it. [1], It consider as one of the sources of the production of meat, egg and feather and these productions play a big role in the economics of animal worth in the world. [2]. All the vertebrates except the cyclostomes possess thymus gland which derives its name from the resemblance of its lobes in human beings to a leaf of the thyme plant. [3,4]. In neonatal, young and adult mammals the thymus is a single, bi-lobed mass located in the root of the neck, occasionally the two lobes united to form a single organ and sometimes separated by an intermediate lobe. [5,6]. Thymus of reptiles and birds have a series of large nodes along the neck. the thymus in birds regarded immunologically as a primary or central lymphoid organ and its presence are essential for the development of peripheral lymphoid tissues and its associated adaptive immune functions an important factor that separates higher vertebrates from the rest of the animal phyla. [7,8 ,9,10,11 ,12,13,14]. It also provides a specific microenvironment for multiplication and differentiation of cells into the immunologically competent effector cells [15]. During chicken embryonic development the various reticular- epithelial cells and humoral factors, that make up the thymic microenvironment, process T-cell precursors [16,17,18,19].

Materials and Methods

This study was carried out in a total number of (10) apparently healthy Turkey birds of both sexes and different ages ranging between (9–16) months were divided into two equal groups: five birds for anatomical study and five birds for histological study. All the birds in the two groups were sacrificed by anesthesia by using high dose of xylazine (25 mg/Kg. B.W) in the wing vein (Fig.1) and left for (2-4 min.) to complete anesthesia, then immediately the position, shape and color were recorded also latex and carmine stain used to coloring the arterial blood supply for the anatomical study. While in the histological study immediately after anesthesia the birds, the specimens were collected from turkey birds and washed by normal saline and mopped with blotting paper then fixed in 10% neutral buffered formaldehyde solution and were dehydrated in the series of ascending grade of alcohol followed by clearing in three changes in xylene and the tissues then were infiltrated in two changes of melted paraffin in the oven, then tissues were embedded in paraffin and finally the sections cut at 5-6 μ thickness by using a rotary microtome. After cutting, the sections were put on clean slides by using an adhesive (egg albumin) and were dried in a hot air oven[20,21]. The sections were stained with Hematoxylin and Eosin (H&E), PAS and Masson Trichrome stains, then the stained slides were examined by using light microscope with different adjustment powers (4x; 10x; 20x; 40x; 100x) [22,15].

Results and Discussions

Anatomical results: Gross morphological studies in the Iraqi local breed of Turkey “*Meleagris gallopavo*” showed that thymus gland located along either side of the neck, lying close to the jugular vein, common carotid artery and the brachial plexus in the base of the neck at the thoracic inlet on each sides of the body, having two long chains of thymic lobes, each chain consisted of numerous lobes ranged from (6-8) in number (Fig.2), so there is a similarity in the position with [23] in quail; [9, 10, 24] in chicken, [25] in turkey, [15] in Aseel chicken, although other species of birds possess different numbers of lobes as mentioned by [26] that there were 13 thymic lobes in Guinea Fowl or it ranged from 2-11 lobes on right side and 1-8 on left side in fowls *Gallus gallus domesticus* [27] or five lobes in ducklings [22] or it ranged from 7-9 lobes on right side and 6-8 on left side in Aseel chicken [15]. The color of thymus gland ranged from yellowish to pinkish color and the shape of the lobes of thymus was varied from irregular to flattened shape although the lobulation wasn't clearly distinct (Fig.3), this observation is agree with [24] in chicken, [25] in turkey; [22] in ducklings and [15] in Aseel chicken. The caudal part of thymus gland lie in contact with thyroid gland on each side of the base of the neck (Fig.3), this result is the same description mentioned by [28, 29, 9] in chicken; [30] in quail; [14] in tolests, [25, 31] in turkey; [32] in ostrich.

Blood Supply: Thymus gland in the Iraqi local breed of Turkey was supplied with blood by direct and indirect branches of the following arteries: the cranial thyroid, the caudal thyroid and the ascending esophageal arteries which almost derived from the common carotid artery in both right and left sides of the neck (Fig.4,5) this result is similar to the previous finding mentioned in other domestic fowls by [27, 33, 34, 35] in chicken.

Histological results: The current work indicated that the thymus gland of the turkey was large, lobulated and consisted of numerous lobes and was covered by connective tissue capsule composed mainly of collagen and fine reticular fibers. Numerous connective tissue septa extended from the capsule and divided it into lobules, these septa contained the thymic blood vessels (Fig.6), this result was in agreement with [36] in ostrich; [22] in ducklings; [37] in chickens. Each lobule was organized into two parts: outer darkly stained cortex and inner lightly stained medulla, the cortex was dark in staining and located in the peripheral part of the lobules while the medulla was appeared light in staining and located in the central core of the lobules (Fig.7). Both of these components were formed from a framework of scattered epithelial reticular cells and their reticular fibers. The parenchyma of cortex was enriched with densely packed lymphocytes which was small in size with darkly stained, central basophilic nuclei. The medulla was typically consisted of many epithelial cells and appeared lightly stained because it occupied

by large size lymphocytes with centrally located nuclei and acidophilic cytoplasm (Fig.8), these results were parallel to that mentioned by [10,24] in chicken; [36] in ostrich; [38,22] in ducklings; [19,37,15] in Aseel chicken. The epithelial reticular cells were numerous and characterized by distinct cell boundaries and faint basophilic cytoplasm and central to may be eccentric nuclei, the small lymphocytes were few in medulla in comparison to that of the cortex. The epithelial reticular cells might be arranged together with the lymphocytes to form the Hassall's corpuscle which was characterized by degenerated structurless, hyalinized center and peripheral concentric arranged epithelial-reticular cells (Fig.9), this result was in agreement with [10,36] in ostrich; [37] in chickens; [15] in Aseel chicken, but disagree with [19] in chickens who mentioned that no Hassall's corpuscles were observed.



Fig. (1): Photograph showed: Iraqi local breed of turkey (*Meleagris gallopavo*) was sacrificed by euthanasia by using high dose of xylazine in the wing vein

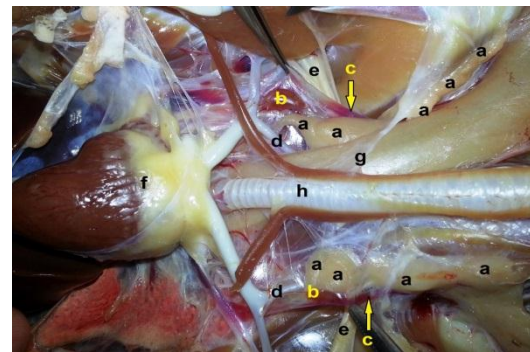


Fig.(2): Photograph showed: a- Thymic lobes of Thymus gland b- Thyroid gland c- Jugular vein d- Common carotid artery e- Brachial plexus f- Heart g- Esophagus h- Trachea



Fig.(3): Photograph showed: The color of a- thymus gland ranged from yellowish to pinkish color, the caudal part of thymus lie in contact with b- thyroid gland at the base of the neck on each side of the body

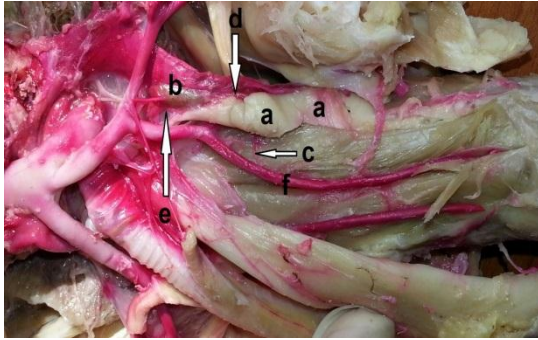


Fig.(4): Photograph showed: a- Thymus gland b- Thyroid gland c- Direct branch of the common carotid artery d- Cranial thyroid artery e- Caudal thyroid artery f- Common carotid artery

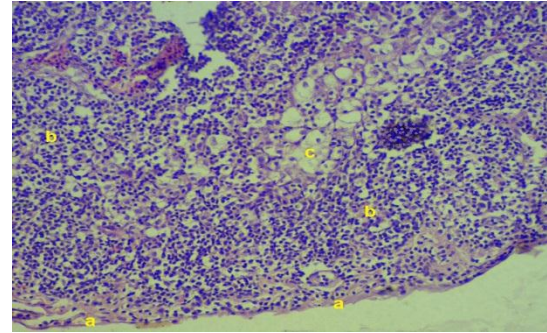


Fig.(7): Histological section of thymus gland showed: a- Capsule b- Outer darkly stained cortex c- Inner lightly stained medulla (H & E stain, 20 X).

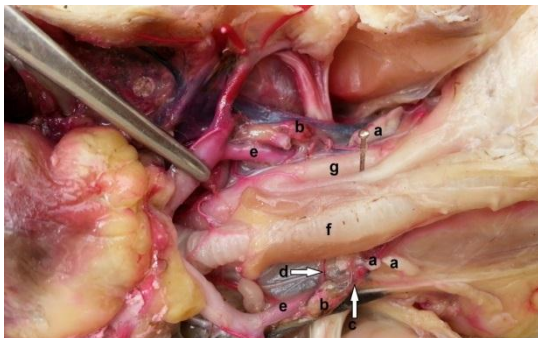


Fig.(5): Photograph showed: a- Thymus gland b- Thyroid gland c- Cranial thyroid artery d- Ascending esophageal artery e- Common carotid artery f- Trachea g- Esophagus.

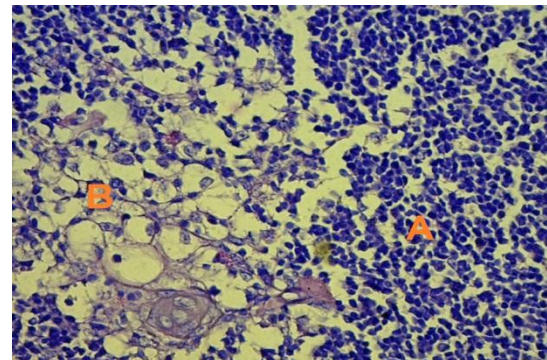


Fig.(8): Histological section of thymus gland showed: A- cortex densely packed of small lymphocytes B- medulla lightly stained epithelial cells occupying large size lymphocytes (H & E stain, 40 X).

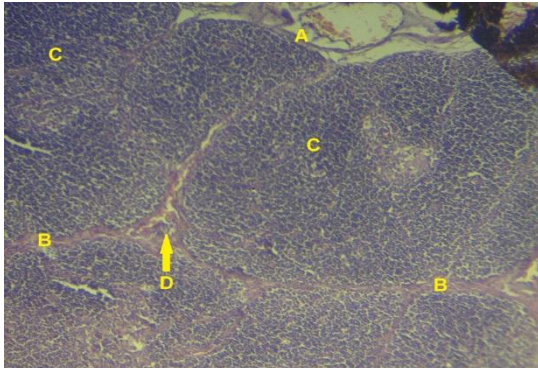


Fig.(6): Histological section of thymus gland showed: A- Connective tissue capsule B- Connective tissue septa C- Thymic Lobules D- blood vessel inside the connective tissue septa (H & E stain, 10 X).

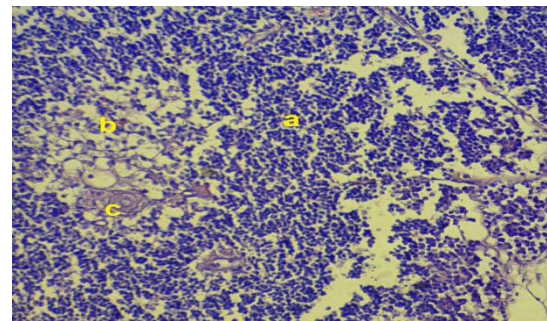


Fig.(9): Histological section of thymus gland showed: a- cortex b- medulla c- Hassal's corpuscle (H & E stain, 20 X).

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دراسة تشريحية ونسجية للغدة الزعترية في السلالة العراقية المحلية للديك الرومي

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الملخص

ألقي الضوء على الغدة الزعترية للديك الرومي وسماتها التشريحية والنسجية المميزة مع إيلاء اهتمام خاص للموقع التشريحي ، الشكل والحدود والمدد الدموي ، فضلا عن التركيب النسيجي في السلالة العراقية المحلية من الديك الرومي. عشرة طيور من السلالة المحلية للديك الرومي من كلا الجنسين أخذت خالية من الأمراض. قسمت الى مجموعتين متساويتين بواقع خمسة للدراسة التشريحية وخمسة للدراسة النسيجية. سجل الوصف العياني والذي يشتمل على الشكل واللون والموقع التشريحي والتجهيز الدموي اضافة الى التركيب النسيجي للغدة وأظهرت النتائج التشريحية أن الغدة الزعترية في الديك الرومي تقع على طول جانبي الرقبة، قريبة من الوريد الوداجي والشريان السباتي العام والصفيرة العضدية العصبية ، وعلى اتصال بالغدة الدرقية عند قاعدة الرقبة في مدخل الصدر، وتتألف من سلسلة طويلة على كل جانب مؤلفة من 6-8 فصوص ذات لون ابيض مصفر الى وردي ، مفلطحة أو غير منتظمة الشكل . وتزود الغدة بالدم من خلال فروع مباشرة وغير مباشرة متفرعة من الشرايين التالية: الشريان الدرقي القحفي أو الأمامي، الشريان الدرقي الخلفي أو الظهرى والشريان المريئي، المشتقة في الغالب من الشريان السباتي العام. تتكون الغدة نسيجيا من عدد من الفصوص وتكون محاطة بمحفظة من النسيج الضام تمتد منها حواجز الى متن الغدة تقسمها الى عدد من الفصيصات ، يتكون كل فصيص من جزء خارجي داكن اللون يسمى القشرة وجزء داخلي فاتح اللون يسمى اللب. تتميز القشرة بكثافة الخلايا للمفاوية التي تكون صغيرة الحجم وداكنة اللون ، اما اللب فهو يحتوي على العديد من الخلايا الظهارية ويظهر اللب بلون فاتح بسبب احتوائه على الخلايا للمفاوية ذات الحجم الكبير والهوليوي الحامضي الفاتح اللون. الخلايا الظهارية الشبكية ربما تتجمع مع بعضها ومع الخلايا للمفاوية لتكون التراكيب المسماة بمحفظة هاسال.

الكلمات المفتاحية: الغدة الزعترية للديك الرومي ، دراسة تشريحية للغدة الزعترية ، التركيب النسيجي للغدة الزعترية ، المدد الدموي للغدة الزعترية.