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Assessment functional activity of thyroid gland throughout histological exploration and morphometric evaluation in Buffalo

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Abstract

The study aimed to explain the role of histological examination and morphometric parameters to determine activity of thyroid gland as comparison with other animal. The study carried out on twenty-two specimens of thyroid gland which taken from Al-Nasiriya abattoir.

Results pointed that thyroid gland covered by capsule which consisted from two layers, outer layer is irregular connective tissue and inner layer is regular connective tissue it sent septa which it divided lobe of thyroid gland into many lobules, also septa penetrating the lobule to diffuse around follicles. Follicles were two types, the small follicles had high preparation in number and located in peripheral area of lobule as well as they lined by tall cuboidal to columnar epithelial cells and their diameter 23-59 Mm and 28-64 Mm dimensions were for both sides of lobe (right and left) respectively. Large follicles had fewer propositions in number and located in central area which lined by cuboidal to squamous epithelial cells. Also their diameter attained to 125-154 Mm and 135-166 Mm for both sides of lobules diameters.

The height of the follicular epithelium was in reserve relation to size of follicles. The morphometric of measurement of follicular height were 6.2-11.3 Mm and 5.1-9.3 Mm for small follicle in both sides of lobe right and left respectively. Meanwhile the height of follicular epithelium in large follicles both sides (right and left) were 2.2-3.1 Mm and 1.5-2.8 Mm respectively.Para follicular cells were present within inter-follicular space and their numbers were ranging from four to ten cells.

The study concluded the thyroid gland in buffalo characterized with higher metabolic rates them other animals as like in bovine, camel and human. As well as the right lobe more active than left side according to categories were provided.

Introduction

The thyroid gland is enveloped by fibrous capsule from which fine collagenous septa external into gland, dividing it lobules. The septa convey a rich blood supply together with lymphoid and nerves (Young *et al*.2005), lobule displaying many follicles of varied size, each follicle is surrounded slender connective tissue, which supports the follicles and brings blood vessels in close approximation (Robinnes*et al*.,1994). The functional unties of the thyroid gland are thyroid follicles, spheroidal structures composed of single of cuboidal epithelial cells bonded basement membrane, normal active thyroid, the follicles are variable in size and contain homogenous colloid material which is stained pink in eosin and heamotoxylin preparation (Young *et al*.,2005).

The active thyroid follicle with epithelial cells are taller, with more cytoplasm and larger pale staining, nuclei reflecting their increase activity in the active follicles. They are extracting stored thyroid coiled from the lumen and converting it into active thyroid hormones, when in active, thyroid epithelial cells simple flat or cuboidal cells (Robinns*et al*., 1994).

The shape of thyroid gland follicles has close relationship with their functional state, thus the changes of its histological morphology follicles whose shape range from flattened to lower columnar with follicles entreating, colloid plentiful and margin clear represents their inactive state and active state when the epithelial columnar or bucking into follicles to form papillae (Haipeng *et al*.,2002).

As regarding to follicles size, previous study mentioned that small follicles were located mainly at peripherally of lobules; therefore follicles were classified according to the size for their in different measurements, the average of length and width of small follicles were 15.0-80 Mm, middle follicles were 80.1-175.0 Mm (Jelinek *et al*.,2000) so thatmany authors stated the histological assessment of functional activity of the thyroid gland consist of estimation of size of follicles, height of the follicular epithelium, quantity and color of colloid and proliferate activity of the epithelial cells (Korova*et al*.,1998,Serakides *et al*.,1999, Schorsch&Pohlmayeresch*et al*.,2000).According to the previous study on histological of thyroid gland activity in cattle by Corta*et al*.,1994 revealed that thyroid gland is in constant process of

adaptation, the functional liability is reflected in transient hyperplasia of thyroid epithelium.

At the same time, thyreoglobulin is resorbed, follicular cells become tall and columnar when the stress abates, involution occurs, the height of epithelium falls, colloid accumulates and follicular resume their normal size and architecture. Failure of normal between hyperplasia and involution may and produce deviations from the usual histologipattren. In addition, the role of Para-follicular cells in the function of the thyroid gland has not been clarified till now (Schorsch&Pohlmayeresch*et al*.,2000).

Despite controversial data, one can presume that co-localization of follicular and para follicular cells in the thyroid gland are not accidental. It seems to be possible that there is an interaction between them mediated by the releasing of peptideric hormones (Zbuki*et al*., 2007).

The histology of the thyroid gland in different animals were studies by Roy and Yadava (1978) in Indian buffalo, Roy (1970) in buffalo and Roy and Saigal 1987) in Sheep, Sanap and Mugale, 1998 in cattle.

As there is no available literature regarding the histological structure of buffalo in Iraq, hence the present study will provide value information histological structures and morphemically parameters of thyroid at different stages with its activity in detail thyroid gland.

Materials & Methods

The study was performed on 22 of thyroid gland which obtained from slaughtered at Al-Nassiryia abettor. Thyroid glands were examined histologically. Immediately after evisceration and removed adherent fat tissue from normal glands which selected without any remarkable lesions. In this present study, all specimens were taken from animal with age ranging from over 6 months to 2 years for both sex (12 male and 10 female) by means of two parallel transversal selection, in the middle of length of the lobes, samples 4.5 mm thick were fixed in 10% buffered formalin. The samples were processed by common paraffin technique.

To obtain accurate results of morphometric examination, the histological sections were 5 Mm stained with heamtoxlin and eosin (H&E) stain according to (Luna, 1968).After staining, the measurements of morphometric were estimated the means

and ranges for capsules thickness, follicles diameters and height of epithelial of follicles. Photomorphic has been taken by digital camera, and statistical measurements were estimatedaccording to (المحمد واخرون,1986).

Results

According to histological examination, the present study revealed that thyroid of buffalo covered by typical connective capsule which contained all types of fibers, most of them were fibers mean while reticular fibers appeared more than elastic layer. Capsule consist of two layers of connective tissue, the first one, outerlayer which composed from irregular connective tissue with higher vascular and highly lymphocyte infiltration.

As concerted to the second one was inner layer which contained collagens and elastic fibers with remarked fibroblast cells, this layer characterized with regular connective tissue wich sent septa with different thickness into lobe of thyroid gland to divide it to different lobules. The connective tissue of septa penetrated the lobules and surrounded with thyroid follicles. The diffusion of connective tissue within lobules present in different distribution. As well as septa contained remarked some with large blood vessels. In addition to the outer layer of capsule was more thickness than inner layer according to morphometric measurement were 5-7 mm and 2.5-3.5 mm respectively.

As relating to follicles, each lobule of thyroid gland consisted of different follicles with inter follicular storm with a variable concentration from C.T which contain small blood vessels.

The follicle consisted of follicular epithelium and intra follicular colloid substances, follicles were various sizes and shapes that usually small sizes, follicles were nearer to the capsule and large follicles were towards the center of follicles.

The small follicles numbers present in high proportion than large follicles numbers which formed 67% and 33% respectively. Follicles contained colloid in the intra follicular spaces. Some follicles filled up, with colloid and small follicles contained small amount of colloid in the center of intra follicular space, whereas few follicles were completely empty from it

Most of follicles were small and located mainly at peripherally of the lobule, they were oval to around in shape, in the right side they were more in number than number

from the left side similar to histological structure of the left. There is no different in histological structure between both sides' right and left of lobe thyroid glands.

Also small follicles were lined with cuboidal or columnar tall cuboidal epithelium and sometimes epithelium was observed, follicular cell had light cytoplasm vacuoles at periphery vacuoles were found. Meanwhile, large follicles were lined with cuboidal or squamous epithelium eosinphilic cytoplasm. Some cells with light cytoplasm were observed. Colloid was slightly homogenous, only in few follicles the reception vacuoles were found. As well as the follicular epithelium were found on follicular basement membrane. Sometimes Para- follicular were observed on basement membrane of follicles also they were found inter-follicular stroma which was varying in number ranging from 4-10 cells. They were arranged singly or groups within inter follicular space.

As regarding to morphometric measurements of diameter of follicles for both sides (small and large) which attained to 23-59 Mm and 28-64 Mm for small follicles in both sides right and left at respective.

Discussion

The current study was provided that histological observation for thyroid glands found with various studies. The histological of capsule was accordance with distribution by (Robbins *et al*.,1994) in monkey and Kausar b,2006.In camel where as there is certain differences with observations by (Adikary*et al*., 2003) that thyroid gland was covered by three layered capsule. Outer layer was dense collagen fibers with few reticular and elastic fibers .Middle layer was adipose tissue and inner was collagens andelastic fibers. As concerning to size and shape of follicle histological constitution. The study revealed that similarity was reported by Kausar and Shahid, 2006) in camel and (Dikary*et al*., 2003) in goat there is slightly differences with observations was stated by (Jelinek*et al*., 2003) in bovine there is three size of follicles as well. The description was explained by (Alhasan, 2008) in human. Para follicular cells description was accordance with (Roy *et al*., 1971) in buffalo, (Sanap*et al*., 1995) in cattle and (Young *et al*., 2005) in monkey. While means the study was disagreement with in camel that Para-follicular cells were absent.

As regarding to morphometric measurements related to functional activity, the study explain that buffalo characterized with high activity of thyroid gland according to Cotran*et al*., (1994). Stated that thyroid gland is constant process of adaptation.

The functional liability is reflected in transient hyperplasia of thyroidal epithelium. At this time, thyroglobulin is resorbed follicular cells become tall and columnar. When the stress abates, involution occurs, the height of the epithelium falls, colloid accumulates and follicular cells resume their normal size and architecture. Failure of this normal balance between hyperplasia and involution may produce deviations from the usual histological pattern. So that morphometric measurement was provided higher activity that left lobe of thyroid gland. As comparison in the present study morphometric parametric indicated the thyroid gland activity was highest than the observation of (Linek *et al*., 2003) in bovine, Kausar and Shahid (2006) in camel, Alhasan (2008) in human.

The differences between individual observation which related to size, shape, number, proportion of follicular epithelial cells as well as diffuse of connective tissue intra follicular space. That attribute to the changes which companied the different stage of age according to observation of Roy and Yadava (1978).

That the inter follicular connective tissue was Constantine found around the follicles and increase with age the follicles became irregular in outer line and their diameter increase in older subjects. The follicular epithelium comprised of two types of cells, follicular cells and light cells and has tendency to become squamous with aging.

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