POSTNATAL DEVELOPMENT OF THE SHEEP TESTIS

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A B S T R A C T

The ovine testis undergoes several histological changes during it's development, there are three stages in development, prepuberty stage, maturity stage and adulthood stage. At early ages from the first month till the fifth months (prepuberty stage), no spermatogenesis is initiated and the testicular parenchyma is composed of spermatic cords only which are lined with prespermatogonia and Sertoli cells, the lumens of these cords are filled by basophilic material and termed solid cords. The solid cords fill the majority of testis at one month and decreased in amount with the advance of age. The age of maturity begins at 6-8 months of age and the stages of spermatogenesis for forming spermatozoa is initiated (maturity stage). Then the testis produces more amounts of spermatozoa (adulthood stage).

Keywords: postnatal, testis, sheep, Histological changes.

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1. Introduction

Sheep is one of the most important animals among the livestock species (BBS, 2008). The detailed information about the onset of puberty and sexual maturation are needed for good reproductive management of domestic animals (Abi Saab et al., 1997). It is well established that testis comprises unique functions in the male body, it contains proliferating totipotent stem cells, it is the only male organ where the meiosis occurs and it determines the phenotype of the individual by its endocrine activity. All these specific features are regulated by defined endocrine and local mechanisms to ensure the coordinated expression pattern of the required genes (Schlatt et al., 1997). This work aims to throw light on histological structure of testis during postnatal period, to determine age of sexual maturity in Egyptian ram and best time for artificial insemination, which needed for good reproductivity.

2. 2. Material and Methods

The study was conducted on 15 clinically healthy rams, from 1 to 12 months of age, which were divided into three groups, first group started from 1-5 months of age, second group started from 6-8 months of age and third group started from 9-12 months of age. Their testes were collected directly by castration till the fifth month then from slaughter house of Elkanater Elkhairia in mature ages, the tissue specimens were rapidly fixed in 10% buffered neutral formalin and Bouin's fluid, then dehydrated, cleared and embedded in paraffin wax. Sections of 4-6 micrometer thick were taken and stained with several histological stains including Harris haematoxylin and eosin, Crossmon's trichrome and PAS stains, all these fixation and staining methods were quoted from Bancroft and Gamble (2001).

3. RESULTS

3.1. Prepubertal stage

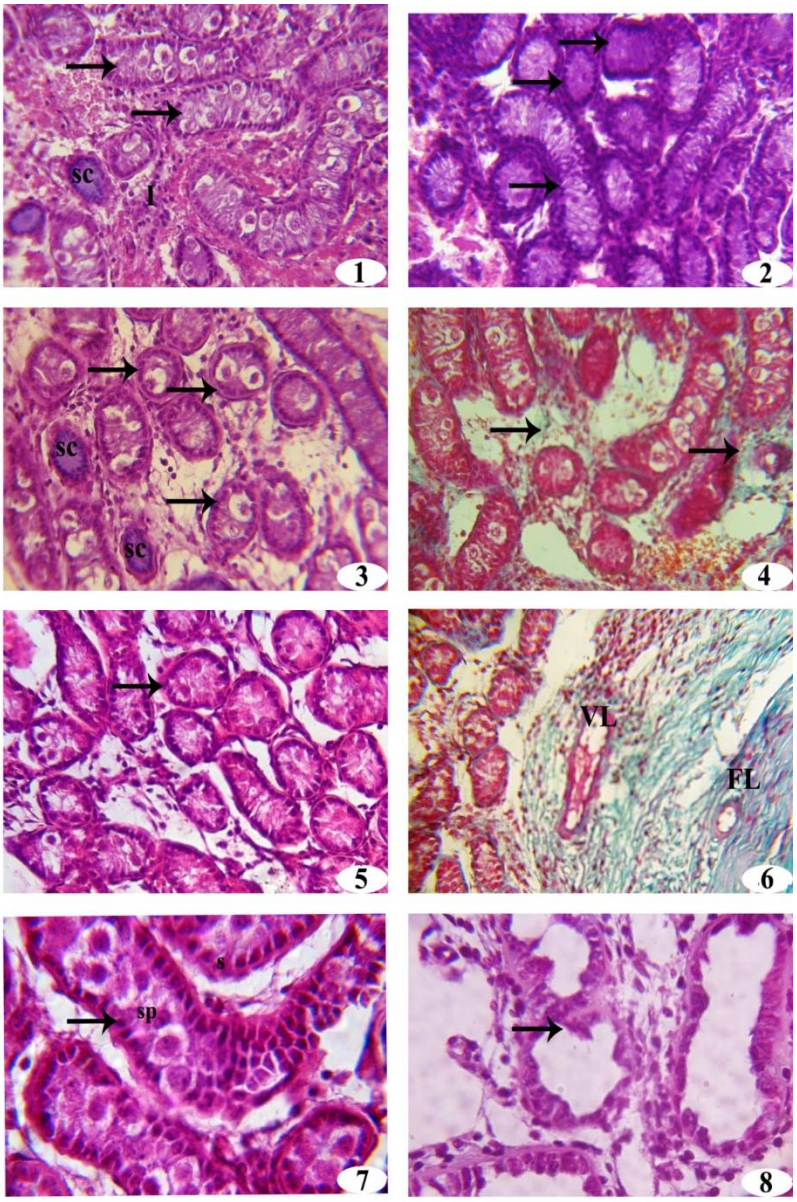

Fig. (1): Photomicrograph of testis at one month age showing testicular cords lined with cells containing oval darkly stained nucleus (arrows), between them interstitial tissue present (I) and some solid cords (sc). (H&E stain, x400). Fig. (2): Photomicrograph of testis at one month of age showing solid testicular cords (arrows) which contained acidophilic substance in their lumens. (H&E stain, x400). Fig. (3): Photomicrograph of testis at two months of age showing testicular cords (arrow) and some solid cords (sc). (H&E stain, x400).Fig. (4): Photomicrograph of testis at two months age showing little collagen fibers in the interstitial tissue and around blood vessels (arrow). (Crossmon's trichrome stain, x400). Fig. (5): Photomicrograph of testis at three months age showing testicular cords (arrow) and no solid cords were observed. (H&E stain, x400). Fig. (6): Photomicrograph of testis at four months age showing outer fibrous layer of tunica albuginia (FL) and inner vascular layer containing blood vessels (VL). (Crossmon's trichrome stain, x400). Fig. (7): Photomicrograph of testis at four months age showing Sertoli cell (s), prespermatogonia (arrow) and spermatogonia (sp). (H&E stain, x400). Fig. (8): Photomicrograph of testis at four months of age showing apical blebs (arrow) in upper surface of cuboidal cells lining the rete testis. (H&E stain, x400).

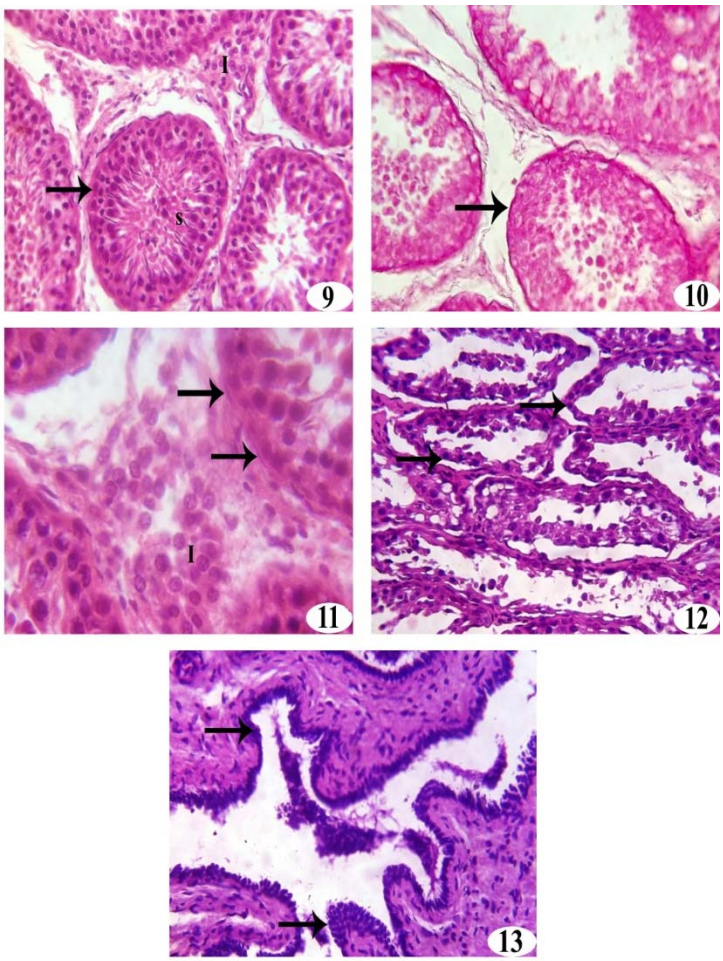

Fig. (9): Photomicrograph of testis at 8 months age showing seminiferous tubule (arrow), containing spermatozoa (S) and in between them interstitial cells are present (I). (H&E stain, x400). Fig. (10): photomicrograph of testis at 8 months age showing PAS positive basal lamina surrounding the seminiferous tubules. (PAS technique, x400). Fig. (11): Photomicrograph of testis at 8 months age showing the interstitial cells (I) and myoid cells (arrow). (H&E stain, x1000). Fig. (12): Photomicrograph of testis at 1 year age showing straight tubules which are lined with simple cuboidal epithelium (arrow). (H&E stain, x400). Fig. (13): Photomicrograph of testis at 1 year age showing rete testis channels lined with simple cuboidal epithelium with some patches of stratified epithelium (arrow). (H&E stain, x400).

The parenchyma of testis of one month old ram was characterized by presence of several seminiferous cords or testicular cords. There were three types of cells present inside the seminiferous cords, first type of cells were resting on the basement membrane of seminiferous cords their nuclei were spherical or oval and darkly stained, second one was present in lumen and characterized by spherical centrally located nucleus and acidophilic cytoplasm, some cells of them showed degenerative changes and the third cell was the Sertoli cell, elongated pyramidal cell, characterized by acidophilic cytoplasm and their nuclei were ovoid in shape, interstitial cells were present in connective tissue between testicular cords (Fig. 1). Some cords, their lumens were filled with homogeneous acidophilic ground substance or matrix, some cells were observed embedded in matrix, this constitutes large volume of testis during first month of age and appeared as solid testicular cords that showed no lumina (Fig.2). At 2 months of age, the number of solid cords became very few in comparison with the first month, most cords contained lumina (Fig.3), little

amount of collagen fibers were only obvious between testicular cords and around blood vessels (Fig.4). During the third month, most cords showed luminae and few solid cords were present (Fig.5). During the fifth month, the tunica albuginea became more organized into two layers, outer fibrous layer and inner one contained blood vessels (Fig.6). The testicular cords resembled those of the third month, no spermatogenesis is initiated till this age. The Sertoli cells were pyramidal in shape and showed euchromatic nucleus, their cytoplasm appeared acidophilic (Fig.7). The rete testis cords were present within the mediastinum and appeared as irregular tubules with varying sizes and were lined with cuboidal epithelium with central, spherical nucleus and acidophilic cytoplasm. The cuboidal cells lining the rete testis tubules had bleb-like apical protrusions which might indicate apocrine mode of secretory activity (Fig.8).

3.2. Pubertal stage

At this stage, maturation of testis was occurred and spermatogenesis was initiated and some spermatozoa could be seen inside the seminiferous tubules (Fig.9). The spermatogenic cells were resting on basal lamina which reacted positively with PAS (Fig.10). The interstitial tissue was present between the seminiferous tubules was formed of Lydig cells, which were polymorphic with ovoid eccentrically located nucleus with prominent nucleolus, also there were some myoid cells surrounding the seminiferous tubules (Fig.11).

3.3 Adulthood stage

The structure of seminiferous tubules were similar to the testis at previous stage except in presence of well developed spermatozoa in lumen, the excurrent duct system of ram testis became well organized, it consisted of terminal segment of convoluted seminiferous tubules, straight tubules and rete testis channels. The straight tubules were lined with simple cuboidal epithelium (Fig.12). The straight tubules were ended by the rete testis channels which were lined with simple cuboidal epithelium with some patches of stratified epithelium (Fig.13).

4. DISCUSSION

The present study revealed that the postnatal development of the testis in sheep could be divided into three stages, prepubertal, pubertal and adulthood stages, this result is in line with Wrobel and Steger (1996) in ovine. The parenchyma of testis of one month old ram was characterized by the presence of several solid cords and some testicular cords, this result is in accordance with El-oksha (1993) in *rabbit*. With the advance of age, the number of solid cords decreased and were replaced by testicular cords which contained spermatogonia and Sertoli cells, no spermatogenesis was initiated at prepuberty stage, this result is in accordance with Ulkera et al. (2005) and Odabas and Kanter (2008) in *lamb*, but conflicted with Nishimura et al. (2000) in *goats*, where they found that, at three months of age, the epithelium lining the seminiferous tubules was stratified and some kids with large body weight their seminiferous tubules containing spermatids. The solid rete cords appeared within the mediastinum at two months of age and became well developed at four months of age, this result is coinciding with El-oksha (1993) in *rabbit* who found that the rete testis canalization starts at 13 days of age and become more organized at 21 days of age. The puberty stage started at 6-8 months of age and the histological observation of testis showinged stratification as the prespermatogonia were replaced by spermatogonia which were dividing mitoticaly to form primary spermatocytes which in turn divide meioticaly giving spermatids, this result disagree with Kishore et al. (2012) in ram who repoted that the age of puperty was 7-9 months of age and in agreement with Odabas and Kanter (2008) in *ram*, who mentioned that spermatogenesis is started at

6 months of age. The adulthood stage started from 9-12 months age, this in line with Kishore et al. (2012) in ram who repoted that postpubertal stage is at 10-12 months age. The histological structure of testis at this stage resembles that described by Abd- El- Maksoud (2005) in bull. The adulthood stage is the best period for artificial insemination.

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تطور الخصية في الخراف بعد الولادة

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الملخص العربي

الخصية في الخراف تمر بتغيرات هستولوجية عديدة أثناء التطور بعد الولادة حتي البلوغ وقد تم ملاحظتها تحت المجهر الضوئي بداية من عمر شهر حتي اكتمال البلوغ عند عمر سنة. في الأعمار الصغيرة من عمر شهر حتي خمسة أشهر لا يوجد تخليق للحيوانات المنوية داخل الخصية ولكن تكون مكونة من أحبال منوية مبطنة بالخلايا المنوية الأم وخلايا سيرتولي ويكون تجويفها مليء بمادة زرقاء لذا تسمي أحبال صلبة وهذة الأحبال الصلبة تكون معظم أجزاء الخصية في عمر شهر وتقل في الكمية مع زيادة العمر. في داخل هذة الأحبال تنقسم الخلية المنوية الأم انقساما ميتوزيا حتي عمر البلوغ الذي يبدأ من ستة الي ثمانية أشهر حيث يبدأ تخليق الحيوانات المنوية. بينما في عمر من تسعة الي اثني عشر شهرا يكتمل تكوين الحيوان المنوي داخل الخصية ويكون الخروف جاهز لاستخدامه في التلقيح الاصطناعي بنجاح.

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