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Histological and Histochemical Features of the Newly Lactating Udderinlocal Breed She Goat (*Caprice Hirccus*)

Yousif R.Jumaah[1], Abdul KarimJafar Karim[2]

[1]Assitant Lecturer, Department of Medical Physics/ Applied Sciences / Fallujah University, [2]Assistant professor, Department of Anatomy and Histology/Veterinary medicine/ Baghdad University.

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Abstract

Six samples of one day post parturition mammary glands of local breed goats were used for this work. The samples of glands were dissected the tissue specimens were fixed in 10% formalin solution. The specimens were processed according to paraffin embedding technique, sectioned at 5-6µm and stained by hematoxylin and eosin, Masson's Trichrom stains and Verhoff stain. The newly lactating mammary gland was covered by very thick, well glandular skin that measured 210.32±9.03µm. The mammary parenchyma was composed of groups of huge mammary lobes which separated by well vascular thick layer of inter lobar fibrous tissue that measured 986.19±23.10 µm (Thickness). The mean of surface area of mammary lobe was134785.48±15.89µm², it was consisted of numerous small size lobules that measured 9848.79±23.75µm² and separated from each other by thin layer of fibro muscular inter lobular connective tissue that measured 138.16±4.11 µm. The lobule was composed of mammary alveoli which revealed marked secretory activities. The mean surface area of alveolus was 784.79±19.09 µm² that lined by cuboidal cells that measured 14.11±1.09 µm. Duct system of newly lactating mammary gland was intra lobular duct, large inter lobar duct, largest lactiferous sinus, the lactiferous sinus was drainage to glandular cisterna that opened into teat cisterna and the later opened into teat canal. Gland cisterna was huge chamber had wide irregular shaped lumen. The mucosa of gland cisterna had few mucosal folds which lined by simple cuboidal epithelium and supported a lamina propria of dense fibro muscular connective tissue. The epithelium of cisterna which close to the mammary lobules was supported thick layer of well vascular fibrous connective tissue. Teat cisterna was composed of mucosal folds that supported by fibro muscular layer with venous plexus.

Keyword: Mammary gland; Goats; Post parturition mammary glands; Lactating; Histological.

Introduction

The mammary gland is an exocrine gland modified to the mammalians which is adapted to the growth requirements in each species, the mammary gland develops during pregnancy and early lactation, and regresses quickly after dry-off.[1] The mammary gland consists of the mamma and the teat, undeveloped in male and female at birth, the female mammary gland begins to develop as a secondary sex characteristic at puberty.[2] In the ruminants, the

Corresponding Author: Yousif Rafea Jumaah, Assitant Lecturer, Department of Medical Physics/ Applied Sciences / Fallujah University.

Email: yousif.r.alani@uofallujah.edu.iq

udder was divided into two distinct halves, separated by the medial or median suspensory ligament, which provided the strength to hold the udder attached to the ventral body wall.[3] The Lactating mammary glands in small ruminants are classified as tubulo-alveolar glands which composed of many lobes those subdivided in to many lobules by strand of intra-lobular connective tissue. The parenchyma of mammary gland consists of alveoli, network of ducts and bundles of connective tissue. The alveolus is the basic secretary unit it is sac like or vesicle of unequal size. They are made of flattened or cuboidal epithelial cells with round nucleus. Myoepithelial cell present in between the basement membrane and epithelium lining the alveolus.[4] The importance of small dairy ruminants has increased significantly during recent years, especially in developing countries where they are an interesting and important alternative for the supply of dairy products for human consumption, whereas in developed countries they are considered as a healthier alternative to cows' milk. Additionally, it is often considered that dairy production in developing countries is an essential tool to overcome social and economic issues such as poverty and malnutrition, particularly in infants.[5] Several studies have investigated the factors influencing milk production, especially lactation stage are very important[6] in cattle[7] in camel[8], havestudying the relationship between the external and internal udder features, teat parameters characters with machine milked of dromedary camels and in ewes have compared between immature mammary gland and lactating mammary gland.[9] The current study was aimed to investigate the histological features of one day post parturition she goat udder.

Materials and Methods

A total six samples of healthy, lactating mammary glands of she goat were collected at one daypost parturition used for this work. The sample were removed immediately from the carcasses and infused with 10% formalin throughout the teats orifices. Each sample was trimmed into small specimens involved teat canal, teat cistern, gland cistern, and parenchyma. All specimens were fixed by neutral buffer formalin 10%. The specimens were prepared with paraffin embedding technique. The tissues specimens were sectioned at 5-6 µm by rotary microtome. The prepared sections were stained with the Hematoxylin and Eosin stain, Masson's Trichrom stain and Verhoff stain[10]. The Histometrical measurements were the diameters of the mammary lobes, lobules, alveoli, thicknesses of inter lobar connective tissue, thickness of inter lobular connective tissue, the heights of the alveolar epithelial cells and number of alveolar cells per alveolus. The sections were examined by light microscopy and photograph has been done by Future electronic microscopic camera, then images have analyzed and scored by using Fiji image analyzer system.[11]

Results

During period of one day post parturient the skin of mammary gland was composed of thick hairy skin, the epidermis of skin was composed of very thick keratinized stratified squamous epithelium which measured 210.32±9.03µm, The dermis was composed of well glandular irregular denes collagenous connective tissue which enriched with groups of sebaceous, sweat glands and had no elastic fibers, the cutaneous glands were composed of groups of tubular coiled apocrine sweat glands and sebaceous glands (Fig. 1).

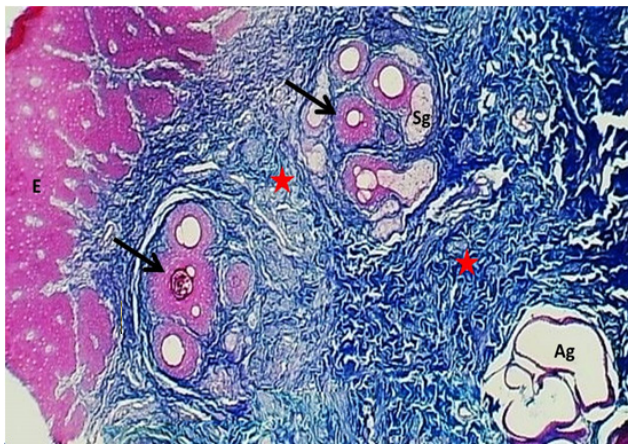

Figure 1: section of skin of goat's mammary gland (One day post parturient) shows: epidermis (E), sub dermal collagenous connective tissue (Asterisks), apocrine sweat glands (Ag), sebaceous gland (Sg), hair follicles (Black arrow). Masson's trichrom stain 40x.

The fibro muscular layer beneath skin of the newly lactating mammary gland was well developed to represent the mammary ligaments, it was thick layer of paralleled and inter crossed bundles of smooth muscle fibers that intermingled with collagen bundles close to glandular mass of the mammary quarter.

At one day post parturition the udder parenchyma was composed of groups of large size lobes which separated by very thick layer of well

vascular inter lobar fibrous connective tissue that measured 986.19±23.10 µm. the inter lobar connective tissue was enriched with small size arteries, veins in addition for branches of autonomic nerves fibers (Fig. 2). The mean of surface area of mammary lobe was 134785.48±15.89 µm² that consisted of numerous small size lobules which measured 9848.79±23.75 µm² those separated from each other by thin layer of fibro muscular inter lobular connective tissue with mean thickness measured 138.16±4.11 µm. Each mammary lobule was composed of cluster of mammary alveoli which revealed marked secretory activities.

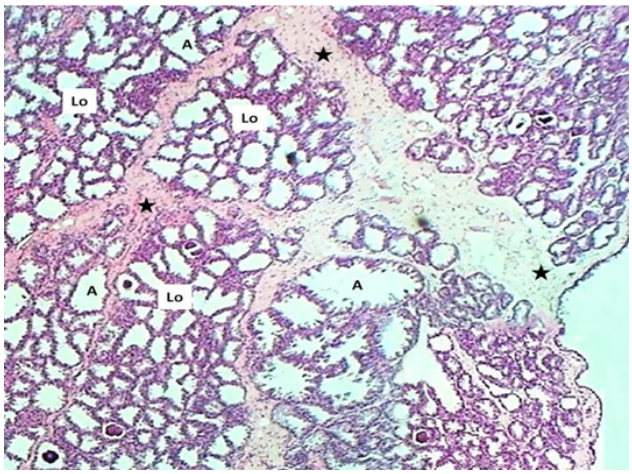

Figure 2: Section of mammary lobe (One day post parturient) shows mammary lobules (Lo), inter lobular connective tissue (Asterisks) and mammary alveoli (A). H&E stain. 40x.

The current results suggested that the secretory activities of mammary alveolar cells required enriched connective tissue that adapted for functional status of lactating gland, the fibroblasts or and precytes were the predominant cells type which was seen in the inter lobar and inter lobular connective tissue that required for angiogenesis and fibrogenesis. The mean of surface area of alveolus was 784.79±19.09 µm² which lined by secreting cuboidal cells, containing large nucleus, dark cytoplasm and resting on basement membrane that followed by clear single layer of myoepithelial cells, the mean height of epithelial cells was 14.11±1.09 µm (Fig. 3). The number of alveolar cells per alveolus was 28.2±0.37.

Duct system of mammary gland was started by intra lobular duct which lined by simple cuboidal cells that showed secretory activities (Fig. 4). The intra lobular duct drained into large inter lobar duct that lined by stratified cuboidal cells at which the first layer of cell represents the basal cells. Both types of ducts were supported by sub epithelial fibrous connective tissue which revealed fibroblasts and fibrocytes. The intra lobar ducts were drained to the largest lactiferous sinus which appeared as wide, had irregular folded lumen and lining by stratified cuboidal cells. The lactiferous sinus was drainage to glandular cisterna that opened into teat cisterna and the later opened into teat canal.

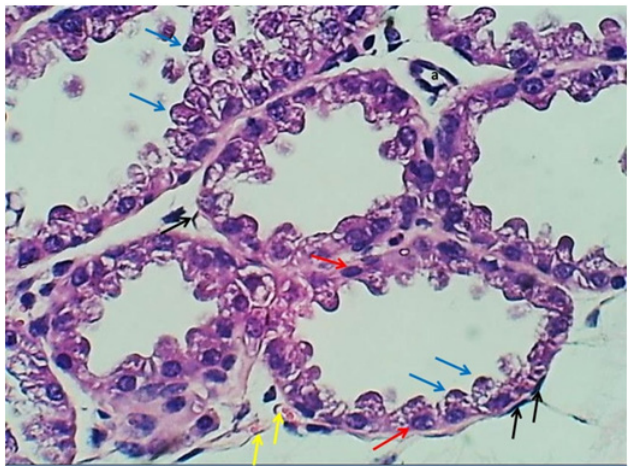

Figure 3: section of mammary alveoli (One day post parturient) shows; secretory activities (Blue arrows), myo epithelial cells (Black arrows), epithelial cells (Red arrows), blood capillaries (yellow arrows) & arteriole (a). H&E stain.400x.

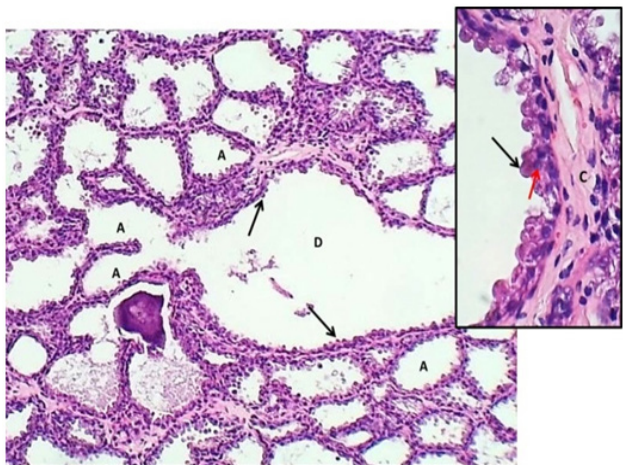

Figure 4: Section of mammary lobule (one day post parturition) shows; intra lobular duct (D) alveoli (A), epithelium (Red arrows) & secretory activities (black arrows). 100 & 400x. H&E stain.

The current result showed that the gland cisterna was huge chamber and displayed wide irregular shaped lumen. The mucosal surface of the gland cisterna was showed multiple mucosal folds. The folds were lined by simple cuboidal epithelium and

supported a lamina propria of dense fibro muscular connective tissue. The epithelium of cisterna which close to the mammary lobules was supported thick layer of well vascular fibrous connective tissue.

Teat cisterna was composed of three layers: mucosal cisterna folds (epithelium and cellular lamina propria) and fibro muscular layer with venous plexus, the folds epithelium was similar that in gland cisterna.

Discussion

The current results of epithelial type, measurements and dermal components were resemble that of immature mammary glands reported by[9] also these results were similar to those reported by[6,7] in she camel and cow respectively, also was reported by[12] in camel and in ewe[4], in mare, bitch and queen.[13,14,15] The current study fined that content of sweat and sebaceous glands were similar that reported by[9] who mentioned that the gland parenchyma of immature and lactating ewes udder had furthermore of both apocrine sweat glands and sebaceous glands, this result disagree with that mentioned by[16] who refereed for neither sebaceous nor sweat glands are found in the wall of teat of lactating cow.

The presence of the fibrous muscle layer represented by thick layer of paralleled and inter crossed bundles of smooth muscle fibers that intermingled with collagen bundles was similar to that mentioned by[2,17] who reported that the inter lobar septa was originated from cutaneous dermis.

Thick well vascular layer of inter lobar fibrous connective tissue was recorded by[4,7,9,12,18,19,20] and [21] who mentioned that the lactating udder the connective tissue became little and lobulo-alveolar tissue is mostly increased.

The type of alveolar epithelial cells at one day post parturition was similar that seen in newly lactating mammary alveoli which described by[4,9] in lactating ewe,[7] lactating cow, and[22] in lactating she camel which was modified for milk production. The alveoli are enlarged with epithelium hypertrophic and they are often folded, they are tense with full of secretion in the mammary glands of lactating.[23] The current results revealed that the alveolar epithelium was cuboidal that disagree with[12] who referred for columnar type this difference is beyond the secretory phase of epithelial cells. The presence of myoepithelial cells around alveoli and inter alveolar connective tissue during immature and lactating period was reported by.[20,24,25] The size of mammary lobes and lobules during lactating period were associated with hormonal effects.[26,27,28] The current result suggests that the stromal cells are the supporting connective tissue which was the main cellular components plays a significant part of the lactating udder, so the myo epithelial cells had supporting role and represented the contractile system which is involved in the ejection of milk from secretory units.

The results of mammary ductal system were agree with those reported by[2,4,7,29], while[9] has revealed that the duct system of mammary gland of newly lactating ewe showed the epithelial cells of intra lobular duct which lined by simple cuboidal cells that showed secretory activities.

The current results suggested that the gland cisterna was huge sinus that adapted for milk storage, so the presence of sub epithelial myo epithelial cells which mentioned by[7,9] could not beneficial, usually the myo epithelial present to support the secretory units of most exocrine glands and never seen at the end parts of duct system.

The current study showed that, the wall of the teats cisterna was similar in to report of[9] in immature and lactating mammary glands of ewe,[7] in cow,[6,12] in camel and[4] in small ruminants, the current results suggests that the composition of low part of mammary gland consider a part of storage and pumping function so, adapted for milking. The venous plexus at the wall of the teats cisterna was formed cavernous like tissue.

Conclusion

In compression to other studies the one day post parturition lactating mammary gland has small alveolar secretory size and number and the less content of elastic fibers within glandular capsule and interstitial tissue.

Ethical Clearance: All samples were taken under local anesthesia and were from multiple animals. Therefore, kindness and compassion for these animals were taken into consideration.

Source of Funding: Self.

Conflict of Interest: Nil.

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