

Histological Study of Ureter and Urinary Bladder of the Adult Black-Tailed Gazelle (*Gazella Subgutturosa*)

Ali, F. Reshag¹ , Ahmed Abdulla Hussein² , Mohammed S. Kadhim³

¹Department of Anatomy, Histology and Embryology, College of Veterinary Medicine University of Baghdad, Iraq.

² Department of Anatomy and Histology, College of Veterinary Medicine University of Diyala, Iraq

³Department of Medical Laboratory Technique, Al-Yarmouk University College

Corresponding author: Ahmed Abdulla Hussein zainabubaidy151515@gmail.com

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Abstract

The histological characteristics of the ureter and the urinary bladder in the Iraqi black-tailed gazelle were investigated by using the histological methods. The current study revealed that both ureter and urinary bladder had the same general histological structures, the wall of each organ consisted of three layers (mucosal layer, muscular layer and adventitia). In ureter the middle muscular layer was circular, thick and clearly distinct. In urinary bladder the mucosa was less folded and the muscular layers were well distinguished and thicker. The urothelium (transitional epithelium) lines the luminal surface of the ureters, and the urinary bladder, it was stratified and consisted of (basal cells, intermediate and the superficial cells). The basal cells were cuboidal to columnar, the intermediate cells was piriform with dark nuclei. The surface cells were large round with pale stained cytoplasm and small dark stained nucleus .The apical membrane of the surface cells was thickened and appeared as dark area. Because of the present of such specialized lining epithelium with the modification of luminal surface of the apical cells membrane , The study suggest that the ureter and urinary bladder of black tail Gazelle was able to with stand the effect of concentrated urine .

Key words: Black-Tailed Gazelle, ureter, urinary bladder, urothelium

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Introduction

The urinary system of mammals include the main functional organs (kidneys), in which urine is excreted, and the conducting organs (ureters, urinary bladder, and the urethra). After renal blood filtration, the resulting liquid (urine) is concentrated and collected in the renal pelvis. The ureters connected with renal pelvis and transport urine to the urinary bladder, which is a temporary storage compartment. Finally through the urethra the urine is evacuated outside the animal body (1, 2).In desert animals like Iraqi black tail Gazelle, the anatomical and histological structures of kidney designed to re absorption of water from the excreted urine, the urine is highly concentrated (3, 4, 5). Histologically the urinary bladder and ureters are similar they have three layers (inner mucosal, middle muscular layer and outer connective tissue adventitia) (6, 7). The ureter and the urinary bladder are lining with unique uroepithelium(transitional epithelium)with very important barrier function (8, 7).The structures, the wall of each organ consisted of three distanced layers from the luminal surface to the peripheral (mucosal layer, muscular layer and mostly connective tissue adventitia or serosa)(Fig.1).This histological picture of urinary path way (ureter and urinary bladder was constant in all mammals. Ureter: The current study revealed that the wall of the ureter consisted of three layers, The mucosal layer formed of urothelium (transitional epithelium)rest on lamina propria-submucosa which consisted of connective tissue, The muscularis mucosa was missing. The muscular layer ,which consisted of smooth muscle bundles which arranged in three levels, inner longitudinal, middle circular, and outer longitudinal layers, The arrangement of the layers was not clearly distinguishable. The inner layer appeared as loose, anastomosing strands of smooth muscle fibers separated by connective tissue fibers mainly collagen fibers. The middle circular layer was thicker and clearly

present study aims to provide histological information about the ureter and urinary bladder of Iraqi black-tailed gazelle which was not previously studied.

Materials And Methods

Six adult healthy male Iraqi black-tailed gazelle (*Gazella Subgutturosa*) from governmental reserve in Kusaybah city were used in this study. The mean weight of live animals was 19Kg. The individuals were scarifed. Their ureters and urinary bladders were dissected and fixed in ten percent formaldehyde solution. Seven micrometer thick Paraffin section were then stained with Haematoxilin and Eosin and Massons 's Trichrome (9). The stained slides were examined and photographed by Olympus light microscope and digital camera.

Results

The current study revealed that both ureters and urinary bladder had the same general histological distinct among the three layers of the muscularis. The outer longitudinal layer was less distinguished. The adventitia of loose connective tissue or a tunica serosa of mesothelium and connective tissue when peritoneal covering is present. The lumen of ureter was star in shape, the mucosal layer was folded, (Fig.1,2). The mucosa epithelium composed of specialized uroepithelium. The smooth muscles bundles was arranged in circular and longitudinal layers. The outer surface was surrounded with connective tissue adventitia. The lamina propria of ureter was formed of dense irregular connective. The muscularis mucosa was absent that caused interwoven of lamina propria with the submucosa forming one layer of connective tissue. The folds of the mucosal layer and the appearance of ureter lumen in cross section was related to the absent of muscularis mucosa and because the present of thick circular middle muscular layer in the wall of Ga-

zelle ureter. In this study we noticed that the in circular manner, whereas the muscular bundles of outer and inner muscular layers were arranged in longitudinal manner, the muscles bundles of this layer were less accuracy and separated by collagen fibers because of this pattern arrangement. The current study suggest that the flow of urine throw the ureter caused mainly by the contraction of the middle muscular layer. Urinary Bladder: The urinary bladder had a histological structure resembles to that of the ureter, except that it was large global with wide lumen structure. Tunica mucosa of the bladder was less folded, lined with urothelium and the propria submucosa appeared as one layer due to lack of of muscularis mucosa. The lamina propria was dense connective tissue with high cellular occurrence, whereas the sub mucosa consisted of high vascular connective tissue. The tunica muscularis was thick layers composed of smooth muscle bundles arranged in many direction (Fig.3,4). The urothelium : The uroepithelium(transitional epithelium) lines the luminal modified urothelia.

most smooth muscle bundles were arranged surface of the ureters, and the urinary bladder. It was stratified in type consisted of the basal cells, the intermediate and the superficial cells. The basal cells were cuboidal to columnar cells in shape, located in the deep layers and larger, pale piriform cells with small nuclei forming the intermediate layer, The surface cells were large round cells with pale stained cytoplasm and small dark stained nucleus. The apical membrane of the cells was thickened and appeared as dark thick area (Fig.5,6). Because the present of such specialized lining epithelium with the modification of luminal surface of the apical cells membrane, this study suggest that the uerter and urinary bladder of black tail Gazelle was able to with stand the effect of concentrated urine and act as barrier during the flowing and storage of urine. This study concluded that the lower urinary tract of Black-Tailed Gazelle which lives in desert and produced high concentrated , Lining with histologically good barrier

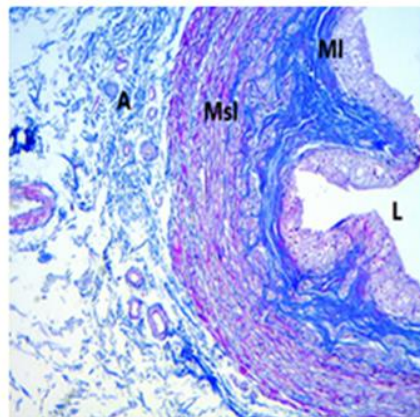


Figure 1 Histological section of ureter shows: L ,lumen MI, mucosa Msl ,muscular layer A(Masson's trichrom stain,X100)

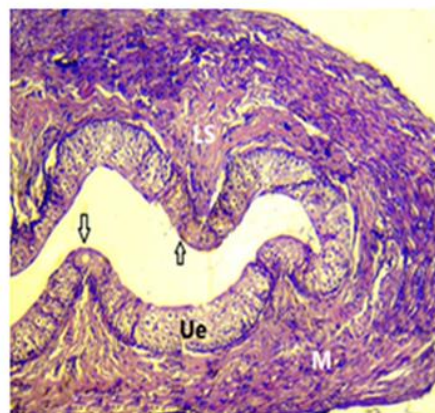


Figure 2 Histological section of ureter shows:Ue, Uroepithelium Ls,lamina propria submucosa ,mucosal folds (black arrows)M,muscularis layer (H&E stain X100)

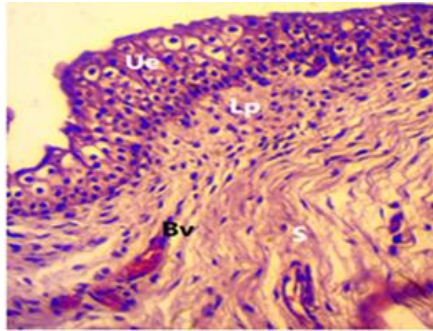


Figure 3 Histological section of urinary bladder shows: Ue, Uroepithelium Lp, lamina propria S, submucosa , Bv, blood vessels (H&E stain X100)

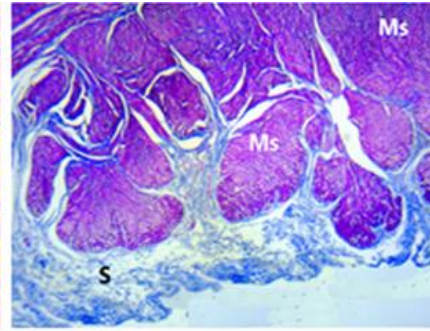


Figure 4 Histological section of urinary bladder shows Ms ,muscular layer S, adventitia (Masson's Trichrom stain X40)

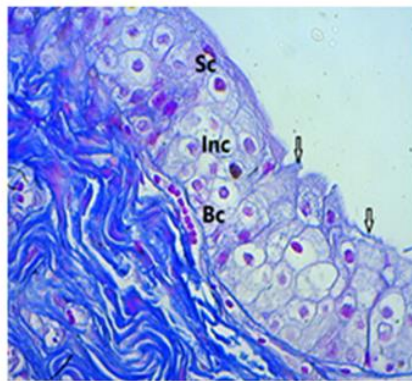


Figure 5 Histological section of ureter shows: Sc, surface cells Inc, Intermediate B, basal cells , membrane plaque (black arrows) (Masson's Trichrom stain X400)

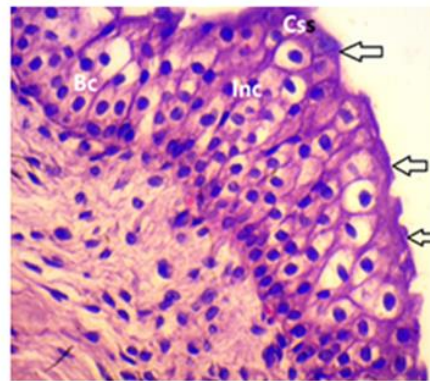


Figure 6 Histological section of urinary bladder shows Sc, surface cells Inc, Intermediate B, basal cells , membrane plaque (black arrows) (H&E stain X400)

Discussion

This histological picture of urinary pathway (ureter and urinary bladder) was constant in all mammals, this fact was reported by many researchers, (10) in rabbits (7) in guinea pig (8) in camel. Ureter: The outer longitudinal layer was less distinguished. The adventitia of loose connective tissue or a tunica serosa of mesothelium and connective tissue when peritoneal covering is present. This result was mentioned by (6, 11) they found that the wall of ureter was consisted of three layers (mucosa, layer of smooth muscles and outer adventitia). The mucosa epithelium composed of specialized uroepithelium. The smooth muscle bundles were arranged in

circular and longitudinal layers. The outer surface was surrounded with connective tissue adventitia. The lamina propria of ureter was formed of dense irregular connective. The muscularis mucosa was absent that caused interwoven of lamina propria with the submucosa forming one layer of connective tissue. This histological picture was described by (8) in the ureter of camel. The folds of the mucosal layer and the appearance of ureter lumen in cross section was related to the absent of muscularis mucosa and because the present of thick circular middle muscular layer in the wall of Gazelle ureter as recorded by (8) and (12). In this study we noticed that the most smooth muscle bundles were arranged in circular man-

ner, whereas the muscular bundles of outer and inner muscular layers were arranged in longitudinal manner, the muscles bundles of this layer were less accuracy and separated by collagen fibers. because of this pattern arrangement, The current study suggest that the flow of urine throw the ureter caused mainly by the contraction of the middle muscular layer. This finding disagree with the results of (12) they suggests that contraction of smooth muscle would cause local shortening of the ureter, than cause luminal constriction.

The histological structure and the layers of Gazelle urinary bladder which described in the present study was compatible with the results of (13, 10, 7) in which they mention that wall of urinary bladder consisted of mucosa. lined by a unique layered transitional epithelium or urothelium, underneath the epithelium connective tissue lamina propria and sub mucosa blood capillaries and lymphocytes, smooth muscular layer followed by connective tissue adventitia.

In the current study the cellular structure of the epithelium which lining the ureter and the urinary bladder of Gazelle was the same and similar with what was mention by (13, 8, 14, 15 and 16). Because the present of such specialized lining epithelium with the modification of luminal surface of the apical cells membrane , this study suggest that the uerter and urinary bladder of black tail Gazelle was able to with stand the effect of concentrated urine and act as barrier during the flowing and storage of urine. This facts were reported by (17,18,19 and 20). They stated that the urothelium cell types and the structure of surface apical cells have modified sight termed plaques are formed at the surface plasma membrane, which act as barrier prevent the transport of urine toxic constraints to the under lining tissue and blood stream. (15) review in their paper that the uroepithelial outermost surface cell layer,

modification and regeneration ability and present of tight junctions, surface thick membrane and dynamic apical membrane exocytosis and endocytosis mechanism , contribute to barrier function to toxic martial uropathogenic bacteria to infect the uroepithelium. The results of the current study proved the finding of (11) who found that some health problem related to the consequence of urothelial defects and urothelial barrier breakdown.

References

1. Dyce, K.M., Sack, W.O. and Wensing, C.J.G., 2002. Textbook of Veterinary Anatomy. 3rdEdn.2. Hickling, D.R., Sun, T.T. and Wu, X.R., 2017. Anatomy and physiology of the urinary tract: relation to host defense and microbial infection. *Urinary Tract Infections: Molecular Pathogenesis and Clinical Management*, pp.1-25.
3. El-Salkh, B.A., Khidr, H.A., Zaki, Z.T. and Basuony, M.I., 2008. Anatomical, Histological and histochemical studies on some organs of true desert rodents in the Egyptian habitats. *The Egyptian journal of hospital medicine*, 33(1), pp.578-306.
4. Mohammed, S.K. and Ali, F.R., 2018. Morpho-Histological Investigation of the Kidney of Iraqi Black-Tailed bull Gazelle (*Gazella Subgutturosa*). *Kufa Journal For Veterinary Medical Sciences*, 9(1).
5. Ali, F. R. and Mohammed, S.K.2018 . Anatomical and Morphometrical Study of the Adult Black-Tailed Gazelle (*Gazella Subgutturosa*) Male Kidney. *Basrah Journal of Veterinary Research*, 17(3):110-119.
6. Jaffer, S.E. and Haso, A.A., 2006. Anatomical and histological study of urinary duct (ureter urinary bladder and urethra) in buffalo and cattle females.
7. Yousif, R.R., 2019. Anatomical and histological study of kidney, ureter and urinary bladder in male guinea pig (*Cavia porcellus*). *Iraqi Journal of Veterinary Medicine*, 43(1), pp.75-84.
8. Zaghloul, D., Hafez, S. and Caceci, T., 2013. Microscopic anatomy and ultrastruc-

- ture of the *Camelus dromedarius* ureter. *Eur. J. Anat*, 17(4), pp.202-208.
9. Bancroft, J.D. and Cook, H.C., 1994. *Manual of histological techniques and their diagnostic application*. Churchill Livingstone.
10. Farhana, S. and Wibowo, F.A., 2019, March. Anatomical and Histological Study of Male Uropoetic Organs of Common Rabbit (*Oryctolagus cuniculus*). In *Proceeding International Conference on Science and Engineering* (Vol. 2, pp. 149-152).
11. Hill, W.G., 2015. Control of urinary drainage and voiding. *Clinical Journal of the American Society of Nephrology*, 10(3), pp.480-492.
12. Spronck, B., Merken, J.J., Reesink, K.D., Kroon, W. and Delhaas, T., 2014. Ureter smooth muscle cell orientation in rat is predominantly longitudinal. *PloS one*, 9(1), p.e86207.
13. Polák, Š., Žiaran, S., Mištinová, J., Bevizová, K., Danišovič, Ľ. and Varga, I., 2012. Options for histological study of the structure and ultrastructure of human urinary bladder epithelium. *Biologia*, 67(5), pp.1018-1025.
14. Martin, B.F., 1972. Cell replacement and differentiation in transitional epithelium: a histological and autoradiographic study of the guinea-pig bladder and ureter. *Journal of anatomy*, 112(Pt 3), p.433.
15. Khandelwal, P., Abraham, S.N. and Apodaca, G., 2009. Cell biology and physiology of the uroepithelium. *American Journal of Physiology-Renal Physiology*, 297(6), pp.F1477-F1501.
16. Woldemeskel, M., Drommer, W. and Wendt, M., 1998. Histology and ultrastructure of the urothelium lining the ureter and the renal pelvis in sows. *Anatomia, histologia, embryologia*, 27(1), pp.51-55.
17. Haschek, W.M., Rousseaux, C.G., Wallig, M.A., Bolon, B. and Ochoa, R. eds., 2013. *Haschek and Rousseaux's handbook of toxicologic pathology*. Academic Press.
18. Apodaca, G., 2004. The uroepithelium: not just a passive barrier. *Traffic*, 5(3), pp.117-128.
19. Birder, L. and Andersson, K.E., 2013. Urothelial signaling. *Physiological reviews*, 93(2), pp.653-680.
- 20 . Lewis, S.A., 2000. Everything you wanted to know about the bladder epithelium but were afraid to ask. *American Journal of Physiology-Renal Physiology*, 278(6), pp.F867-F874.