

Histomorphometrical Study of Infundibulum and Magnum in Turkey and Pigeon

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Abstract: This research was carried out to define the morphological features of infundibulum and magnum in turkey and pigeon. For this purpose, a total of 10 adult healthy turkey (No=5) and pigeon (No= 5) were used. After dissecting, infundibulum and magnum of each specimen was separated by incision and fixed in 10% buffered formalin. For histological studies, after tissue preparation and staining with H&E and special stains, histological layers of infundibulum and magnum were recognized and the size was determined using micrometry method. In turkey, the epithelium of infundibulum was variable in upper end and lower end. It was simple cuboidal in upper end and ciliated simple columnar in middle and lower end. In pigeon, the epithelium of infundibulum was ciliated simple columnar. In histometrical studies, the length of mucosal folds of infundibulum in pigeon and turkey were $500.47 \pm 57.7 \mu\text{m}$ and $125.25 \pm 28.8 \mu\text{m}$ respectively. Mucosal folds in pigeon were leaf shape with secondary folds. The funnel part of infundibulum had no gland but there was seen serous acinus gland in lamina propria of tubular part of it. In pigeon cilia was distinctable. In magnum, epithelium was ciliated pseudostratified in turkey and ciliated pseudostratified columnar in pigeon. In lamina propria mucosal glands with basophilic cytoplasm were seen very extensive. In pigeon, mucosal folds were in different shape and the length of them was seen $1987.5 \pm 161.25 \mu\text{m}$ and $775.12 \pm 35.16 \mu\text{m}$ in turkey and pigeon respectively.

Key words: Histometry • Infundibulum • Magnum • Turkey • Pigeon

INTRODUCTION

In the domestic fowl the functional left oviduct consists of five regions: Infundibulum, magnum, isthmus, uterus or shell gland and vagina. The wall of the oviduct consists of a mucosa made up from pseudostratified epithelium and a glandular lamina propria. The loose connective tissue of the propria-submucosa is rich in lymphocytes and plasma cells. Longitudinal folds in the mucosa extend spirally down the length of the oviduct but vary in height and thickness. The tunica muscularis is smooth muscle and comprises a few bundles in the infundibulum and forms two distinct layers ; inner circular and outer longitudinal in the reminder of the oviduct. It is thickest in the uterus, where it forms a sphincter at the uterovaginal junction and in the vagina (where it causes expulsion of the egg). The tunica serosa consists of a thin layer of loose connective tissue covered by mesothelium [2]. The infundibulum has a secretory function. It produces the first of the egg coats, the chalazae. These are the whitish string-like structures on either side of the

yolk, that keep the embryo in proper position during development [3]. The largest segment of the oviduct, the magnum, is responsible for the production of several egg proteins including avidin, ovomucoid and conalbumin [8,11].

The structure and function of the magnum has been documented in a variety of birds, such as the domestic fowl [4,5,7,14], the Japanese quail [6,9], the guinea fowl [16, 15] and the pied myna (10). In addition, information is available on the maturation of the magnum in the quail [17], the domestic fowl [20] and the ostrich [13]. Because of there is lack of information about pigeon and turkey, so this investigation aimed to describe the various histological and morphological aspects of infundibulum and magnum in the two birds.

MATERIALS AND METHODS

Ten adult female specimens of the turkey and pigeon (each of them five) were collected once a month throughout the year from local natural populations near

Mashhad, Iran. They were killed by cervical dislocation 24 h after capture. The whole oviduct was quickly dissected out and stretched on a paper. For histological observations, two different regions (infundibulum and magnum) of the oviduct were separated by incision and fixed in 10% buffered formalin and processed for routine microtomy. After tissue preparation and staining with H&E, histological layers of infundibulum and magnum such as tunica mucosa, submucosa and muscularis were recognized and the size of them and length of tunica mucosa with micrometry method were measured. In the following, Histochemical reactions were carried out: periodic acid-Schiff(PAS) and Alcian blue(AB) for acid glycoconjugates.

RESULTS

In this research, in turkey, the epithelium of infundibulum was variable in upper end and lower end. It was simple cuboidal in upper end and ciliated simple columnar in middle and lower end. In pigeon, the epithelium of infundibulum was ciliated simple columnar. In histometrical studies, the length of mucosal folds of infundibulum in pigeon and turkey determined $500.47 \pm 57.7 \mu\text{m}$ and $125.25 \pm 28.8 \mu\text{m}$ respectively. Mucosal

folds in pigeon were leaf shape with secondary folds. The funnel part of infundibulum had no gland but there was seen serous acinus gland in lamina propria of tubular part of infundibulum. In pigeon cilia were distinctable and tunica muscularis of infundibulum in turkey was thick (Fig. 1).

In magnum, epithelium was ciliated pseudostratified in turkey and ciliated pseudostratified columnar in pigeon. In lamina propria mucosal glands with basophilic cytoplasm were seen very extensive. In pigeon, mucosal folds were in different shape and size of them, were smaller than turkey. It was seen ($1987.5 \pm 161.25 \mu\text{m}$) and ($775.12 \pm 35.16 \mu\text{m}$) in turkey and pigeon respectively (Fig. 2). Histochemical results showing that, PAS and Alcian blue staining have a similar pattern in infundibulum and magnum of two birds. At results, weak reactivity for Alcian blue and PAS observed.

DISCUSSION

The oviduct of birds, like that of mammals, has an expanded upper end, to catch the released egg. The size of the infundibulum in birds is proportional to the size of the egg. The upper end of the tract is expanded to include long fingerlike fimbriae.

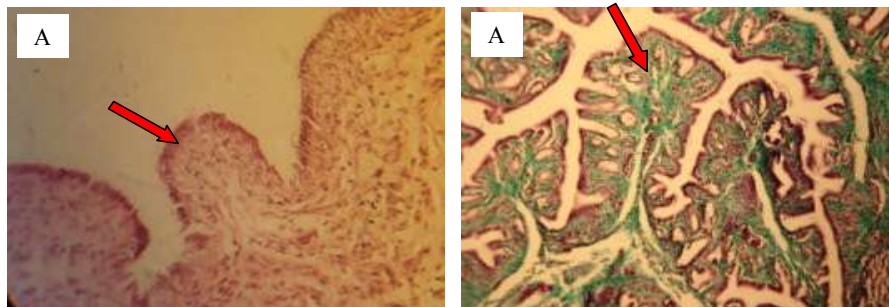


Fig. 1: Photomicrograph showing that size and shape of mucosal folds (arrow) in wall of infundibulum in turkey (A) and pigeon (B)

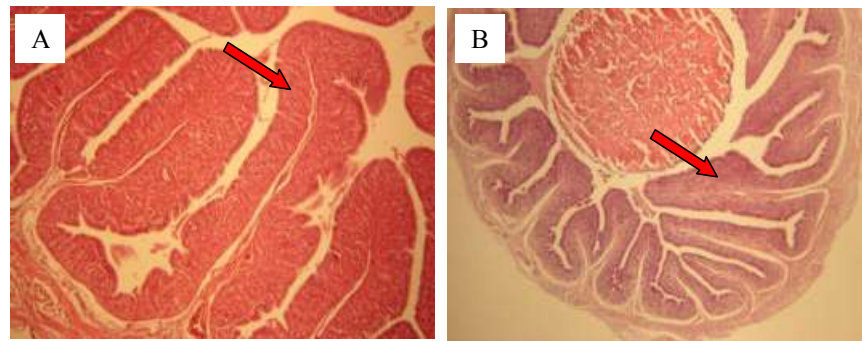


Fig. 2: Photomicrograph showing that size and shape of mucosal folds (arrow) in wall of Magnum in turkey (A) and pigeon (B)

The fimbriae are the long, slender, finger-like projections to the upper right. Each is covered with a ciliated simple columnar epithelium. The beating of the cilia is important in moving the egg into the funnel shaped upper end of the tube [2].

The infundibulum engulfs the shed oocyte and, after fertilization lays down the first layer of albumen. The infundibulum's mucosa is quite rugated and extensive folds are present, but even so, compared to the upper end of the mammalian reproductive tract, it's very open. This is to be expected in light of the size of the egg it has to carry.

As with mammals, fertilization of the egg takes place in the oviduct, usually by sperm that have been stored in the lower end of the tract and squeezed out by the passage of an egg. They then swim up the tract and meet the oncoming next egg. Contractions of the muscular oviduct and body movements help shove the egg along [2,15].

The greatest proportion of albumen is produced by the next and longest part of the duct: the magnum. The mucosal glands of the magnum are lined with columnar cells spacked with eosinophilic granules before the arrival of an egg and depleted after its.

In particular deciliation and the shortening of microvilli were noted in both the current study, as well as in the investigation carried out by Arnold and Shorey [1]. Deciliation is expected, as it is known that ciliogenesis and the maintenance of cilia are dependent on the concentration of circulating oestrogen [12,18]. In addition to deciliation, the extrusion of cells is an indicator of regression in both birds [9] and mammals [19]. Likewise, in the immature ostrich the loss of cells and the presence of cellular debris were prominent features of magnum regression.

The ciliation on the mucosal lining of the fimbriae is very heavy, as you can see here.

The gross arrangement of the fimbriae and the beating of the ciliated epithelium creates a vortex to pull in the egg. The ciliation here is so extensive that it was from this organ that these organelles were first reported, in the early 19th Century. Note the simple nature of the epithelium and the well vascularized CT of the underlying lamina propria.

It was concluded that, histology and morphology of infundibulum and magnum can be variable in birds. Also each part of oviduct has different structures in one species.

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