

Gross and histomorphological studies on infundibulum of adult indigenous chicken (*Gallus domesticus*) of Assam

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ABSTRACT: The present study was conducted on the gross and histomorphological structure of left infundibulum in indigenous chicken of Assam. The infundibulum consisted of a wide funnel shaped membranous part and a short tubular part. The mucosa of infundibulum was lined by pseudostratified ciliated columnar epithelium with primary secondary and tertiary folds and the lamina propria-submucosa was packed with branched tubular glands and it contained large amount of reticular fibres with scanty collagen and elastic fibres. PAS stain reaction was intense in apical part of epithelium, moderate at central part of mucosal folds and weak at lamina propria-submucosa.

Key words: Infundibulum, gross, histomorphology, histochemistry, chicken.

The biological feature of the birds especially the reproductive tract has a great importance replicated by the ever growing weight of aviculture as a branch of animal breeding. The importance of the study of the infundibulum in poultry merges from economical point of view for obtaining the most important product i.e. egg.

In the domestic fowl, the functional left oviduct consists of five regions i.e. Infundibulum, magnum, isthmus, uterus and vagina. Among all, infundibulum is very important as it provides the appropriate environment for its fertilization. In the infundibulum, the egg is fertilized and the first layer of albumen is deposited by its tubular glands. The infundibulum also holds the rooster sperm sac which can supply the germinal disc for each ovum for as much as 10-14 days of chicken oviduct (Mickey *et al.*, 1998). The structure and function of oviduct was like ureter (Sinha *et al.*, 2014) and the structure and function of infundibulum has been documented in a variety of the birds, such as Aseel birds, the domestic fowl, Japanese quail, pigeon and turkey Mohammadpour and Kehtmandi (2008) but information on reproductive tract of chicken of Assam is still to be documented. So the present investigation was aimed to describe the gross and histological aspect of infundibulum in indigenous chicken of Assam.

MATERIALS AND METHODS

The present study was conducted on twenty apparently healthy adult indigenous female chickens (*Gallus domesticus*) of Assam in Department of Anatomy and Histology, College of Veterinary Science, Assam

Agricultural University, Khanapara Guwahati, India. The birds were purchased locally and live weight of each bird was recorded at the time of procurement. The experimental birds were sacrificed as per recommendation of Gracey (1986). The location and topographic position of the ovary and oviduct were located and infundibulum was separated from the reproductive tract. The biometrical measurements viz. the length, breadth and thickness of infundibulum were recorded with the help of Vernier calliper. The tissue pieces were collected from infundibulum and fixed in 10 percent neutral buffered formalin solution for 12 to 24 hours for the histological and histochemical study. Tissues were processed by routine methods, paraffin sections of 5-6 m thickness were cut then these sections were stained with Mayer's haematoxylin and Eosin stain for general tissue reaction, Mallory's methods for collagen fibers, Gomori's methods for reticular fibers, Hart's method for elastic fibers and McManus method for glycogen (PAS) as described by Luna (1968). Epithelial length and thickness of lamina propria-submucosa, tunica muscularis and tunica serosa of infundibulum were recorded in Haematoxylin and Eosin (H & E) stained sections as per standard methods of micrometry (Culling, 1974). Data of the experiment were analyzed by standard statistical method as detailed by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The infundibulum consisted of a wide funnel shaped membranous part and a short tubular part (Fig-1) same was also reported by Vjayakumar *et al.* (2014) in adult

emu bird. The base of wide funnel part was at the level of vertebral end of 7th ribs. The left lateral attachment of the slit like of funnel part was attached to the left abdominal wall caudal to the caudal border of 6th ribs located caudal to the caudal aspect of ovary but it did not show direct attachment to the ovary. (Fig. 2).The tubular part was connected to the magnum by a constricted junction. Its average weight (funnel and tubular) part was 2.0635 ± 0.0794 g, the average breadth and thickness of tubular part were 0.3985 ± 0.0187 cm and 1.0490 ± 0.0209 cm respectively and average length was 7.3000 ± 0.1375 cm. Mishra *et al.* (2014) also reported that length of infundibulum (7.18 ± 4.22 cm) in native chicken of Bangladesh and Romanoff and Romanoff (1949) was reported 7.5 to 9.0 cm in domestic fowl. The wall of the tubular part of the infundibulum was thicker than that of funnel part but thinner than the other parts of oviduct in consonance with Richardson (1935) in fowl.

The infundibulum of adult female indigenous chicken of was highly folded and extended towards the lumen. The mucosal folds were primary secondary and tertiary types (Fig. 3) with many leaf shaped folds, Mohammadpour and Kechtmandi (2008) in pigeon also



Fig. 1. Photograph of infundibulum of adult chicken showing funnel shaped membranous part and tubular part



Fig. 2 Photograph of infundibulum of chicken showing the attachment of funnel part to the left abdominal wall caudal to the caudal border of 6th ribs.

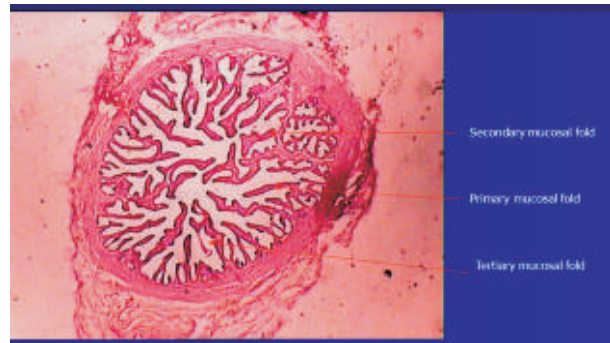


Fig. 3 Photomicrograph of infundibulum showing the primary secondary and tertiary mucosal fold h & e x10

reported that mucosal folds were leaf shaped folds with secondary folds. Primary folds were long slender projecting towards the lumen and some of them had short small folds near the base of folds same was reported by Sharaf *et al.* (2012) in the infundibulum of ostrich. The surface epithelium of infundibulum was pseudostratified ciliated columnar type with some goblet cells (Fig-3) similar finding was also reported by Dellmann (1993) in fowl. However the bases of the all folds were lined by simple ciliated columnar cells. Basal membrane of the lamina epithelialis mucosae contained connective tissue with few collagen fibers. The average height of epithelium was 31.4480 ± 0.9341 m which supports the finding of Richardson (1935) (20.00 to 29.00 m) in fowl and Bansal *et al.* (2010) (57.39 ± 9.93 m to 37.43 ± 11.24 m) in cranial to caudal part of infundibulum of Punjab white quail.

The lamina propria-submucosa was packed with branched tubular gland, areolar connective tissue and lymphatic tissue. The mean thickness of the lamina

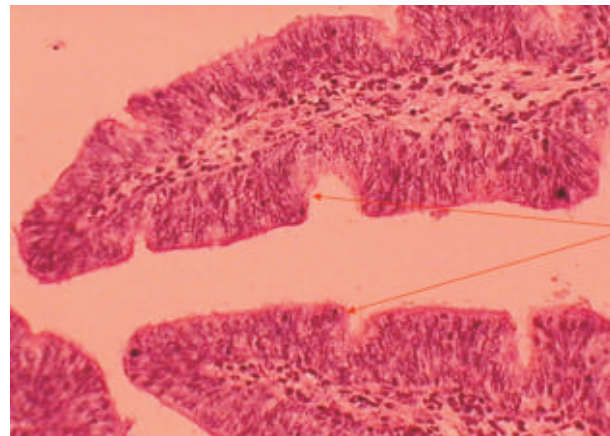


Fig. 4 Photomicrograph of infundibulum showing the pseudostratified ciliated columnar epithelium and tubular glands (g) . H & Ex40.

propria-submucosa, was $1247.1500 \pm 12.1200 \mu\text{m}$. The lamina propria-submucosa contained large amount of reticular fibers with scanty collagen and elastic fibers (Fig. 5) similar to finding of King and Mclelland (1975) in fowl, while Dellmann and Carithers (1996) in poultry reported that these tubular parts were composed of simple tubular glands. There was significant presence of glycogen at the apical part of lining epithelium which was exhibited by intense PAS positive reaction at centre of the fold. Moderate PAS positive reaction was observed in between central part of mucosal fold (Fig-6) and epithelium, and reaction was weak in the lamina propria-submucosa (Fig. 6). However, Aitken (1971) reported that secretory granules in the tubular glands contained neutral polysaccharides.

The tunica muscularis mucosae of infundibulum were composed of inner circular and outer longitudinal fibers of smooth muscles.

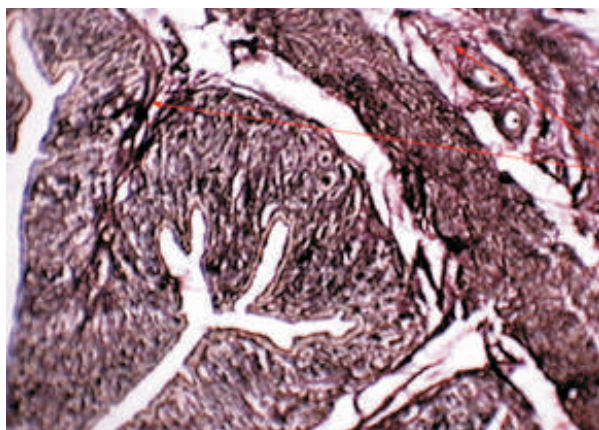


Fig.5 Photomicrograph of infundibulum showing the presence of more reticular fibers in lamina-propria submucosa and tunica muscularis layer X 40

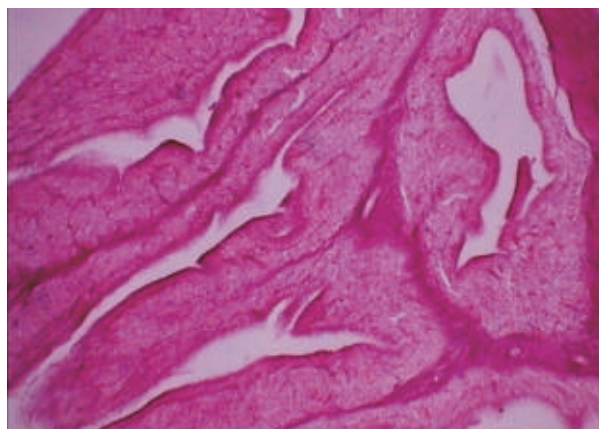


Fig.6 Photomicrograph of infundibulum showing intense pas positive reaction at epithelium and at center of the fold. H & E X40.

Blood vessels were present more in longitudinal layers than circular layers. These layers contained more amounts of reticular fibers and elastic fibers (Fig. 5) and less amount of collagen fibers. Tunica serosa was formed by loose connective tissue, nerve fibers, blood vessels and lymph vessels. Similar finding were also reported by Geetha *et al.* (1992) in Japanese quail. The mean thickness of the tunica muscularis and tunica serosa were $219.5400 \pm 5.8000 \mu\text{m}$ and $22.0195 \pm 0.1800 \mu\text{m}$ respectively.

CONCLUSION

The infundibulum consisted of funnel and tubular parts. The lateral angle of slit (funnel part) extended further cranial and was attached to the left abdominal wall just at caudal border to the vertebral part of the 6th ribs. The mucosa of infundibulum was lined by pseudo stratified ciliated columnar epithelium and consisted of primary, secondary and tertiary mucosal folds. The lamina propria submucosa was packed with branched tubular glands areolar tissue and contained large amount of reticular fibers with scanty collagen and elastic fibers. The tunica muscularis mucoase of infundibulum was composed of inner circular and outer longitudinal fibers of smooth muscle and PAS positive reaction was instance at central parts of fold of the tunica mucosa.

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