

Morphological Morphometrical and Microscopic Studies of Isthmus in Adult Indigenous Chicken (*Gallus Domesticus*) of Assam

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ABSTRACT

The present study was conducted on the gross and histomorphological structure of isthmus in indigenous chicken of Assam. The isthmus was short narrow and partially tortuous tube. The line of demarcation between magnum and isthmus was marked by sharp narrow band of tissue. The lamina epithelialis mucosae were lined by simple ciliated columnar epithelium and the lamina propria submucosae was composed of distended branched tubulo-alveolar gland with loose connective tissue. Tunica muscularis consisted of inner circular and outer longitudinal layers of smooth muscles fibres and tunica serosa was composed of loose connective tissue. The isthmus exhibited PAS positive reaction at the cytoplasm of aggregated clusters of cells located at the folds and in the lamina epithelialis mucosae, lamina propria-submucosa and blood vessels and muscles.

Key words: Chicken, Isthmus, Gross, Histomorphology, Histochemistry

The structure and function of isthmus has been documented in a variety of the birds, such as the domestic fowl, the Japanese quail, pigeon, turkey and hybrid chicken by Khan *et al.*, (1999) but information on reproductive tract of indigenous chicken of Assam is still to be documented. Therefore, this investigation was aimed to describe the gross, histological and histochemical aspects of isthmus in indigenous chicken of Assam.

MATERIALS AND METHODS

The present study was conducted on twenty apparently healthy adult indigenous female chickens of Assam in Department of Anatomy and Histology, Veterinary College at Khanapara, Guwahati. The experimental birds were sacrificed as per the recommendation and technique as described earlier. Bharti and Gautam, 2014; Saleem *et al.*, 2017). The biometrical measurements, viz. the length, breadth and thickness of isthmus were recorded with the help of Vernier callipers. The tissue pieces collected from isthmus were fixed in 10 % neutral buffered formalin for 12 to 24 hours for the histological and histochemical study. Tissues were processed by routine methods and 5-6 μ m thick paraffin sections were cut and stained with Mayer's haematoxylin and eosin stain, Mallory's method for collagen fibers, Gomori's method for reticular fibers, Hart's method for elastic fibers and McManus method for glycogen (PAS) (Luna, 1968). Epithelial length and thickness of lamina propria-submucosa, tunica muscularis and tunica serosa

of isthmus were recorded. Data of the experiment were analyzed by standard statistical method as detailed by Snedecor and Cochran (1994).

RESULTS AND DISCUSSION

The third segment of the oviduct i.e. the isthmus was short and narrow in comparison to magnum and was partly tortuous having a mean length and breadth of 7.8365 \pm 0.1581 cm and 0.7115 \pm 0.0288 cm respectively as reported by King and McLelland (1975) as 8.000 cm and 1.000 cm, respectively.

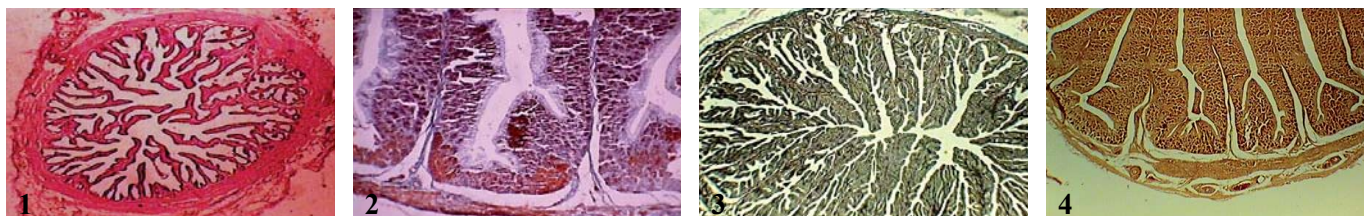
A sharp narrow band of tissue marked the line of demarcation between the magnum and isthmus. The junction was observed as a constricted neck. Isthmus was situated ventral to the caudal lobe of the left kidney and was in relation to the colon ventrally and ascending lobe of the duodenum right laterally. However, Dyce *et al.* (1987) reported that the isthmus was demarcated from magnum by a glandular translucent zone.

The average weight of the isthmus portion of the oviduct was 2.3930 \pm 0.0750 g with an average thickness of 1.0435 \pm 0.0110 cm, respectively. The average weight and thickness of isthmus were 2.3930 \pm 0.0750 g and 1.0435 \pm 0.0110 cm respectively. However, Sarma and Sarma (2001) reported that thickness in local birds of Assam was 0.6900 \pm 0.0100 cm.

The tunica mucosa of the isthmus of adult indigenous chicken was folded. Numerous slender folds were present towards the lumen of the isthmus. The folds were primary, secondary and tertiary type but tertiary folds were few in numbers (Fig. 1). The primary folds were slender and long

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Figs.1-4. 1. Photomicrograph of isthmus showing presence of primary, secondary and tertiary folds. H. & E. x 100; 2. Collagen fibres present in lamina propria-submucosa, tunica muscularis and tunica serosa layers of isthmus. x 40; 3. Presence of reticular fibres; 4. Presence of elastic fibres.

projecting to the center of the lumen (Fig.1). They also contained short uniform secondary folds and height of epithelial cells was comparatively lower than those present in primary fold. In some region of the mucosa, the secondary folds were associated with tertiary folds at the base of primary folds. The lining epithelium of isthmus of adult female indigenous chicken was simple ciliated columnar with goblet cells. Basement membrane of lamina epithelialis mucosae consisted primarily of collagen fibres and very less amount of reticular fibres. Lamina propria-submucosa was filled with distended branched tubular glands. These glands were lined by pyramidal cells with cytoplasm containing many secretory granules. This layer contained more amount of reticular fibres, and little amount of collagen and elastic fibres. The reticular fibres were more in the center of folds (Fig. 3) and few amount of collagen fibres (Fig. 2) and elastic fibres were concentrated towards base of folds (Fig. 4), and presence of lymphocytes, monocytes and plasma cells were noticed in the center of the same fold, as reported by King and McLelland (1975).

The tunica muscularis consisted of two layers of smooth muscle fibres viz., the inner circular and outer longitudinal layer with connective tissue fibres. The tunica serosa consisted of loose connective tissue along with few lymph and blood vessels and nerve fibres. The mean thickness of lamina epithelialis mucosae was 37.4240 ± 1.002 nm. However, Richardson (1975) reported that the thickness of surface epithelium of isthmus was about 25.000 nm. The mean thickness of the lamina propria-submucosa, tunica muscularis and tunica serosa were 2167.1800 ± 13.0018 , 339.2800 ± 4.2528 and 24.9160 ± 0.4489 nm, respectively. However King (1977) reported that the thickness of primary folds was 1.5-2.5mm. Presently, isthmus exhibited PAS positive reaction at the cytoplasm of aggregated clusters of cells located at the folds and in the lamina epithelialis mucosae, lamina propria-submucosa and blood vessels and muscles. However,

Aitken (1971) reported presence of mucopolysaccharides in secretion of granules of tubular glands.

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