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RESEARCH ARTICLE

Histomorphological and histochemical studies on infundibulum of oviduct in Japanease quails

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Abstract : The mucosa of Isthumus presented lamina epithelialis, lamina propria and lamina mucosae. The mucosa was thrown into folds *viz.*, primary and secondary folds. The lamina epithelialis presented simple columnar ciliated epithelium in pseudostratified columnar ciliated epithelium was observed in isthmus in both the groups of quail.

Key words : Histomorphology, Histochemistry infundibulum , Oviduct, Japanease quail

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INTRODUCTION

Very mear information is available in literature on histology and histochemistery of infudibulum in Japanies quails, hence present investigation was made.

RESEARCH METHODOLOGY

The present study was conducted on twenty Japanese quails. The birds were equally divided into two group's *viz.*, group I (4-5 weeks of age) and group II (7-8 weeks of age). Apparently healthy quails were used for this study.

For histological study, tissue pieces of 3 to 5 cm thick, were cur across the center of each segment of the oviduct and were fixed in 10 per cent neutral buffered formalin overnight at room temperature. These tissue pieces were then treated with routine methods of dehydration of ascending grades of alcohol (ethanol), cleared in xylene and embedded in paraffin wax. Each prepared paraffin blocks were sectioned serially at 3 to 5 µ thickness. The sections were stained with Mayer's haematoxyline and eosin stain for general histological and micrometrical observations (Singh and Sulochana, 1996). The following special staining techniques were also used for histomorphological study Massons trichrome for collagen fibres (Luna, 1968) and Verhoeff's stains for elastic fibres (Luna, 1968).

McManus's PAS method (Singh and Sulochana, 1996), was implied to demonstrate the glycogen and

mucopolysaccharides in different segments of oviduct in both the groups.

The micrometrical observations of infundibulum of oviduct was recorded in microns (m) as per the method of Culling (1969). The micrometrical observations were made by using ocular micrometer duly calibrated with stage micrometer. The measurements were recorded by calculating the average of 4 to 5 fields from each of stained slides.

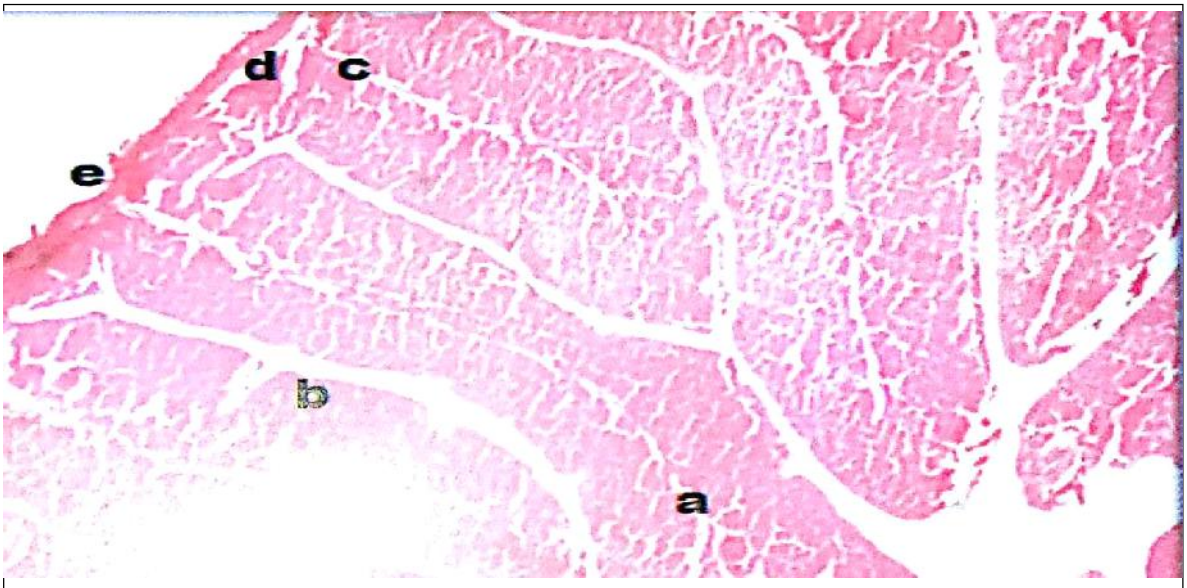
The data obtained was statistically analyzed and compared for micrometrical observations as per the method suggested by Snedecor and Cocharan (1994).

RESULTS AND DISCUSSION

The wall of the infundibulum was composed of four basic layers *viz.*, tunica mucosa, tunica submucosa, tunica muscularis and tunica serosa from inside to outwards. This finding was in consonance with the earlier reports of Dellmann and Eurell (1998) in domestic fowl, Bansal *et al.* (2010) in Punjab white quails and Ghule *et al.* (2010) in Japanese quails.

In the present study, the tunica mucosa presented lamina epithelialis, lamina propria and lamina muscularis mucosea The average thickenss of the tunica mucosa was 2.66 $\pm$ 0.33 μm in immature quails (groups I) and 3.77 $\pm$ 0.27 μm in quails during laying of eggs (groups II) (Table 5). The mucosal thickness was increased with the advancement of age. The mucosa of the infundibulum was highly folded and branched in the cranial part however, this branching and folding gradually decreased in the caudal part and became leaf like. This finding was in accordance with the reports of Kanchana *et al.* (2009) in non-laying guinea fowls, Bansal *et al.* (2010) in Punjab white quails and Ghule *et al.* (2010) in Japanese quails. However, Bacha and Bacha (1990) reported that the mucosal folds were thrown into shallow ridges that increased in height towards the neck region in hen, Dellmann and Eurell (1998) observed that the cranial extremity was dilated and possessed long fimbriae to grasp the egg cell in domestic fowl and Mohammadpour and Keshtmandi (2008) in turkey and pigeon reported that the size of the infundibulum in birds in proportional to the size of the egg and the upper end of the tract is expanded to include long finger like fimbrae.

In the present study, the mucosal folds were classified as primary and secondary (Plate 1) as reported earlier by Ghule *et al.* (2010) in Japanese quails. The average number of primary folds per field at cranial and caudal parts of the infundibulum was 8.50 $\pm$ 0.18 and 8.83 $\pm$ 0.16 in group I and 12.77 $\pm$ 0.27 and 13.88 $\pm$ 0.3 in group II, respectively



(a) Primary mucosal fold, (b) Secondary mucosal fold, (c) Tunica submucosa, (d) Tunica muscularis, (e) Tunica serosa

Plate 1 : Microscopic photograph of caudal part of infundibulum of 4- 5 weeks of age Japanese quail (H and E 200)

and that of secondary folds were 34.50 ± 1.60 and 36.83 ± 1.37 in group I and 47.00 ± 0.70 and 48.88 ± 0.97 in group II, respectively (Table 2). The number of mucosal folds were found to be increased with the advancement of age in group II as compared to group I in the present study.

The length of the primary folds at cranial and caudal parts of the infundibulum was 27.83 ± 0.54 and 20.32 ± 0.49 μm in group I and 41.55 ± 0.62 and 32.10 ± 0.35 μm in group II, respectively and that of secondary folds was 10.16 ± 0.16 and 8.16 ± 0.47 μm in group I and 16.11 ± 0.30 and 14.11 ± 0.26 μm in group II, respectively (Table 3).

Table 1 : Mean (± SE) values of number of primary and secondary mucosal fold per microscopic field in infundibulum of oviduct in Japanese quail at different groups

Sr. No.	Segment of oviduct	Group I Mean ± SE		Group II Mean ± SE	
		Primary folds	Secondary folds	Primary folds	Secondary folds
1.	**Infundibulum of oviduct**				
	Cranial part	8.50 ± 0.18	34.50 ± 1.60	12.77 ± 0.27**	47.00 ± 0.70**
	Caudal part	8.83 ± 0.16	36.83 ± 1.37	13.88 ± 0.30**	48.88 ± 0.97**

** indicate significance of value at P ≤ 0.01
Group I : Japanese quail of 4-5 weeks of age; Group II : Japanese quail of 7-8 weeks of age

Table 2 : Mean (± SE) values of length («m) of primary and secondary mucosal folds in infundibulum of oviduct in Japanese quail at different groups

Sr. No.	Segment of oviduct	Group I Mean ± SE		Group II Mean ± SE	
		Primary folds	Secondary folds	Primary folds	Secondary folds
1.	**Infundibulum of oviduct («m)**				
	Cranial part	27.83 ± 0.54	10.16 ± 0.16	41.55 ± .62**	16.11 ± 0.30**
	Caudal part	20.33 ± 0.49	8.16 ± 0.47	32.11 ± 0.35**	14.11 ± 0.26**

NS = Non-significant ** indicatea significance of value at P ≤ 0.01
Group I : Japanese quail of 4-5 weeks of age ; Group II : Japanese quail of 7-8 weeks of age

Table 3 : Mean (± SE) values of height of epithelium («m) in infundibulum of oviduct in Japanese quail at different groups

Sr. No.	Segment of oviduct	Group I Mean ± SE	Group II Mean ± SE
1.	**Infundibulum of oviduct («m)**		
	Cranial part	3.33 ± 0.21	3.88 ± 0.11*
	Caudal part	2.66 ± 0.21	2.88 ± 0.2 ^{NS}

NS = Non-significant * and ** indicate significance of values at P ≤ 0.05 and 0.01, respectively

Table 4 : Mean (± SE) values thickness («m) of tunica mucosa, tunica submuosa, tunica muscularis in infundibulum of oviduct in Japanese quail at different groups

Sr. No.	Segment of oviduct	Group I Mean ± SE			Group II Mean ± SE		
		Tunica mucosa	Tunica submucosa	Tunica muscularis	Tunica mucosa	Tunica submucosa	Tunica muscularis
1	Infundibulum of oviduct (μm)	2.66 ± 0.33	1.16 ± 0.16	3.16 ± 0.16	3.77 ± 0.27**	1.38 ± 0.16^{NS}	4.11 ± 0.11**

NS = Non-significant * and ** indicate significance of values at P ≤ 0.05 and 0.01, respectively
Group I : Japanese quail of 4-5 weeks of age ; Group II : Japanese quail of 7-8 weeks of age

Table 5 : McManus's PAS activity for glycogen in infundibulum of oviduct in Japanese quail at different groups

Sr. No.	Segment of oviduct	Group I Regional showing PAS		Group II Regional showing PAS	
		Lining epithelium	Proprial gland	Lining epithelium	Proprial gland
1	Infundibulum of oviduct	+	+	++	++

+ Weak PAS +ve reaction ++ Moderate PAS +ve reaction
Group I : Japanese quail of 4-5 weeks of age ; Group II : Japanese quail of 7-8 weeks of age

Similar findings have been reported in the infundibulum of Punjab white quails by Bansal *et al.* (2010). However, the values found in the present study are lower than the reports of Bansal *et al.* (2010) in Punjab white quails. But the trend of decrease in the length of the folds definitely correlates with the reports of Bansal *et al.*(2010) in Punjab white quails. Further, the length of the folds was increased with the advancement of age in the present study, could not be compared for want of similar records in the literature.

The lining epithelium of the infundibulum was simple columnar ciliated type. The nuclei of the epithelial cells were placed centrally (Plate 1). These observations were in accordance with the reports of Berg *et al.* (2001) in Japanese quail, Kanchana *et al.* (2009) in non-laying guinea fowls. Mohammadpour and Keshtmandi (2008) in turkey and pigeon. Bansal *et al.* (2010) in Punjab white quails and Ghule *et al.* (2010) in Japanese quails.

The height of cranial and caudal parts of the infundibular epithelium was 3.33 $\pm$ 0.21 and 2.66 $\pm$ 0.21 µm in immature quails and 3.88 $\pm$ 0.11 and 2.88 $\pm$ 0.20 µm in group II, respectively However, Khoklov (2008) reported higher values of epithelial height 10.00 – 18.00 µm in sexually mature hens. Though the values are lower in the present study, the trend of reduction in the height of the epithelium in caudal part as compared to cranial part of the infundibulum were in agreement with the findings of Bansal *et al.* (2010) in adult Punjab white quails.

The cranial part of the infundibulum was devoid of the proprial glands where as the caudal part showed simple tubular glands, lined by cuboidal to low columnar cells and were located in vicinity of secondary folds (Plate 1). This finding goes well with the reports of Gopinath and Hafeezuddin (1980) in domestic fowl, Mohammadpour and Keshtmandi (2008) in turkey and pigeon and Bansal *et al.* (2010) in Punjab white quails. Bansal *et al.* (2010) further, opined that the absence of proprial glands in the cranial part of the infundibulum may be correlated to facilitate the fertilization before deposition of albumen.

The tunica submucosa was made up of loose connective tissue with blood vessels but without glands. The average thickness of the tunica submucosa was 1.16 $\pm$ 0.16 µm in group I and 1.38 $\pm$ 0.16 µm in group II (Table 5). The average thickness of tunica submucosa was slightly increased with the advancement of age in the present study.

The tunica muscularis was found thicker due to scattered and loosely arranged smooth muscle bundles. The collagen fibres were interspersed between the two muscle layers It was measured 3.16 $\pm$ 0.16 µm in group I and 4.11 $\pm$ 0.11 µm in group II (Table 5). The loose arrangement of muscle bundles may give flexibility and aid in picking up the oocyte at ovulation from ovarian surface as suggested by Artan and Daghoglu (1984) in hen and Parida *et al.* (2000) in coturnix quails.

The tunica serosa was made up of a subserosa with loose connective tissue fibres and lamina epithelialis serosa with mesothelium in group I and group II.

The lining epithelium and the proprial glands of the infundibulum showed weak reaction for PAS activity in the immature quails. However, with the advancement of age, the reaction was observed to be moderate in the lining epithelium and the proprial glands of the infundibulum in the quails during laying of egg Similar were the reports of Artan and Daghoglu (1984) in hen.

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