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M Santhi Lakshmi

Department of Veterinary
Anatomy, College of Veterinary
Science, Tirupathi,
Andhra Pradesh, India

K Raghu Naik

Department of Veterinary
Anatomy, College of Veterinary
Science, Tirupathi,
Andhra Pradesh, India

D Pramod Kumar

Department of Veterinary
Anatomy, College of Veterinary
Science, Tirupathi,
Andhra Pradesh, India

Microanatomical studies on the uterus (shell gland) of Emu bird (*Dromaius novaehollandiae*)

M Santhi Lakshmi, K Raghu Naik and D Pramod Kumar

Abstract

The mucosal folds of uterus were the longest folds among all the regions in the oviduct and they were found to be long, narrow, leaf like and branched into primary and secondary folds. The surface epithelium was pseudo stratified columnar ciliated epithelium. The lamina propria was packed densely with tubular glands. The submucosa was highly vascular, rich in collagen and elastic fibres and carried branched tubular glands. The submucosa was extended upward into the central core of primary folds. The tunica muscularis was highly vascular and contained inner circular and outer longitudinal layers of smooth muscle fibres and a distinct stratum vasculare in between the layers.

Keywords: Microanatomy, uterus, oviduct, emu bird

1. Introduction

The Emu is the second largest living bird and is reared commercially in many parts of the world for meat, oil, skin and feathers, which are of high economic value. The uterus in emu is also called 'Shell gland', a long expanded area of the oviduct. It is located ventral to the left pubic bone along the dorsolateral aspect of the descending colon. The literature is available only on the gross anatomical features of the oviduct in the emu bird. Hence the present work has been undertaken to study in detail about the microanatomical features of uterus under light microscopy.

Materials and Methods

The present work was conducted at the Department of Veterinary Anatomy, College of Veterinary Science, Rajendranagar, Hyderabad. The tissue samples of uterus were obtained from ten adult apparently healthy Emu birds from slaughter house in Vijayawada and poultry farm in the Hyderabad. The tissue pieces were fixed in 10% neutral buffered formalin and Bouin's solution and processed as per the methods described by Singh and Sulochana (1997) [12]. Paraffin sections of 3-5 μ m thickness were cut and subjected to the routine and special histological staining methods.

Results and Discussion

The wall of the uterus was formed by mucosa, submucosa, tunica muscularis and tunica serosa from within outwards (Fig.1). The mucosal folds were long and short primary folds as reported by in fowl and Saber *et al.* (2009) [11] in ostrich. Most of the primary folds were long, narrow, tortuous, leaf shaped and branched into secondary folds (Fig. 1) and their spiral arrangement gave a floral appearance for the lumen. These observations were similar to the reports in ostrich (Saber *et al.*, 2009) [11], Japanese quail (Ghule *et al.*, 2010) [3] and duck (Mirhish and Saif, 2013) [6]. The primary folds of uterus were observed to be the longest folds of the oviduct and their length was found as $4301.3 \pm 479.65 \mu$ m. The width of primary mucosal folds was least among all the regional folds and it was recorded as $590.40 \pm 49.94 \mu$ m. The total number of mucosal folds per cross section of uterus was ranged from 105-127.

The surface epithelium was pseudo stratified columnar ciliated epithelium (Fig. 2) as noticed in quail (Bansal *et al.*, 2010 and Ghule *et al.*, 2010) [1, 3], guinea fowl, turkey (Parto *et al.*, 2011; Mirhish and Saif, 2013) [9, 6]. However a single layer of ciliated cylindrical and secretory cells were reported in duck by Ozen *et al.* (2009) [8]. The epithelium contained ciliated, non-ciliated columnar, basal and goblet cells, of which the non ciliated columnar cells were predominant. Similar types of cells were reported by Bansal *et al.* (2010) [1] in duck. In contrary to the present findings, only ciliated columnar cells were observed in the lining

Correspondence

M Santhi Lakshmi

Department of Veterinary
Anatomy, College of Veterinary
Science, Tirupathi,
Andhra Pradesh, India

epithelium of hen and duck by The nuclei of ciliated cells positioned apically and that of non ciliated cells lay basally. The height of the lining epithelium was $23.73 \pm 1.06 \mu\text{m}$. Two types of non ciliated columnar cells i.e., light and dark cells, light cells with spherical vesicular nucleus towards the base and the dark cells showed darkly stained nucleus either in the central or in the basal portion.

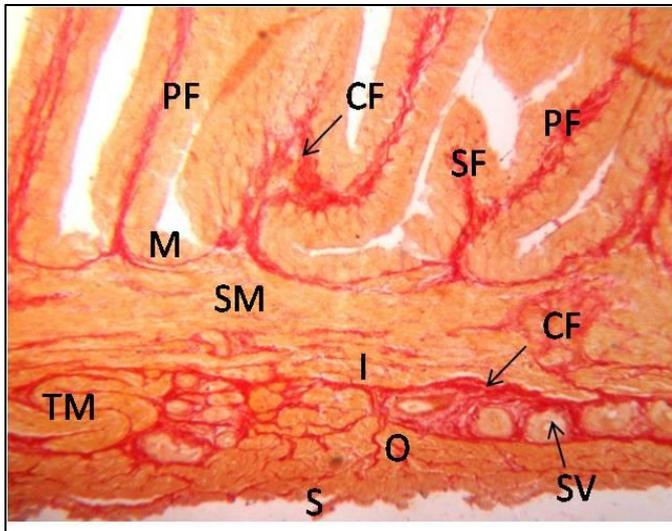


Fig 1: Photomicrograph of wall of the uterus showing long, leaf like branched primary folds (PF) and collagen fibres (CF) in the stratum vasculare (SV), central core of folds. Mucosa (M), submucosa (SM), I- Inner circular layer, O- Outer longitudinal layer, tunica muscularis (TM), tunica serosa (S), secondary folds (SF).

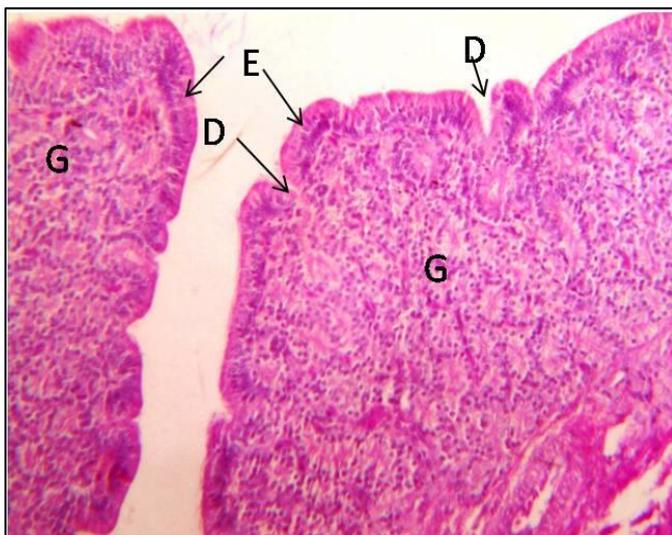


Fig 2: Photomicrograph of primary fold of uterus showing the surface epithelium (E) i.e., pseudostratified columnar ciliated epithelium and densely packed branched tubular glands (G) in subepithelial layer. D-openings of ducts of glands

The surface epithelium of the primary folds showed several invaginations, which formed tubular glands in the underlying connective tissue, which was similar to the observations found in fowl and duck. The core of the long primary folds carried a layer of submucosa rich in collagen fibres (Figs. 1, 3), elastic fibres (Fig. 4) and smooth muscle fibres in the center and tubular glands in subepithelial layer. The lamina propria was composed of loose vascular connective tissue and packed densely with tubular glands (Fig. 2) as reported in quail by Bansal *et al.* (2010) [1]. The thickness of the glandular

acini was $32.36 \pm 2.43 \mu\text{m}$, while that of glandular epithelium was found to be $18.93 \pm 0.99 \mu\text{m}$. The glandular acini were lined by columnar cells, which contained spherical basal nuclei and apical secretory granules (Fig.2). The ducts of the glands were lined with pseudostratified columnar epithelium and opened either onto the surface epithelium or at the bases of invaginations on long primary folds. The cells lining the ducts showed distinct cilia at their openings on to the surface. The muscularis mucosa was distinct and contained a thin layer of smooth muscle fibres.

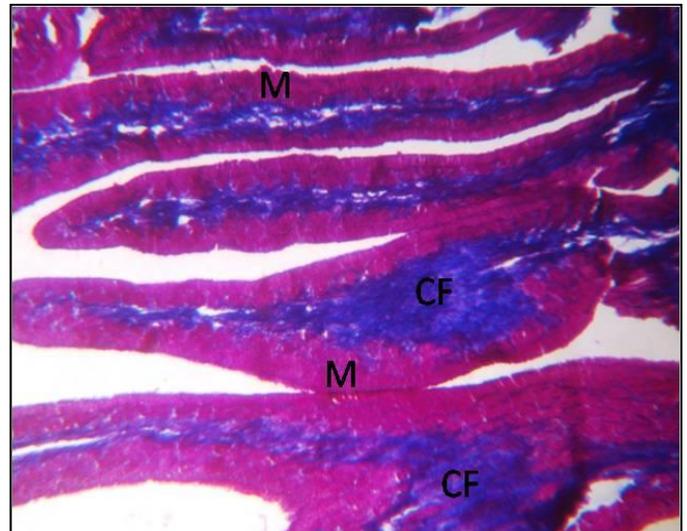


Fig 3: Photomicrograph of long leaf shaped primary folds of uterus showing collagen fibres (CF) extended from sub mucosal connective tissue into the central core. M- Mucosa

The submucosal connective tissue was highly vascular with large amount of collagen (Fig. 1) and elastic fibres (Fig. 4) along with branched tubular glands (Fig.5). Similar observations were reported in turkey (Parto *et al.*, 2011) [9] and Japanese quail (Ghule *et al.*, 2010; Mirhish *et al.*, 2013) [3, 6]. The submucosal connective tissue was extended into the middle core of long primary mucosal folds (Fig.3).

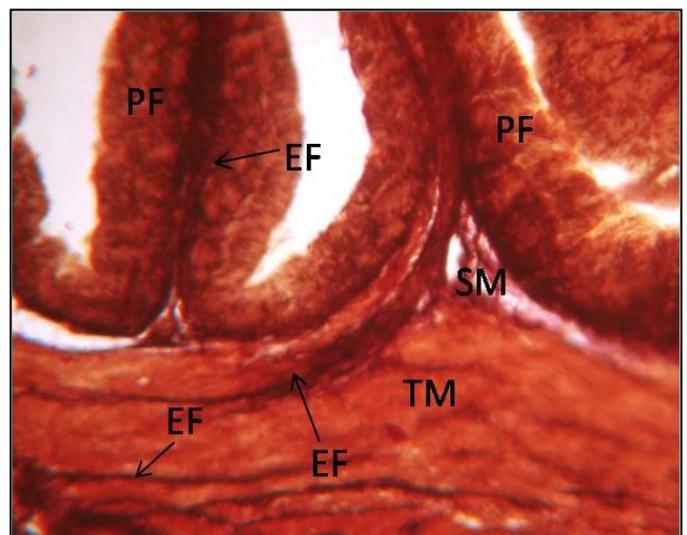


Fig 4: Photomicrograph of uterine wall showing large number elastic fibres (EF) in submucosal connective tissue (SM) of primary mucosal folds (PF) and tunica muscularis (TM).

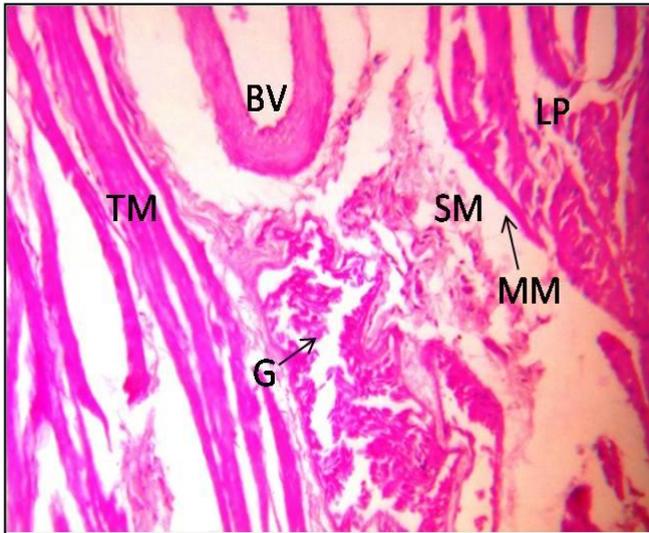


Fig 5: Photomicrograph of wall of the uterus showing distinct muscularis mucosae (MM), branched tubular glands (G) in the submucosa (SM). BV- Blood vessels, LP- Lamina propria, TM- Tunica muscularis

The tunica muscularis was the thickest layer in the wall of uterus, highly vascular and contained thick inner circular and thin outer longitudinal layers of smooth muscle fibres (Figs. 1,5) as reported in Japanese quail by Ghule *et al.* (2010) [3]. The stratum vasculare was well developed in between the layers of tunica muscularis and contained a layer of blood vessels surrounded by large amounts of connective tissue (Figs. 1). In the present study, smooth muscle fibres from inner circular layer were extended into the middle of the primary and secondary folds, which was not reported in earlier studies. The tunica serosa was very thin and made up of a thin layer of loose connective tissue covered with mesothelium.

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