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Research Article

Anatomical and histological finding of proventriculus and gizzard in crow (Linnoecus Corvus)

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Article Info

Article history:

Received 30-4-2023

Received in revised form

7-7-2023

Accepted 26-7-2023

Available online 13-12-2023

Keywords: morphological, histology, proventriculus and gizzard, Crow

ABSRACT

The gross morphological and histological structure of the proventriculus and gizzard in crow (*Linnoecus Corvus*) were the goal of the current study. Twenty adult birds were obtained from bird hunters in Diyala province and all birds were weighted, the mean total body weight was (206.818± 0.22) gm, and the mean total body weight of the stomach was 6.971± 0.33gm. The stomach of the Iraqi crow appeared as muscular organ divided into two parts glandular and muscular part that located in the left cranial of the coelomic cavity, while the proventriculus appeared as tubular in form.An internal surface of gizzard was connected with the small intestine through an opening as a slit.The mucus membrane of the gizzard has mucus folds with yellow in color The current study the histological description of the stomach in the Iraqi crow showed that the stomach consists of four layers (mucosa, submucosa, muscularis, and serosa). The mucosa consists of three layers. and there were many tubular glands present in submucosa lined by simple cuboidal epithelium.The muscular layer of stomach (proventiculus) has two layers internal and external while the gizzard has four layers .the gastric gland present in submucosa.the muscular layer consist of two layers such as the proventiculus

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Peer review under responsibility of Iraqi Academic Scientific Journal and University of Kerbala.

Introduction

The Iraqi crow (*Linnoecus Corvus*) is a great distinguished type of birds, large to medium in size. The crows are related to corvidae family, which is one of the most brilliant birds (1). In comparison with mammals, a singular character in physiology and anatomy is manifested the bird's digestive system (2).The stomach of a bird varies in size and is distinguished into two portions the upper portion glandular and the lower part (gizzard) non-glandular, Generally, the wall of the glandular part(proventriculus) In the birds that eat seed and meat were thin.(3) (4).

The internal mucosa of the glandular and non-glandular stomach contains the project into the lumen as the fold (gastric fold) but a small depression of the epithelium that extended into lamina propria known as a gastric pit (5) (2).Generally, the wall of a glandular part is composed from 4 layers (mucosa, submucosa , musculais and serosa). The epitheliums lining are simple columnar and lack cells of goblet, and lamina propria these layers consist of highly vascular connective tissue and manydistribution of lymph cells as in as in moorhen(6) and ostrich(7)

Materials and methods

Twenty adult Iraqi crow (*Linnoecus corvus*)were obtained from bird hunters in Diyala province, and immediately slaughtered after they were hunted and all the birds were weighted , means of crows body weight were (206.818± 0.22) gm and mean total weight of the stomach was (6.971± 0.33gm), the stomach was obtained from the killed birds and washed with normal saline, and by using digital camera photographs the anatomical pictures of the stomach and its relation with other organs were achieved, specimens were fixed by using 10% Formalin and bouins solution for a histological study, after fixation and dehydration, the specimens were processed by ascending ethanol and embedded in wax then cleared by using xylene and finally preparation the slides and staining technique (8).

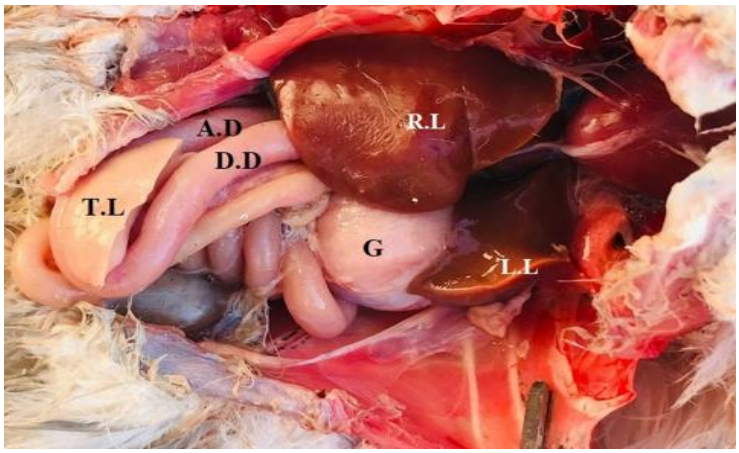


Figure 1: Photograph illustrate position stomach of Crow, (*Linnaecus corvus*) in the left side of coelomic cavity shows gizzard (G),right liver lobe(R.L),and left liver (L.L).duodenum ascending and descending (A.D& D.D.)

Figure 2: Photograph illustrate A- Anatomical appearance of the external surfaces of stomach in crow, proventriculus (P), Gizzard (G); B- Anatomical appearance of the interior surfaces of stomach of, longitudinal of mucosal fold (black arrow), isthmus (i)

Results

Morphological study: The morphology in the present study revealed the stomach of the local Iraq crow (*Linnoecus corvus*) situated cranially in the left coelomic cavity (Fig.1) composed of two dilatation (expended) parts and an isthmus. The cranial part was glandular called the proventriculus the muscular part (ventriculus). The isthmus is the middle region is connect cranial part of the stomach with the caudal apart . The proventriculus jointed with the esophagus there is no demarcated boundary between them, the proventriculus takes a form of a spindle and there were present an amount of fat covering it, the muscular stomach was elongated structure spindle in shape (Fig.2, A) positioned at cranial dorsal region to coelomic, and found near the median plane between the lobes of the liver.

Gizzard: The muscular stomach is a muscular organ, have wide body and oval in shape

two ends the cranial end connected with the isthmus and the pyloric region caudal end connected with the duodenum on the left side and passes obliquely from left to right and connected with the duodenum (Fig.2).The inner aspect of the gizzard was lined by a hardened mucous membrane, yellow color, and it contains distinct mucosal folds (20-24) folds of mucosa and observed the small grit and stone (Fig.2, B)

Histological features of proventriculus:

The tunica mucosa was protrudes into the folds (plicae proventiculares) with different heights that separated one another by Tsulici histologically the glandular part that secretes the gastric juice section of the crow revealed the tubular organ possessed four tunica arranged from the outside to inside include (serosa, musculais, submucosa and mucosa) (Fig.3) cells of simple columnar represent the epithelium lining, while lamina propria that extended inside the fold and it is narrow also contain irregular arranged collagen fibers and rich with blood lymphatic vessels and infiltration by leucocyte observed also and (Fig.4). The muscularis mucosa was absent (Fig.4) .and the lamia propria lies on the submucosa.

Submucosa tunica: this tunica occuped the space between propria and tunica muscularis and was composed of dense connective tissue (Fig.3), and contains many glands lined with cuboidal epithelium and had a serrated appearance and they opened into the lumen of the stomach through a duct (Fig. 5)

Tunica muscularis was thick and composed of two layers, an outer layer is circular, whereas longitudinal layer as inner one, a connective tissue of loose type formed the serosa (Fig.3).

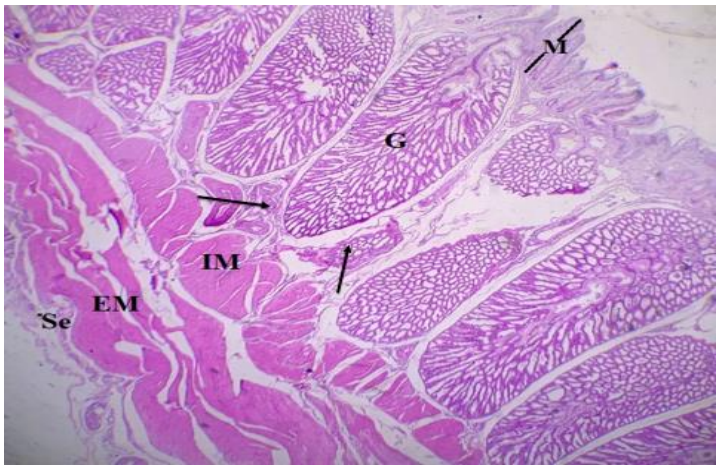


Figure 3: photomicroscopy illustrates the proventriculus wall of crow: tunica mucosa (M), gastric glands (G), sub mucosa (black arrow), tunica muscularis (MI,ME), Serosa (Se),(H & E stain X 40).

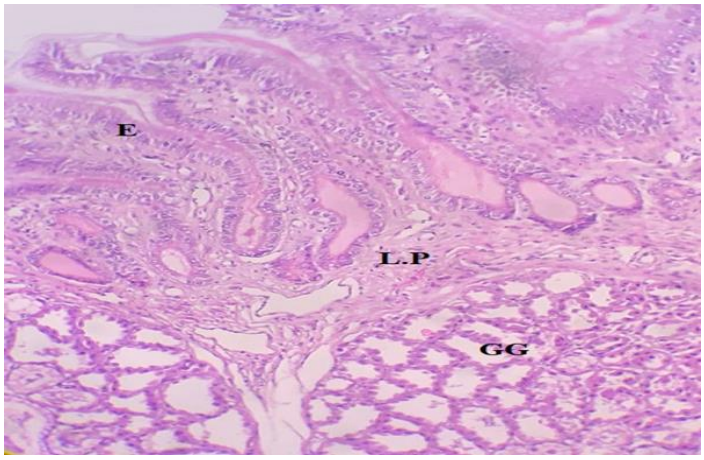


Figure 4: photomicroscope illustrates the proventriculus wall of crow showed tunica mucosa, Show: lining simple columnar epithelium (E), lamina propria (L.P), Submucosa gland (GG), around the glands (H & E stain X200).

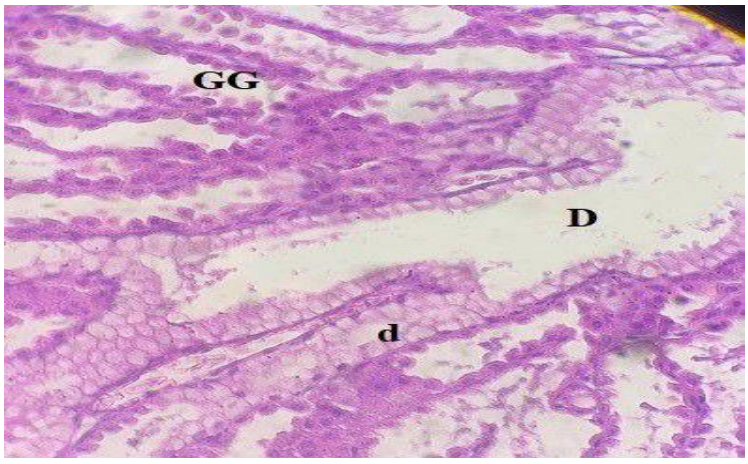


Figure 5: P.hotomicroscope section shows of the proventriculus gland (GG); shows secretory tubule glands have one duct (d), and opens in the major collecting duct

Histological result of Gizzard:

histologically the muscular wall of the gizzard was thicker than the proventriculus, the mucosa is invaginated into the lamina of the gizzard and forms the different pits (Fig.6). These tunicae consisted of three part the epithelium was simple columnar cells,that lie in the shot fold, the lamina propria contain many glands (tubular glands) that opened among the folds and cover the superficial surface by koilin (Fig.7) these glands composed of the flattened cells (chief cell) line in upper and mid region of gland(Fig.8).And the muscularis mucosa was thick band scattered between the lamina and submucosa, under the gastric glands (Fig.8). In the current study, observed the muscularis tunica of the gizzard was, developed and it had a hardening lining and composed of two circular tunics of smooth muscle inner layers were circular, while the longitudinal found outer layers.

Tunica serosa: was covered by mesothelium (mesothelium), which contains the many blood vessels, it is constituted by of loose connective tissue (Fig.6).

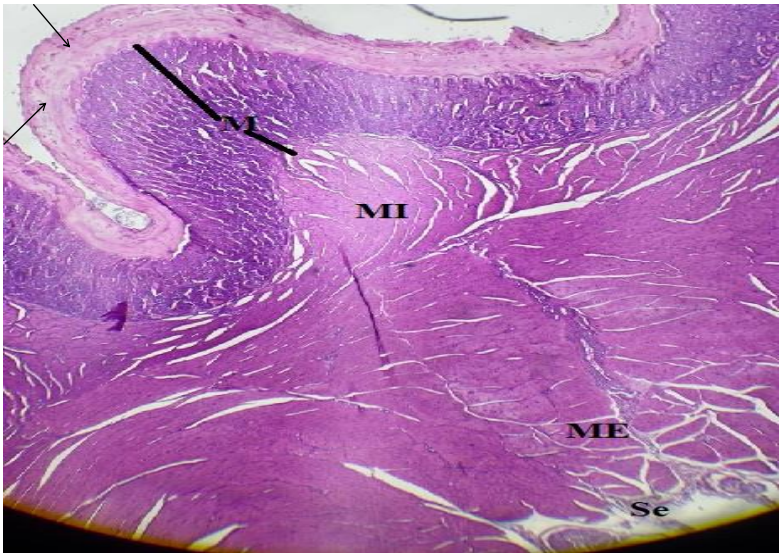
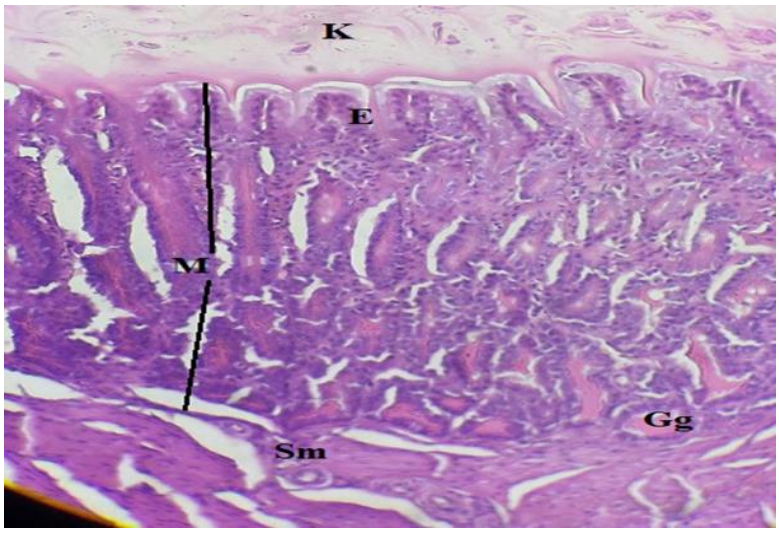
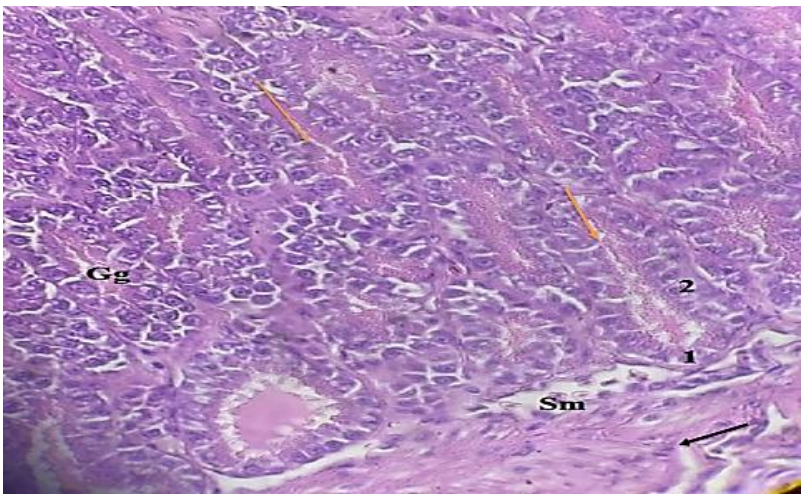


Figure 6: photomicroscopic illustrates the gizzard wall of crow showed mucosa (M) cuticle and epithelial lining of the mucosa black (arrow),.muscularis mucosa inner (MI), muscle outer layer (ME),and tunica serous (SE) H & E stain X40.



Figure, 7: photomicroscope of the gizzard wall of crow illustrate the cuticle (K), mucosa (M), submucosa (Sm), mucosa showed higher magnification of epithelial cells in the mucosa, epithelium (E)simple columnar cells,(H & E stain, X100).



Figure, 8: the gizzard wall of crow illustrate the gastric gland (Gg),the basal cell (1) ,the flattened chief cells (2),gastric pit (yellow arrow),sub mucosa (Sm) (H & E stain X400).

Discussion

In current study the shape of the proventriculus was spindle and elongated similar to previous study as laughing dove as well as pigeon (9), and disagree in common moorhen (10), in ostrich (7) and located in left side obliquely which occupies the cranial cavity of coelomic these results are acceptable in falcons (4); in rock pigeons (9). In the current study, the gizzard was circular in shape and surrounded by fatty tissue and keratinoid lie the mucosal surface this results in disagreement with Captive bustards (11).

The stomach structures of birds vary in size and shape dependingon external environment, the current work is similar to the finding of the previous study.Histologically the of proventriculus was thrown into many fold (plicae proventicular) lining by the simple columnar epithelium this result was similar with findings of quail (12), duck and pigeon (13), Rock pigeon, and Egyptian laughing dove (9), that indicating some participation in the immune response of bird(crow) (14) (15), in current study the muscularis mucosa was absent in crow (*Linnaecus corvus*) this result finding in falcon (4); turkey (16), but some birds the muscularis mucosa appeared as the thin smooth muscle fibers underlying submucosa such as in guinea fowl (17); red jungle fowl (18);blue-fronted parrot (19).Egyptian mallard (20),while some species of birds the mucosa lamina located under the mucosal glands such as ostrich (7) and Moorhen (6),in the current study, the submucosa of proventriculus was observed developed and contained many simple tubular glands, this result is similar to present in many birds such as in Guinea fowl (*Numida meleagris*) (17) ; coot bird (21); Magpie (*pica pica*)(15); Eygpain mallard (20),these glands extended from the base of the lamina propria to the submucosa but this resulted is disagreement with Black-tailed Crake (22), submucosa was lacking. unica muscularis composed of the two layers the inner layer and outer layer these tunica are high thick layers to assist grinders mechanically in gizzard (5)this result was reported in the broiler (23); Mallard (24),and the blue-fronted parrot (19),but different in Magpie (pica pica) that have a fibers of three layers smooth muscle (15),which covered with loose connective tissue (tunica serosa) this result is present in most avian such as in blue-fronted parrot (*Amazona aestiva*)(19) in hooded crow (25) .

Gizzard: The muscular stomach walls in local crows similar to other avian species such as guinea fowl (17), were composed of four layers. the mucous membrane was very distinct has low folds and the superficial surface filled the cavity with koiline is secreted from the gastric gland to protect and lubricant the cells lining and play a role in antibacterial materials(26), this result is similar in magpie (pica pica) (15) and disagrees with partridge(*Rhynchotus*

rufesence)(27),and in kestrel(28) in striated scop owl (12) that lack the keratinoid lining.The epithelium of gizzard lies by columnar cells similar observation was reported in red-capped cardinal (29). other species in blue-fronted-parrot (19). Lamina mucosa contained numerous the tubular glands which were the protruding lamellae of the glandular cells making depth crypts these results agree in Laughing dove,(30)and in duck (31).The muscularis mucosa was present under lamina as smooth muscle bundles this result finding in Egyptian mallard(20) and in parrot and black francolin (32).but disagreement in red-capped –cardinal bird (18) and in Black –tailed crake (22).

In present study a two layers detected in muscular tunica that arranged thick circular outer and longitudinal shape of thin layer as inner one. and these findings agreed within carnivorous bird (Iraqi falcon) (15), and in ostriches (*Struthiob camelus*) (7).while mentioned three layers of the muscles fibers forming the muscularis tunica that includes inner(circular), middle (oblique), and outer (longitudinal),this result finding in bred –capped cardinal(29), and Moorhen (6)and disagreement in parrot observed only one the layer (inner) (33) was adapted depending on the type the food lead to break up and grinding of grains (20). Tunica serosa similar in serosa in proventiculus consists of connective tissue which comprised the vessels of lymphatic and blood, nerve same as those mentioned in partridge (Rhyn chotus rufesence) (27) and in avian and Egyptian mallard

Conclusions

The morphology of stomach of crow divided into two compartments are separated from each other isthmus the glandular part is connected cranially by the esophagus there are no demarked districts between them and the muscular part is connected by the duodenum. Histologically the stomach was a typical tubular organ, the proventriculus composed of four layers (mucosa, submucosa,muscularis and serosa).and the gland present in lamina propria,and lack muscularis mucosa in gizzard but present in proventiculus .the gizzard wall has similar to the proventriculus wall

Acknowledgment:

In the beginning, I thank the Lord of the Worlds for granting me the health, and strength for completing this research. The authors would like to thank the dean of the veterinary college in Diyala University to facilitate the requirements for this study and we would like to thank the reviewers for this article.

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