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Morphometric Study of the Small Intestine in Two Types of Bird's Guinea Fowl (Numidia Meleagris) and Falcon (F. Tinnunculus)

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Annotation: The small intestine in studied birds consists from three part (duodenum, jejunum, and ileum). The small intestine extended from the pyloric portion of the gizzard to the junction with large intestine .It was appeared as a coiled mass of long tube forming series loops inside the coelomic cavity. Only the duodenum was obvious towards the right side of the coelomic cavity , while the other parts of small intestine jejunum and ileum were covered partially by duodenal loop. The duodenum was distinct form of a characteristic U-shape tube, consisted of proximal "descending" and distal "ascending" arms forming loops of the duodenum. The small intestine become coiled and structured a number of short garland-like coiled at the dorsal edge of a thin mesentery towards the dorsal part of coelomic cavity to form the jejunum which was the longest part of small intestine in current study that have pinkish gray color guinea fowl and in falcon show dark pink part. Ileum of studied birds were the third part of the small intestine. It appeared as a reddish gray to yellowish straight short structure and it was shorter than the previous parts of small intestine.

Keywords: Duodenum, Jejunum, Ileum and Small intestine.

Introduction

There are about 8600 kinds of birds distributed throughout the world, out of them the order Passeriformes found the largest. Whereas, the smallest one was the order Struthioniformes . During previous century, different kind of birds were studied in Iraq by several investigators such (AL-Samawy, E.R; Fayak, J.t. (2015).

Guinea fowls were produced in Africa, and were first domesticated by earliest Egyptians (Oakland, 2001). They are presently distributed in many parts of the world (Dondofema, 2000; Ligomela, 2000; Robinson, 2000; Smith, 2000; Embury, 2001; Saina, 2001).

Kestrel is a characterized member of the falcon family , and one of the most popular birds of prey , it is numerous and wide spread of the world , have much or varied colors , feed on different insects types or tiny mammals such as mice , young ground squirrels and sometime feeds even small birds (AL-kafagy, S. M. 2016)

The avian digestive system consist of the mouth cavity, phyranx ,esophagus, crop, and stomach (proventriculus and ventriculus),small intestine , large intestine and cloaca. It is short compared to those of mammals (**Gelis**, S. (2012).

The small intestine of the birds made up of three portions: duodenum, jejunum and ileum respectively. The first one begins from the gizzard constitute a loop encompass large part of the pancreas. The second part between the duodenum and the ileum when is jointed by the Mackle's diverticulum, the last part in the small intestine is ileum which extends from the diverticulum to the ileocaecal junction (Yamauchi et al ., 2010). The aims of the current study are to highlight the morphological features of the (duodenum, jejunum and ileum) in the studied birds.

Material and Method

Ten birds were used to conduct the current study. The samples were examined by me and made sure that they were in good health and didn’t contain any diseases. The study was based on the differences in their food types.

The studied birds were weighed and euthanized by Ketamin (100 mg /Kg) xylazine (10mg/Kg) intramuscular injection (Murphy and Fialkwaski ,2001; Atiyah and Amin,2014).

Each male Falcon and Guinea fowl were dissected by fixing it on a suitable dissecting plate to expose the abdominal viscera including the small intestine , then mid-line incision was made in the abdominal wall, then the small intestinal segments (duodenum, jejunum, ileum,) were identified and photographed in situ by using the digital camera . Location, relationships of each segment of the small intestine. The small intestine was extirpated, washed with normal saline to remove the blood and adhered debris, emptied the contents of intestine then rinsed and cleaned by the normal saline.

Each bird's weight was measured using sensitive balance before anesthesia and the weight of the entire small intestine was calculated after emptying its contents and cleaning with normal saline slowly, The relative weight was calculated by using the equation below (al-kafagy,2016).

The length of the body was measured in centimeters, starting at the front and going down to the back. The total length of the small intestine was calculated after extracting the entire small intestine from the abdomen and placing it in a straight line on a plate. Following the extirpation of the relative mesentery, the relative length of the small intestine was computed using the following equation (alkafagy,2016).

Results and Discussion:

The small intestine in studied birds appeared after uncovering show the consists from three part (duodenum, jejunum, and ileum) (Fig.1,2). The small intestine extended from the pyloric portion of the gizzard to the junction with large intestine .It was appeared as a coiled mass of long tube forming series loops inside the coelomic cavity. Only the duodenum was obvious towards the right

side of the coelomic cavity , while the other parts of small intestine jejunum and ileum were covered partially by duodenal loop, thus results similar to the previously reported data in different avian species such as quail, birds, herbivores and omnivores birds, Barn Owl (Tyto alba), ostrich, and chickens (Wang and Peng, 2008; Yammauchi *et al.*, 2010; Ahmad *et al.*, 2012; Nasrin *et al.*, 2012; Zaher *et al.*, 2012; Mostafa *et al.*, 2012 Oyleowo *et al.*, 2016).

The duodenum was distinct form of a characteristic U-shape tube, (Fig.1.)consisted of proximal "descending" and distal "ascending" arms forming loops of the duodenum in studied birds with pink color guinea fowl while pink to white color in falcon which surrounded most of the pancreas which connected and holds the two arms together this results resembling to that observed previously in different avian species as captive bustards (Bailey *et al.*, 1997; Dyce, 2002), Aseel and Rhode island poultry red breed (Dang ,2009), quail by Ahmed *et al.* (2012), mallard by Dawood (2013), buzzard *Buteo buteo vulpinus* by AL-ghakany (2013).

After the termination of duodenal loop, the small intestine become coiled and structured a number of short garland-like coiled at the dorsal edge of a thin mesentery towards the dorsal part of coelomic cavity (Fig.1,2)to form the jejunum which was the longest part of small intestine in current study that have pinkish gray color guinea fowl and in falcon show dark pink part . It is related to the stomach, the spleen and the right lobe of liver . No marked demarcation between jejunum and ileum, they were attached to the roof of the celomic cavity by a well-marked mesentery, as similar finding by Aizawa *et al.*, (2012) Usendi *et al.*,(2013), and (Oyelow *et al.*, 2016) . In poultry, similar observations were reported (Ahmad *et al.*, 2012; and Nasrin *et al.*, 2012).

Ileum of studied birds were the third part of the small intestine. It appeared as a reddish gray to yellowish straight short structure and it was shorter than the previous parts of small intestine. Cranially it was continuing with the jejunum and it terminating at the ileo-cecal junction, caudally, it was located between right and left ceca.

This finding was in agreement with the previous observations of Ahmad et al. (2012) on Coturnix coturnix japonica, but in contrary to Aizawa et al. (2012) on yellow and blue macawa in which the ileum was continuous with the colorectum and no caeca were present. While Bailey et al. (1997) reported that they were unable to identify the different segments of Gallus small intestine, thus they named the jejunoileum. The ileum of falcon which was starts after vitelline diverticulum lies on and attached to floor of abdomen, somewhat gray in color, directed caudally to its when it joined with two tiny ceca.

Part of small intestine	**Anatomical parameters**	**Guinea fowl**	**Falcon**	**T- test**
		Average ± SE	Average ± SE	
Duodenum	Weight (g)	10,67±1.19	2.28±0.27	14.76*
	Length (cm)	18.82±2.80	8±1.55	9.30*
	Diameter (mm)	8±1.22	4.20±0.84	5.728*
jejunum	Weight (g)	12.40±0.73	2.68±0.31	29.65*
	Length (cm)	33.06±2.18	18.4±2.32	16.40*
	Diameter(mm)	5.40±1.14	3.60±0.89	2.713 NS
ileum	Weight (g)	3.12±0.33	1.0±0.2	14.49*
	Length (cm)	10.08±1.9	4.02±1.4	4.57*
	Diameter (mm)	4.20±0.84	3±0.71	3.207*
	* (P<0.05) significant, NS: Non-Significant.			

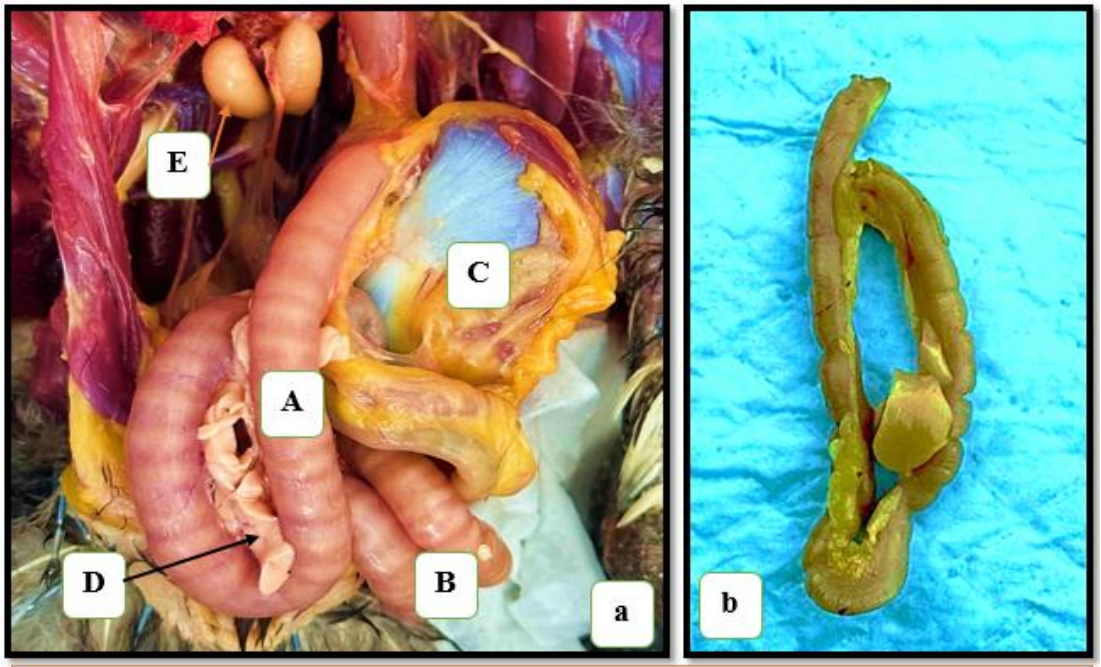

Fig.1. Show the parts of celomic cavity with small intestine (**A**): Duodenum, (B): Jejunum, (**C**): Muscular stomach, (**D**): Pancreas and (**E**): testes. In Guinea fowl (**a**) Visceral cavity, (**b**) Duodenum parts

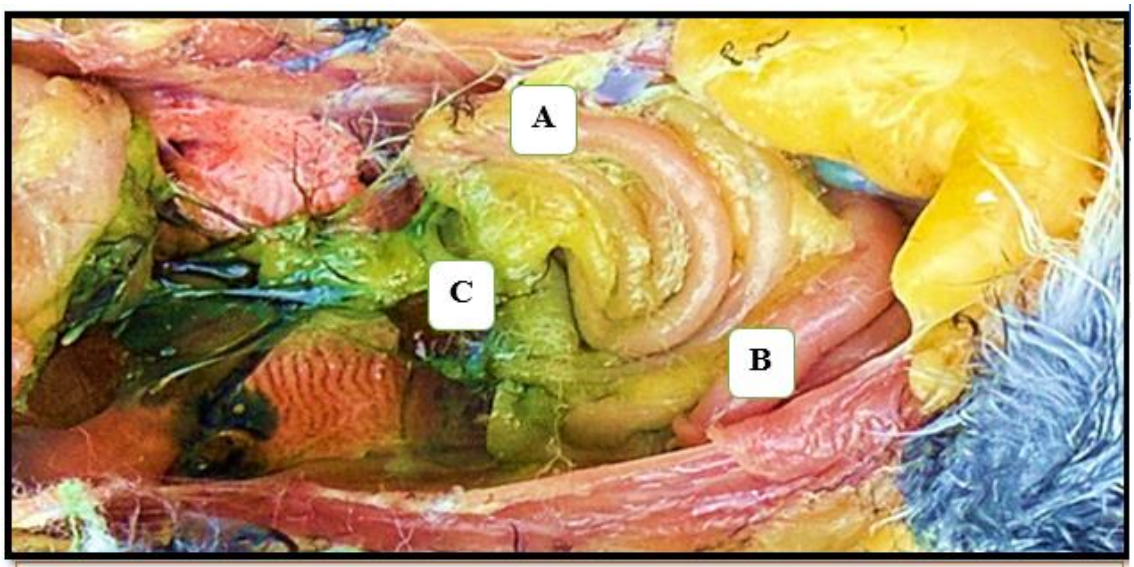

Fig.2. Show the parts of celomic cavity with small intestine (**A**): Duodenum, (B): Jejunum, (**C**): Pancreas. In Falcon

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