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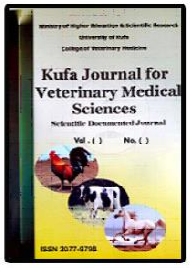

Morphological description of the pancreas in male and female swan geese

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Abstract

One of the organs that can be found in the abdominal cavity is called the pancreas. It is a vital component in the process by which the food we eat is transformed into fuel for the cells of the body. For investigation of morphological description of the pancreas, the study was performed on twenty adult swan geese (10 males and 10 females). According to the morphological findings, the pancreas of geese was located on the right side of their abdominal cavity. It possessed four lobes—dorsal, splenic, ventral, and third and a distinctive duodenal papilla. It was between the ascending and descending duodenal loops. The goose pancreas has a thin covering of connective tissue over its mesothelium. The pancreatic parenchyma was divided by connective tissue septa, into numerous lobules, and these lobules extended outward from the pancreatic capsule. There was a wide range of diameters for the blood vessels. It consists of significant blood arteries, which can be identified by their oval or circular, bright nuclei. They have oval or circular, brilliant nuclei with the nucleolus. In the swan goose, serous acini and islets of Langerhans made up most of the pancreatic parenchyma. Exocrine cells had pyramidal shapes, acidophilic granules, and serous acini. In conclusion, the pancreas of geese like the most bird and is different from domestic animals.

Keywords: Endocrine, exocrine, histology, geese, pancreas

Introduction:

The adult length of the giant goose species Anser cygnoides ranges from 81 to 94 cm. They typically weigh around 3150 g, and their wing span can be anywhere from 160 to 185 cm. [1]. The pancreas is a gland long and white in appearance. When the ascending and descending duodenal loops join, the intraduodenal gap forms. In poultry, it on the right side of the abdominal cavity (right side of the bird). The digestive system's exocrine and endocrine glands. The exocrine pancreas secretes digestive enzymes and basic electrolytes, while the endocrine portion secretes insulin, glucagon, somatostatin, and pancreatic polypeptides. The bird's species determines whether the pancreas has dorsal, ventral, third, or splenic lobes. [2-4].

Histologically, it is seen in the goose, the pancreas is a tubuloacinar gland that contains both an exocrine and an endocrine component. Smooth muscle fibers were not present in the pancreatic capsule at any point in time. Acinar cells have a Bizonal shape. The parenchyma had significant excretory ducts including interlobular and interlobular ones. Intralobular ducts had simple cuboidal epithelium, while interlobular ducts had low columnar epithelium [4, 5].

The primary excretory ducts were lined with columnar epithelium that might either be simple or stratified in structure. From interlobular to primary excretory ducts, the pancreatic duct system has a basophilic stain on the apical surface and glands in the connective tissue [6]. The splenic lobe of the endocrine pancreas contains a greater number of islets of Langerhans than any other area [7, 8]. The study aimed to describe the histomorphology of pancreas in geese.

Material and Method:

Ethical approval

All procedures used in this study were reviewed and approved by The Scientific Committee of the College of Veterinary Medicine, University of Al-Qadisiyah in compliance with the ethical principles of animal welfare

Sample collection

Twenty seemingly healthy adult male and female swan geese were allocated into two equal sex groups of 10 each. The apiece sex group had two subgroups of five birds each. The first subgroup of each sex was studied morphologically, whereas the second was studied histologically. Local suppliers in Aldwiynia province markets sold these fowl (September 2021- March 2022).

Morphological study

The birds were weighed, then euthanized by inhalation of chloroform [9]. Each bird was dissected by the thoracic and abdominal viscera including the pancreas. A midline incision in the thoracic-abdominal wall was made, and after that, the pancreas was identified and photographed in situ using a digital camera (Sony Dsc-H90). The five male and female birds studied have well-described pancreatic locations and connections. Specimens were extirpated and washed with normal saline to remove adhered debris and blood, then they have wash again with normal saline. The macroscopic measurements (length and diameters) of the organ were conducted in centimeters and millimeters by using the electronic Vernier caliber, while the volume was measured by the water displacement method.

Histological study

For histological studies, the pancreas of males and females was used. fixed by (10%) formalin for 48h Then they proceed with a routine histological technique [8].

Results:

The pancreas of swan geese was on the right side. As seen in (Figure 1), it was situated between the duodenum's ascending and descending loops, meaning that the pancreas was not housed in either of those anatomical hollows (Figure 2). The duodenal papilla is the site where the pancreatic duct connects to the duodenum (Figure 2 &3). It had two primary lobes one dorsal and one ventral. The ventral lobe is more extensive than the dorsal (Figure 4).

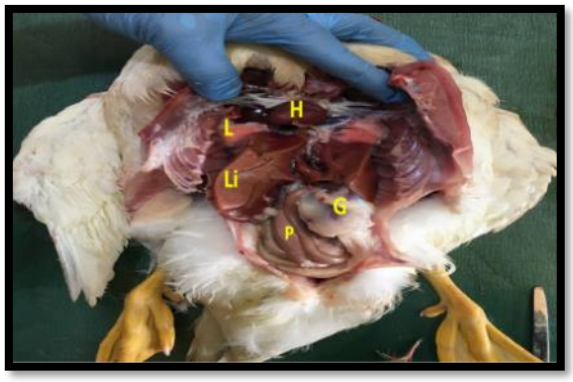

Figure 1. Anatomical position of the geese pancreas show: Heart (H) , Lung (L) ,Liver (Li) , Gazzired(G) , pancreas (P)

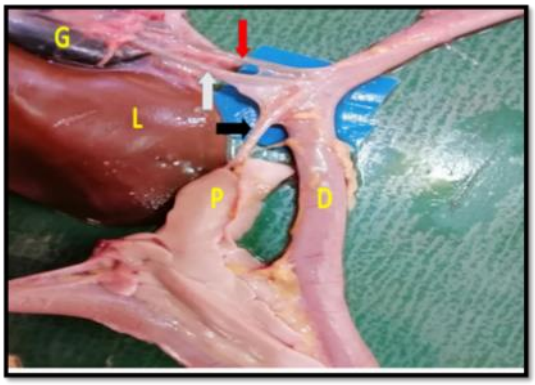

Figure 2. Cross section show gallbladder(G), Liver(L), Pancreas(P), Duodenum(D), Hepatoenteric duct (red arrow), Cysticoenteric duct (White arrow) and pancreatic duct (black arrow).

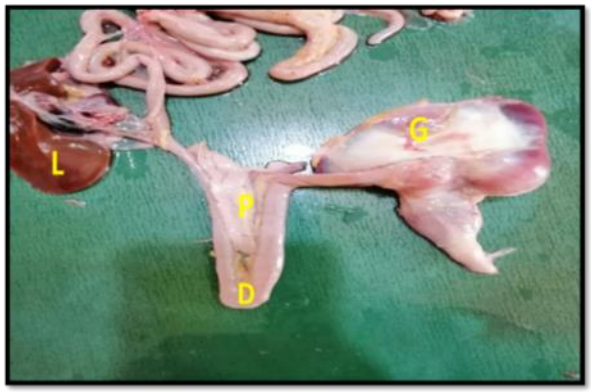

Figure 3. Cross section show location of pancreas(P) between viscera, Duodenum(D), Liver(L) and Gizzard(G).

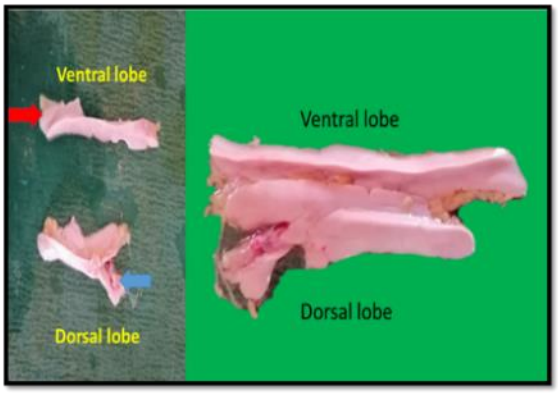

Figure 4. Cross section of the lobes of goose pancreas show : ventral and dorsal lobe with splenic lobe(red arrow)and third lobe (blue arrow)

The pancreas averaged 5.72 ± 0.010 g. The mean relative weight was 0.5 ± 0.03, and the volume was 11.39 ± 0.08 ml (Table 1). In the dorsal lobe, the average weight, length, width, thickness, and volume were (1.64 ± 0.06) g, (0.66±0.03) mm, (1.81±0.11) mm, and (2.92±0.04) mm. Ventral lobe weight was (1.72 ± 0.02) g, (3.38 ±0.61), (0.84 ± 0.03) mm, (1.77 ± 0.08) mm, and (3.07 ± 0.02). (Table 2). The average weight, length, width, thickness, and volume of the splenic lobe were (0.92 ± 0.11) g, (3.76±0.09) mm, (0.34 ± 0.03) mm, (1.77±0.08) mm, and (2.6 ± 0.14) mm. In the third lobe, the average weight, length, width, thickness, and volume were (1.44± 0.04) g, (4.14±0.02), (0.52± 0.03), (1.57± 0.07), and (2.8± 0.06) mm (Table 2)

Table1: Anatomical Measurements of pancreas from five geese.

Measurements of pancreas	**Mean± SE**
Weight (g)	**5.72 ± 0.01**
Relative Weight	**0.5 ± 0.03**
Volume (ml)	**11.39 ± 0.08**

Table 2: Anatomical Measurements of four lobes of pancreas of goose (N =5)

Anatomical Measurements Of pancreas	**Dorsal lobe**	**Ventral lobe**	**Splinch lobe**	**Third lobe**	**T-TEST**
	Mean±SE	**Mean±SE**	**Mean±SE**	**Mean±SE**	
Weight(g)	1.64 ± 0.06	1.72 ± 0.02	0.92 ± 0.11	1.44± 0.04	0.407*
Length (mm)	0.66±0.03	3.38 ±0. 61	3.76±0.09	4.14 ±0. 2	0.247*
Width(mm)	0.89 ± 0.18	0.84 ± 0.03	0.34 ± 0.03	0.52 ±0.03	0.133*
Thickness(mm)	1.81±0.11	1.77± 0.08	1.77±0.08	1.57± 0.07	0.084*
Volume(ml)	2.92 ± 0.04	3.07 ± 0.02	2.6 ± 0.14	2.8 ± 0.06	0.288*
		* (P<0.05) significant			

For the purpose of providing protection, the pancreas of the swan goose was contained in a capsule comprised of connective tissue that was rather thin. Its surface was covered in the mesothelium (Figure 5 & 6), and numerous lobules were generated from the pancreatic parenchyma, which was partitioned into smaller portions by connective tissue septa. These lobules emanated from the pancreatic capsule

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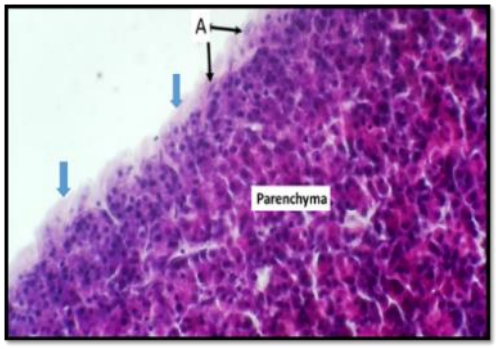

Figure 5. Histological section of parenchyma of Pancreas the parenchyma of pancreas covered by a thin layer of connective tissue capsule (blue arrow) with mesothelial cells (A). H&E, X400.

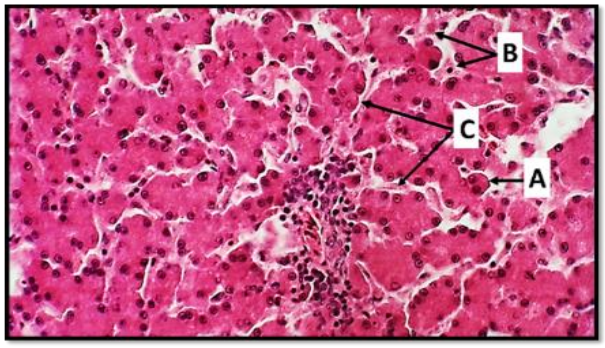

Figure 6. Histological section of pancreas the blood vessels (yellow arrow) among pancreatic acini (A). Note the ganglionic nerve cells (B) within the connective tissue around blood vessel (C) . H&E, X400.

The islets of Langerhans represent the endocrine portion of the pancreas of the swan goose, and they are positioned between the serous acini, which are the exocrine section of the pancreas (Figure 7). These islets were referred to as the acini serious. Inside the pyramid-shaped cells that had a dark, rounded nucleus in the center of the cell found acidophilic granules. These cells were found in acidophilic granules. It was possible to make out one or two nuclei at the core of the pancreatic acini, which is where the Centro acinar cells were found (Figure 8).

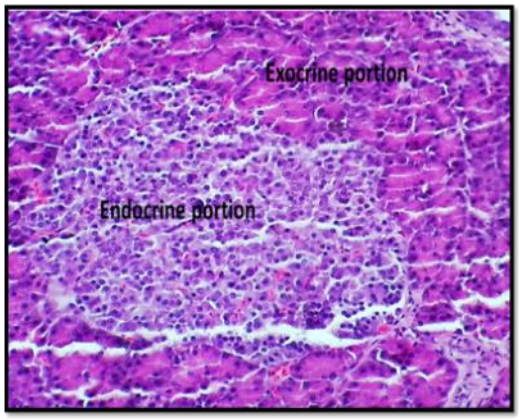

Figure 7. Histological section of pancreas, the endocrine and exocrine portions of pancreas. H&E, X400.

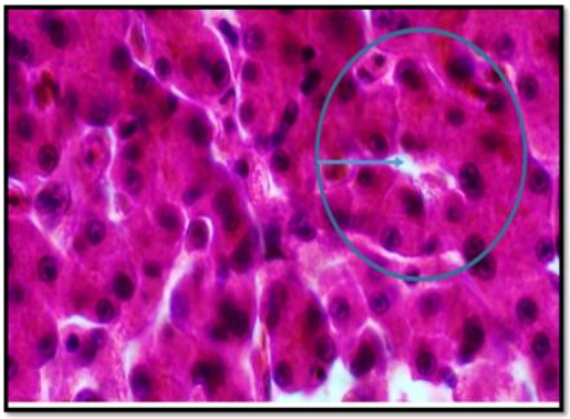

Figure 8. Histological section of pancreas the pancreatic acini (dotted circles) and the Centro acinar cells (blue arrows) in the center of acini. H&E, X800.

The spleen was developed from the cranial end of the dorsal lobe, while the third lobe developed from its ventral end. The dorsal, splenic, ventral, and third lobe make up the pancreas. The pancreas of swan geese had four lobes, each a delicate pink color. (Figure 9 & 10).

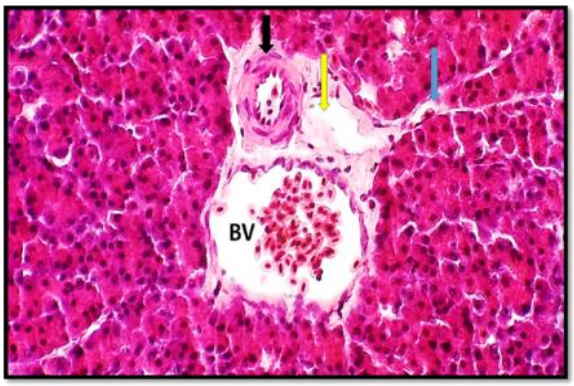

Figure 9. Histological section of pancreas the interlobular duct within pancreatic lobule (black arrow), Interlobular (yellow arrow) and Main duct (blue arrow) and blood vessels (BV)H&E, X100.

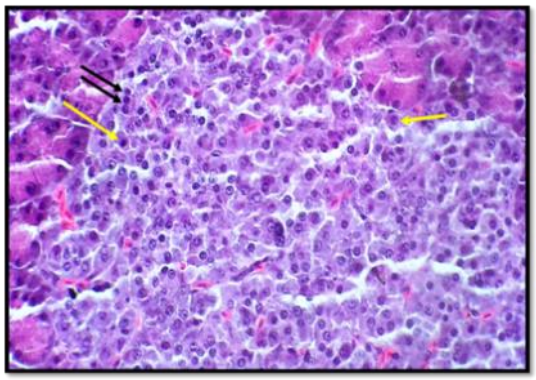

Figure 10. Histological section of pancreas show endocrine portion contains alpha cells (yellow arrow) Beta cells (black arrow) H&E, X400.

It appears that the exocrine component of the pancreas, which consists of tubular-acinar serous glands that secrete digestive enzymes, is the more important part of the organ. In addition to the numerous secretory acini, it also possesses a duct system.

The exocrine component of the swan goose pancreas contained a duct system that was composed of the interlobular duct, the interlobular duct, and the main duct. The interlobular ducts of the pancreatic acini were ordered by simple columnar cells that have oval nuclei (Figure 9). Although the islets of Langerhans, which comprise the endocrine component, were discovered to be oval or spherical, pale structures of varying sizes, there were only a few endocrine cells distributed throughout the pancreatic acini. These islets contained two distinct cell types eta cells, which appeared to be more numerous and had large, dark nuclei, and alpha cells, which appeared to be less numerous and had smaller, lighter nuclei. The beta cells appeared to produce a greater quantity of beta-cell insulin, whereas the alpha cells appeared to produce a smaller quantity of alpha-cell insulin. The endocrine cells were discovered to contain a substantial number of minuscule blood vessels (Figure 10)

Discussion:

Swan geese had pancreases on the right side. It was situated between the ascending and descending duodenal loops, therefore it did not occupy either of the two spaces. There were two primary lobes, dorsal and ventral. Ventral lobe is longer than dorsal lobe. The dorsal lobe's ventral end formed the third lobe, while its cranial end produced the splenic. Consequently, the pancreas consists of dorsal, splenic, ventral, and third lobes. The pancreas of the swan goose had four pale pink lobes. The pancreatic duct enters the duodenal papilla.

The pancreas in (trapped bustards) was a pale yellow organ with a finely lobulated, fat-covered surface, located between the duodenum's two extremities [10]. It had two lobes, one dorsally (lobus pancreatic dorsalis) and one ventrally (lobus pancreatic ventralis), and in the majority of birds, the interlobar connections were highly developed, making it impossible to distinguish between them. [11] discovered three lobes in the pancreas of hatching geese (Anser Anser). It also contradicts [12] in Goose (Anser Anser), which states that the ventral lobe proper and the third lobe are distinguished by the latter's

independent morphology. There are two lobes and three sub-lobes in the dorsal lobe of the pancreas of ducks [13]. The dorsal lobe of the pancreas is longer than the ventral, splenic, and accessory lobes, and its dorsal surface bears the duodenal impression on both sides. There are four pancreatic lobes. Nonetheless, [14] observed that the mynah's Mynahs have three lobes and no spleen, whereas chickens and geese have four lobes and splenic segments are connected to the dorsal lobe.

The pancreas of the swan goose was covered in a relatively thin capsule made of connective tissue for protection. Its surface was covered in the mesothelium. Numerous lobules emanating from of the pancreatic capsule were formed from the pancreatic parenchyma, which was partitioned into smaller sections by connective tissue septa. This result agrees with [15] in turkey (*N. meleagris*), wood pecker (*L. canus*), and parrot (*A. fischeri*), as well as [12] in duck. The septa were extremely thin, and some of them had blood vessels that came in a variety of sizes. In addition, the discovering of ganglionic nerve cells in perivascular connective tissue of substantial blood.

In general, the endocrine portion of the pancreas of the swan goose is represented by the islets of Langerhans, and these islets are located between the serous acini, which are the exocrine portion of the pancreas. These islets are referred to as the Acini Serious. Inside the pyramid-shaped cells that had a dark, rounded nucleus in the center of the cell, we found acidophilic granules. These cells were found in acidophilic granules. It was possible to make out one or two nuclei at the core of the pancreatic acini, which is where the centro acinar cells were discovered. These findings coincide with those found by [16] in duck.

It would appear that the exocrine component of the pancreas, which is comprised of tubulo-acinar serous glands that release digestive enzymes, is the more significant portion of the organ. It also possesses a duct system in addition to its numerous secretory acini.

The exocrine component of the swan goose pancreas contained a duct system that was composed of the intralobular duct, the interlobular duct, and the main duct. The intercalated duct could not be found in this specimen. The intralobular ducts of the pancreatic acini are bordered by simple columnar cells that have oval nuclei [8].

According to [17] in ducks, [12] in geese, and [18] in adult pigeons, the secretory acini were circular, oval, and elongated. These findings are consistent with one another. Acini with an oval shape were discovered by [19] in the Palam dove. These acini included cells that were either pyramidal, tall columnar, or rectangular in shape, and they were arranged in a single layer. [18] performed observations in pigeons, [20] made observations in turkeys, [21] made observations in ostriches, and [17] made observations in ducks.

Although the islets of Langerhans, which make up the endocrine component, were found to be oval or spherical, pale structures of different sizes, there were only a few endocrine cells found spread throughout the pancreatic acini. These islets contained two distinct cell types: beta cells, which appeared to be more numerous and had large, dark nuclei, and alpha cells, which appeared to be less numerous and had smaller, lighter nuclei. The beta cells appeared to produce more beta-cell insulin, whereas the alpha cells appeared to produce less alpha-cell insulin. The endocrine cells were found to include a significant number of very small blood arteries [6]. The pancreas of geese contains both alpha and beta islets, both of which belong to different types of islets. Alpha islets were larger than beta islets and did not have clear borders with the exocrine region of the cell, whereas beta islets were distinguished from the acini that surrounded them by the presence of collagenous fibers, [20] found in the pancreas of turkeys, there are no clear boundaries that divide the exocrine component of the pancreas from the islets. There was no longer any of the fibrous connective tissue capsule on these islets. [12, 22] made comparable observations in pigeon.

Conclusion:

The morphological and histological analyses of the pancreas, with a few notable exceptions, are very similar to those performed on other domesticated birds' pancreases. There are no significant gender differences in the

morphological or histological features of the pancreas of swan geese, which indicates that the bird's genus has no effect on the function of these organs. This was determined by the fact that there were no gender differences in the characteristics of the pancreas.

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References

1. Wang W, Zheng S, Sharshov K, Cao J, Sun H, Yang F, et al. Distinctive gut microbial community structure in both the wild and farmed swan goose (Anser cygnoides). J Basic Microbiol. 2016;56(11):1299-1307.

2. Turk DE. The anatomy of the avian digestive tract as related to feed utilization. Poultry Sci. 1982;61(7):1225-1244.

3. Sturkie PD. Avian physiology. 4th ed. New York: Springer Verlag; 1986. p. 498.

4. Gussekloo SWS. Feeding structures in birds. 1st ed. Cambridge: Wallingford; 2006. p. 201-205.

5. Deprem T, Tasci SK, Bingol SA, Sari EK, Aslan S, Ilhan S. Histological and histochemical studies on the structure of pancreatic duct of goose. Turk J Vet Anim Sci. 2015;39:62-68.

6. Mobini B. Histological studies on pancreas of goose (Anser albifrons). In: Veterinary Research Forum. Vol. 2, no. 1. Urmia, Iran: Faculty of Veterinary Medicine, Urmia University; 2011. p. 25-29.

7. Hodges RD. The histology of the fowl. London: Academic Press, Inc. Ltd.; 1974. p. 55-101.

8. Bacha JRW, Bacha LM. Color atlas of veterinary histology. 2nd ed. Blackwell Publishing; 2006.

9. Underwood W, Anthony R, Cartner S, Corey D, Grandin T, Greenacre C, et al. AVMA guidelines for the euthanasia of animals: 2013 edition. Schaumburg, IL: American Veterinary Medical Association; 2013.

10. Bailey TA, Mensah EP, Samour JH, Naldo J, Lawrence P, Garner A. Comparative morphology of the alimentary tract and its glandular derivatives of captive bustards. J Anat. 1997;191:387-398.

11. Al-Sharoot HA. Anatomical, histological and histochemical architecture of pancreases in early hatched goose (Anser anser). Kufa J Vet Med Sci. 2016;7(1).

12. Gulmez N, Kocamis H, Aslan S, Nazl M. Immunohistochemical distribution of cells containing insulin, glucagon and somatostatin in the goose (Anser anser) pancreas. Turk Anim Sci. 2003;28:403-407.

13. McClish RD, Eglitis JA. Distribution of the A and B cells and of the islets (Langerhans) in the duck pancreas.

14. Saadatfar Z, Asadian M. Anatomy of pancreas in mynah (Acridotheres tristis). J Appl Anim Res. 2009;36(2):191-193.

15. Hamodi HM, Abed AA, Taha AM. Comparative anatomical, histological and histochemical study of the liver in three species of birds. Rafidain J Sci. 2013;24:12-23.

Sure! Here are the references converted into Vancouver style:

16. Al-abody AS, Al-hacham EI. Groose and microscopic description of pancrease in local duck (Anser platyrlancus). Qad. J. of Vet. Med. Sci. 2005;4(1):3-8.

17. Das A, Das RK, Parida S, Mishra UK, Solanki D. Histomorphological study on pancreas of duck (Anas boscas). Indian Journal of Animal Sciences. 2003;73(3):232-235.

18. Mobini B. Histochemical and histological studies on the pancreas in mature pigeon (Columba livia). Eur J Exp Biol. 2013;3(2):148-152.

19. Saadatfar Z, Asadian M, Alishahi E. Structure of pancreas in palam dove

(Streptoplia selegalensis). Iranian Journal of Veterinary Science and Technology. 2011;3(2):25-32.
20. Mobini B, Aghaabedi B. Histological and histochemical studies on pancreas of native turkey in Iran. Vet Res Biol Prod. 2009;22(2):2-8.
21. Helmy SA, Soliman MTA. Histological, histochemical and ultrastructure studies on the ostrich pancreas (Struthio camelus). Egypt Acad J Biol Sci D Histochem. 2018;10(1):63-77.
22. Abou-Zaid FA, Salem SB, Madkour GA, Alm-Eldeen AA. Histological and immunohistochemical studies on the pigeon endocrine pancreas at different ages. Egypt J Exp Biol. 2010;6(1):385-394.