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Histochemical and histological studies on the pancreas in mature pigeon (*Columba Livia*)

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ABSTRACT

The objective of this investigation was to study the histochemical and histological structure of the pancreas in pigeons. Samples were obtained from 9 male and 9 female adult clinically healthy pigeons. Tissue sections were stained with haematoxylin eosin, Verhoeff's, Gomori's method for reticulum, Masson's trichrome and Maldonado's methods for pancreatic islet cells. The pancreas of adult pigeons was serous tubuloacinar gland which covered by a thin connective tissue capsule consisted of collagenous, elastic and reticular fibres. The all connective tissue fibers were observed into pancreatic islands, as well as, in inter acinar connective tissues. Parasympathetic ganglia were present in interlobular connective tissue, but lobulation was not clear.The gland's parenchyma was consisted of exocrine portion and pancreatic islands. The pancreatic islands were composed of large Alpha and small Beta islets but mixed islets were not observed. The Alpha islets were composed of Alpha and Beta cells, whereas, Beta islets containing Beta and Delta cells. The duct system composed of intercalated duct, intralobular duct, interlobular duct and main excretory duct. Goblet cells were not seen in the epithelium of duct systems, but the mucosal folds and basophilic staining border observed in the apical surface of ductual epithelium. In addition, ductual glands were absent in the wall of duct systems. No significant sex-based differences were found. It is concluded that the general histochemical and histological properties of the pancreas gland in pigeons are similar to those of geese, turkey and some other avian species, but that there are also some differences.

Key words: Sex, Histochemical, Pancreas, Histological, Pigeon

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INTRODUCTION

The avian pancreas which is located on the right side of the abdominal cavity in all birds [1], is the largest gland connected with alimentary tract [2]. The gland is consist of an endocrine portion or pancreatic islands and an exocrine portion [2-9]. The pancreatic islands are responsible for the control of blood sugar concentration and consisted of isolated groups of pale staining islet cells called islets of Langerhans [3]. The exocrine portion releases many essential electrolytes and digestive enzymes [4].

For the elucidation of histochemical and histological properties of pancreas, some investigations have been carried out in different avian species, such as the goose [7, 9, 10, 11], ostrich [12, 13], turkey [8], duck [6, 14], Houbara bustard [15], and Coturnix quail [16]. In spite of scattered histological investigations on Langerhans islets of pancreas by Alm-Eldeen [17], and effect of lithium chloride on the endocrine cells by Ghosh [18], in pigeon, no information is yet available on histochemical and histological details of pigeon pancreas. Therefore, the present study was aimed at the demonstration of the histochemical and histological structure of the pancreas gland of the adult pigeon.

MATERIALS AND METHODS

The pancreas gland samples used in the study were obtained from 18 adult healthy pigeons of both sexes (9 females and 9 males), from the research farm of household bird maintenance of the College of Veterinary Medicine, Azad University of Shahrekord. Food and water were given *ad libitum*. The pigeons were euthanized by cervical dislocation. The pancreases were removed and tissue samples from different lobes of pancreas fixed in Bouin's solution for 24 to 48 hours, dehydrated and embedded in paraffin blocks. Sections (5 µm) were stained with hematoxylin eosin for general observations and special stainings; Gomori's method for reticulum, Masson's trichrome, Verhoeff's and Maldonado's methods for pancreatic islet cells [19]. Histochemical and histological studies on stained sections were carried out by light microscopy.

RESULTS AND DISCUSSION

In the present study, the histochemistry and histology of the pancreas gland showed no significant differences according to sex which is in agreement with the results reported by Mobini [7, 9]. The pancreas gland of the pigeons was covered with a thin capsule which concords with the findings of Mobini in geese [7]. In contrast, the capsule of pancreas was thick in the turkeys [8]. The capsule of pancreas was made up of collagenous, elastic and reticular fibres (Figures 1-3), which correlate to the findings of Das et al. in duck [14] and Mobini in geese [7]. In this study, septa from the connective tissue capsule penetrated into the gland dividing it into indistinct lobes and lobules (Figures 1, 2), which is similar to previous findings [3, 4, 5, 7]. The all connective tissue fibers were observed into pancreatic islands, as well as, in inter acinar connective tissues (Figures 1-3). Mobini [7], and Mobini and Aghaabedi [8] reported only a few reticular fibres within pancreatic islands of the pancreas gland in turkey and goose. In the present study, parasympathetic ganglia with nerve bundles were observed in interlobular connective tissue which again concords with the findings of Das et al. in duck [14], Mobini and Aghaabedi in turkey [8], and Ohmori et al. in chicken [20].

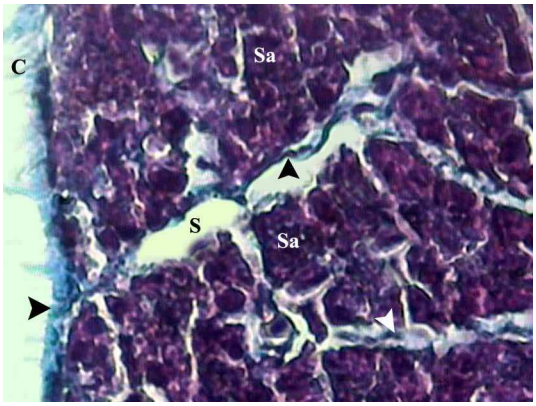

Figure 1. Collagenous fibres (arrowheads) in the capsule (C) and septa (S) of pancreas in pigeons, secretory acini (Sa). Masson's trichrome × 100

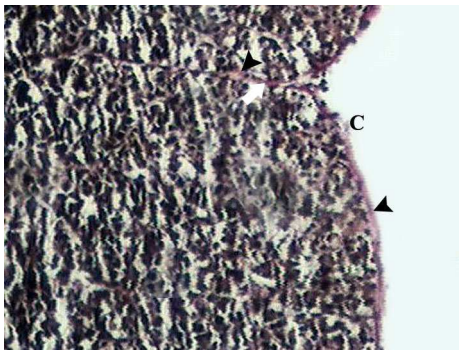

Figure 2. Elastic fibers (arrowheads) in the capsule (C) and septa (arrow) of pancreas in pigeons. Verhoeff's × 100

Figure 3. Reticular fibers in the capsule (C), inter acinar connective tissues (arrowheads) and into pancreatic islands of pancreas in pigeons, intercalated duct (arrows), secretory acini (Sa). Gomori's method for reticulum × 400

The parenchyma of the pigeon pancreas gland consisted of exocrine and endocrine portions (Figure 4), which again concords with the previous findings [3-18]. The exocrine portion of the pancreas gland was arranged in form of serous tubuloacinar glands and consisted of many secretory acini and duct systems which again concords with the findings of Das et al. in duck [14], Gulmez in goose [10], and Mobini and Aghaabedi in turkey [8]. In the present study, shape of secretory acini varied from tall columnar to polygonal (Figures 1, 3) as reported in turkey [8], duck [14], and columnar in goose [10].

The duct system of pigeon pancreas composed of intercalated duct, intralobular duct, interlobular duct and main excretory duct (Figures 3, 5). This finding is in agreement with the results of previous studies [8, 10, 14].

In the present study, epithelium of the duct system varied from simple squamous (intercalated duct) (Figure 3), to tall columnar (main excretory duct) (Figure 5), which agrees with the results of previous studies [8, 14].

Some researchers reported the goblet cells [14], and ductual glands [10] in the epithelium of duct systems of pancreas in duck and goose, but these cells and ductual glands were not found in the duct systems of pigeon pancreas. In the present study, the mucosal folds and basophilic staining border observed in the apical surface of ductual epithelium (Figure 5) which was similar to the findings of Gulmez in goose [10], and Mobini and Aghaabedi in duck [8]. The pancreatic islands, which consisted of various shapes of large Alpha and small Beta islets (Figure 4) were in agreement with the previous findings [8, 10, 12-14, 16]. Das et al. [14] reported the mixed islets in the duck pancreas, but in the present study, these islets were not noticed in the pigeon pancreas. The Beta islets were composed of Beta and Delta cells whereas, Alpha islets containing Alpha and Beta cells (Figure 6). This finding is in agreement with the results of previous studies [7, 8, 16].

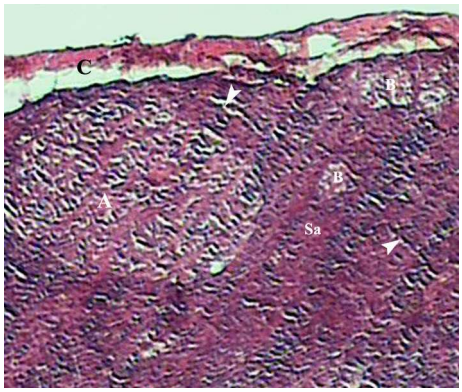

Figure 4. Photomicrograph of the pancreas in pigeons, capsule (C), septa (arrowheads), secretory acini (Sa), large Alpha islets (A), small Beta islets (B). Hematoxylin eosin × 100

Figure 5. The mucosal folds and basophil staining border (arrowheads) on the apical epithelial surface of main excretory duct, lumen (L). Hematoxylin eosin × 400

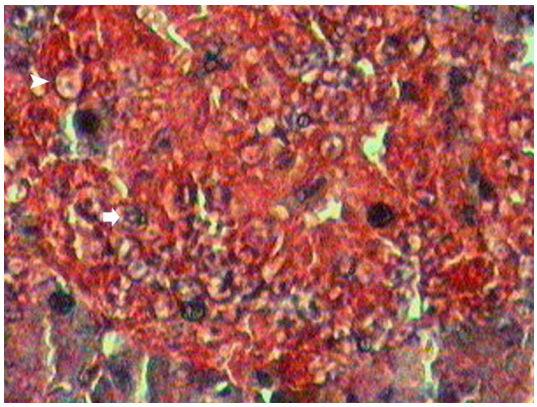

Figure 6. Alpha cells (arrowhead) and Beta cells (arrow) in Alpha islets of the pancreas in pigeons, Maldonado's methods for pancreatic islet cells × 400

CONCLUSION

In summation, the histochemical and histological properties of the pancreas gland were not affected by sex and the pigeon pancreas was generally similar to those of geese, turkey and some other avian species except for the capsule, connective tissue fibers into pancreatic islands, goblet cells and ductual glands in the epithelium of duct systems.

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