

AMORPHOLOGICAL AND HISTOLOGICAL STUDY OF THE LIVER AND PANCREAS OF SMALL INDIAN MONGOOSE (*Herpestes Javanicus*)

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ABSTRACT

The present study was carried out to identify the morphological description and histological structure of liver and pancreas in mongoose . Six adult males mongoose from Al-Basra province were used in this study and were transferred to the anatomy branch of veterinary medicine, and were sacrificed for collecting the livers , pancreas and fixation 10% formalin. The morphological study revealed that the liver in adult mongoose was located in cranial part of abdominal cavity , caudal and ventrally to the heart and was associated with stomach .the mongoose's liver is composed of six chief lobes. Histological examination result revealed that the liver consist of several lobules separated from each other by trabeculae of connective tissue extend from the basic unit of the parenchyma of liver is hepatocyte which arranged in plates or cords like that radiated around the central vein and between these cords there is sinusoids lined by a layer of fenestrated endothelial cells and Kupffer's cells .in the boundary of each lobule showed portal area which consist of hepatic artery : hepatic vein and bile duct lining by cuboidal cells .

The result appeared that the pancreas in adult mongoose is roughly U in shape, it has yellow pale color and lies rather to the dorsal side of the duodenum, between it and the stomach . it has divided into three parts, the right lobe, body, and left lobe . the pancreas is composed exocrine and endocrine tissues. The exocrine portion consists of clusters of pyramidal cells, which are mostly organized in acini. the cells have a dark basophilic cytoplasm, distinct basal nuclei, and many large eosinophilic zymogen granules containing enzymes ,Trypsinogen and Chymotrypsinogen responsible for the digestion of proteins, carbohydrates, fats and nucleotides. The endocrine portion of the pancreas consist of small clusters of glandular epithelial cells called pancreatic islets (islets of Langerhans). However , the lack of studies in Iraq on this type, so this study came to provide us with information on the major glands of the digestive system.

INTRODUCTION

The small Indian mongoose, (*Herpestes javanicus*) is small carnivores occupying various regions from Africa to Southeast Asia particularly India, Pakistan, South of Iran and Iraq (1). The genus *Herpestes* contains 10 species (2) and is considered the oldest genus within the carnivores, dating back approximately 30 million years (3). According to IUCN Red list 2012 status they are listed as Least Concern mammals (4,5,6).

This carnivore mammal preys on rodents, snakes, birds' eggs and hatchlings, lizards and variety of invertebrates (4). The small Indian mongoose is one of the few animals that can survive a cobra attack, which makes it one of the deadly snake's few predators.

The digestive tract represents a functional link between foraging activity and energy conservation through energy allocation for various activities (7, 8). Over the last decades, field observations and experimental laboratory studies have shown that the anatomy and physiology of the digestive tract of many species are flexible, and can change in response to variation in environmental conditions (9). The liver and pancreas are major secretory structures that lie across the stomach and duodenum and are derived from the embryonic gut. The liver is the largest of the digestive glands, serving as a nutrient storage organ and producer of bile (10). The bile drains from the liver into the gallbladder and then moves via the bile duct into the duodenum, where it assists in the breakdown of food. The liver is situated in the epigastric region, between both costal arches, reaching the level of the right 7th and left 9th ribs. Liver is a large, lobed gland. Each lobe is covered by a mesothelium, beneath which is a thin connective tissue layer, the capsule. Each lobe is divided into numerous classic lobules. The lobules consist of sinusoids and of plates of parenchyma cells, hepatocytes, radially organized about a central vein. The anatomy and histology of the liver was studied in dogs, cats and pigs, ruminants and horses (11,12).

The pancreas is part of the gastrointestinal system that makes and secretes digestive enzymes into the intestine, also an endocrine organ that makes and secretes hormones into the blood to control energy metabolism and storage throughout the body. The pancreas lies in the upper abdomen behind the stomach, it is composed of exocrine digestive gland and endocrine cell islets (13).

The exocrine pancreas composed of two epithelial cell types, acinar and ductal epithelial cells. The acinar epithelial cells make up the major portion of the pancreas, and the ductal system is composed of centroacinar cells, followed by the intercalated, intralobular, interlobular, and main ducts⁴. The endocrine cells form islets of Langerhans, and extra insular endocrine cells are scattered randomly

as single cells or as clusters composed of two to five cells in the components of exocrine gland tissue (10).

However, the lack of studies in Iraq on this type, so this study came to provide us with information on the major glands of the digestive system.

MATERIALS AND METHODS

Six adult males mongoose were collected from Al-Basra province. The animals are classified according to the field guide of wild mammals of Iraq (14). All animals were sacrificed for collecting the livers, pancreas and fixation 10% formalin for morphological, histological and histochemical study. After that the specimens were dehydrated in different grades of alcohol, cleared in xylene and embedded in paraffin wax (15). Sections were cut at 5-6 μ m thickness by microtome and stained with haematoxyline and eosin, Masson's Trichrome and Van Gieson's (16). Sections were observed with an Olympus microscope and were photographed with a digital camera mounted to a microscope.

RESULTS AND DISCUSSION

1-Morphological study:

Results of gross anatomy figure (1) A- revealed that the liver in adult mongoose located in cranial part of abdominal cavity behind the diaphragm, it located caudally and ventrally to the heart and was associated with the stomach, it has red-brown to dark brown color. The visceral surface was concave and there was an area, which outlined porta hepatis. The mongoose liver touched the left and right abdominal walls and its parietal surface was in close contact with diaphragm. The lesser curvature of stomach was covered by this organ. It lies directly behind the diaphragm (the muscle that aids in breathing and separates the chest from the abdomen) and directly in front of stomach. Like the assertion of these authors about dog and cat liver localization we confirmed that this organ in the mongoose was in close contact with the same organs and structures, described in the dog and cat (11). The adult mongoose liver was lobated organ, composed of six lobes. The left and right hepatic lobe was divided in lateral and medial parts. the right medial lobe was the largest and rectangular in outline. The left lateral lobe was second in size and was somewhat tongue shaped. but the left medial lobe was a small and prismatic. The quadrate lobe was a small structure, and the gall bladder fossa was a marker for its position. Caudate lobe had deep impression of right kidney Figure(1) B, C. these results are similar to liver's dogs and cats (11). Contrary to (17,18) about the liver of New Zealand rabbit and

rat consists of five lobes. The left hepatic lobe was divided in lateral and medial parts, while the right lobe was single.

Results of gross anatomy figure (1) D- revealed that the pancreas in adult mongoose located in the dorsal part of the duodenum, caudal to the liver, is roughly U shape, it has yellow pale color, and divided into three parts, the right lob, body, and left lob. The right lob lies near the duodenum and the left lob extends to the hilum of the spleen. These results are similar to these observed in dogs and cats (11) (19).

Histological study:

Result of the present study figure (2)A,B- showed that liver in mongoose was consist of numerous lobules separated from each other by thin layer of connective tissue which is continuous from thin liver tissue capsule, this observed was agreed with (20,21,22). The parenchyma of the liver lobule is composed of epithelial polyhydal cell called hepatocyte arranged in branching barriers (cords, like) hexagonal shape and this barriers are separated by blood sinusoid and arranged in radiation form around central vein, the result was agreed with (23) in the pig but liver pig is the typical form and ideal for hexagonal forms of the lobules where the capsule surrounding the organ, the barriers you penetrate are enough to show the regular hexagonal shape as well not (24) is identical in the mammals where it is found that the capsule penetrates the organ and divides it to lobules by barriers. The hepatocytes in each barriers of liver mongoose are polyhedral in shape with central nucleus and this result similar to these observed with (25). The sinusoids are large and irregular in shape and it lining with two type of cells stellate cells called (Kuepfer's or hepatic macrophage cells and flattened endothelial cells) figure (2)C, this observed was agreed with (26). In this study showed between the liver lobules the portal area consist of, branch of portal vein and branch of the hepatic artery and bile duct which lining with one layer of cuboidal cells resting on basal lamina figure (6), and this observed was agreed with (26, 27)

The histochemical study revealed the strong positive reaction for Masson's Trichrome stain when appear red color in cytoplasm of hepatocyte and anther parts of liver tissue, the collagen showed positive reaction with Masson's Trichrome stain that take a blue color black nucleus cells figure (3)A,B with Van Gieson's stain collagen fiber was stained red in color, while nucleus of the different cells appear blue to black color figure (3)C,D.

Results of the present study figure (4) A,B,C- showed that the pancreas is a lobulated, branched, acinar gland. It consists of numerous tubuloacinar secretory units, which form the exocrine component of the organ. Clusters of epithelial cells are grouped into acini and are pyramidal in shape, with basal nuclei

and numerous secretory (zymogen) granules, containing the digestive enzymes , Trypsinogen and Chymotrypsinogen . Tubuloacinar units drain into long, narrow intercalated ducts, which are lined with low cuboidal cells. Intercalated ducts communicate directly with interlobular ducts. The exocrine components comprise more than 95% of the pancreatic mass. the endocrine islets of Langerhans (pancreatic islets), are rounded structures of varying sizes but always larger than acini .The distribution pattern of islet cells are different, β -cells are distributed in all parts of the islet, and α -cells are scattered in the center or periphery of the islet against the background of β -cells regardless of the size of the islet . Fewer δ -cells are scattered in the center or periphery of the islet. Islets comprise 1-2% of pancreatic mass. these results agree with several previous results in dogs (11 , 28, 29).

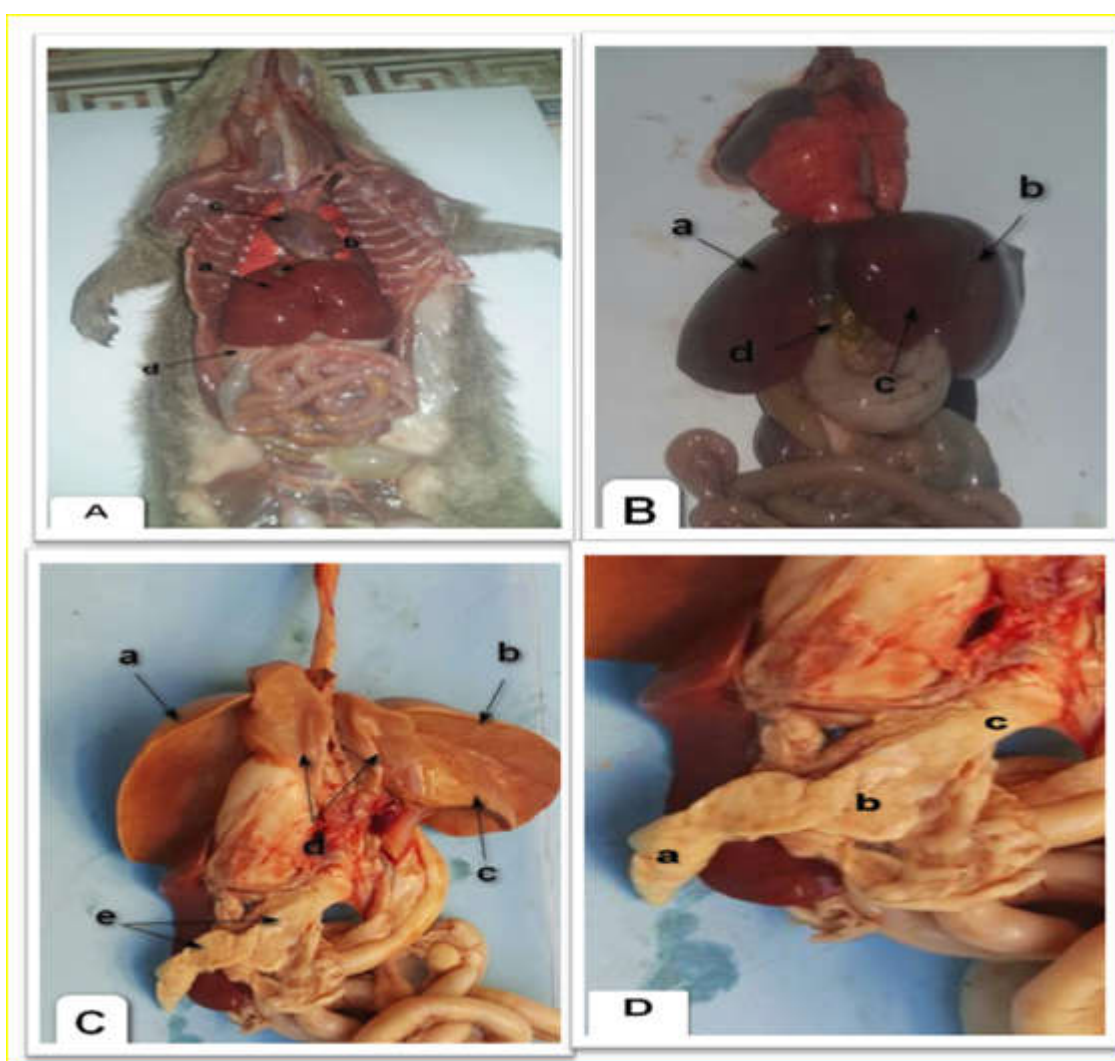


Figure (1) : The liver and pancreas of mongoose . A- the position and relationship of liver of mongoose in abdominal cavity:- (a) liver (b) gall bladder (c) heart (d) stomach. B- parietal surface of the liver of mongoose. (a) right medial lobe (b) left medial lobe (c) quadrate lobe (d) gall bladder. C- veseral surface of liver mongoose. (a) left medial lobe (b) right medial lobe (c) right lateral lobe (d) caudate lobe(tow processes). (e) pancreas . D- parts of pancreas(a)left lobe (b) body (c) right lobe.

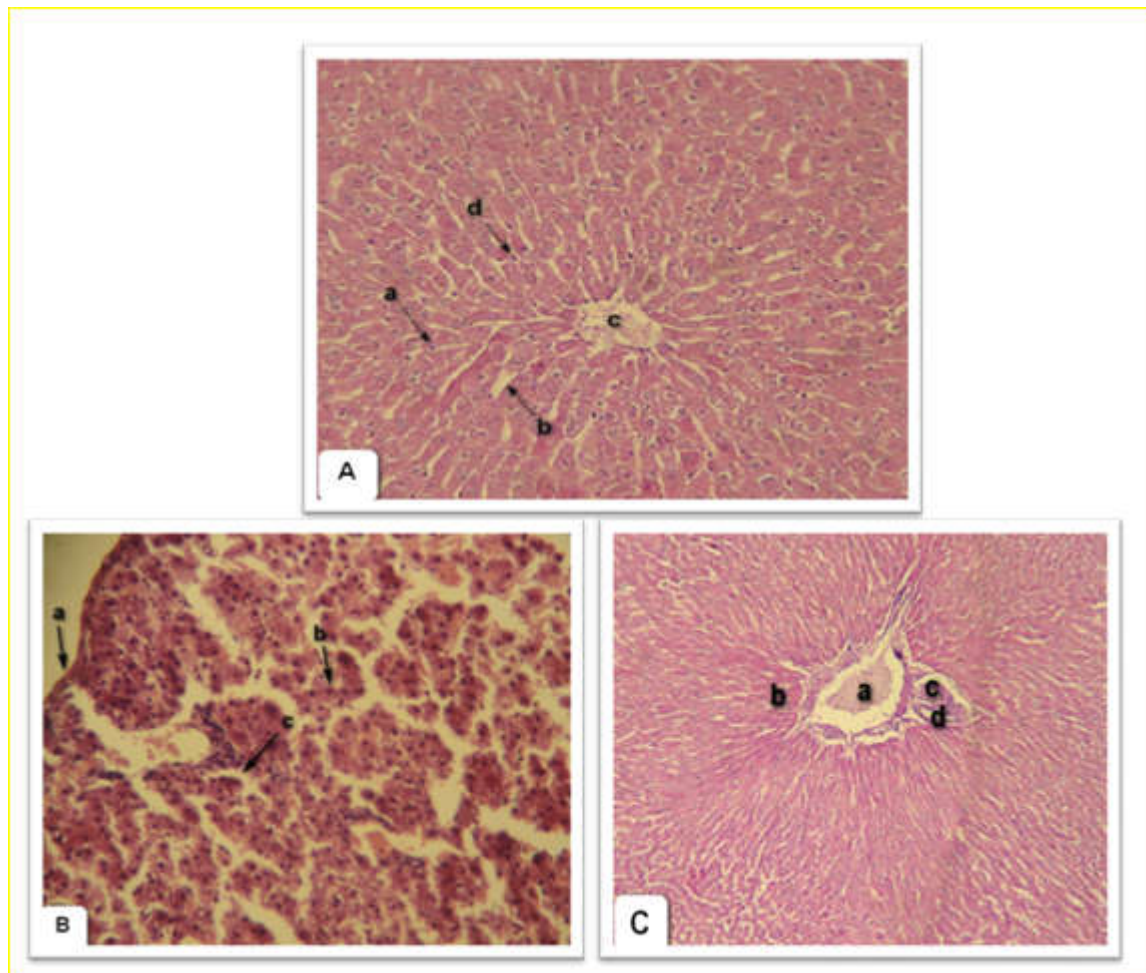


Figure (2) :- Cross section in liver showing A- (a) hepatocyte (b) sinusoid (c) central vein (d) kupffer's cell(H & E stain 10 X). B- (a) capsule (b) hepatocyte(c) sinusoid(H & E stain 40 X) . C- (a) hepatic portal vein (b) cord hepatocyte (c) hepatic portal artery (d) bile duct (H & E stain 10 X) .

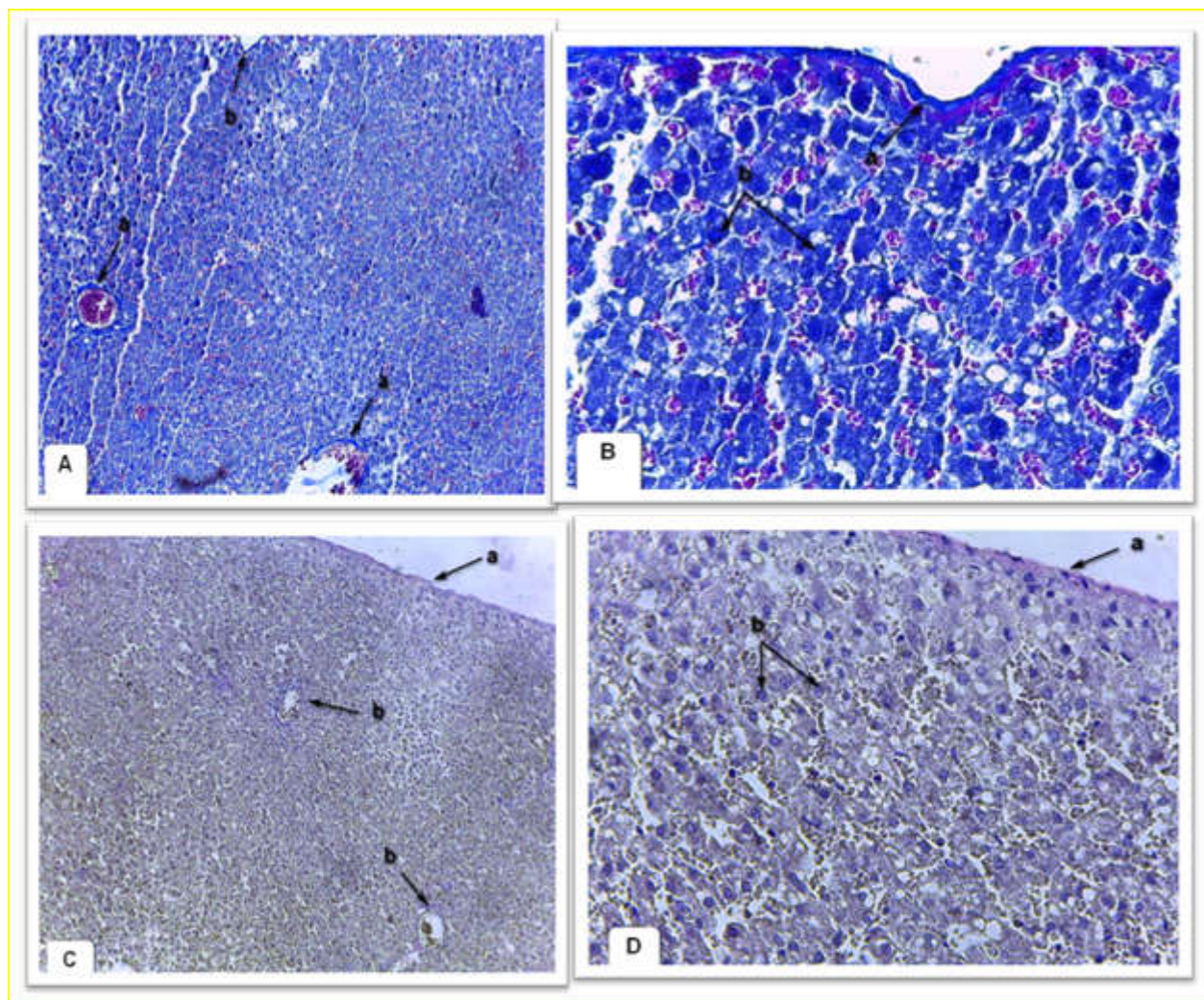


Figure (3) :- Cross section in liver showing A- (a) collagen fiber around central vein (b) collagen Fiber in capsule (Masson's Trichrome stain) 10 X. B- (a) collagen fiber in capsule (b) nucleus of hepatocyte black color (Masson's Trichrome stain) 40 X. C- (a) collagen fiber in capsule (b) collagen fiber around central vein (Van Geison's stain) 10 X D- (a) collagen fiber in capsule (b) nucleus of hepatocyte blue color (Van Geison's stain) 40 X.

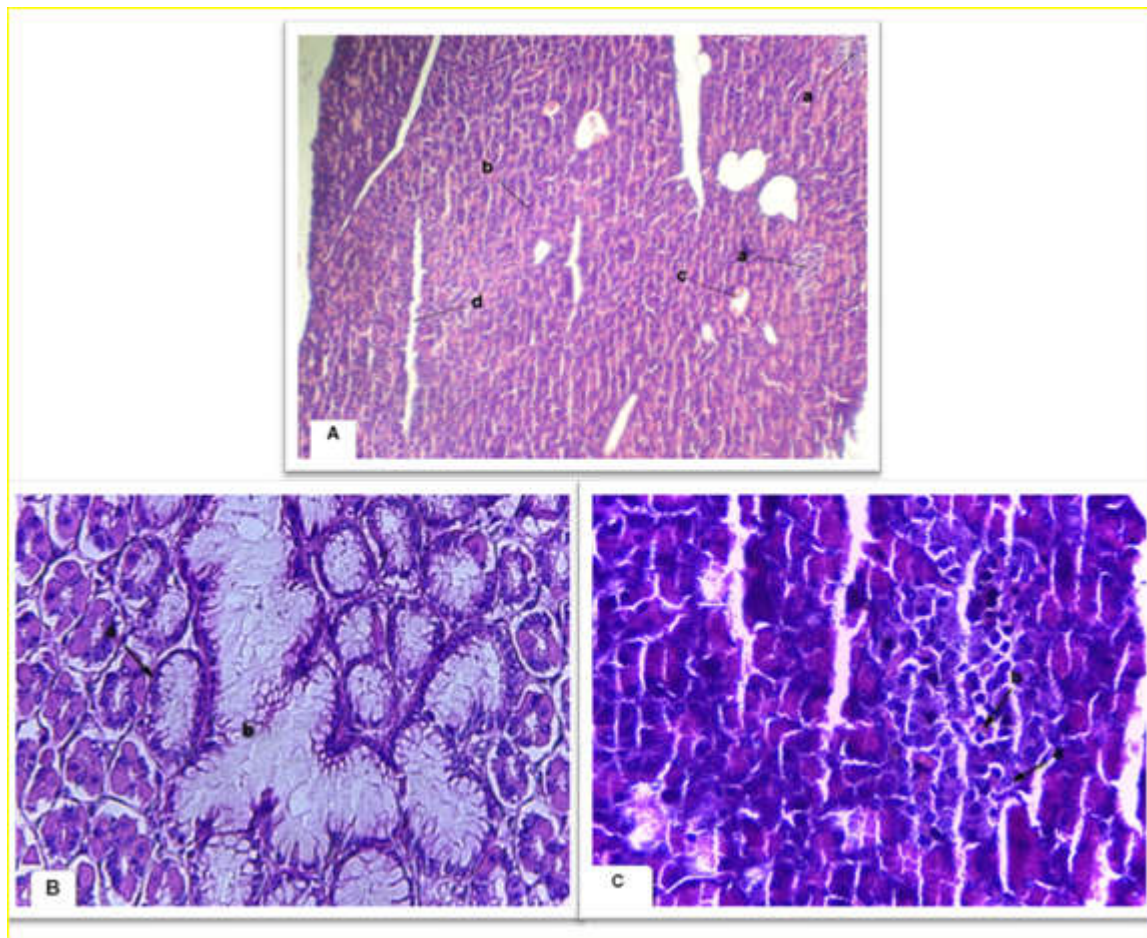


Figure (4) :- Cross section in pancreas showing A- (a) pancreatic islets (b) acini (c) intercalated duct (d) inter lobular duct(H & E stain 10x). B- (a) acini (b) inter lobular duct(H & E stain 40 X). C- islets cell (a)beta cell (b) alpha cell (H&E stain 40X).

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