

Postnatal Morphological Development of Pancreas in Guinea Pig (*Caviaporcellus*)

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ABSTRACT

The pancreas is an accessory organ of the digestive system and also an important endocrine organ of vertebrates. The research work is carried out to study the morphological development of the pancreas in postnatal age groups of guinea pig. Guinea pigs were procured from the Department of Laboratory Animal Medicine, TANUVAS. The pancreas was white fatty coloured, irregularly lobulated and located on the left side of the abdominal cavity. It presented three lobes viz; splenic, ventricular and intestinal lobe. The main pancreatic duct was formed by the union of pancreatic ducts of all the three lobes.

Key words: Developmental anatomy, guinea pig, morphology, pancreas

Guinea pigs are large rodents and best experimental animals for physiological, pharmacological, clinical and anatomical research because of their large body weight, stout, compact body, easiness of handling and rapid adaptation in laboratory situation (Rowlands and Weir, 1974).

The pancreas is an accessory organ of the digestive system and also an important endocrine organ of vertebrates. The pancreas has both endocrine and exocrine function. Its function is to regulate blood sugar levels by secretion of hormones like insulin, glucagon, somatostatin and pancreatic polypeptide. As an exocrine gland, it produces pancreatic juice for digestion (Sisson *et al.*, 1975).

The proposal of endocrine-exocrine interface as target of injury related to pancreatic toxicity and the endocrine-exocrine interface is adaptable to certain types of pancreatic lesions, peri-islet hemorrhage and fibrosis (Elmore *et al.*, 2015). There is species-specific variation in the gross and microanatomy of the pancreas with regard to distribution and composition of endocrine cell in the islets, which varies among experimental animals (Tsuchitani *et al.*, 2016).

The understanding of the anatomical variation and embryology of rodent pancreas is essential for performing experimental surgery with precision on these organs. To evaluate the pathologic and clinical correlations, it is essential to understand the normal structure of the organ.

Since, there is paucity of literature in the structure of pancreas of guinea pig, the present research work is carried out with the objective to study the morphological development of the pancreas in postnatal age groups of guinea pig.

The present study was conducted at the Department of Veterinary Anatomy, Madras Veterinary College, Chennai from 2018 to 2021. Guinea pigs were procured from the Department of Laboratory Animal Medicine, Madhavaram Milk Colony, TANUVAS, Chennai-51. The animals were grouped as shown in the table 1. After collection, guinea pigs were euthanized by using the Carbon dioxide asphyxiations as per CPCSEA norms and were subjected for the dissection. The animal ethical committee of the Madras Veterinary College, Tamilnadu Veterinary and Animal Sciences University, Chennai, India had approved the collection of laboratory animals and handling as per the Ethical Committee approval (Lr. No. 1467/DFAB/IAEC/2018 dated 13.07.2018). The methods were performed in accordance with the guidelines of the institutional ethical committee of TANUVAS, India. All procedures were performed in accordance with the CPCSEA norms.

Topography

The pancreas in guinea pig was located on the left side of the abdominal cavity (Fig. 1) Similar results were found in Sunda porcupine pancreas by Budipitojo *et al.* (2016) and in human, dog and monkey pancreas (Tsuchitani *et al.*, 2016). whereas, in birds as reported by Sturkie (1985) in poultry, Faris (2012) in pigeon, Deprem *et al.* (2015), Beheirya *et al.* (2018) in goose and Iniyah (2018) in

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Table 1: Details of age groups of guinea pigs used for research work

Age Groups	Preweaning 0-2 weeks (Male + Female)	Weaning 2-8 weeks (Male + Female)	Young Ones 8-16 weeks (Male + Female)	Adult 16-32 weeks (Male + Female)	Total
No. of Animals	3+3	3+3	3+3	3+3	24

guinea fowl, it was located on the right side of abdomen.

Morphology

The pancreas of guinea pig was irregular in shape and lobulated (Fig. 2) as stated by Ahmadi *et al.* (2002) in rat but, it was thick in mini pigs (Tsuchitani, *et al.*, 2016). These differences might be due to species variation. It was white fatty in colour (Fig. 2) whereas pale yellow in guinea fowl (Hani *et al.*, 2013), light pinkish in guinea pigs (Al-Saffar and Nasif, 2020) and pink in rat (Ahmadi *et al.*, 2002). It was found disseminated in 0-2 weeks of age (Fig. 1) but as age increased it became compact from 8-16 weeks and 16-32 weeks of age. (Fig. 2). It was soft to touch and had lobulated surface. It was loosely packed in the mesentery.

Lobation

Three lobes of pancreas were observed in guinea pig namely splenic lobe, ventricular lobe and intestinal lobe and these were closely related to the spleen, stomach and duodenum in all the age groups studied (Fig. 2). Similarly Ahmadi *et al.* (2002) reported gastric, splenic and duodenal parts in pancreas of rat, Tsuchitani *et al.* (2016) in dogs, monkeys, Karaca *et al.*, (2014) in cat, (Budipitojo *et al.*, 2016) in Sunda porcupine, Tsuchitani *et al.*, (2016) in rats and Al-Saffar and Nasif (2020) reported splenic, body and duodenal lobes in guinea pigs. Splenic lobe was related to the spleen and greater curvature of the stomach. Ventricular lobe was located on the dorsal surface of the stomach.

Pancreatic duct

The main pancreatic duct was formed by the union of pancreatic ducts of all the three lobes and was not clearly seen. The main pancreatic duct opened into the duodenum one mm after the opening of common bile duct in 20 week-old guinea pig. But, Endo *et al.* (1997) in hyena found three pancreatic ducts, Ahmadi *et al.* (2002) in rat, Budipitojo *et al.* (2016) in Sundaporcupine had two pancreatic ducts and Al-Saffar and Nasif (2020) found two pancreatic duct in guinea pigs. This variation might be due to species and breed variation.

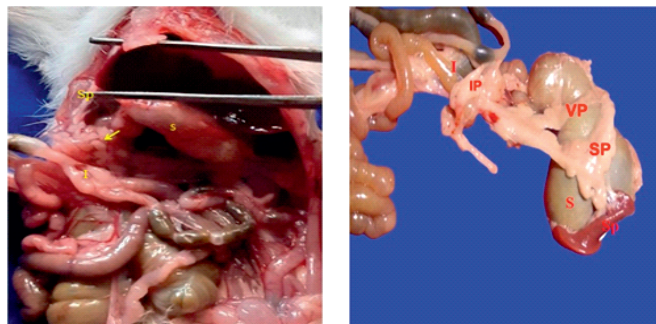


Fig. 1: The photograph of two week-old guinea pig showing the disseminated lobes of pancreas (arrow) in the left side of the abdominal cavity in relation to stomach (S), Intestine (I) and spleen (Sp). **Fig. 2:** The photograph of the 28 week-old guinea pig showing the relationship of pancreas to stomach (S), Intestine (I) and spleen (Sp). IP – Intestinal pancreas VP – Ventricular pancreas SP – Splenic pancreas.

SUMMARY

Pancreas of guinea pig was lobulated and the pancreatic duct opened into the duodenum about one mm behind the opening of bile duct.

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