



ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2020; SP-9(7): 237-239
© 2020 TPI

www.thepharmajournal.com

Received: 06-05-2020

Accepted: 08-06-2020

Sreeranjini AR

Associate Professor, Department of Veterinary Anatomy and Histology, College of Veterinary and Animal sciences, Mannuthy, Thrissur, Kerala, India

Ashok N

Registrar, Kerala Veterinary and Animal Sciences University, Pookode, Wayanadu, Kerala, India

Maya S

Professor and Head, Department of Veterinary Anatomy and Histology, College of Veterinary and Animal sciences, Mannuthy, Thrissur, Kerala, India

Lucy KM

Controller of Examinations, Kerala Veterinary and Animal Sciences University, Pookode, Wayanadu, Kerala, India

Chungath JJ

Professor and Head, Department of Veterinary Anatomy and Histology, College of Veterinary and Animal sciences, Mannuthy, Thrissur, Kerala, India

Corresponding Author:

Sreeranjini AR

Associate Professor, Department of Veterinary Anatomy and Histology, College of Veterinary and Animal sciences, Mannuthy, Thrissur, Kerala, India

Microanatomical studies on vasculogenesis and angiogenesis in the pancreas of crossbred goat kids

Sreeranjini AR, Ashok N, Maya S, Lucy KM and Chungath JJ

Abstract

The present study was conducted on the pancreases of goats collected from second to fifth month of prenatal life. Tissue pieces were fixed in 10% Neutral buffered formalin, processed, sectioned, examined under light microscope and the images were recorded digitally. Vasculogenesis within the mesenchyme of pancreas was evidenced in 58 days-old foetuses. By 69 days of development, more vessels could be noticed indicating angiogenesis. Accumulation of blood cells was found within the central part of a few developing, large islets of Langerhans. In 70 days-old foetuses, small blood vessels and blood cells were noticed in the capsule and within the islets. In foetuses of 91 days age blood-filled spaces were seen among the endocrine cells of some larger islets. After 105 days, arterioles and venules could be differentiated among acini along with ducts of varying size, nerve bundles and isolated neurons. In 140 days-old foetuses, sinuses were seen in most of the large islets. By 148 days, within most of the lobules a central trunk of blood vessels, peri-vascular plexuses, intralobular ducts and peri-ductular plexuses were noticed. In addition, blood vessels were observed in the interlobular septa along with ducts, nerve bundles and ganglia. The present study indicated that vasculogenesis was initiated in the pancreas of goats during early prenatal life itself and angiogenesis progressed throughout prenatal life corresponding with advancement in the development of exocrine and endocrine components.

Keywords: Microscopic anatomy, histology, vasculogenesis, angiogenesis, pancreas, goat kids

1. Introduction

Pancreas is an important gland with exocrine and endocrine functions. The exocrine part plays major role in digestion of carbohydrates, proteins and lipids while the endocrine part regulates blood sugar level. This gland develops from two primordia which unite to form a single structure. Even though there are several reports regarding the development of blood vessels in the embryonic pancreas in other species including man, such reports regarding the same in goats are scanty. Hence, the present study was undertaken to understand the steps involved in the development of blood vessels in goat pancreas during the prenatal period.

2. Materials and Methods

2.1 Animals

The present study was conducted on goat embryos and foetuses available in the department museum and on those collected from clinics and farms. Immediately after collection, the body weight and crown rump length (CRL) of the embryos and fetuses were recorded and their age was calculated from the formula derived by Singh *et al.*, (1979) [4] for goat foetuses. Based on the age, foetuses were divided into four groups of six each belonging to 31-60 days, 61-90 days, 91-120 days and 121-150days of age respectively.

2.2 Fixation, Processing, Sectioning and Staining

The embryos and foetuses up to 59 days of age were fixed as such in 10 per cent neutral buffered formalin (10% NBF). Pancreases from the foetuses of later age groups were collected by careful dissection; tissue pieces were fixed in 10% NBF and were processed for paraffin embedding. Sections of 5-7µm thickness were stained by Ehrlich's Haematoxylin and Eosin (H&E) staining technique (Luna, 1968) [2]. The slides were examined under Leica DM2000 LED digital light microscope and the images were recorded digitally.

3. Results and Discussion

Vasculogenesis within the mesenchyme of pancreas was evidenced in 58 days-old foetuses by the presence of small capillary spaces containing red blood cells (Fig. 1).

Similar observations were made by Cerf (2011)^[1] in mice. By 69 days of development, a greater number of small vessels could be noticed in the mesenchyme adjacent to ductules indicating progress of angiogenesis (Fig. 2). Accumulation of blood cells was found within the central part of a few developing, large islets of Langerhans. In 70 days-old foetuses, small blood vessels and blood cells were noticed in the well-developed capsule (Fig. 3). Within the islets and in close proximity to them capillaries were noticed (Fig. 4). Presence of blood vessels within islets is indicative of the beginning of the functioning of endocrine system. From 71 days onwards, distinct lobules could be noticed in the pancreatic parenchyma. In foetuses of 91 days age blood-filled spaces were seen among the endocrine cells of some larger islets and most of the islets were enveloped by a thin connective tissue capsule. Large blood vessels could be seen in the interacinar connective tissue and in the interlobular septa (Fig. 5). Around the blood vessels, nerve plexuses were recorded. In 125 days-old buffalo foetuses, Singh and Sethi (2012)^[3] recorded distinct lobules and large number of blood vessels in the pancreatic connective tissue and parenchyma. Presence of larger blood vessels in the interlobular septa indicate further progress of angiogenesis. Occurrence of perivascular plexuses are clear indications of the progressive development of an extensive innervation and nervous control over the vasculature of pancreas. After 105 days, arterioles and venules could be differentiated among acini along with ducts of varying size, nerve bundles and isolated neurons.

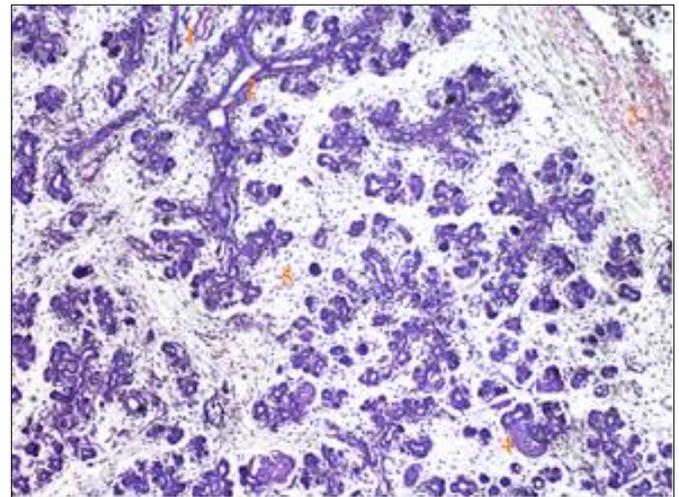


Fig 3: Section of Pancreas showing progress of angiogenesis. (70 days of gestation). H&E X100. 1. Blood vessel 2. Ductule 3. Red blood cells in in capsule 4. Developing islet of Langerhans 5. Mesenchyme

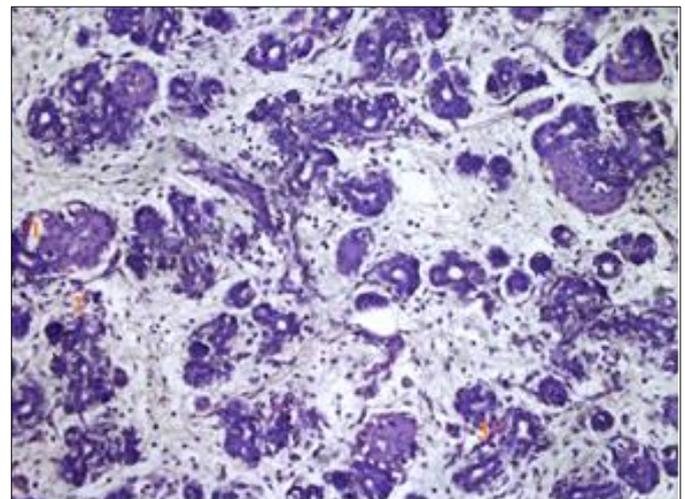


Fig 4: Section of Pancreas showing progress of angiogenesis (70 days of gestation). H&E X200. 1. Capillary within islet of Langerhans 2. Capillary outside islet of Langerhans 3. Capillary near ductules

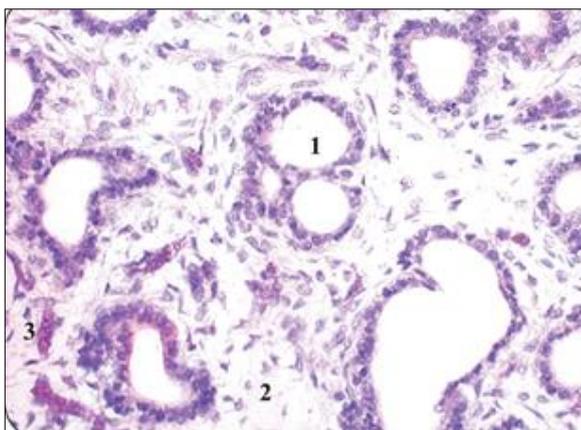


Fig 1: Section of Pancreas showing vasculogenesis. (58 days of gestation). H&E X400. 1. Ductule 2. Mesenchyme 3. Red blood cells in capillary spaces

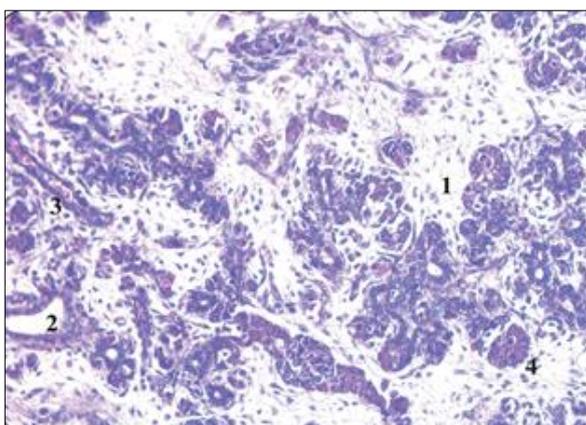


Fig 2: Section of Pancreas showing progress of angiogenesis. (69 days of gestation). H&E X200. 1. Mesenchyme 2. Ductule 3. Blood vessel

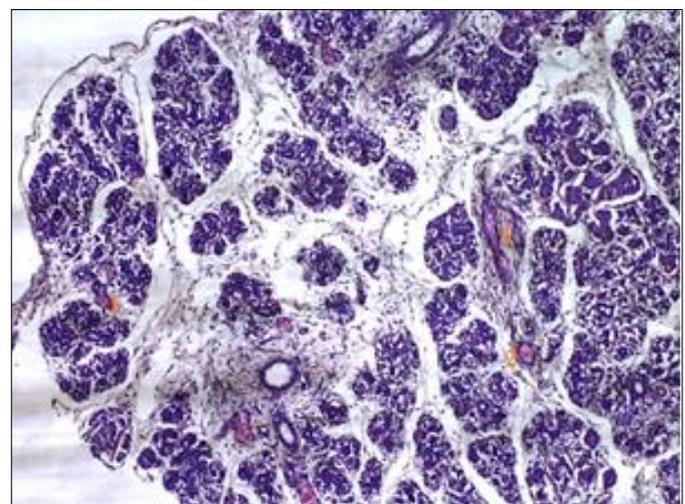


Fig 5: Section of Pancreas showing progress of angiogenesis. (91 days of gestation). H&E X100. 1. Blood vessel in interacinar space 2. Blood vessel in interlobular space 3. Perivascular plexus

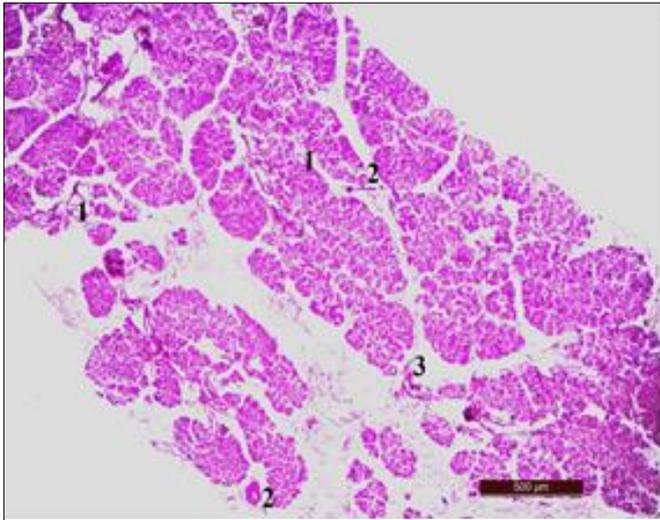


Fig 6: Section of Pancreas showing progress of angiogenesis (148 days of gestation). H&E X100. 1. Intralobular blood vessel 2. Large islet of Langerhans with central sinus 3. Interlobular blood vessel

In 140 days-old foetuses, a large central sinus with peripherally arranged groups of cells was noticed in most of the large islets while some islets showed several small sinuses among groups of cells. By 148 days, a central trunk of blood vessels and peri-vascular plexuses could be noticed within most of the lobules. Along with blood vessels, intralobular ducts with peri-ductular plexuses were also noticed (Fig. 6).

In addition, blood vessels were observed in the interlobular septa along with ducts, nerve bundles and ganglia. Adjacent to the interlobular blood vessels, bundles of nerve fibres arising from the ganglia were seen. Such an arrangement is indicative of the establishment of a well-developed vascular system within the pancreas with ample nervous control.

4. Conclusions

The present study indicated that vasculogenesis occurred in pancreas of goats during early prenatal life itself and angiogenesis progressed throughout prenatal life corresponding with advancement in the development of exocrine and endocrine components.

5. References

1. Cerf ME. Islet organogenesis, angiogenesis and innervation. *Cell Biology International*. 2011; 35(11):1065-1078.
2. Luna LG. *Manual of Histologic Staining Methods of the Armed Forces institute of Pathology*. Edn 3, Mc Graw-Hill Book Company, New York, 1968, 258p.
3. Singh O, Sethi RS. Histogenesis of pancreas of Indian buffalo (*Bubalus bubalis*) during prenatal development. *Indian Veterinary Journal*. 2012; 89(11):56-59.
4. Singh Y, Sharma DN, Dhingra LD. Morphogenesis of the testis in goat. *Indian Journal of Animal Sciences*. 1979; 49(11):925-931.