



## **Anatomical study of the arterial blood supply of dog pancreas**

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Article info	Abstract
Original: 5 September 2019 Revised: 21 November 2019 Accepted: 30 January 2020 Published online: 20 June 2020	This research was carried out to study the arterial blood vessels of the pancreas in dogs by using latex injection. The six adult male and female dogs were collected from Sumel town -Duhok governorate, Kurdistan region-Iraq. Our results exhibited that the left lobe of dog pancreas was supplied by pancreatic branches originated from celiac, splenic and gastroduodenal arteries. The right lobe was equipped by pancreatic branches aroused from both cranial and caudal pancreaticoduodenal arteries which were anastomosed within the gland. In addition to supply the right lobe, the cranial pancreaticoduodenal artery was also supplied the body of pancreas. The present study recorded a significant variation in the origin, number and distribution of most aforementioned arteries. Therefore, the anatomists and surgeons should take this into account during dissected of cadavers or performed the surgical operations.
<b>Key Words:</b> Pancreas, Dog Arterial, vessels Latex	

### **Introduction**

There were several arterial blood vessels supplying the dog pancreas; pancreatic branches of the cranial and caudal pancreaticoduodenal arteries outfit the right lobe of the pancreas, pancreatic branches from the splenic, hepatic and gastroduodenal arteries supplying the left lobe of the gland [1], [2], [3], [4] and [5]. In addition to these main arteries, Howard *et al.*, (2013) [20] had been mentioned that the pancreas was supplied by small branches originating directly from hepatic, gastroduodenal and celiac arteries.

The abundant blood supply of the pancreas was reflected on the organ's endocrine and enzymatic functions [6], [7] and [8]. Furthermore, the study of pancreatic vascular supply seems important to solve some problems like pancreatectomy, since the researchers in the field of surgery (department of medicine and surgery/ college of veterinary medicine/ university of Duhok) had been experienced from the problem of hemorrhage and death of the dogs when they did the partial or complete pancreatectomy. So, anatomically the determination of the distribution of the arterial vascularization was very necessary to control them surgically. As a result, this investigation was prepared to study the arterial blood supply of the pancreas in local dogs and to achieve accurate information for the surgeons.

### **Materials and Methods**

For identification of pancreatic blood supply, 6 adult male and female local dogs aged about (9-12) months and weigh (20-30 kg) were collected from Sumel town -Duhok governorate, Kurdistan region-Iraq. The age of the animals was estimated through dentition [21] and their health status was examined clinically and in laboratory by collecting blood and fecal samples from each animal. The dogs were kept in cages individually at the animal farm, college of veterinary medicine, university of Duhok. The animals were quarantined for ten days [22] to monitor any diseases that might be obvious on animals. Food and water were

provided to animals during this period. Each dog fasted for 24 hours after that pre-anesthetic medication including atropine sulfate (0.02 mg/kg, SC) was given to the animal. Anesthesia was induced by xylazine HCl (1.0 mg/kg, IM) followed by ketamine (5.0 mg/kg, IM) [9]. At the left upper third of the neck, the left common carotid artery was identified by dissection. This artery was punctured and was catheterized for proper bleeding. Later on, the same artery was injected with 10% formalin and the cadaver was preserved in a pool containing the same fixative for 24 hours. The left side of the thorax was opened and the thoracic aorta was injected near to aortic hiatus by gum milk latex mixing with carmine. Later, the abdominal region was opened and the branching of the abdominal aorta (celiac and cranial mesenteric arteries) was dissected carefully to reveal pancreatic vascular supply. All arterial blood vessels were photographed by a camera (Nikon D5300/Japan) and their nomenclature was identified according to that of the *Nomina Anatomica Veterinaria* [10].

## **Results**

The current study revealed that the local dogs have an inverted V-shaped pancreas. This gland consisted of the left lobe and the right lobe joining with each other by a body (Fig: 1).



Fig-1: A photograph of the local dog pancreas showing their different parts.

The arterial blood supply of each part of the pancreas was provided with specific pancreatic branches that originated from different sources. In general, the celiac and cranial mesenteric arteries were considered the main arterial blood vessels supplying the pancreas (Fig: 2).

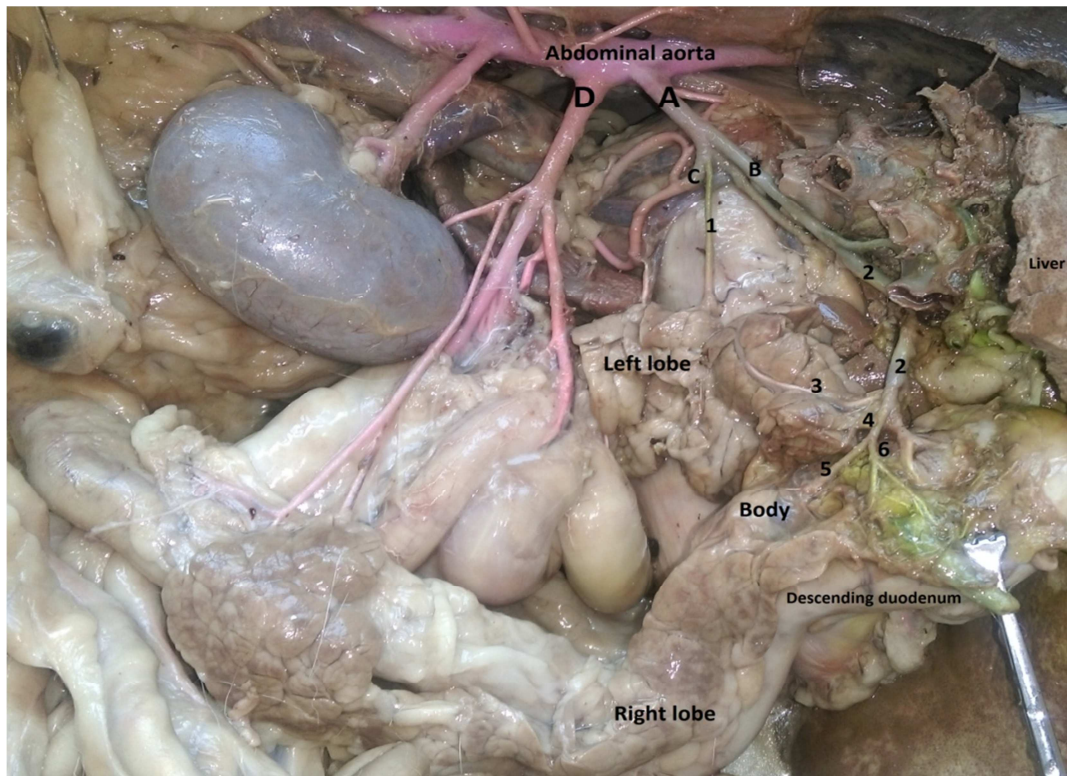


Fig-2: A photograph of the arterial blood vessels of local dog pancreas showing:

- A. Celiac artery
- B. Hepatic artery
- C. Splenic artery
- D. Cranial mesenteric artery
- 1. Pancreatic branch of celiac artery
- 2. Gastroduodenal artery
- 3. Pancreatic branch of gastroduodenal artery
- 4. Cranial pancreaticoduodenal artery
- 5. Caudal branch of cranial pancreaticoduodenal artery
- 6. Cranial branch of cranial pancreaticoduodenal artery

Depending on the different arterial blood patterns supplying the pancreas of local dogs, there were two groups; the first group that comprised four dogs and the second group which included two dogs.

### ***Left lobe of Pancreas***

The left lobe of local dogs was supplied by two pancreatic branches (caudal and cranial) which were different in their origin in two groups of dogs.

In the first group, the caudal pancreatic branch originated directly from the ventral aspect of the celiac artery (Fig: 3). This branch passed ventromedially to equip the medial side of the caudal extremity of the left lobe. The cranial pancreatic branch originated from the ventral aspect of the ventral branch of the splenic artery (Fig: 3) and directed ventromedially to supply the part of the left lobe adjacent to the caudal extremity.

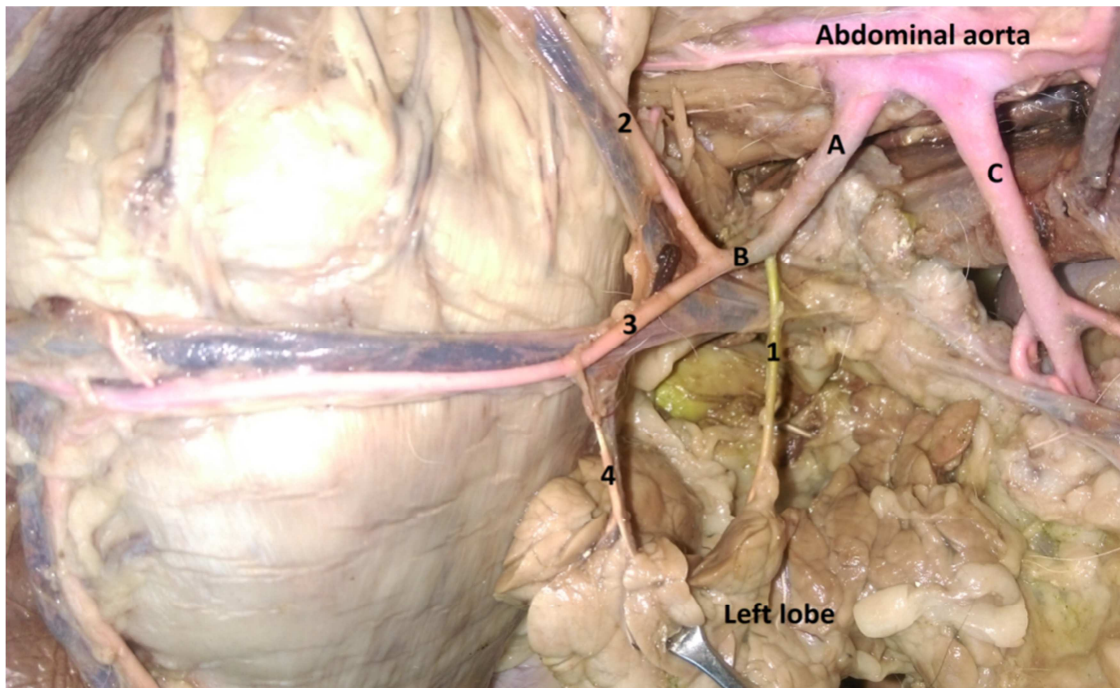


Fig-3: A photograph of the arterial blood vessels of local dog pancreas showing:

- A. Celiac artery
- B. Splenic artery
- C. Cranial mesenteric artery
- 1. Pancreatic branch of celiac artery
- 2. Dorsal branch of splenic artery
- 3. Ventral branch of splenic artery
- 4. Pancreatic branch of ventral branch of splenic artery

In the second group, the pancreatic branch originated as a common artery from the ventral aspect of the splenic artery close to its origin from the celiac artery (Fig-4), this artery directed ventromedially near to the medial side of the pancreas where it divided into two branches (caudal and cranial branches). The caudal branch supplied the caudal extremity of the left lobe, while the cranial branch directed medially and cranially where it supplied the part of the left lobe close to the caudal extremity.

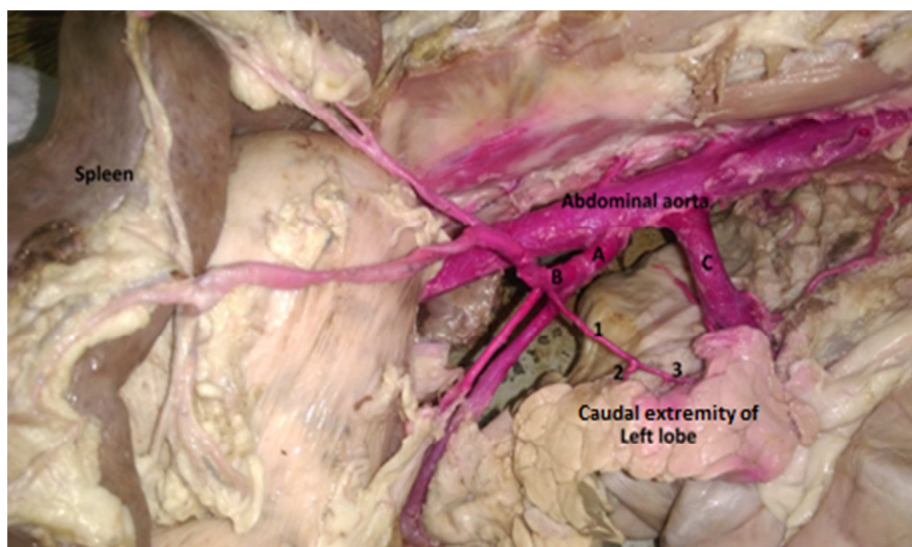


Fig. 4: A photograph of the arterial blood vessels of local dog pancreas showing:

- |                              |   |
|------------------------------|---|
| A. Celiac artery             | 1. Common pancreatic branch of splenic artery                   |
| B. Splenic artery            | 2. Cranial branch of common pancreatic branch of splenic artery |
| C. Cranial mesenteric artery | 3. Caudal branch of common pancreatic branch of splenic artery  |

In the first group, the pancreatic branch originated from the caudal surface of the gastroduodenal artery was provided the part of the left lobe of the pancreas adjacent to the body (Fig: 2).

### **Right lobe of Pancreas**

The right lobe of the dog pancreas was supplied by both cranial and caudal pancreaticoduodenal arteries. The origin of the cranial pancreaticoduodenal artery was diverse in both groups. In the first group, the cranial pancreaticoduodenal artery originated from the gastroduodenal artery (Fig: 2). The cranial pancreaticoduodenal artery was directed caudomedially where it divided into two branches (cranial and caudal). The caudal branch descended ventromedially to supply the body of the pancreas, while the cranial one was regarded as a continuation of the cranial pancreaticoduodenal artery that gave branches to the descending duodenum and then continued cranially to supply the right lobe of the pancreas.

In the second group, the cranial pancreaticoduodenal artery was originated directly from the caudal surface of the hepatic artery (Fig: 5) close to the entrance into the portal area. It is divided into the pancreatic branch that supplied the body and the right lobe, while the duodenal branch equipped the descending duodenum.

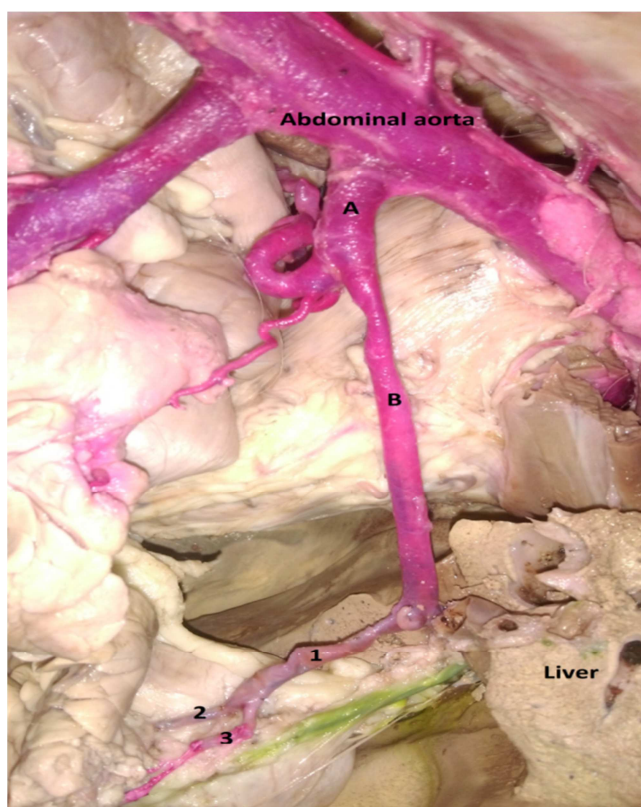


Fig-5: A photograph of the arterial blood vessels of local dog pancreas showing:

- A. Celiac artery
- B. Hepatic artery
- 1. Cranial pancreaticoduodenal artery
- 2. Pancreatic branch of cranial pancreaticoduodenal artery
- 3. Duodenal branch of cranial pancreaticoduodenal artery

In both groups, the caudal pancreaticoduodenal artery originated from the caudal aspect of the cranial mesenteric artery. This artery was descended ventrally and directed to the medial surface of the caudal extremity of the right lobe of the pancreas. Close to caudal extremity, this artery divided into two branches; the caudal duodenal branch was directed caudally to furnish the descending duodenum and also gave small pancreatic branch supplying the caudal extremity of the right lobe (Fig: 6). The cranial pancreatic branch was directed cranially and continued within the gland to form anastomosis with cranial pancreaticoduodenal artery.

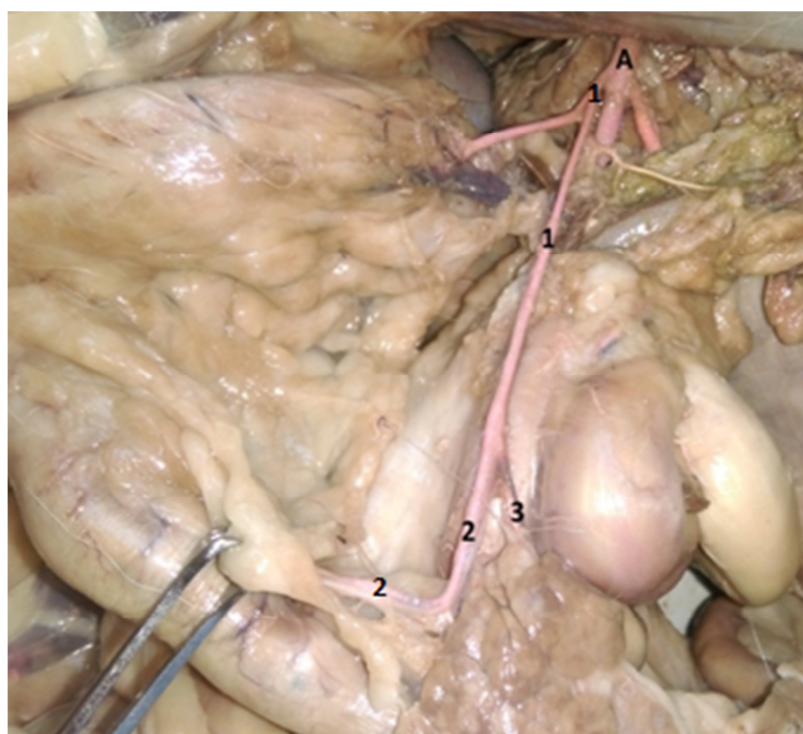


Fig-6: Aphotograph of the arterial blood vessels of local dog pancreas showing:

- A. Cranial mesenteric artery
- 1. Caudal pancreaticoduodenal artery
- 2. Caudal duodenal branch
- 3. Cranial pancreatic branch.

## Discussion

The importance of this research in exploring the local dog pancreatic vascularization comes because the blood vessels provide the developmental and adult pancreas with non-nutritional signals [11]. They could also be a bridge between the growth of local tissue and the whole organism. Blood vessels could also play an important role in the control of organ size [11]. The celiac and cranial mesenteric arteries were considered the main arterial blood vessels supplying the pancreas of local dogs. This result was according to Ayşe *et al.* [12] in the rat.

In current work, the caudal extremity and adjacent area of the left lobe of the pancreas was supplied by pancreatic branches originating from celiac and splenic arteries in four dogs, and from the splenic artery in two dogs. Also, in four dogs, the pancreatic branch originated from the gastroduodenal artery was provided the part of the left lobe of the pancreas adjacent to the body.

According to previous studies in the dog [1], small animals [5], cat [2] and Suncus [14] the left lobe of the pancreas mainly was supplied by a pancreatic branch originating from the splenic artery. In addition to a pancreatic branch of the splenic artery as a major artery supplying the left lobe of dog pancreas, several small branches were originating directly from gastroduodenal, hepatic and celiac arteries [20].

The variety in origin of pancreatic branches supplying the left lobe was stated in our study and other studies, since the study was performed by Van Schilfgaarde *et al.*, (1983) [17] mentioned that the pancreatic artery originated from the splenic artery in 80% of the dogs, whereas it arose from the cranial mesenteric artery in 20% of the dogs. In another study, Latorre *et al.*, (2011) [15] had been revealed that the pancreatic artery outfit from the splenic artery in 80% of the pigs, while the same artery was originated from the hepatic artery in 20% of the pigs.

The caudal extremity of the right lobe in all local dogs was supplied by pancreatic branches of the caudal pancreaticoduodenal artery that originated from the cranial mesenteric artery. This finding was similar to investigations of Prue, (2019) [3], Howard *et al.*, (2017) [1] and Cornell *et al.*, (2012) [5] in dogs, whereas Ayşe *et al.*, (2018) [12] documented that the same lobe of rabbit pancreas was provided by a small branch of the gastroduodenal artery which was a branch of the hepatic artery.

The cranial pancreaticoduodenal artery originated from the gastroduodenal artery in four dogs and it aroused directly from the hepatic artery in two animals. The aforementioned data of our result showed

anatomical variations in origin, number and distribution of arterial blood vessels of local dog pancreas, therefore it was essential for anatomists and surgeons to be aware of it [13].

The current study was agreed with observations of other investigators about the numerous arterial blood vessels supplying the pancreas. This made the pancreas vasculature a difficult subject and needed more attention [16] and [19]. So, the plentiful vascular supply of the pancreas might complicate the surgical operations of this organ. The risk of hemorrhage could be high with associated mortality more than 50%, due to the abundant vascular supply of the pancreas in human [18].

### Recommendation

The present work was restricted to use the injection of latex to demonstrate the arterial blood vessels of the pancreas in local dogs. Additional studies by using the corrosion cast and radiographic techniques would be needed to show finer details of pancreatic vasculature. So, the itemized anatomical knowledge of origin, number and distribution of pancreatic blood vessels could aid in preventing intraoperative and postoperative surgical complications of this organ.

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