TOPOGRAPHIC RELATIONS OF PANCREAS DURING DEVELOPMENT IN KUTTANAD DUCKS (*Anas platyrhynchos domesticus*)*

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Abstract

A study was conducted to trace the topographic relations of pancreas during prehatch and posthatch periods in Kuttanad ducks using 18 embryos and 78 female ducklings from the day of hatch to 24th week of age. Though the primordium appeared on third day of incubation, the gland attained a visible size on 10th day. The gland was located in the duodenal loop and did not show impressions of any visceral organs during embryonic life. However, on the day of hatch itself, the ventral lobe showed impressions of both limbs of duodenum. Impressions of various visceral organs viz., gizzard and left caecum appeared on the surfaces of dorsal and ventral lobes only by second week of posthatch period. Generally, as the age advanced, the impressions of these visceral organs on pancreas became more extensive and prominent.

Key words: *Kuttanad Ducks, Pancreas, Development, Topography*

The topographic relations and spacial arrangement of any visceral organ within the body cavity largely depends upon investments of peritoneum and volumetric changes of gastrointestinal and urogenital segments in the vicinity, which in turn relies on the age and other body parameters. The available literature on the topographic development of pancreas in Kuttanad ducks appears to be scanty.

Therefore, a detailed study was envisaged to establish a baseline data on the topographic relations of pancreas during prehatch and posthatch development in Kuttanad ducks for a better understanding of the pathological deviations during development. Moreover, this work will further contribute to the body of knowledge in the field of physiology and endocrinology.

Materials and Methods

Development of topographic relations of pancreas was studied in Kuttanad ducks during prehatch and posthatch periods using 18 embryos and 78 apparently healthy female ducks from day-old to 24th week of age. These

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birds were selected at random from a single hatch and reared at the University Poultry and Duck Farm, Mannuthy under semi-intensive system of management. After recording body weight, the ducklings were anaesthetized and bled to death. The morphology and topography of pancreas including its position and relationship with other visceral organs were studied and recorded by using a digital camera with 12X zoom (Nikon) and stereozoom microscope (Zeiss). Serial sections of embryos were taken till 21st day of incubation and were subjected to routine H&E staining.

Results and Discussion

In Kuttanad ducks, though the primordia appeared histologically on third day of incubation, it could be detected by stereozoom microscope only on eighth day. Despite a longer incubation period of 28 days, the time of appearance of pancreatic primordia in Kuttanad ducks did not differ considerably from other domestic birds. In fowl (McEwen, 1969; Ziswiler and Farner, 1972; Patten, 1973; Freeman and Vince, 1974) and Japanese quails (Sivakumar *et al.,* 1999) also, the primordia appeared on the third day of incubation.

The organ was grossly visible on tenth day. On fourteenth day, it was positioned in the duodenal loop (Fig.1). The final topographic position of pancreas was attained by 21st day of incubation (Fig. 2). At this age, the three lobes, *viz.*, dorsal, ventral and splenic lobes were clearly distinguishable. Histologically, both the lobes were loosely held in position by richly vascularized pancreatico-duodenal ligament. The dorsal lobe was observed to be closely related to the descending limb of duodenum whereas, the ventral lobe was situated freely between both the limbs at this age (Fig.3). On the day of hatch the ventral lobe showed impressions of both limbs of duodenum. Impressions of various visceral organs viz., gizzard and left caecum appeared on the surfaces of dorsal and ventral lobes only by second week of posthatch period.

During prehatch and posthatch periods, among the three lobes the dorsal lobe was the largest and was related to the gizzard, whereas the ventral surfaces of ventral lobe and splenic lobe were related to the liver. These findings are in accordance with those of Romanoff (1960) in birds Indu *et al.* (2001) in White pekin ducks.

In posthatch period, it was noticed that in all age groups, the dorsal, ventral and splenic lobes extended longitudinally in parallel with the ascending and descending limbs of duodenum and were held in position by the pancreatico-duodenal ligament that connected the gland with the two limbs of duodenum. The duodenal loop extended well beyond the distal end of the pancreas. These observations totally concur with those of Nickel *et al.* (1977) in ducks and geese. However, in the fowl and pigeon, the gland completely occupied the gap between the limbs of the duodenum (Hodges, 1974; Nickel *et al.,* 1977).

The dorsal surface of the dorsal lobe presented a deep concave impression formed by the body of left caecum proximally (Fig. 4). This impression divided the dorsal surface into two unequal regions and also gave rise to a short and sharp dorsomedial border limited to upper one third of the dorsal lobe that later continued as lateral border of the same lobe. Craniomedially, ventral surface of dorsal lobe showed a shallow impression formed by descending limb of duodenum. This impression became profoundly concave at the extreme distal region. Similar reports are not available in birds.

Towards the distal extremity, the dorsal surface showed another deeply concave impression of gizzard (Fig. 5). The whole distal extremity was curved around the gizzard in such a manner that the caudal hook-like ungular process pointed in cranial direction in relation to central axis of the body. These observations are in agreement with the findings of Indu *et al.* (2001), in White pekin ducks.

In the ventral lobe, the medial and lateral surfaces showed deeply concave impressions of the limbs of duodenum. Of which the concavity of the medial surface was more compared to the lateral surface since the descending limb of duodenum was larger

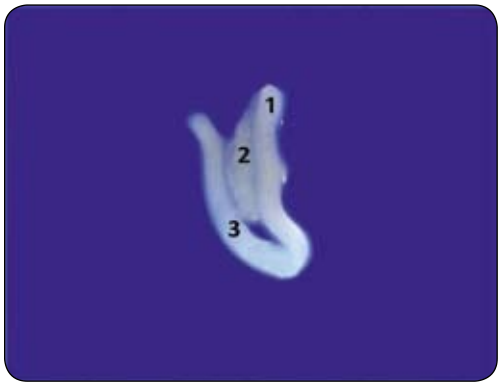

Fig. 1. Pancreas at 14th day of incubation
1. Descending limb of duodenum 2. Pancreas
3. Ascending limb of duodenum

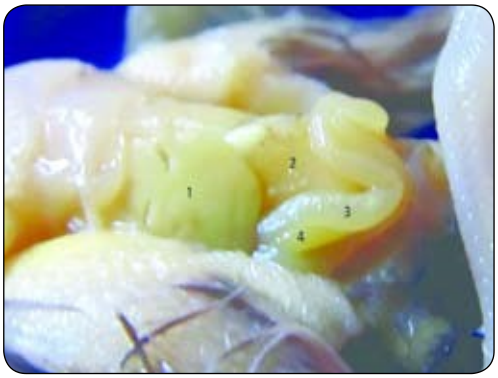

Fig. 2. In situ position of Ventral lobe pancreas on 21st day of incubation
1. Liver 2. Gizzard
3. Descending limb of duodenum 4. Pancreas

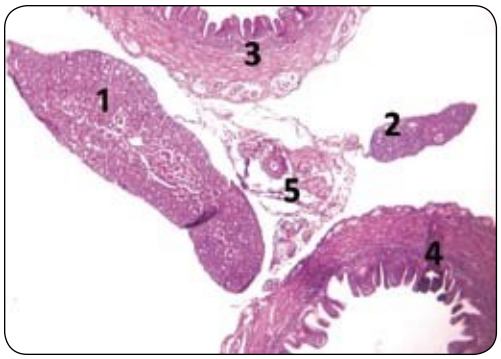

Fig. 3. C.S. of pancreas and other visceral organs on 21st day of incubation (H&E x 400)
1. Dorsal lobe 2. Ventral lobe
3, 4. Duodenum 5. Mesentery

Fig. 4. Caecal impression on dorsal lobe (18 weeks)
1. Ventral lobe 2. Duodenum
3. Dorsal lobe 4. Caecum

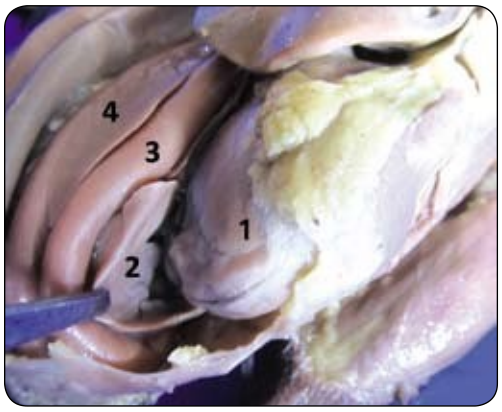

Fig. 5. Gizzard impression on dorsal lobe (16 weeks)
1. Gizzard 2. Dorsal lobe
3. Duodenum 4. Ventral lobe

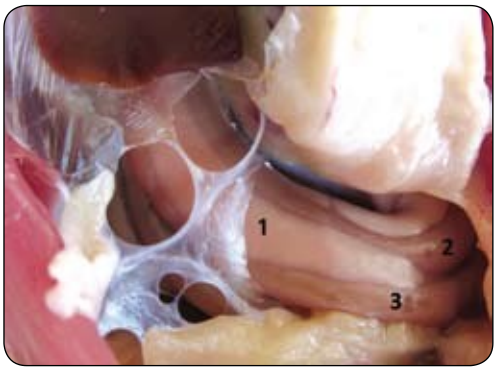

Fig. 6. Ventral lobe of pancreas (22 weeks)
1. Ventral lobe 2. Descending limb of duodenum
3. Ascending limb of duodenum

in diameter than the ascending limb. The ventral surface was also smooth and showed a marginal convexity transversely that increased with age. At its cranial two-thirds, this surface was covered by the right lobe of the liver and its caudal one-third of came in direct contact with the right abdominal air sac situated against the right body wall (Fig. 6) as reported by Indu *et al.* (2001) in White pekin ducks. Both cranial and caudal extremities were devoid of any attachment and hence located freely in between the limbs of duodenum.

Both dorsal and ventral surfaces of the splenic lobe were smooth. On the day of hatch, the dorsal surface was slightly convex while the ventral surface showed marginal concavity. The concavity of ventral surface increased with age and harboured the proximal part of duodenum soon after its emergence from the gizzard. The lateral border was convex, thin and devoid of any attachments. The thick medial border was almost straight and attached to the proximal extremity of dorsal lobe.

In general, the visceral organs situated in body cavity face diverse degree of spatial constrains during the course of development that ultimately results in formation of impressions and grooves on neighbouring organs. During the course of evolution many of these impressions have become more species specific. Throughout the avian kingdom, pancreas is seen to have modified its shape in relation to other visceral organs with vast structural diversity. In the present work also certain impressions were conspicuous that have not been described in other birds. With the advancement of age, many of these impressions became deeper and wider depending upon the relative growth of neighbouring organs.

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