

GROSS MORPHOLOGICAL STUDY ON THE STOMACH AND INTESTINE OF AN ASIAN ELEPHANT CALF (*Elephas maximus indicus*)

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ABSTRACT

Elephants are the herbivores and the largest existing terrestrial mammal. Morphology of stomach and intestine of an elephant calf is described in this study. Elephant possessed simple cylindrical stomach with a well-developed saccus caecus. Small intestine comprised of duodenum, jejunum and ileum and had a length of 55, 350 and 30 cm, respectively. Mucosa of duodenum showed major and minor duodenal papilla located at the same level but on opposite walls. Ileum opened into base of caecum on a papilla, papilla ilealis. Caecum was a blind cylindrical tube and possessed three each of teniae and haustrae, which were muscular bands and sacculations respectively. Colon had two teniae coli and two rows of sacculations. The sacculations were continued in the proximal part of rectum.

Keywords: Asian elephant, morphology, saccus caecus, teniae

INTRODUCTION

Elephant is the largest existing terrestrial mammal. The most distinctive

and fascinating feature of elephant is its elongated upper lip, commonly known as "trunk". Elephants are classified under the family Elephantidae of order Proboscidae. Asian elephant (*Elephas maximus*) is one among the three extant species of Proboscidae; the other two being bush African elephant (*Loxodonta africana*) and forest African elephant (*Loxodonta cyclotis*) (Shoshani and Tassy, 2005). *Elephas maximus indicus* is the subspecies of Asian elephant seen in Indian subcontinent. In general, Indian elephants are smaller than African elephants. Elephants are herbivorous animals and their digestive tract is described as having resemblance to horse, a domestic herbivore. Intestine of elephant is very cumbersome and received little attention. As there is only little information on the gross morphologic features of digestive tract in elephants, the present study was conducted to elucidate the anatomical peculiarities of stomach and intestine.

MATERIALS AND METHODS

Stomach and intestine used in the

present study were collected from a female baby elephant which was brought for post-mortem examination to the Department of Pathology, College of Veterinary and Animal Sciences, Pookode. The elephant calf was about two months old, had a height of 57 cm and weight of 150 kg. During necropsy, the stomach and intestines were carefully collected from the abdomen, cleared off the adhering mesenteries and morphological features and morphometric parameters were recorded.

RESULTS AND DISCUSSION

Elephant possessed simple stomach (Fig. 1). It was cylindrical in shape and its long axis extended obliquely from left to right side in the abdomen posterior to liver and spleen. It had a length of 76 cm and maximum breadth of 16 cm. The left end, fundus was 20 cm long and ended in a blunt projection. Fundus was broader than the right pyloric end of stomach. Oesophagus opened about one third distance from the left extremity of stomach, so the stomach had a well-developed saccus caecus (Fig. 1). A well-developed saccus caecus had been reported in Indian elephant (Mariappa, 1986; Indu *et al.*, 2014) and also in horse (Nickel *et al.*, 1986). At cardia the oesophagus to stomach angle was 65° . Insura angularis of stomach was very obtuse and angle measured was 160° . Greater curvature gave attachment to greater omentum which almost completely enclosed all the viscera of the abdomen. A lesser omentum extended from the lesser curvature to visceral surface of liver. Mucosal folds were larger, thicker and more distinct in the fundus and proximal half of body of stomach whereas folds

were less distinct in the remaining caudal half of body. However, the folds became more evident in the pyloric region and were better developed at the pyloric sphincter.

The intestine was divided into small and large intestine as in domestic animals. Small intestine comprised of duodenum, jejunum and ileum. Length of duodenum, jejunum and ileum were 55, 350 and 30 cm, respectively. Duodenum extended from the pyloric end of stomach which at first ran cranially up to the visceral surface on the right lobe of liver. Here it formed an S-shaped bend and later descended caudally on the right dorsal part of abdomen up to the base of caecum. Similar features had been described in the elephant foetus by Mariappa (1986). The remaining part of small intestine constituted jejunum that was suspended by mesentery inside the abdomen. Jejunum presented large spiral loops (Fig. 2) which were lying in contact with the abdominal floor on both right and left sides.

The jejunum was followed by ileum, the latter forming a terminal straight portion. Ileum opened into base of caecum and at the ileo-caecal orifice and its terminal part projected about 2 cm into the lumen forming papilla ilealis as observed in horse. Clauss *et al.* (2007) described the length of intestine of adult Asian and African elephants as 22 and 13.8 m, respectively. The mucosa of small intestine revealed longitudinal and transverse folds. In the mucosa of duodenum at the spiral bend noticed two papillae placed at the same level but on opposite walls. The larger one, major duodenal papilla was surrounded by a circular mucosal recess, hepato-pancreatic ampulla. Combined hepatic duct and major pancreatic duct opened on the summit of

that papilla. Elephant and horse do not possess gall bladder, the storage place of bile. The hepato-pancreatic ampulla may serve for storage of bile released into the duodenum. The minor pancreatic duct opened on the summit of smaller duodenal papilla. Similar positioning of major and minor duodenal papilla was described in horse (Singh, 2017).

Large intestine comprised of caecum, colon and rectum. Caecum was in the form of a blind cylindrical tube (Fig. 2, 3) and presented three regions: base, body and apex. The base was anterior positioned at dorsal part of right sublumbar region from which body extended and ended in a blind apex located at right iliac region. It had a dimension of 28 cm and 15 cm. The major feature of caecum was the presence of three teniae and haustrae, which were longitudinal muscular bands and rows of sacculations, respectively (Fig. 3), and these were reported previously in elephant foetus by Mariappa (1986). The teniae caeci and haustrae caeci extended up to the apex of caecum. Apex of caecum had a bifid nature. The present study revealed that almost entire length of caecum had same diameter. However, Mariappa (1986) described that the apex of caecum was pointed. The ileocolic orifice was located at the right side of base of caecum. The large circular caecocolic orifice by which caecum opened into colon was located proximal to ileocolic orifice on the left side. The comma-shaped caecum of horse also presented four each of teniae and haustrae (Nickel *et al.*, 1986).

The colon (Fig. 2, 3) was 450 cm long and had an average diameter of 10 cm. In the colon, two each of teniae coli and haustrae coli were evident. One tenia was

located on the attached border of visceral peritoneum (mesocolon), while the other was free. Though sacculations were seen throughout colon, they were more distinct at the junction with caecum. Ascending colon spread in the dorsal part of right and left sides of abdomen. Interior of caecum and colon presented semicircular folds corresponding to sacculations, which increased the absorptive surface area. It was held by a pendulous mesocolon and was placed over the small intestine. Major part of horse colon has four bands (Nickel *et al.*, 1986). The ascending colon was followed by a short transverse colon and a descending colon. Both transverse and descending colon were located on the dorsal part of abdomen. Transverse colon extended from right to left and continued on right dorsal part of abdomen as descending colon. Rectum, the last part of digestive tube was located in the dorsal part of pelvic cavity and measured 30 cm. The two teniae of colon were continued on the proximal peritoneal part of rectum. However, distal retroperitoneal part of rectum was devoid of muscular bands and sacculations. The caudal end of rectum was dilated to form ampulla recti and ended in the anus located below the root of tail.

SUMMARY

Stomach of Asian elephant was simple, cylindrical in shape; and possessed a well-developed saccus caecus. The large intestine was characterized by teniae and haustrae. The present study provided baseline data on morphology of stomach and intestine of Asian elephant, which has applications in wild animal physiology and pathology.



Fig. 1. Stomach of Asian elephant. O - Oesophagus, C - Cardia, S - Saccus caecus, B - Body of stomach, P - Pylorus



Fig. 2. Intestine of Asian elephant. J - Jejunum of Small intestine, C - Caecum, A - Ascending colon, T - Transverse colon



Fig. 3. Intestine of Asian elephant. J - Jejunum of Small intestine, M - Mesentery, A - Apex of caecum, B - Body of Caecum, T - Tenia coli, S - Sacculations, A - Ascending colon

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