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Gross anatomical studies on the large intestine in adult guinea pig (*Cavia porcellus*).

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Abstract

Large intestine of guinea pig comprised of caecum, colon and rectum. Caecum was the largest and more voluminous segment of the large intestine. Caecum was located in ventral third of the abdominal cavity. Caecum had sacculations and haustra. Caecum was divisible into ampulla caeci, corpus caeci and apex caeci. Opening of the ileum and colon was located in the ampulla caeci with little distance from one another. Colon was the longest segment of the large intestine and divided into three parts namely ascending colon, transverse colon and descending colon. Colon started from caeco-colic orifice and extend cranially to form the proximal colon. Rectum was the terminal portion of the large intestine which was straight without any wrinkles and its diameter was apparently larger than that of colon.

Keywords: Large intestine, guinea pig, caecum

1. Introduction

Guinea pigs (*Cavia porcellus*) are small laboratory animals which constitute a small suborder (Hystricomorphic) from the order rodentia. This type of rodent is probably first introduced into Europe from South America some 400 years ago [14]. Only five strains of guinea pigs are often used in research. Short haired American or English guinea pig is the most popular laboratory and pet variety. Other typically used laboratory varieties includes the Duncan Hartley, Hartley, strain 2 and strain 13 [3]. The morphology of the digestive tract of animal was related to the nature of food, feeding habits and body size [8]. The caecum was the most characteristic feature of gastrointestinal tract of guinea pig. It was a large thin walled semicircular sac with numerous lateral pouches [2]. However, literature on detailed study of gross morphological features of large intestine of guinea pig is very much limited. Hence, the present study was conducted with an aim to explore the gross anatomical features of large intestine of guinea pig.

2. Materials and methods

Six adult guinea pigs (three males and three females) of 4-8 months age from Duncan Hartley strain were obtained from Laboratory animal medicine, Madhavaram milk colony, TANUVAS, Chennai-600051. After getting approval from Institutional animal ethics committee (IAEC) TANUVAS. After proper euthanasia dissection was performed via one median-longitudinal incision on the ventral abdominal wall to expose the thoracic and abdominal viscera. After this, the entire digestive tract of each animal was dissected out and gross morphometrical observations of large intestine were recorded. Length of different parts of the large intestine were recorded in centimeter (cm) by using a calibrated scale and thread. Along with the length, the weight was recorded in gram (gm) using the sensitive electronic balance after evacuating the contents. Volume of the organ measured by water displacement method. These morphometric data were analysed statistically and presented as Mean \pm Standard deviation by using SPSS software application.

3. Results and discussion

Large intestine of guinea pig started from the ileo-caecal orifice to the anus. Large intestine of guinea pig comprised of caecum, colon and rectum.

3.1 Caecum

In guinea pig, the caecum was first part of the large intestine which was large in size and

comma in shape and dark green brown in colour with its contents had a blind end. This observation was in concurrence Snipes (1982)^[9] and Stan (2018)^[12] in guinea pig and Schrage and yewadan (1999)^[7] and Byantel *et al.* (2011)^[11] in grass cutter. However, contrary to this the shape of the caecum in rats and mouse was kidney shaped (Snipes, 1981)^[10] cone shaped caecum in african gaint rat (Nzalak *et al.*, 2015)^[5] and spiral shaped caecum in rabbits (Stan, 2014)^[11]. In the present study, caecum was placed transversely and extended from left iliac to right iliac region. However, maximum occupancy by the caecum was in the ventral third of the left side of the abdominal cavity which is similar observations were recorded by the Snipes (1982)^[9] and Potter *et al.* (1956)^[6] in guinea pig and Byantel *et al.* (2011)^[11] in grass cutter. Contrary to this, in rabbits, caecum occupied the entire ventral aspect of the abdominal cavity and in chinchilla, caecum was located on the left median plane (Stan, 2014)^[13]. Ventrally, caecum was crossed over by first part of proximal colon. Caecum was caudally and ventrally related to the urinary bladder in both male and female guinea pigs. While crossing the mid part of the abdominal cavity, In addition caecum of male guineapig was related to accessory sex glands (Fig.1). Caecum was related cranially to the parts of proximal colon which in turn covered the coils of jejunum and parts of the large intestine these observations in the present study were in agreement with those of Potter *et al.* (1956)^[6], Snipes (1982)^[9] and Stan (2018)^[12] in guinea pigs. But, in rabbits, caecum had three compartments which was located between the stomach and ascending colon (Stan, 2014)^[11] (Fig.1).

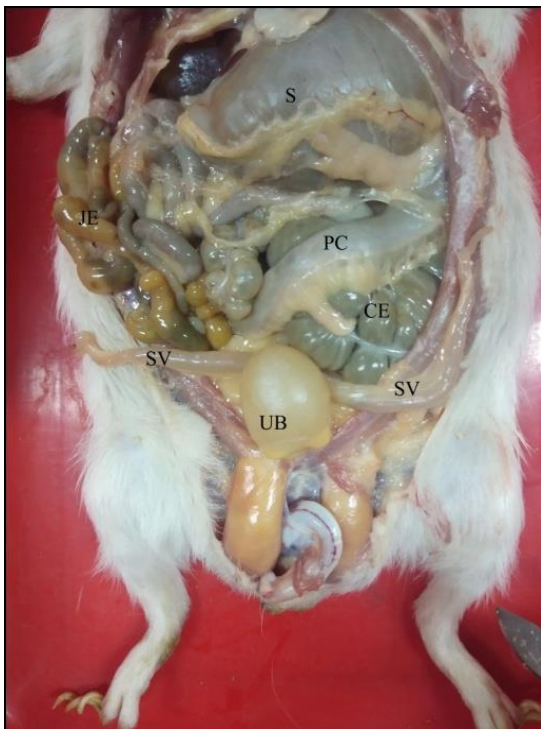


Fig 1: Photograph showing ventral abdominal opening showing in situ position of the parts of the large intestine located between stomach (S) and urinary bladder (UB) Caecum (CE), Proximal colon (PC), Jejunum (J) and Seminal vesicle (SV).

Caecum of guinea pig was made up of many sacculations. It had three muscular bands or taenia coli which were running longitudinally as ventral, lateral and medial bands out of which ventral one was visible while opening the abdominal cavity (Fig. 2). These muscular bands constricted the walls of

the sac into cup-like pockets or outpouchings known as haustra was similar observations were reported by Potter *et al.* (1956)^[6], Snipes (1982)^[9] and Stan (2018)^[12] in guinea pig and Byantel *et al.* (2011)^[11] in grass cutter.

Further, caecum was large semicircular thin walled structure had numerous lateral haustra and sacculated appearance. Presence of three white muscular bands along its length with medial lateral and ventral in disposition leads to formation of haustra as reported Snipes (1982)^[9] and Stan (2018)^[12] in guinea pig where as in sacculations and haustra were not observed in rat (Stan 2018)^[12].

Grossly, caecum could be divisible into three parts namely apex (apex caeci), body (corpus caeci) and base (ampulla caeci). Apex caeci was less delineated than rat two junctions ileo-caeco orifice and caeco-colic orifices were little distance one from another (Fig. 2). But in rats opening of the both ileum and colon were close together (Snipes 1981)^[10]. Corpus caeci was larger than that of the rat and no transition zone between the corpus and apex snipes (1982)^[9] and Stan (2018)^[12]. The base or ampulla of the caecum was dilated when compared with the body and apex. Caeco-colic orifice was located at the ampulla caeci. Two to three lymph nodes of different sizes were noticed at the mesenteric border of caecum (Fig. 2).

Mean length, weight and volume of the caecum were 10.3±7.4 cm, 12.63±3.3 gms and 12±5.7 ml respectively in all adult animals



Fig 2: Photograph showing the three parts of the caecum (CE) I- Ampulla caeci, II-Corpus caeci and III-Apex caeci with muscular bands (Arrow) and opening of ileum (I) into caecum (CE) and exit of colon (C) from caecum. Presence of Two mesenteric lymphnodes (*) at the near the colon and ileum.

3.2 Colon

In guinea pig, colon was divisible into three parts viz., ascending, transverse and descending colon. The ascending colon which in turn had proximal, coiled and distal loops. From the caeco-colic orifice, proximal loop of the ascending colon ran downward and caudally and crossed obliquely under the ventral aspect of the caecum towards the right side of abdomen. Then, it dipped under caecum and other intestinal parts to be continued by the next part, coiled loop (ansa spiralis) (Fig. 3). Ansa spiralis had one centripetal and one centrifugal coils which were bounded tightly together by the peritoneal folds and related ventrally by caecum and parts of the intestine. Pellet type of faeces was noticed in the ansa

spiralis. Ansa spiralis was continued by the last part of the ascending colon, the distal loop which in turn ran forward and continued as the transverse colon.

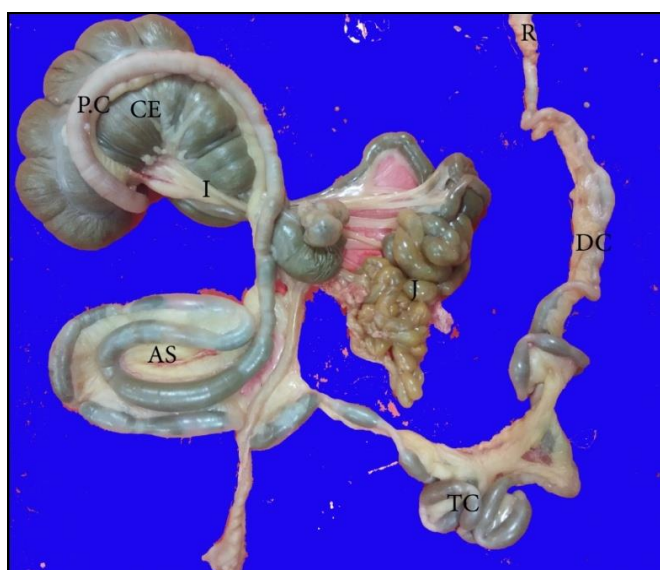


Fig 3: Photograph showing Digestive tract of guinea pig showing the caecum (CE) with different parts of colon PC-Proximal colon, AS-Ansa spiralis TC-Transverse colon, DC-Descending colon and R-Rectum

The transverse colon was short and had a slightly contorted course. Similar findings were observed by Stan (2018)^[12] and Snipes (1982)^[9] in guinea pig, Nzalok *et al.* (2012)^[4] in African gaint rat and Nath *et al.* (2016) in rabbits. Transverse colon ran forward and crossed the upper abdomen. Where it was crossed by the proximal part of the duodenum (Fig.3). Then it continued as descending colon which was long and coiled. It descended under the left lumbar region to the pelvic inlet. Throughout its course, the descending colon was greatly puckered to have sacculations known as haustra which contained pellet form of faeces. Colon along with its contents appeared as dark green brown in colour.

The colon was said to be wrinkled in appearance with a wide lumen which contained fecal balls and had sacculations with a thick wall compared to the caecum in grass cutter (Schrage and Yewadan, 1999)^[7]. Byanet *et al.* (2008) observed that the colon was the longest segment of the large intestine in grasscutter. In African gaint rat colon was the longest segment of the large intestine (Nzalok 2012)^[4].

In the present study, mean length, weight and volume of the colon were 79.2±9.5 cm, 28.15±1.06 gms and 27.7±16.14 ml respectively.

3.3 Rectum

Rectum was the terminal portion of the large intestine. Rectum was light pinkish in colour. In its course, rectum was observed in the left of pelvic cavity. Rectum was the straight portion without any wrinkles and its diameter was apparently larger than that of colon. It started from terminal end of descending colon and ended in anus (Fig.4). Rectal wall was appeared to be thick particularly in its terminal portion and had some pellet faeces as observed by Stan (2018)^[12] and Potter *et al.* (1956)^[6] in guinea pigs, Snipes (1981)^[10] in rats, Nzalok *et al.* (2015)^[5] in African gaint rat and Schrage and Yewadan (1999)^[7] in grass cutter.

In present study mean length, weight and volume varied from 4.8±3.3 cms, 1.65±1.19 gms and 2±0.1ml respectively.

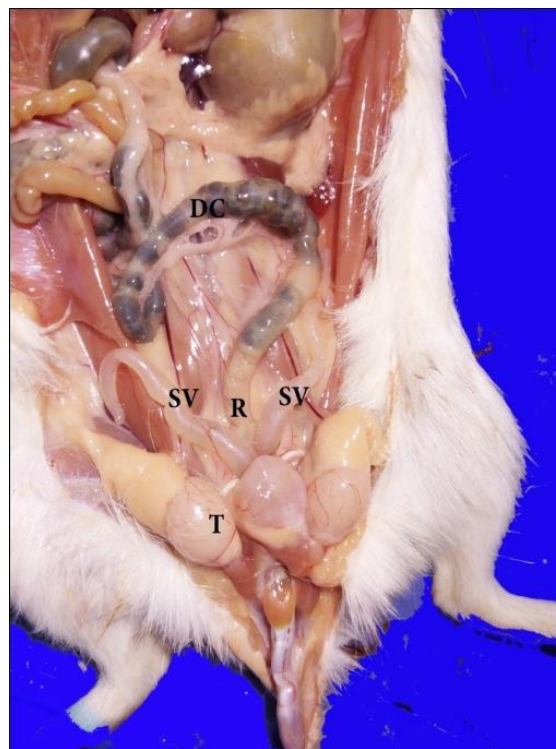


Fig 4: Photograph showing the position of the R-Rectum, DC-Descending colon. Related to T-Testis and SV-Seminal vesicle.

4. Conclusion

Large intestine of guinea pig comprised of caecum, colon and Rectum. Caecum of guinea pig has characteristic features of three muscular bands with sacculations known as haustra. opening of the ileum and exit of colon from the caecum were located at the ampulla caeci of the caecum. colon was the longest part of the large intestine comprised of ascending colon transverse colon and descending colon. Rectum was short straight.

5. References

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