



***In Vivo Ex-Vivo* Measurement of Crown-Rump and Small Intestinal Length in Nigerian Dogs: A Surgical Measure for Safe Intestinal Resection and Anastomosis**



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Abstract

The purpose of this study is to establish the relationship between crown-rump length and small intestinal length and how this can be used to estimate the total small intestinal length in dogs that have to undergo small intestinal resection and anastomosis. Thirteen adult Nigerian dogs with mean body weight of 11.5 ± 1.5 kg were used in this study. The animals were premedicated with atropine and xylazine intramuscularly. Anaesthesia was induced with thiopentone sodium intravenously. Access to the abdominal cavity was through the ventral midline abdominal incision. The small intestine was exposed and four measurements were made for each animal and the average small intestinal length was determined. The average length of the small intestine in Nigerian dogs was 247.6 ± 22.4 and that of crown-rump length 72.4 ± 3.8 cm. The small intestinal length was found to be 3.4 times the crown-rump length. These measurements have defined a normal range for crown-rump and small intestinal lengths in Nigerian dogs and may be of importance in planning surgical and nutritional interventions.

Keywords: Anastomosis; Resection; Treitz ligament; Intestine

Introduction

Crown-rump length is the measurement of the length of human or animal embryos and foetuses from the top of the head (crown) to the bottom of the buttock (rump). It can be used to estimate gestational age [1] and the length of the crown-rump is the same as that of umbilical cord of a fetus whereas the intestinal length is the measurement of the length of the intestine. It is done to know the transit time of agents ingested. Its measurement can also provide useful information in disease conditions where multiple bowel resections are envisaged [2,3]. The small intestine is designed to perform various functions such as nutrient absorption, barrier function, injury response and immunologic reservoir [4-7]. It is therefore, endowed with unique anatomic features, which provide it with a massive surface area, a diversity of cell types, and a complex neural network to coordinate these functions [8-12]. The length of the small intestine and its physiologic condition determine the capacity for absorption of nutrients which ensures the survival of the individual animal [2]. The small intestine in adults is reported to be longer than that of infants and this excess length confers adults with the advantage of adjusting favourably to

physiological and pathological challenges [3]. The small intestine given the role it plays in absorption and secretion of enzymes can be said to be the numero uno of the gastrointestinal tract. The aim of this study was to determine the crown-rump and small intestinal length with intent for identifying anatomical landmarks for intestinal resection and anastomosis in Nigerian dogs.

Materials and Methods

Thirteen adult Nigerian dogs with average body weight of 11.2 ± 2.8 were used for the study. The dogs were bought from breeders and housed in kennels within the Veterinary Teaching Hospital for four weeks for acclimatization.

Anaesthesia and Surgical procedure

Each animal was premedicated with Atropine (0.04 mg/kg) and xylazine (1 mg/kg) intramuscularly. Induction of anaesthesia was done using thiopentone Sodium (10 mg/kg) intravenously. Endotracheal intubation was instituted. Standard sterile preparation for laparotomy was done. Each animal was weighed and the Crown-rump length was measured using standard

flexible tape rule.

The ventral midline abdominal approach was used to access the abdominal cavity. The ventral abdomen of each animal was aseptically prepared for surgery. The incision was made through the skin, subcutaneous tissue and linea alba. The peritoneal stab incision was then extended with scissors. The intestinal loops were then exteriorized. The duodenum which is the first part of the small intestine was traced from its beginning at the pylorus and all the three parts of the small intestinal tract were identified. The duodenocolic ligament at the caudal duodenal flexure was severed to free the duodenum. A sterile drip infusion set with both end cut was used to measure the small intestinal length insitu. The measurement was done beginning from the duodenum, just at the distal end of the pancreas to

5% level [13].

Results

Table 1: Crown-rump length, intestinal length and ratio of crown-rump to intestinal length of Nigerian local dogs.

Dog	Weight (Kg)	Crown-Rump Length (Cm)	Intestinal Length (Cm)	Ratio of Intestinal Length Over Crown-Rump Length (Cm)	Ratio of Crown-Rump Length to Intestinal Length (Cm)
1	14	2	242.2	3.4	0.3
2	11	76	243.6	3.2	0.3
3	7	71	238.5	3.4	0.3
4	7	71	233.2	3.3	0.3
5	10	71.5	267.6	3.7	0.3
6	10	71.5	248.7	3.5	0.3
7	12	71	258.7	3.6	0.3
8	12	71	239.5	3.4	0.3
9	14	80.5	282.4	3.5	0.3
10	9	67	221.1	3.3	0.3
11	9	67	202.5	3	0.3
12	15	76	276.9	3.6	0.3

13	15	76	263.8	3.3	0.3
Mean	11.2±2.8	72.42±3.8	247.59±22.4	3.42±0.2	0.30±0.0

The crown-rump length, intestinal length, ratio of intestinal length to crown-rump, intestinal length, ratio of intestinal length to crown-rump and inverse ratio of intestinal length to crown-rump are presented in Table 1. The crown-rump length of the dogs ranged from 67 to 80.5cm with the average length of 72.4±3.8cm. However, the intestinal length of the dogs ranged from 202.5 to 282.4cm with average length of 247.6±22.4cm. Ratio of intestinal to crown-rump length is between 3.2 and 3.7cm with the average of 3.4±0.2cm. But its inverse ratio is generally 0.3cm.

Discussion

The obtaining of 72.4±3.8cm of crown-rump length and 247.6±22.4cm of intestinal length show that intestinal length is much longer than crown-rump length. This difference may

be due to curvature of rump and coiling nature of the intestine. But since the ratio of crown-rump length to intestinal length is 0.3cm, it shows that the small intestinal length is three times more than the crown-rump length. These measurements will benefit surgical or nutritional intervention and the success of these depend on accurate measurement of small intestinal length viz-a-viz the crown-rump length [14,15].

Statistical Analysis

Student t-test was used to compare the crown-rump length and intestinal length. The level of significance was determined at

There are various methods of measuring the small bowel length such as anatomical or surgical measurement, MR enterography and barium examination using opsometer. However, it was reported that anatomical (surgical) measurements and MR enterography have good high degree of correlation and gives better results compared with barium examination [2,16-18]. In this study, the surgical (anatomical) method of measurement was used and to the best of our knowledge, this is the first report on small intestinal length measurement in Nigerian dogs.

Previous studies on small bowel length in humans showed

variability between individuals which was attributed to subject type (cadaver vs living), methods of measurement and subject characteristics [19]. Therefore to reduce the influence of variability on our measurement, four measurements were taken for each small bowel length and the average was determined. The intestine in Alsatian dogs is reported to be about five times the body (crown to rump) length [10,20] with the small intestine constituting 80% of this length [20]. This by calculation means that the small intestine is four times the crown-rump length. However, in this study, the small intestinal tract was found to be 3.4 times the crown-rump length in Nigerian dogs. This could be due to breed, nutritional, environmental and genetic factors.

Conclusion

The length of the small intestine is 3.4 times higher than the crown-rump length as against 5 times reported in Alsatian breed of dogs.

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