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ESTABLISHING SHORT BOWEL SYNDROME IN NIGERIAN DOGS

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ABSTRACT

Determining the relationship between percentage resection and development of short bowel syndrome is important as it provides information on the expected outcome of the resection carried out which will enable the surgeon to prepare adequately to manage such patients. Ten adult Nigerian indigenous dogs with mean body weight 11.2 kg were used in this study. The animals were premedicated with atropine (0.04mg/kg) and xylazine (1mg/kg) intramuscularly. Anaesthesia was induced with thiopentone sodium (10mg/kg) intravenously. The abdominal cavity was entered through the ventral midline incision. Three animals each were subjected to 50% and 60% small intestinal resection while four animals were subjected to 70% small intestinal resection. The animals subjected to 50% and 60% intestinal resection did not manifest signs of short bowel syndrome. However, the animals subjected to 70% small intestinal resection manifested clinical signs attributable to short bowel syndrome. The animals subjected to 50% and 60% small intestinal resection had remnant small intestinal tract of up to 100cm while dogs that underwent 70% resection had remnant small intestinal bowel length of less than 100 cm. It is therefore, concluded that 70% small intestinal length resection is the minimum that can produce short bowel syndrome in Nigerian dogs and animals with remnant small bowel length of less than 100 cm after undergoing resection will come down with short bowel syndrome.

Contribution/Originality: This study is one of very few studies which have investigated the crown-rump length, total small intestinal length and the percentage small intestinal resection that will result in short bowel syndrome in Nigerian dogs.

1. INTRODUCTION

Intestinal resection and anastomosis is a surgical procedure that involves the removal of a diseased or damaged section of the dog's intestine and suturing the remaining sections together. Intestinal resection is performed frequently in dogs and cats and is generally associated with minimal morbidity [1]. However, massive or extensive intestinal resection will result in short bowel syndrome [2-9]. Affected animals experienced insufficient intestinal absorptive capacity and this result in the clinical manifestations of diarrhea, dehydration, malnutrition and weight loss [1, 10, 11]. Disease processes in dogs and cats that may require extensive resection include linear foreign bodies, intussusception, mesenteric volvulus or entrapment/ischemia [12, 13] necrotic, neoplastic, or fungal-infected segment of intestine [14]. Long-term survival of patients with short bowel syndrome is dependent on the

extent of anatomical and functional adaptation of the remaining small intestine and response to pharmacological and nutritional management [13, 15].

The aim of this study was to establish the relationship between percentage small intestinal resection and the development of short bowel syndrome in Nigerian dogs.

2. MATERIALS AND METHODS

Ten (10) adult Nigerian dogs between the ages of 6months – 2years with body weight ranging from 9-15 kg (mean 11.2 kg) were used. They were stabilized for 4 weeks and were dewormed and treated against ectoparasites and hemoparasites. They were fed daily and water was provided *ad libitum*. The animals were weighed and the crown-rump length was measured and recorded. The small intestinal length and crown-rump length of each dog were measured and the average value for each determined.

2.1. Drugs

Each animal was fasted for 12 hours (food and water) prior to surgery. The dogs were premedicated with Atropine Sulphate (Jiangsu Huayang pharmaceutical, China) at a dose rate of 0.04 mg/kg body weight intramuscularly and Xylazine hydrochloride (XYL-M2®, VMD, Belgium) at a dose rate of 1 mg/kg body weight intramuscularly. Each dog was given Ringer's Lactate solution (Dana pharmaceuticals ltd, Nigeria) at10 mls/kg/hr intravenously throughout the surgery. Procain penicillin (Shuazhuang co ltd, China) at 20, 000 IU/kg and Streptomycin (North China pharmaceutical co ltd, China) at 10 mg/kg intramuscularly were administered pre, intra and post surgery for prophylaxis. The animal was intubated with endotracheal tube and esophageal stethoscope was put in place to monitor the respiratory and heart rates.

2.2. Operative Procedure

The skin of the ventral abdomen was shaved, scrubbed and prepared aseptically using medicated soap (Dettol soap) (Reckitt Benckser ltd, Nigeria) with water. The final scrubbing of the proposed surgical site was done using sterile gauze soaked in chlorhexidine solution. The total small intestinal length in each dog was calculated and recorded as described by Kisani, et al. [16]. The crown-rump length of each dog was also measured and the average value for each determined. The average small intestinal length was divided by the average crown-rump length to get 3.4cm as the proportion. The crown-rump length value obtained was multiplied by 3.4 cm (mean of index of small intestinal length) and this gave the average total intact small intestinal length in each dog [16]. This was then recorded.

The patient was placed on dorsal recumbency. Skin drapes and surgical incision drapes were placed on the animal. A ventral midline abdominal incision was made from the Xiphoid process through the umbilicus to the pubis. The incision was made through the skin and subcutaneous tissue. Stab incision was made on the linea alba. This was then extended with scissors. The abdominal cavity was entered. The intestinal tract was exteriorized and the small intestine was identified. Fifty per cent (50%) of the small intestinal tract which was earlier determined using the formular 3.4 (mean of index of the length of small intestinal tract in Nigerian dogs) times the crown-rump length of each dog was measured using sterile drip infusion set beginning from a point 7cm behind the duodunojejunal flexure(treitz ligament). The affected length of bowel was resected as described by Brown [17] Three of the animals had 50% of their small intestinal tract resected; three had 60% of small intestinal tract resected while four of the dogs had 70% of the small intestinal tract resected. The mesenteric vessels supplying the affected part were doubly ligated with polyglactin 910 (vicryl® Ethicon, USA). The residual intestinal tract was anatomosed end to end using horizontal mattress suture pattern with polyglactin 910 (vicryl® Ethicon, USA) as described by Brown [17]. After anastomosis, 2mls of normal saline was injected tangentially into the intestinal tract close to the anastomosed site to check for leakage and patency. Intestinal viability was assessed using arterial pulsations,

peristalsis and bright red colour of the intestinal tract. The anastomosed site was covered with omentum and returned into the abdominal cavity. The linea alba incision was closed with horizontal mattress suture pattern using polyglactin 910 (vicryl® Ethicon, USA). The subcutaneous tissue was closed using subcuticular suture pattern with polyglactin 910 (vicryl® Ethicon, USA). The skin incision was closed using horizontal mattress suture pattern with nylon suture material size 1-0.

2.3. Post-Operative Care

The incision site was dressed with sterile gauze and adhesive tape and Paediatric vest was put on the body of the dogs to protect the incision site. The animals were returned to the kennels after recovery from anesthesia. Procain penicillin (Shuazhuang co ltd, China) (20, 000 IU/kg) and streptomycin (North China pharmaceutical co ltd, China) (10mg/kg) antibiotics were administered for 5 days post surgery. Pentazocine (Bharat Parenterals ltd, India) was administered at the dose rate of 3mg/kg for 5 days post-operatively to relieve pain. Dextrose 5% solution was administered intravenously on the second and third day (24 and 48hrs) post surgery. The dogs were given bland diet on the fourth day (72hrs) after surgery. They were then given their normal ration of food from the fifth day (96 hrs) post surgery.

The same procedure was repeated for all the dogs that underwent 60% and 70% small intestinal resection. The dogs were then observed for 4 weeks for signs attributable to short bowel syndrome.

3. RESULTS

The animals that had 50% and 60% resection showed reduced activity and appetite for about 7 days. However, there were no manifestations of clinical signs of short bowel syndrome. The appetite returned to normal by about 7th day post surgery and the animals became active.

The dogs with 70% intestinal resection showed the following clinical manifestations: voluminous, pale and bile-stained watery faeces, malabsorption, dehydration, weakness, weight loss and reduced appetite. These signs continued throughout the period of observation.

Table-1. Percentage resection and clinical signs of short bowel syndrome

Clinical sign	50% (4weeks)	60% (4weeks)	70% (4weeks)
Diarrhoea	-	-	+ (7)
Malabsorption	-	-	+
Dehydration	-	-	+
Weight loss	-	-	+
Weakness	+ (7)	+ (7)	+
Anorexia	+ (7)	+ (7)	+

( ) - Duration in days

Table-2. Crown-rump length for each dog and calculated small intestinal length (x3.4)

Dog	Group 1			Group 2			Group 3			Group 4			Group 5		
	Crown-rump length	x3.4	70%	Crown-rump length	x3.4	70%	Crown-rump length	x3.4	70%	Crown-rump length	x3.4	70%	Crown-rump length	x3.4	70%
1	70	238	166.6	78	265.2	185.6	79	268.6	188.0	79	268.6	188.0	70	238	166.6
2	70	238	166.6	76	258.4	180.9	76	258.4	180.9	81	275.4	192.8	76	258.4	180.9
3	59	200.6	140.4	68	231.2	161.8	70	238	166.6	76	258.4	180.9	73	248.2	173.7
4	68	231.2	161.8	65	221	154.7	70	238	166.6	65	221	154.7	68	231.2	161.8
5	69	234.6	164.2	71	241.4	169	80	272	190.4	70	238	166.6	70	238	166.6
6	72	244.8	171.4	65	221	154.7	67	227.8	159.5	68	231.2	161.8	72	244.8	171.4

4. DISCUSSION

Gorman, et al. [2] reported that resection of 50 -80% of small intestinal tract in dogs, 70 - 90% in cats and more than 50% in humans results in short bowel syndrome. This is partly in agreement with our findings. However, the minimum range of percentage small intestinal resection that resulted in short bowel syndrome reported by Gorman, et al. [2] is not in agreement with our findings in this study as our dogs that were subjected to 50% and 60% small intestinal resection did not show the above reported signs attributable to short bowel syndrome. They only showed weakness and reduced appetite. This could be as a result of differences in breed and diet. The clinical signs attributable to short bowel syndrome by other workers are diarrhea, fluid and electrolytes abnormalities and weight loss [2, 18-22]. The clinical signs attributable to short bowel syndrome mentioned in their report is in agreement with our findings as our dogs that had 70% of their small intestinal tract resected manifested these clinical signs. The diarrhea and weight loss was due to malabsorption as a result of the loss of mucosal absorptive surface area associated with short bowel syndrome [20, 23].

This study has identified the relationship between percentage resected small intestine and the development of short bowel syndrome which previous workers did not [2]. It is also observed that dogs subjected to 70% small intestinal resection that came down with short bowel syndrome had remnant small intestinal tract less than 100cm.This means that the remnant small intestinal length is an important factor in the development of short bowel syndrome

5. CONCLUSION

The 70% of small intestinal length resection is the minimum that can produce short bowel syndrome in Nigerian dogs.

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