

Volvulus in a 20 years old captive hippopotamus (*Hippopotamus amphibius*, Linnaeus, 1758)

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ARTICLE INFO

Case Report

Received:

01 August 2020

Accepted:

13 September 2020

ABSTRACT

A volvulus is a twisting of the intestine on its mesenteric axis that could result in bowel obstruction and ischemic injury. Here the authors report a case of intestinal volvulus in a 20 years old captive hippopotamus (*Hippopotamus amphibius*, Linnaeus, 1758), the first well described case in this specie. The animal died suddenly after a previous history of diarrhea. At post mortem examination the animal presented a good body condition and abdominal distention. Upon opening of the peritoneal cavity, a large twisted segment of small intestine was observed. The segment was rotated on its mesenteric axis and was dilated with gas and fluid and with dark red coloration, due to hemorrhage. The cause of death was intestinal volvulus. Its diagnosis is a challenge to veterinary surgeons due to the progressive onset of the symptoms that can delay diagnosis and treatment. The result is the progression to the acute fulminating type with bowel infarction and death.

Keywords:

Hippopotamus amphibius, mortality, volvulus, pathology, intestine

J. Adv. Vet. Res. (2020), 10 (4),261-262

Clinical Case

The common hippopotamus (*Hippopotamus amphibius*, Linnaeus, 1758) is a semiaquatic, pseudoruminant mammal originated from sub-Saharan Africa (Walzer and Stalder, 2012). This species is listed as Vulnerable in the IUCN Red List Endangered species (CITES Appendix II) (Lewison and Pluháček, 2017).

A 20 years old H. *amphibius* living in Maia Zoological Park (Maia, Portugal), presented with diarrhea and anorexia for two days. Subsequently, diarrhea stopped and the animal died suddenly (Fig. 1A).

The animal was sent to the Histopathology Laboratory of University of Trás-os-Montes and Alto Douro for necropsy, in order to define the cause of death. The necropsy exam was performed according to the techniques described for large mammals and under the appropriate conditions of safety and hygiene (Garcês and Pires, 2017).

At post-mortem examination the animal presented a good body condition and abdominal distention. Muscular hemor-

rhages were observed, especially in the limbs. Upon opening of the peritoneal cavity, a large twisted segment of small intestine was observed. The intestinal segment rotated on its mesenteric axis and was dilated with gas and fluid, being characterized by a dark red coloration due to hemorrhage (Fig. 1B). The intestinal mucosa was hemorrhagic and ulcers were present (Fig. 1C). The gastric mucosa also presented erosions and ulcers. The lungs presented interstitial emphysema. A tumefaction was also observed in the gingiva, around the molar teeth of the right side of the mandibula. There were no other gross lesions in the remaining internal organs. Histological findings confirmed the macroscopic observations of the affected intestine segments, which revealed ulceration, congestion, hemorrhage and necrosis. The tumefaction in the gingiva corresponded to a gingival hyperplasia. The cause of death was intestinal volvulus.

An intestinal volvulus is a rotation (>180°) of the intestine on its mesenteric axis that could result in bowel obstruction, ischemic injury, congestion, hemorrhage, and necrosis. The ischemic necrosis of the intestine occurs quickly, causing metabolic acidosis, toxic shock, sepsis and finally death (Wilson, 2012; Uzal *et al.*, 2016). Death occurs rapidly if not treated. The mechanism associated to intestinal twisting can be secondary to movement of the walls of the abdominal cavity, alterations

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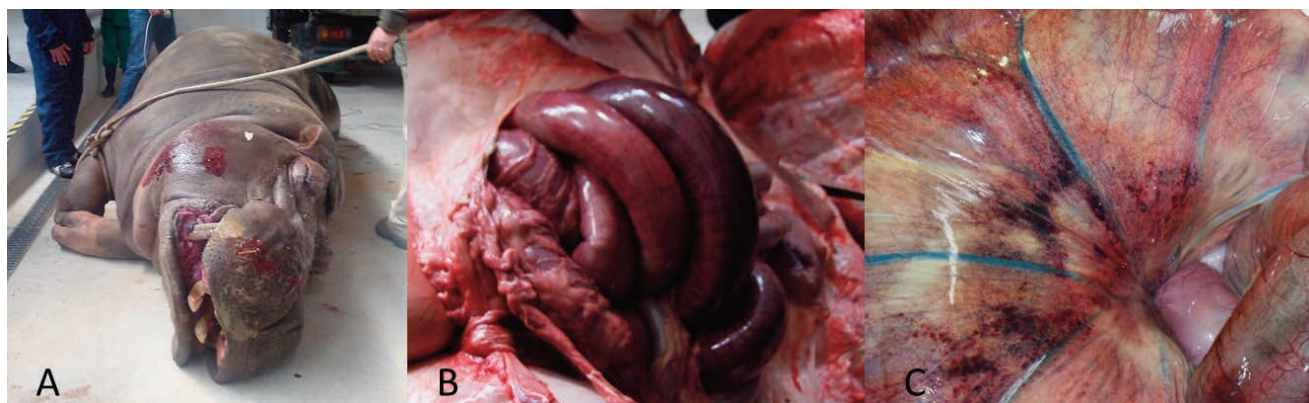


Fig. 1. A-full body image of the male *Hippopotamus amphibius*; B- intestinal segment rotated on its mesenteric axis and dilated with gas and fluid, being characterized by a dark red coloration due to hemorrhage; C- mesenteric hemorrhages.

in normal peristalsis or function of the small intestine (e. g. strangulating lipoma, inguinal hernia, adhesions, postoperative ileus) or gas production from a highly fermentable substrate in the colon (Wilson, 2012; Gelberg, 2017). Intestinal volvulus is likely to occur in any animal species. In the family Hippopotamidae there is a case reported in a pygmy hippopotamus (*Choeropsis liberiensis*) (Flacke et al., 2016). In this particular case we can hypothesize that the volvulus was secondary to alterations in normal peristalsis or function of the small intestine, since the animal presented clinical signs of diarrhea two days before death. Its diagnosis is challenging to veterinarians due to the progressive onset of the symptoms that can delay the diagnosis and the treatment. Additionally, in this species, the approach is far more complicated due to the difficulty in restraining such large and aggressive animals.

This case reports an intestinal volvulus in a captive *H. amphibius*, the first in this specie. Despite the few cases reported on Hippopotamidae, the diagnosis of intestinal volvulus should be considered as a possible evolution of inflammatory bowel disease, when there are symptoms of intestinal obstruction.

Acknowledgement

This work was supported by the project UIDB/CVT /00772/2020 funded by the Fundação para a Ciência e a Tecnologia (FCT).

Conflict of interest

None of the authors has any conflict of interest to declare.

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