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CLINICAL REPORT

Surgical Approach to Mandibular Symphysis Fracture in Black-Eared Opossum (*Didelphis aurita*): Case Report

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ABSTRACT

An adult female black-eared opossum (*Didelphis aurita*) was found in the city of Guarulhos, Brazil, and was sent to veterinary care for clinical examination and future rehabilitation. In the physical exam, it was possible to verify mobility between the hemimandibles. The animal was submitted to the anesthetic procedure for a complete oral exam, intraoral radiography, and possible surgical intervention. The opossum was diagnosed with mandibular symphysis disjunction, needing surgery. The technique chosen was the labial locking system with buttons and cerclages. After the procedure, the animal was sent to the environmental organs for rehabilitation. After 40 days, the locking system was removed showing a complete healing of the mandibular symphysis. The animal was reintroduced to nature within 45 days of the procedure.

Introduction

Opossums are marsupial animals belonging to the Didelphidae family and *Didelphis* genus, a genus that comprises six species, four of which can be found in Brazil, the most common being the black-eared opossum (*Didelphis aurita*) and the white-eared opossum (*Didelphis albiventris*), species that adapt easily to different environments, biomes and climates, in addition to a great tendency towards synanthropic habits.[1,2] Because they are increasingly closer to urban areas, opossums are at the focus of several conflicts, either because of the One Health concept, where some diseases are shared with domestic animals and humans, such as rabies, leptospirosis, Lyme disease, Chagas disease, leishmaniasis, among others, and because they are surrounded by myths and popular beliefs that lead to several episodes of aggression and mistreatment in human-animal interactions, often leading to death.[3,4]

Case Description

An adult female black-eared opossum (*Didelphis aurita*), weighing 1,5 kg, was referred by environmental agencies in the city of Franco da Rocha, in the state of São Paulo, Brazil, to veterinary clinical evaluation after being found in an urban area to a zoological park in Guarulhos, São Paulo, Brazil. The animal was sedated in a isoflurane (Isoforine, Cristalia, Itapira, Brazil) vaporization mask in a 2% minimal alveolar concentration to a complete evaluation, during the physical examination, it was found that the animal had instability between the hemimandibles, leading to a strong suspicion of a mandibular symphysis disjunction, a temporomandibular hematoma, infraorbitary edema and soft palate excoriation, as the diagnosis and treatment involve radiographic imaging and surgical approaches, the patient was medicated with ketoprofen (Ketojet 100 mg, Agener União, São Paulo, Brazil) in a 2

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mg/kg and sodium dypirone (D-500, 500 mg/ml, Zoetis, Campinas, Brazil). In the following day, the opossum was sent to a dental practice veterinary clinic in the same city.

Clinical Findings

For a correct evaluation, the animal was submitted to general anesthesia with isoflurane 2% in 100% oxygen in a mask for induction of the anesthetic plane and maintenance with isoflurane by orotracheal intubation with a 3.5 mm diameter endotracheal tube (Cuffed endotracheal tube, Solidor, São Paulo, Brazil), the monitoring with electrocardiography and pulse oximetry (SDAmonitor 8, SDAMed, Campinas, Brazil) demonstrated stability through all the procedure duration.

After induction of the anesthetic plane, the disjunction of the mandibular symphysis was observed, through the loss of the articular relationship between the hemimandibles (Figures 1 and 2), in addition to a thorough clinical examination of all oral structures such as teeth, gingiva and attachments, with no clinical changes, periodontal treatment was performed (Figure 3) and the animal was submitted to intraoral radiographs of the entire cavity before the surgical approach (Figure 4).

Treatment and Outcome

For the surgery, the animal was placed in right lateral recumbency position. The first approach to the mandibular symphysis was made through the oral cavity with the analysis of tissue viability, with the soft tissues and mandibular bone fragments being viable, the approximation began. With the fragments in place, it was opted for the labial locking technique with buttons, as it is a stable, minimally invasive technique that is commonly used in the surgery of domestic carnivores.

The suture of the adjacent soft tissues was performed with poliglecaprone-25 monofilament absorbable suture (Monocryl, Atramat, Ciudad de Mexico), as it is a material with good tension, resistant to wet and contaminated areas, and is more affordable. For this stage of the surgery, the simple interrupted pattern was chosen (Figures 5 and 6).

For the button technique, 0.4 mm diameter steel cerclages, a button with four ports and 40 × 1.2 mm needles were used. The needles are passed from the vestibular region caudal to the canine in each hemimandible to the outside of the oral cavity, having to

Figure 1. Physical examination of the mandibular symphysis.

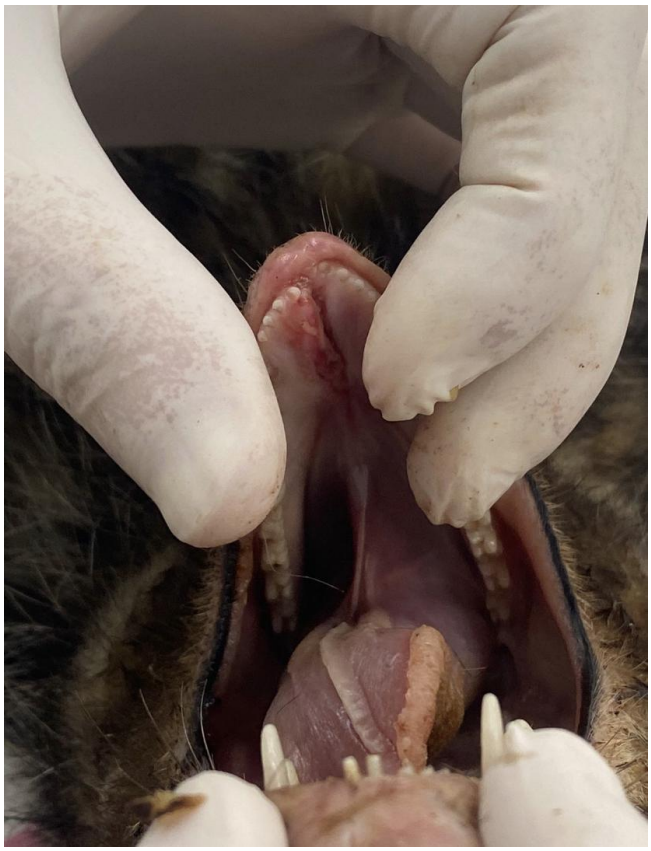

Figure 2. Physical examination of the mandibular symphysis.

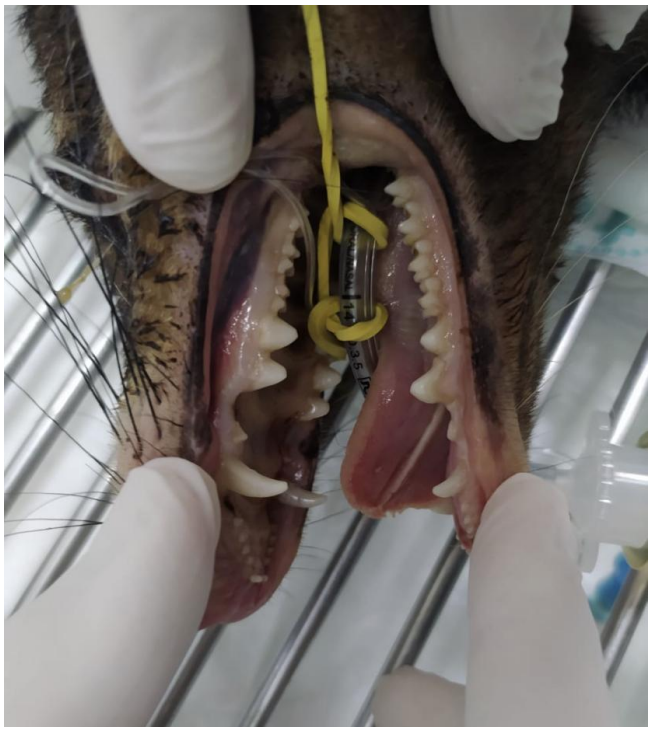

Figure 3. The teeth after periodontal treatment.

be careful, because if the passage is done wrongly, there may be damage to the mental nerve, being used as a guide for the normograde passage. of the cerclage. After that, the button is fitted and the threads are passed through the holes at each end of the button, which serves as a support, preventing the fraying of all the noble soft tissues present, after which the cerclage was closed with a cerclage needle holder. To prevent the animal from injuring itself, a layer of bisacrilic resin (Structur 2 SC, VOCO, Cuxhaven, Germany) was applied under the button with cerclage tips (Figure 7). The procedure lasted 70 minutes and the anesthetic recovery took 20 minutes. For postoperative therapy, the same doses of sodium dypirone and ketoprofen, with tramadol hydrochloride (Cronidor 2%, Agener União, São Paulo, Brazil) at 3 mg/kg dose were chosen.

After 40 days, the animal underwent a new anesthetic-surgical intervention for implant removal. Even being kept with minimal human contact to avoid any type of imprinting and harm to rehabilitation, the animal showed a good clinical evolution and consolidation of the mandibular symphysis. After that, the opossum was sent back to environmental agencies and after three days of procedure, it was reintroduced to its natural habitat. After 5 days of the removal, the opossum was reintroduced.

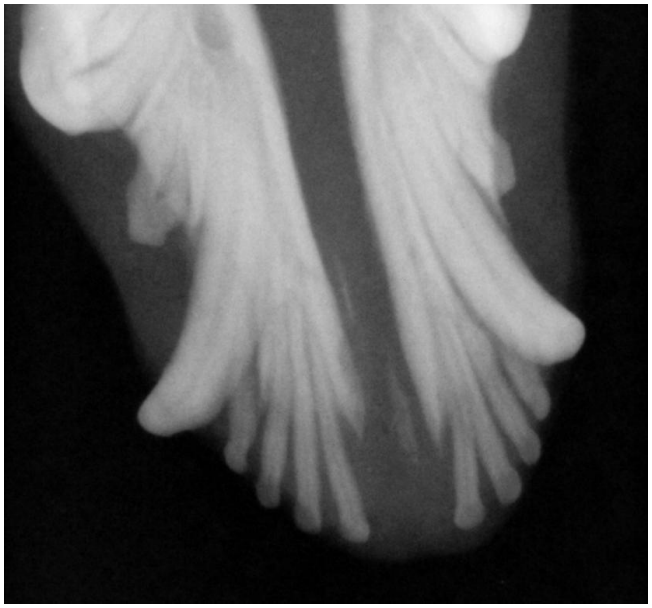

Figure 4. Intraoral radiograph of the fractured mandibular symphysis.

Figure 5. Suture of the soft tissue with poliglecaprone-25.

Figure 6. Suture of the soft tissue with poliglecaprone-25.

Figure 7. The labial locking system with steel cerclage, button and resin.

Clinical Relevance

Traumatic injuries in opossums are increasingly common, taking into account the aforementioned fact and also the expansion of urban areas, since many wild animals end up suffering vehicular impact, as in Mead's 2009 research,[5] which shows in post mortem study of a population of Virginia opossums (*Didelphis virginiana*),

which lives near a road, showing that the most common fractures would be those of the rib, with the stomatognathic system representing only 13% of fractures in this population, but the etiology and evolution remain unknown.

Among the particularities of the anatomy of the skull of the genus *Didelphis*, the most evident is the fact that the viscerocranium, the facial region of the skull, is quite elongated, including the rigid mandibular symphysis accompanying this anatomy, due to the generalist diet of these animals. Other marsupials such as kangaroos, family Macropodidae, and koalas, genus *Phascolarctos*, have absent or flexible mandibular symphysis due to the consumption of high-density fibrous plant matter. This morphology of the genus *Didelphis* favors trauma in this region, taking into account trauma by collision, contusion, fall and shock wave conduction.[6-8]

Mandible fractures differ from those of the appendicular skeleton since the anatomy is quite particular as it involves the mandibular plexus that runs through the mandibular canal, in addition to the dental elements that, in anelodont dentition animals, have their roots implanted in alveoli and with roots connected to the plexus, preventing the use of surgical osteosynthesis techniques that involve drilling and implants that injure the plexus and dental roots.[9]. For fractures in the mandibular symphysis region, there are techniques described in small animal medicine, and the most applied are circumferential wires between the canines, use of splinting with resin between the canines, titanium mini-plates positioned in the region of the symphysis itself and labial locking systems.[10,11]

The labial locking systems consist of a thread of resistant material, either steel or nylon suture, positioned percutaneously connecting the interior of the oral cavity and the external environment, with some apparatus to avoid injuries to the various tissues present in that region, whether it is a button or orthopedic mini plates, thus maintaining tissue viability and occlusion, an extremely necessary parameter in this case, since the patient is a free-range opossum that would later be destined for its natural habitat.[12]

Conflict of Interest

The authors declare no conflicts of interest related to this report.

References

1. Cerqueira R. The distribution of Didelphis in South America (*Polyprotodontia, Didelphidae*). *Journal of Biogeography*. 1985; 12: 135-145.
2. Bezerra-Santos MA, Ramos RAN, Campos AK, Dantas-Torres F, Otranto D. Didelphis spp. opossums and their parasites in the Americas: A one health perspective. *Parasitology Research*. 2021; 120(12): 4091-4111.
3. Gilbert AT. The ecological range and principles of wildlife rabies virus perpetuation in the Americas. In: *History of Rabies in the Americas: From the Pre-Columbian to the Present, Volume I: Insights to Specific Cross-Cutting Aspects of the Disease in the Americas*. Cham: Springer International Publishing. 2023; 61-75.
4. Bitencourt M, Bezerra A. Infection agents of Didelphidae (Didelphimorphia) of Brazil: an underestimated matter in zoonoses research. *Mammalia*. 2022; 86(2):105-122.
5. Mead AJ, Patterson DB. Skeletal lesions in a population of Virginia opossums (*Didelphis virginiana*) from Baldwin County, Georgia. *Journal of wildlife diseases.* 2009; 45(2): 325-332.
6. Mohamed R. A descriptive morphometric approach of the skull and mandible of the common opossum (*Didelphis marsupialis linnaeus*, 1758) in the Caribbean and its clinical application during regional anaesthesia. *Veterinary Sciences*. 2018; 5(1): 29.
7. Schimming BC, Reiter LFF, Sandoval LM, Filadelpho AL, Inamassu LR, Mamprim MJ. Anatomical and radiographic study of the white-eared opossum (*Didelphis albiventris*) skull. *Pesquisa Veterinária Brasileira.* 2016; 36: 1132-1138.
8. Beecher RM. Functional significance of the mandibular symphysis. *Journal of Morphology.* 1979; 159(1): 117–130.
9. Kubein-Meesenburg D, Nägerl H, Schwestka-Polly R, Thieme KM, Fanghänel J, Miehe B. Functional conditions of the mandible: Theory and physiology. *Annals of Anatomy-Anatomischer Anzeiger.* 1999; 181(1): 27-32.
10. Davidson JR, Bauer MS. Fractures of the mandible and maxilla. *Veterinary Clinics of North America: Small Animal Practice.* 1992; 22(1): 109-119.
11. Bilgili H, Kurum B. Treatment of fractures of the mandible and maxilla by mini titanium plate fixation systems in dog and cats. *Australian Veterinary Journal.* 2003; 81(11): 671-673.
12. Legendre L. Maxillofacial fracture repairs. *Veterinary Clinical Small Animal*. 2005; 35: 985-1008.