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Comminuted mandibular fracture in child victim of dog bite

CASE REPORT

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Abstract – Dog bites represent lesions commonly found in Hospital Emergency Clinic. This type of lesion may cause severe harm to patients, but it rarely affects the underlying bone structure causes facial fracture. This study aims to illustrate a rare clinical case in which a pediatric patient presented a comminuted fracture in the mandible which evolved into a unilateral avulsion of the mandibular condyle, body fractures as well as a mandibular ramus and hemiface that had been deformed, with multiple lacerations and loss of soft-tissue mass. Intermaxillary fixation was performed using the Ivy method, followed by internal rigid fixation using miniplates and screws in attempt to reconstruct the child's mandible. After 2 years of follow-up, a satisfactory esthetics and functional results could be observed.

Dog bites are common causes of mortality and morbidity in hospital environments. According to the Center for Disease Control and Prevention (2010), approximately 4.5 million people are bitten by dogs each year (1), of which one in five patients requires medical attention, in turn generating enormous expenses for hospitals.

This type of injury not only poses a threat to one's physical integrity, but it may also cause some physical and psychological after effects. The importance of Oral and Maxillofacial surgery is mainly due to the amount of damage caused to the tissues in the head and neck region, ranging from superficial skin lesions to severe bone destruction, as well as vascular and/or nerve tissue damage. Dog bites may cause severe harm to patients, but it rarely affects the underlying bone structure or causes facial fracture.

Case report

A 3-year-old male child, victim of an aggressive dog bite (Pit Bull), was brought to the Joao XXIII Hospital by a Mobile Urgency Assistance (SAMU) ambulance. Naso-tracheal intubation was performed in the initial on scene first aid. At the hospital, the child was quickly transferred to an operating room for a tracheotomy, followed by emergency surgery.

Upon extra-oral examination, it could be observed that the right hemiface had been completely deformed, with multiple lacerations and a loss of soft-tissue mass that included the buccinator muscle, the parotid gland, and other vital structures, including the facial nerve and Stenon's duct (Fig. 1). Under general anesthesia after abundant irrigation and wound cleansing, a comminuted fracture in the mandible (Fig. 2), coupled with an avulsion of the mandibular condyle and multiple fractures, in both the body and the mandibular ramus (Fig. 3), could be observed.

Fig. 1. Extra-oral clinical aspect during pre-operative time.

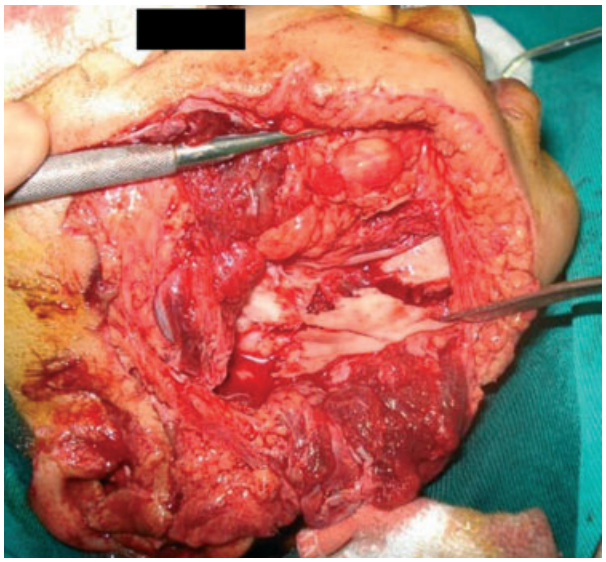

Fig. 2. Comminuted fracture of the mandible.

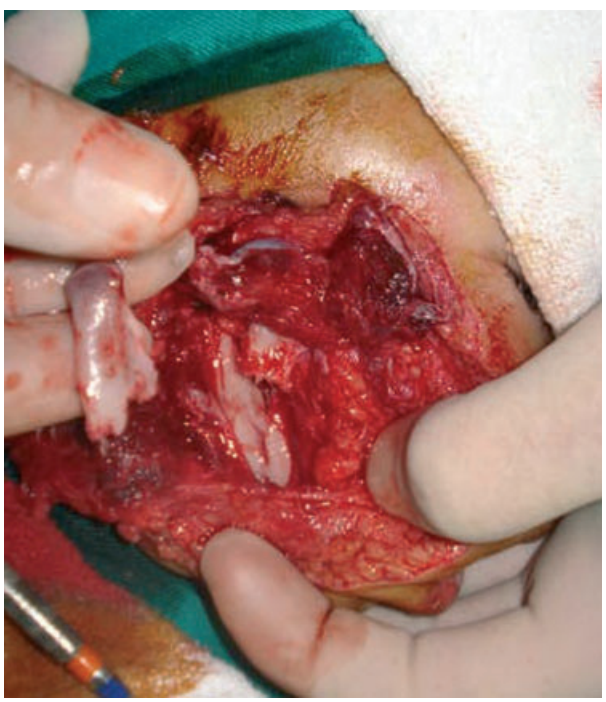

Fig. 3. Avulsion of the mandibular condyle.

Intermaxillary fixation was carried out using a wire (Ivy technique) in an attempt to attain a favorable dental occlusion (Fig. 4). Internal rigid fixation was performed on the avulsed condyle using a 2.0 miniplate system with 16 holes (Fig. 5). In this manner, this condyle was placed on the glenoid cavity and the articular capsule was sutured. The 2.0 miniplate system was also applied to the other bone fragments (Fig. 6).

The suturing procedure for the skin, ear, scalp, and neck was completed by a plastic surgeon. Owing to the severity of the lacerations, it was impossible to perform the Stenon's duct ligature. As a result of the loss of soft

Fig. 4. Intermaxillary fixation was performed using the Ivy method. The satisfactory occlusion of the patient can be observed.

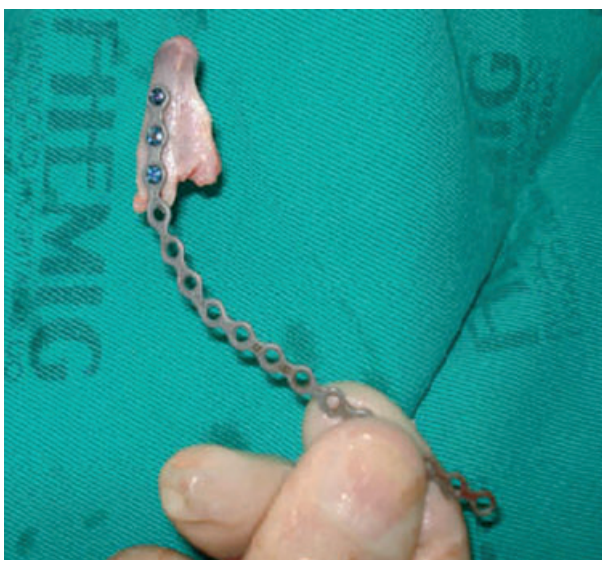

Fig. 5. Internal rigid fixation applied to the avulsed condyle.

tissue, it was also impossible to fully close the wound (Fig. 7). After the partial healing process, another session of plastic surgery, using a skin graft from inguinal region, became necessary.

In addition, as the child was by himself, it was impossible to find out about his past medical history of immunizations. Therefore, three immunizations (diphtheria, whooping cough, and tetanus) were administered intramuscularly.

The local population beat the dog to death, making it impossible to identify the presence of the rabies virus. Therefore, as a necessary precaution, immunization for tetanus and rabies was applied. The patient was seen every day by oral and maxillofacial surgeons, dieticians, pediatricians, plastic surgeons, ophthalmologists, otorhinolaryngologists, physiotherapists, and psychologists. After having been hospitalized for 2 months, the child was released from the hospital with a good mouth opening, satisfactory occlusion, and improved upper lip

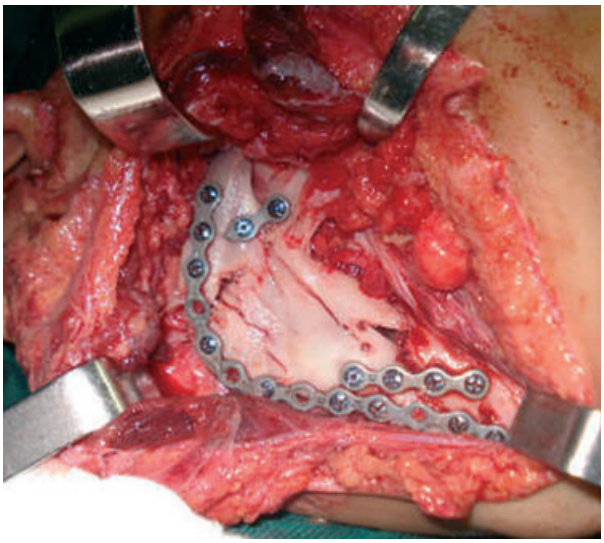

Fig. 6. Internal rigid fixation applied to the other fractures.

Fig. 7. Suture. Tissue loss can be observed.

movements (Fig. 8). Computed tomography was performed, showing satisfactory bone regeneration after 2 years of follow-up (Fig. 9).

Discussion

A bite is defined as any skin rupture caused by any animal's teeth, regardless of its intention, with several origins, including human, canine, feline, and among others. Wounds may be classified as mild non-fatal bites, severe non-fatal bites, and potentially fatal bites, which may cause the death of the victim, whether directly or indirectly (by infection or sepsis) (2).

Several studies have concluded that the risk of animal attacks is more common by dog breeds that are large in physical size. The Center for Disease Control and Prevention identified 25 breeds that are constantly involved in attacks. For instance, Pit Bull Terriers and Rottweilers are responsible for 50% of the cases (3–5).

Approximately 80% of these bites in children occur in the head and neck region, while in adults, they occur in only 10% of the cases. This high prevalence in children is mainly due to the child's short height, resulting in a greater exposure of their faces. These factors are favorable to the occurrence of severe lesions that can cause deformity (6).

The nose, lips, and cheeks tend to be the structures that are most affected by dog bites, considered a 'central target zone' (7–9). In the majority of cases, these bites cause soft-tissue damage and are rarely associated with facial bone fractures (10). On the other hand, when a dog attacks occur in children, the presence of fracture should always be evaluated because of the fact that children's bone is extremely fragile (11, 12). Fortunately, children's bones present a greater osteogenic potential than do those of adults and tend to have an enormous capacity to regenerate the temporomandibular joint (13).

Lesions associated with the spinal column, airway, vessels, nerves, eyes, intracranial damage, and facial fractures may be seen in children who have been attacked by physically large and strong dog breeds. Image examinations are also recommended to exclude the presence of teeth within the adjacent soft tissue, bone fractures, and/or injury skull injury (10).

Non-displaced fractures should be treated using routine methods of soft diet and close reduction, while displaced fractures should be treated surgically with open reduction and internal rigid fixation (14). The use of internal fixation in the mandible of pediatric patients is more difficult because of the presence of mixed dentitions. In addition, this type of fixation may well affect bone growth, as it acts directly on the forces and directions responsible for the growth of the mandible itself (11). Computed tomography is the radiological examination of choice in this case, as it plays as essential role pre- and postoperative therapies and follow-up (10).

If injuries to the parotid duct or to the tear duct can be identified, the repair of these structures should be performed, as should the reconstruction of nerves, including the facial nerve and its branches. The nerve function might return after the reconstruction has been completed (15).

In the past, the recommended routine management was that wounds caused by dog attacks should not be sutured but should be left open, only performing the reconstruction after the infection period (16). More recently, however, many authors have been employing the primary surgical treatment, even in cases in which the lesions have occurred a few hours earlier (10, 17–19). This procedure tends to reduce the number of required surgical procedures and improves morbidity rates.

It is well-known that tetanus and rabies prophylaxis is mandatory in canine attacks (20). The risk of infection in dog bite attacks is determined by local care, the characterization and location of the wounds, individual features, the type of animal, and the time elapsed before medical

Fig. 8. Extra-oral clinical aspect. The healing process of this wound, good facial harmony after mandible reconstruction, and satisfactory mouth opening after 2 years of follow-up can be observed.

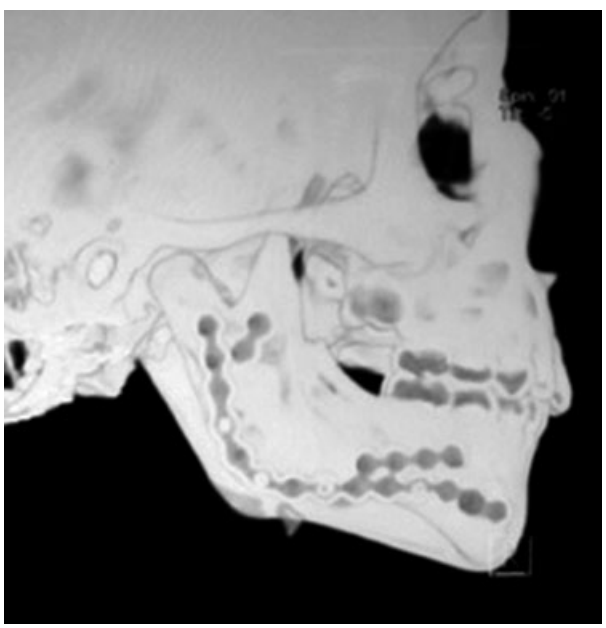

Fig. 9. The good adaptation and mandible arch of miniplates can be observed in the computed tomography.

assistance is provided. There is lesser chance of infection in bites on the face than in other regions, due mainly to a rich facial vascularization and postural drainage from this part of the body. This is commonly treated by means of thorough irrigation and debridement (17).

It is recommended that any dog bite attack to one's face involving bone tissue should be treated with antibiotics (7). Prodigy guide NHS (2010) recommends the use of amoxicillin with potassium clavulanate acid for primary prophylaxis, because this medicine it presents a wide ranging spectrum and acts against all organisms from the canine oral cavity (21). However, when the infection is severe, Morgan and Palmer (22) emphatically suggest the use of imipenem with cilastatin (500 mg 4× per day, endovenous) and clindamycin (900 mg 4× per day, endovenous).

If wounds resulting from dog bites are not treated, they may become infected, in turn causing symptoms and signs, such as pain in the wound, cellulitis, and pus drainage. Other complications may also occur, including lymphangitis, local abscesses, septic arthritis, osteomyelitis, and tenosynovitis. Rare complications include endocarditis, meningitis, brain abscesses, and sepsis, presenting diffuse intravascular coagulation, especially in immunodepressed individuals (23).

Educational programs on the risks and severity of this type of accident need to be offered to children, parents, and the local population in general. The esthetics and psychological consequences of accidents caused by dog bites can negatively influence the quality of life children and their families.

Conclusion

Dog bites represent a lesion commonly found in Hospital Emergency Center Clinics. It is well-known that these lesions may cause a health threat to pediatric patients, including severe infections and even the possible transmission of rabies. The participation of a multidisciplinary team in the rapid and effective treatment of a facial trauma, with the reduction of fracture, the internal fixation of the mandible, and primary wound closure, contributed to the successful of the treatment used in this case study.

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