

## Use of a Fixed Orthodontic Appliance with Polymethylmethacrylate for a Maxillary Fracture in a Dog

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### Abstract

The use of fixed orthodontic appliances with acrylic resin (polymethylmethacrylate - PMMA) is an effective interdental stabilization technique for maxillary/mandibular fractures in dogs, especially for synthesial fractures or those with solid adjacent teeth. However, studies on techniques for treating maxillary fractures in dogs with fixed polymethylmethacrylate appliances are practically nonexistent. Therefore, the objective of this article is to report a clinical case of the use of a fixed polymethylmethacrylate orthodontic appliance for a maxillary fracture in a five-year-old female Schnauzer dog, which showed excellent results with the applied technique. It was possible to conclude that these fractures are uncommon in routine

veterinary clinics. Our knowledge about this type of fracture is insufficient regarding its resolution. However, with the advent of extreme urbanization and consequently the increase in the canine population in large centers, maxillary fractures are beginning to occur with some frequency. This technique is yet another alternative in the treatment of maxillary fractures, and can be performed by any veterinary surgeon, regardless of in-depth knowledge of orthopedics.

**Keywords:** Polymethylmethacrylate; Orthodontic appliance; Fracture; Maxilla; Dog

### Introduction

The face is composed of a set of firmly interconnected bones, with the mandible being the

only movable bone [1]. Mandibular and maxillary fractures occur relatively frequently in dogs and cats, accounting for approximately 1.5% to 6% of all fractures in these species [2]. Most of these injuries are traumatic in origin—resulting from fights, falls, or vehicular collisions—though non-traumatic etiologies, such as periodontal disease, neoplastic processes, and metabolic disorders, can also contribute [3-5]. Diagnosis generally relies primarily on patient history, particularly when there is a report of sudden-onset trauma accompanied by morphological changes and, at times, displacement of the affected fragments. Clinical assessment via oral inspection is essential for identifying and understanding the existing lesions. Radiography aids in identifying fracture lines and the degree of displacement; however, it serves as a supplementary tool to a comprehensive physical examination performed under anesthesia or sedation, as fractures can be difficult to visualize and orient on radiographic images depending on the views obtained and anatomical superimposition [6].

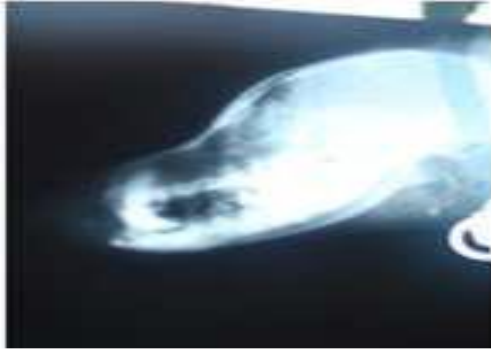
Prominent stabilization procedures include the use of wire, intramedullary pins, skeletal external fixators, acrylic resin, and bone plates [7,8]. The choice of fixation technique depends on several factors, such as the location and pattern of the fracture, the presence or absence of teeth, the extent of soft tissue damage, the surgeon's experience, and available materials [9,10].

The use of a fixed orthodontic appliance with acrylic resin (Polymethylmethacrylate – PMMA) is an

effective interdental stabilization technique for maxillary and mandibular fractures in dogs, particularly for symphyseal fractures or cases with stable adjacent teeth. The technique involves securing steel wires to the teeth and bonding them with PMMA to provide rigid stability, ensuring bone alignment and a rapid return to function. This approach is a common conservative/surgical method for maxillomandibular fixation in small animal fracture management. Studies on techniques using fixed polymethylmethacrylate appliances to treat maxillary fractures in dogs are virtually non-existent. Therefore, this article aims to report a clinical case involving the use of a fixed orthodontic appliance with polymethylmethacrylate to treat a maxillary fracture in a five-year-old female Schnauzer.

### **Case Presentation**

A five-year-old female Schnauzer presented to the clinic with a maxillary fracture. According to the owner, the animal had fallen from a balcony at a height of 3 meters. Following clinical and physical examinations and the administration of initial emergency care for polytrauma, the animal was treated with tramadol hydrochloride (3 mg/kg), meloxicam (0.2 mg/kg), and ceftriaxone (50 mg/kg). The dog was referred for radiographic imaging six hours after the clinical assessment of its general condition. A lateral view radiograph revealed a complete fracture of the anterior third of the maxilla, with the distal fragment displaced ventrally, creating a 45° angular deformity (Figure 1).



**Figure 1:** X-ray of the fracture.

These fractures are uncommon in veterinary clinical practice. Therefore, for certain maxillary fractures, we propose the use of a fixed orthodontic appliance fashioned from Kirschner wire, secured to the teeth on both fracture segments using

polymethylmethacrylate. Following fracture reduction (**Figure 2**) and wire shaping, the wire is attached to the teeth using polymethylmethacrylate of a more fluid consistency, creating a bridge between the teeth that incorporates the wire (**Figure 3**).



**Figure 2:** Fracture reduction.



**Figure 3:** Polymerization of the appliance.

The patient in question underwent this surgical technique; the postoperative regimen consisted of antibiotics and anti-inflammatories for 7 days, along with oral cleansing using an oral hygiene product until the appliance was removed 30 days later. The patient achieved an excellent outcome with the applied technique.

## Discussion

Animals with fractures of the maxilla and incisive bone can be easily diagnosed through direct inspection and palpation [11]; however, radiographic examination is sometimes necessary to assess the severity of the fracture. These procedures must be performed while the animal is sedated or under anesthesia [12]. Techniques for stabilizing the maxilla include the use of metal wire, intramedullary pins, external skeletal fixators, acrylic resin, and bone mini-plates [13,14]. However, the use of conventional bone plates for maxillary fractures requires extensive soft-tissue elevation for application, carries a high risk of injury to the medullary canal and tooth roots, and complicates plate contouring, which can result in malocclusion [15]. Such fractures are uncommon in veterinary clinical practice. Current knowledge regarding the management of this type of fracture is limited. Nevertheless, with rapid urbanization and the consequent increase in the canine population in major urban centers, maxillary fractures are appearing with increasing frequency [16,17]. A maxillary osteosynthesis procedure is described using Chans pins surrounded by a Kirschner external fixator and acrylic resin.

## Conclusion

These fractures are uncommon in veterinary clinical practice. Current knowledge regarding the management of this type of fracture is insufficient. However, with rapid urbanization and the consequent rise in the canine population in major urban centers, maxillary fractures are beginning to occur with some frequency. We conclude that this technique offers an additional alternative for treating maxillary fractures and can be performed by any veterinary surgeon, regardless of whether they possess in-depth knowledge of orthopedics.

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