Bilateral Maxilofacial Fracture in an Equine

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Bilateral Maxilofacial Fracture in an Equine

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Case Report

Summary

Mandible and maxillar fractures are most often caused by direct trauma, but occasionally, pathologic fractures may occur due to tumor lesions. The surgical approach is determined by the type and the location of the mandible fracture. A 3-year-old Arabic horse male was examined for a significant facial injury. On physical examination, asymmetric muzzle, and maxillar fracture were noted. Radiographic of the maxilla was consistent with bilateral transverse multiple fractures on the incisors and maxillary bones. Two surgical methods were used: cerclage wires and fixation with a U-bar which the latter was made using intramedullary pins molded into U shape in the entire length of the dental arcade. The therapy surgical presented a satisfactory outcome.

Keywords: equine, osteosynthesis, bone, trauma, radiograph.

Introduction

Fractures of the mandible and maxilla are common in equine and usually are traumatic in origin (DeBowes et al. 1981). Most facial injuries in equine results from falls, coices, collisions and trauma which the mandibles bone are the most affected site. Moreover, iatrogenic fractures may also occur during dental extraction or in some pathological conditions such as osteosarcoma and osteomyelitis (Turner 1984). Clinical signs associated with mandibular fracture are excess salivation, facial swelling, difficulty in masticate, hemorrhage, halitosis, instability of teeth or bones and tongue protrusion (Auer 2006; Freitas 2010).

In equine, numerous techniques of mandibular fracture repair have previously been described (Belsito et al. 2001) with variable success including cerclage wires, wire and pin fixation, fixation with a U-bar, external fixation with Kirschner apparatus, lag screw fixation, methacrylate fixation and orthopedic bone plating (Schneider 1990; Tremaine 1998).

A previous survey of equine clinical cases in United Kingdom (UK) revealed that the recorded fractured cases were around 3.3%. The incidences of the fractures were also differed according to the
affected region which 7% were caused by kick (Owen et al., 2012). In Brazil reports of surgery procedures on equine maxillary fractures are sparse (Alves et al. 2008; Nóbrega et al. 2013).

The purpose of the present case is describes the osteosynthesis methods combination conducted on 3 years old male Arabe equine presented with bilateral premaxilla fracture.

Case history

A 3-year-old Arabe equine was presented to the Large Animal Hospital at the Federal University of Mato Grosso with a history of bilateral premaxilla fracture. According to the owner the horse was kept under semi stabled environment with other horses and the trauma was resulting from a muzzle kick taken by another horse.

The horse was referred to the veterinary hospital one day after the facial injury. Upon evaluation by the referring veterinarian, the equine had asymmetric muzzle, pain on palpation and the upper incisors were displaced forward of the lower incisors which was loose handling (Fig 1). Radiographs were taken to confirm the maxilla lesion and loss of some incisors teeth.

Clinical findings

Upon presentation, all vital parameters, a complete blood count and biochemistry were within normal limits. No medication has been administered prior to the first examination. Standard radiographic projections of the maxilla were obtained including the laterolateral and dorsoventral views. There were a bilateral transverse multiple fractures on the incisors and maxillary bones as far rostral as caudal of the root of the incisor teeth. Additional moderate harm of the alignment of the 3rd incisor and left canine teeth as well as absence of the right upper canine tooth was also seen.

Treatment

In preparation for mandibular surgery was administered detomidina hydrochloride (Detomidin 1%)¹ (0.05 mg/kg bwt i.v.) as a premedication to obtain adequate sedation. General anaesthesia was induced with ketamine (ketamina Agener 10%)² (2mg/kg bwt i.v.) and maintained with guaiacol glyceryl ether (GGE 10%), ketamine (Ketamina Agener 10%)² (2 mg/ml bwt i.v.) and xylazine (Calmiun 2%)² (1 mg/ml bwt i.v.), combination given intermittently (1-2ml/kg/h) according to the horse reaction for constancy and duration of the anesthesia. In addition, infraorbital foramen block were performed with lidocaine 2% (Lidovet)³ (7ml). The oral cavity and fracture site were thoroughly cleaned with sterile saline and povidone-iodine and then the loose bone fragments were removed. Open wounds were also debrided and whased.
The equine was positioned in lateral recumbency under general anesthesia. The fracture stabilization was achieved with a 1mm cerclage wiring between the first incisive teeth and right interdental space through 4mm holes made in the jaw bone with drill bit. Thereafter, the wiring was done over the left interdental space passed in “X” manner. The intraoral lacerated soft tissue lesions and hard palate were sutured with nylon (n.2).

The post-operative care included flunixin meglumine (Flunixina)\(^4\) (1.1mg/Kg bwt i.v.), administered for 5 days and ceftiofur sodium (TopCef)\(^5\) (4mg/kg, bwt i.m.) while the bone exposure were noted. A bandage in the maxillar region was replaced once or twice a daily. The mouth was flushed with tap water after each meal to prevent food material accumulation around the wires. Also, chlorhexidine 0.12% (Periogard)\(^6\) associated with Dakin solution was administrated in the gingival wounds and fracture. The animal was maintained on semisolid diet composed by feed and Tifton hay crushed and moistened. Additionally, vitamins (Hemolitan 20ml, PO; Glicopan 10ml, PO)\(^7\) were administrated orally daily for next 60 days. Approximately 11 days after, the equine required a second surgery with U-bar fixation due to complications of the original injury characterized by loss of soft tissue around the fracture and detachment of some bone fragments causing instability of the lesion. The bilateral maxillar fracture stabilization was done through the use of two 4mm intramedullary pin which were molded into U shape in the entire length of the dental arcade bilaterally. The brace pin was fixed to the incisor teeth and bone of the premaxilla by 1 mm steel cerclage wires (Fig 2a). The cerclage wire (steel wire) placed on the right jaw in the first surgery was maintained. Thereafter the wires were placed an intraoral splint was made by molding methyl methacrylate resin around the interdental wires and hard palate (Fig 2b). Post operatively, was administered flunixin meglumine (Flunixina®)\(^4\) (1.1mg/Kg bwt i.v.) for 5 days. Ceftriofur sodium (TopCef)\(^5\) (4mg/kg bwt i.v.) and chlorhexidine 0.12% (Periogard)\(^6\) was applied locally administrated during all treatment.

After second surgery, radiographs were taken to evaluate bone calcification, healing or bone sequestrum formation. At 60 days, the methyl methacrylate resin, intramedullary pin and cerclage wire were removed and the maxilla repair was apparently stable. Hydrogen peroxide and chlorhexidine 0.12% (Periogard)\(^6\) was applied locally and the dressings were done daily. Bone exposures were observed on the surface of the hard palate and were debrided with a gauze order to stimulate granulation tissue and epithelium overlying the hard palate. Two months after the second surgery, the radiological examination has shown complete consolidation of the incisors and maxillary bones. Additionally, partial restoration of
paranasal sinus, persisting on the left a small hiperluscente area was also seen. After 143 days of treatment, the fracture was stabilized, the hard palate was healed and the horse was discharged.

**Outcome**

The owner was contacted at 12 weeks post-surgery. The equine was reported to have returned to the previous level of activity, which included return out in the pasture.

**Discussion**

Reports of bilateral transverse maxillar fracture are rare to seen in clinical practice (Beard 2010). The history of previous trauma in the equine maxillofacial region led to the development of lesion which is in agreement with other equine cases reported in the literature (Gopinathan *et al.* 2013). For each type of fracture there are many available options and techniques can be easily combined or modified as necessary to achieve the goals of alignment and stability (Beard 2010). In this case, the bilateral maxillar fracture was highly unstable and was accompanied by a variable amount of comminution and loss of the right canine tooth compromising the use of some methods of fracture repair.

In the first surgery, the anatomic reduction was achieved and the cerclage wire repair was completely stable. However, maxillar fractures are often high-energy fractures with comminution and disruption of the skin or oral mucosa and consequently they are prone to sequestration (Haralambus *et al.* 2010). On 11th postoperative day, it was observed fracture instability as a result of damage of soft tissue and sequestrum formation from avascular bone fragments. Studies have record up to 68% complications in unstable bilateral maxillary and mandibular fractures in horse (Henninger *et al.* 1999). Our result is in agreement with the outcome of 2 retrospective studies (Henninger *et al.* 1999; Reif *et al.* 2000) where sequestration was reported to be a common complication after mandibular fractures in horses and cattle. Application of U-bar repair should be considered when intraoral wiring alone does not provide sufficient stability of an equine maxillar fracture (Belsito *et al.* 2001). In the current case, the intraoral splint generally made from aluminum rods or malleable brass was replaced by two intramedullary pins which together were molded around the contours of the maxilla in U-shaped suggesting that this fixation method is practical and it might be possible to make this adaptation with a little instrumentation and low costs.

As reported previously (Henninger *et al.* 1999), average hospitalisation time was 11 days for houses repaired via U-bars. Meanwhile, the median hospitalisation time was 132 days after de second surgery in the current study. A possible explanation might be the excessive presence of multiple small fragments of
avascular bone causing the formation of large areas of tissue necrosis making healing difficult. Moreover, a
direct kick can transfer a force of more than 10,000 Newtons of impact to any location of the equine head
and affected a large surface area (Leach *et al.* 1983; Exadaktylas *et al.* 2002) making the time for healing and
tissue repair jaw fractures in horses are associated with the type of injury and the type of fracture.

In the case of equine maxillar fractures, the primary objectives are to restore the patient’s ability to
eat normally in the immediate postoperative period and to achieve a strong and lasting fracture repair
(Belsito *et al.* 2001). Although it has been reported that techniques using cerclage wires, intramedullary pins
and U-bar need to force feeding via nasogastric tube or indwelling oesophagostomy tube (Lischer *et al.*
1997), the horse in the current study was not required forced feeding and was able to eat within 24h of
surgery. Nevertheless, the choice of paste food was an attempt to minimize the movement of areas
undergoing osteosynthesis according to Lopes *et al.* (2001).

Radiographs are the main imaging modality used in veterinary medicine to characterize the bone
fractures. In the present case, although a diagnosis could be made clinically, a through radiographic
evaluation was important to determine the extent of the injury and a presence of bony fragments, which
may sequestrate.

In conclusion, the present study confirms that surgical therapy is effective in providing a favorable
prognosis in the bilateral maxillar fracture. Future studies evaluating maxillar and mandible fractures, with
sufficient numbers of horses to perform inferential statistics are warranted.

Authors’ declaration of interests

No conflicts of interest have been declared.

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References


Figures

Fig. 1. Equine, male. Maxilla. Multiple rostral maxilla fractures and canine tooth falling out.

Fig. 2. A. Maxilla recovered with methyl methacrylate resin. B. U-bar fixation technique thought the use of intramedullary pin.
Equine, male. Maxilla. Multiple rostral maxilla fractures and canine tooth falling out.

148x197mm (300 x 300 DPI)
Maxilla recovered with methyl methacrylate resin. B. U-bar fixation technique thought the use of intramedullary pin.

252x101mm (300 x 300 DPI)