Pre-maxilla fracture repair using inter-fragmentary stainless steel wire in a foal

JENA BISWADEEP[1], ANAND ARUN[2] AND SANGWAN VANDANA[3]*

[1] PhD Scholar, Department of Veterinary Surgery and Radiology, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, 141004, Punjab, India.
[2] Professor, Department of Veterinary Surgery and Radiology, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, 141004, Punjab, India.
[3] Associate Professor, Department of Veterinary Surgery and Radiology, College of Veterinary Science, Guru Angad Dev Veterinary and Animal Sciences University, Ludhiana, 141004, Punjab, India.

SUMMARY

The present report describes the successful surgical management of rostral pre-maxilla fracture using inter-fragmental stainless steel wire in a 6 month old colt foal. The foal had the history of bite on the premaxilla by another horse on the day of presentation. The clinical examination and lateral skull radiograph confirmed open, complete fracture at rostral premaxilla (incisive bone) region with displacement. The fracture fixation was done under general anaesthesia in dorsal recumbency. The fracture was primarily stabilized with a two 2 mm Steinmann pins followed by tightening an inter-fragmentary 20-gauge stainless steel wire in a horizontal mattress formation with the 'U' part on hard palate and free ends on the outside of incisors. One month follow up revealed radiological and clinical fracture union and the wire was removed under general anaesthesia.

KEY WORDS

Foal, Horse bite, Pre-maxilla, Rostral, Stainless Steel wire.

INTRODUCTION

Fractures of rostral premaxilla are common in foals and are mostly due to kick by another animal or, self-inflicted trauma[1] and are usually presented at the diastema region *vis-à-vis* transverse[2-4]. More complicated fractures of the face involving sinuses and multiple bones or comminuted fractures have been reported in equine[5]. Internal fixation is mostly recommended for such fractures to reinstate normal occlusion and stability that can facilitate fracture healing. Wiring is the most suitable repair technique[2-4] described for pre-maxilla fractures in foals but plating alone or plating as an external fixator[6] has been described for comminuted fractures of mandible in adult equines. The present report describes the successful surgical management of open, rostral pre-maxilla fracture using inter-fragmental stainless steel wire in a foal with a history of horse bite on the day of presentation.

CASE HISTORY AND PRESENTATION

A 6-month-old colt foal, weighing 150 Kg, was presented with a history of bite on the premaxilla by another horse in early morning hours. The clinical examination revealed an open (Figure 1) fracture at rostral premaxilla (incisive bone) region. All the other physiological parameters were normal. Tetanus toxoid was injected to the foal.

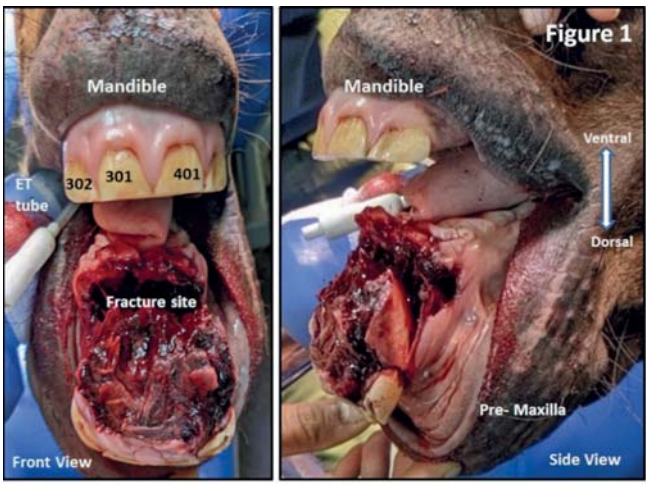
RADIOGRAPHY

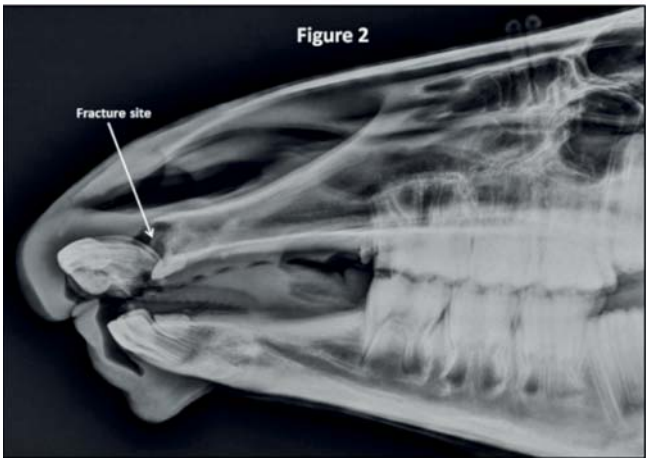
The lateral skull radiograph confirmed a simple, complete fracture at rostral premaxilla (incisive bone) region with displacement (Figure 2). The foal was decided for surgical intervention under general anaesthesia with the consent of the owner.

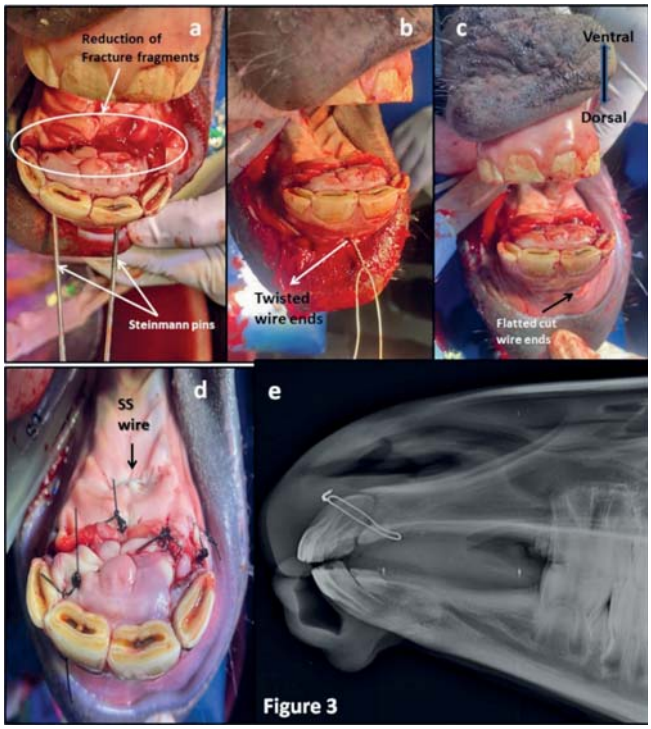
SURGICAL TREATMENT

The foal was pre-anaesthetized with injection Xylazine hydrochloride @ 1.1mg/Kg, IV followed by injection Ketamine hydrochloride @ 2.2mg/Kg, IV at 4 minutes. The foal lied down and was intubated with ID 18 endotracheal tube. The foal was hoisted to operation table and was placed in dorsal recumbency. The general anaesthesia was maintained with Isoflurane mixed in 100% oxygen. Intravenous fluids (Inj. Normal saline @ 10ml/Kg) were started and first antibiotic injection of Ceftriaxone and Tazobactam, 1.5g was given IV.
The fracture site was prepared antiseptically using 1% betadine

Corresponding Author:
Vandana Sangwan (drvandanasangwan@rediffmail.com).







in normal saline. There was no loss of any incisor of premaxilla. The fracture was primarily stabilized by drilling two, 2 mm Steinmann pin in the inter-alveolar space of teeth 101-102 and 201-202 (Figure 3a). One, 2 mm Steinmann pin was removed and a hypodermic 16-gauge needle was inserted into the drilled hole. This 16-gauge needle was used as a cannula to facilitate passage of 20-gauge stainless steel wire. The same procedure was repeated on the contralateral drilled pin site inside out. This helped in formation of a horizontal mattress pattern with the 'U' part of the wire on the hard palate (caudal fracture fragment) and the free ends on the outside of the incisors. The free ends of the wires were twisted together to reduce and compress the fractured fragments (Figure 3b). After tightening, the ends of the wires were cut and flattened against the gum (Figure 3c). Intraoral lacerated soft tissue lesion at fracture site was closed using #2 polyamide sutures (Sutupak®, Ethicon) (Figure 3d). The immediate post-operative radiograph showed satisfactory apposition (Figure 3e).

POST OPERATIVE CARE AND FOLLOW UP

Post-operatively, the foal was advised antibiotics injection Ceftriaxone + Tazobactam 1.5 g twice daily for 05 days, IV and analgesic injection Flunixin meglumine 3ml, IV for 3 days. A soft palatable diet (green grass) was advised for 15 days.

The 28 day follows up revealed the clinical (Figure 4a) and radiological (Figure 4b) fracture union. The wire and the remaining PDS sutures were removed under general anaesthesia (Figure 4c). The foal underwent uneventful recovery.

DISCUSSION

Premaxilla fractures in foals are common due to the kick and not bite by another horse. The premaxilla fractures, if presented early and stabilized adequately are reported to heal fast with good outcome due to abundant vascularization of gingiva[1-4,7]. Multiple fracture fixation methods have been reported to repair premaxilla including the tension band wiring, pinning, plates, screws, splintage (extraoral or, intraoral), but majority were amenable to wiring alone. Wiring was considered comparatively simple but provided satisfactory stability with no requirement for specialized or expensive equipment[2-4].

General anaesthesia is required while repairing fractures in equine and xylazine sedation followed by ketamine induction was found satisfactory for this foal. However, different combinations for foals and adult equines have been described in literature[6].

The cranial fractures of mandible and maxilla can be evaluated without radiography[8] but if available, radiography may help in diagnosing any other fracture line in the vicinity.

The choice of higher generation antibiotic was made in the present case to avoid any complications of root tooth infection, secondary sinus infection pertaining to wire or osteomyelitis[4,9,10] which otherwise might lead to significant morbidity. Equine being a grazing animal and the upper lip being the major prehensile organ, the premaxilla is exposed to continuous shearing force during eating/ grazing. Therefore, biomechanical properties of fracture fixation methods bear paramount importance. The complications and even re-fracture of premaxilla have been reported in 68% of equine[1-3,7]. But the present technique was sufficient to provide biomechanical stability and thus, resumption of normal feed intake without any complications.

CONCLUSION

Inter-fragmentary stainless wiring is a simple, efficient and in-

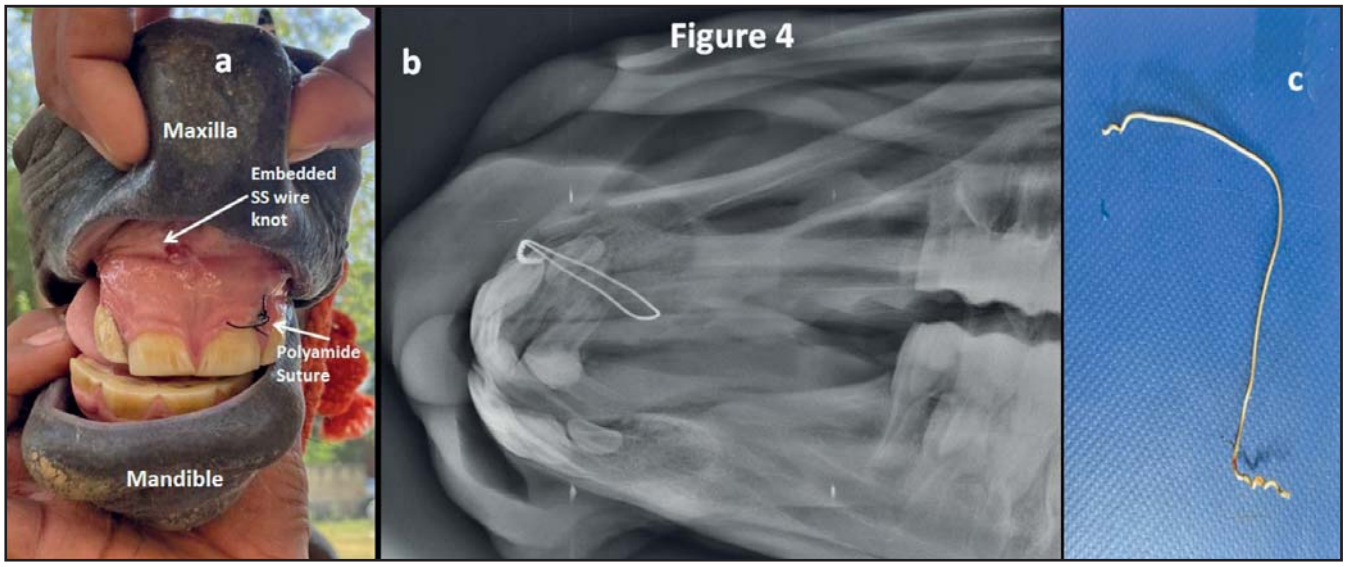


Figure 4

expensive technique to provide adequate rostral pre-maxilla fracture stability using minimal equipment in foal. The fragments may be pre-stabilized with intramedullary pins which can be removed after placing the wire.

Conflicts Of Interest

The authors have no conflicts of interest with anyone.

Authors Contribution

Author 1 wrote the manuscript and was assisting surgery. Author 2 was the major surgeon; Author 3 was the radiologist and anaesthesiologist.

Acknowledgement

The authors are thankful to Rashtriya Krishi Vikas Yojana (RKVY) and Guru Angad Dev Veterinary and Animal Sciences University (GADVASU), Ludhiana, Punjab, India for their support and cooperation in carrying out the study.

References

1. Henninger R. W., Beard W. L., Schneider R. K., Bramlage L. R., Burkhardt, H. A. (1999). Fractures of the rostral portion of the mandible and maxilla in horses: 89 cases (1979-1997). J Am Vet Med Assoc, 214(11): 1648-1652.
2. Wilson D. A. (2011). How to Repair Rostral Mandibular and Maxillary Fractures. Proceedings Am Assoc Equine Pract, 57: 290-295.
3. Çetinkaya M. A., and Demirutku A. (2012). Interfragmental fixation of rostral mandibular fracture with cerclage wire in a thoroughbred English horse. Turk J Vet Anim Sci, doi: 10.3906/vet-1102-792
4. Naddaf H., Sabiza S., Kavosi, N. (2015). Surgical treatment and a unique management of rostral mandibular fracture with cerclage wire in a horse. Vet Res Forum, 6(2): 181-183.
5. Gardner A. K., Santschi E. M., Mudge M. C., Belknap J. K., Metzler A. G. (2020). Intrasinus bolstering of traumatic maxillary sinus fractures by using Foley catheter balloons in two foals. Vet Surg, 49(6):1255-1261. doi: 10.1111/vsu.13433
6. Mählmann K., Cender A. N., Ehrle A., Lischer C. J. (2021). Application of locking compression plates as type 1 external fixators to treat unilateral mandibular fractures in four equids and one dromedary. Vet Surg, 51 (2): 341-352. doi.org/10.1111/vsu.13748
7. Ramzan P. H. L. (2008). Management of rostral mandibular fractures in the young horse. Equine Vet Edu, 20(2): 107-112. doi: 10.2746/095777308X272094
8. Schumacher J. Treatment of horses for injuries of the head. Western Veterinary Conference; Las Vegas, USA. 2013. p. EQ41.
9. Boorman S., Lascola K., Mora-Pereira M., Ceriotti S., Boone L. (2020). Internal Fixation of a Complicated Mandibular Fracture in a Filly Using a String-of-Pearls Locking Plate Assisted by a 3D Printed Model. Vet Comp Ortho Traumatol (open), 3 (2): e90-95. doi: 10.1055/s-0040-1716351
10. Çetinkaya M, Demirutku A. Interfragmental fixation of rostral mandibular fracture with cerclage wire in a thoroughbred English horse. Turk J Vet Anim Sci. 2012; 36 (1):67-71.