# Rostral Mandibular and Maxillary Fractures: Repair by Interdental Wiring

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This technique of interdental wiring can help repair rostral mandibular and maxillary fractures, interdental space involving the incisors, and incisor–alveolar bone. Authors' addresses: University Equine Veterinary Services, 11178 CR 201, Findlay, OH 45840 (Henninger) and Dept. of Veterinary Clinical Sciences, College of Veterinary Medicine, The Ohio State University, 1935 Coffey Rd., Columbus, OH 43210 (Beard). 

## 1. Introduction

Mandibular and maxillary fractures rostral to the cheek teeth are common fractures of the equine head. These injuries often result from self-inflicted trauma such as falls or rearing with the jaw caught on a stationary object. These fractures may also result from a kick to the mandible or maxilla from another horse. Delay or failure to repair these fractures may result in malocclusion, tooth loss, osteomyelitis, loss of function, and less than optimal cosmesis.

A variety of fixation methods have been utilized to repair these types of fractures, including the use of tension band wires, intramedullary pins, lag screws, intraoral acrylic splints, metal rods, compression plates, and external splintage. The overwhelming majority of these fractures are amenable to repair with interdental wiring alone. These methods are relatively simple, provide adequate fracture stability, and don't require expensive or specialized equipment.

## 2. Methods

The actual method of repair is based on fracture configuration, the ease of fracture reduction, and the availability of surrounding stable structures for wire anchorage. Preoperative patient preparation is minimal, requiring mainly standing water lavage to remove feed material from the fracture site. Fractures that do not extend past the canine tooth can often be repaired without the need for general anesthesia. Standing repair is well tolerated by most horses with the aid of tranquilization and regional local anesthesia. Local anesthesia is completed with a mental nerve block for mandibular fractures and an infraorbital nerve block for maxillary fractures. The more complicated or displaced fractures are more easily performed with the aid of short-term injectable anesthesia.

## 3. Equipment

There is no need for AO equipment or special sterilization techniques. The usual equipment is as follows: small bone curettes or dental picks; 14-gauge needles; 18-gauge stainless-steel wire; wire twisters (pliers) and wire cutters; Jacob's chuck and Steinmann pins; hand-held power drill or Dremel tool (optional); and steel drill bits and burrs (optional).

**NOTES**

Although some prefer to use a power drill and bits, this equipment is not necessary unless there is a need to drill between cheek teeth.

### 4. Repair Techniques

The fracture site is thoroughly lavaged with water and a small curette or dental pick is utilized to debride the fracture of feed material and small devitalized bone fragments. Overzealous debridement of the soft tissues or bone is avoided. Teeth that are loose should be preserved as long as they are not obviously devitalized. Many loose teeth will survive and they often add to the overall stability of the repair. Reduction of acute fractures is usually accomplished with manual pressure on the involved teeth.

Fractures that involve the incisors and associated alveolar bone are repaired with tension band techniques that utilize stable teeth on either side of the fracture line. A 14-gauge needle is passed between the teeth at the gum line, and the wire is threaded into the lumen. The needle is then withdrawn, which pulls the wire between the teeth. The wire is woven through the teeth in a figure 8 pattern, or multiple overlapping wires are placed around several teeth to stabilize the fracture. The wire is kept tight with each pass and care is taken not to introduce kinks in the wire, as these may straighten with time and result in implant loosening. The repair is completed by twisting the wire ends together. The knot is bent downward, filed to remove sharp edges, and covered to prevent soft-tissue irritation. Additional wires are added as needed to achieve stability.

Fractures that involve the corner incisors (I 3) or a larger portion of the premaxilla or incisive bone of the mandible may require additional caudal support to achieve stability. A tension band wire may be anchored behind the incisors by drilling a hole in the mandible with a drill bit or Steinmann pin. In older horses the canine tooth may also be utilized to anchor the wire by notching the caudal surface with a motorized burr or small file.

Fractures that enter or involve the maxilla or mandible caudal to the incisors (interdental space) are most often repaired with wires that are anchored behind the first cheek tooth (PM 2). This procedure is performed under general anesthesia. A small stab incision is made through the cheek into the oral cavity, over the junction between PM 2 and PM 3. A soft-tissue protector is placed through the incision and a hole is drilled between PM 2 and PM 3 with a power drill. The wire is then passed through the incision and drilled hole and retrieved from the lingual surface of the teeth. The other end of the wire is passed through the incision and retrieved on the buccal surface of the teeth. Both ends of the wire are pulled rostrally and woven around the intact incisors and twist tightened. The wires are then toggled in the interdental space to provide further stability. This technique does not provide enough stability for most bilateral fractures of the mandible in adult horses.

### 5. Results

The above-described wiring techniques have been used to repair rostral maxillary or mandibular fractures in over 50 horses, aged 1 day to 24 years. The surgeries were performed at The Ohio State University, Penn Paddock Equine Center, and University Equine Veterinary Services. Approximately ⅔ of the fractures involved the mandible, ⅓ involved the maxilla, and both the mandible and maxilla were involved in only two horses.

There were few short-term complications during the period of hospitalization. These included purulent draining tracts, wire loosening or breakage, and difficulty with mastication. All resolved with conservative treatment.

Long-term (>8 months) complications included wire loosening and malocclusion. Wires were removed in all cases in which loosening or breakage occurred, as the fractures were sufficiently stable to allow wire removal. In all cases of malocclusion, the horses were able to prehend and masticate properly. Three foals developed brachynathism following the repair of bilateral fractures of the mandible.

### 6. Discussion

Rostral fractures of the mandible and premaxilla are most often open and contaminated with feed material. Fortunately, the abundant blood supply to the head, relatively stable nature of many fractures, and lack of constant distracting forces allow fracture healing in spite of these factors, which are major deterrents to the healing of fractures in other parts of the body.

The objectives of surgical treatment of rostral fractures are to restore normal occlusion and provide stability that supports fracture healing and allows normal eating and drinking. Wire repair of fractures achieves these goals, is inexpensive, does not require specialized skills or materials, and can often be performed without the need for inhalation anesthesia. Avulsion-type fractures involving the incisor teeth and most fractures in foals can be successfully repaired with wires alone. The incidence of both short-term and long-term complications is low for all fracture types, and long-term function is excellent.

### References

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