INTRODUCTION

The oral cavity of the horse is a frequent location for injury especially in curious, immature horses. The inquiring nature of the youngster often time results in the chewing or “mouthing” of interesting objects. A sudden scare often invokes the “flight or fight” response prior to the “spit out” response, thus injury to the oral cavity results. In addition, certain management practices, aggressive or inexperienced riders, improper dental techniques, and unsuitable or damaged tack may lead to significant oral trauma. Lacerations to the lips, cheeks, tongue and gingiva as well as avulsion fractures of the incisor teeth often occur and can lead to significant deficits in normal function and/or unsightly cosmetic blemishes. The oral cavity also presents some unique challenges to wound healing such as excessive motion and constant contamination with saliva and feed material. However, the tremendous blood supply to the area promotes rapid healing and when suitable repair techniques are applied, successful functional and cosmetic results can be obtained.

PRE-OPERATIVE MANAGEMENT

As with any injury, a comprehensive physical examination should be performed prior to focusing on a specific injury. Other, perhaps more significant injuries may have gone unnoticed by the owner and may need more immediate attention than the presenting complaint. In acute injuries to the oral cavity, hemorrhage will generally be minimal at presentation but the patient may be extremely painful, needing sedation and pain medications in order for the veterinarian to conduct a comprehensive oral examination. More chronic injuries will usually be less painful but may be more extensively contaminated or infected. Antimicrobial therapy is indicated in most cases as are non-steroidal anti-inflammatory medications. The route of administration of these medications should be carefully considered in light of the injury. Oral medications may be appropriate with some injuries but others may call for injectable medications rather than risk further trauma to the oral cavity or if feed is to be withheld. Antibiotics such as sulfamethoxazole/trimethoprim (20mg/kg[9mg/lb]PO) or procaine penicillin G (22,000 units/kg[10,000 units/lb] IM) for 5-7 days depending on the injury is usually sufficient. Vaccination status should be verified and tetanus prophylaxis administered if needed.

LIP LACERATIONS

Lip lacerations are commonly caused by sharp objects, protruding from surfaces in the horse’s environment, such as a nail on the wall of the stall. They can also be caused by mishaps such as the horse stepping on the reins while tacked up causing the bit to inflict severe trauma to the lip margins. Although most partial thickness lacerations
to the lip will heal by second intention, the functional and cosmetic result may be less than desirable. Full thickness defects should be repaired with emphasis to restore the lip margin. If the buccal seal is permanently compromised, saliva and feed materials may persistently drool from the mouth.¹

**Repair**

Depending on the severity, repair of lip lacerations can be performed in the standing, sedated patient using local anesthesia. However, general anesthesia allows for more meticulous dissection and often times results in a better repair with fewer complications. The oral cavity should be flushed with dilute (0.1-0.2%) povidone iodine solution to remove any feed and saliva and the skin should be prepared for surgery in standard fashion. The wound margins of chronic lacerations must be freshened with a scalpel while acute laceration may need minimal debridement. In either situation, the skin and oral mucosa along the edges of the wound must be undermined and separated (approximately 0.5 - 1cm) from the underlying muscular layer. This is an important step and serves to decrease motion at the skin/mucosal margin. One interrupted suture is placed apposing the lip margin at the mucocutaneous junction and the repair is then accomplished in three layers, the mucosa, the muscular layer and the skin. The oral mucosa is closed with 3-0 monofilament absorbable suture in a simple continuous pattern. Vertical mattress sutures are used to appose the muscular layer using 2-0 monofilament non-absorbable suture material. The skin is then apposed with vertical mattress sutures interposed with simple interrupted sutures using 2-0 monofilament non-absorbable suture material. Lacerations involving the commissure of the lips often undergo excessive tension when the mouth is opened. For this reason additional mattress sutures (1-2) are placed in the lip margins rostral to the repair.

**Complications**

The major complication of repair of lip lacerations is complete or partial dehiscence. Meticulous dissection and appropriate undermining of the skin and oral mucosa helps to prevent excessive motion and decreases the risk for dehiscence. Some patients tend to traumatize the repair by rubbing it against objects in the environment. If this is observed, a muzzle should be placed to protect the repair. When dehiscence does occur, revision should be performed using these same techniques.

**CJEX LACERATIONS**

Lacerations to the cheek can be caused by sharp, penetrating objects from the environment as well as by blunt trauma adjacent to the cheek teeth causing the teeth to lacerate the cheek from inside out. Depending on the exact orientation, injury to the facial nerve, facial artery/vein and/or parotid salivary duct may have occurred. Although most partial thickness cheek lacerations heal well by second intention, surgical repair of full thickness cheek lacerations is recommended.

**Repair**

Surgical repair of cheek lacerations should be performed in a manner similar to that described for lip lacerations. The skin and oral mucosa should be undermined and entire wound is sutured from the external side starting with the oral mucosa. Vertical
mattress stent sutures may or may not be required depending on the size of the wound. If the parotid duct is noted to be damaged during initial repair, anastomosis or marsupialization of the proximal end into the mouth is advised.

**Complications**

In addition to those listed above for lip lacerations, orocutaneous fistula formation is a potential complication in cheek lacerations extending into the oral cavity. This rarely occurs if appropriate techniques are followed. Drainage of saliva from the wound post-operatively indicates parotid duct disruption and chemical involution of the parotid gland may be indicated. Muzzle deviation secondary to facial nerve injury may also be noted. If due to generalized inflammation this may spontaneously resolve, however, if the nerve was transected, either during injury or repair, the deviation likely will be permanent.

**TONGUE LACERATIONS**

The tongue is essentially a tube of muscle covered with a mucosa. Generally, areas with significant muscle do well when left to heal by second intention but the tongue is not one of those areas. Even minor lacerations can lead to scarring which can cause a deviation in the tongue’s alignment exposing it to trauma from the dental arcade. Therefore, primary closure of lacerations to the tongue is recommended. Lacerations to the tongue generally occur on the dorsal surface and run transversely extending into the musculature in variable depths. Fortunately, the neurovascular supply to the tongue is anatomically protected to some degree because of its orientation on the ventral midline. In cases where the vascular supply is compromised, partial glossectomy should be performed.

**Repair**

Although rostrally orientated lacerations can be sutured in the standing patient, general anesthesia is recommended for repair of most tongue lacerations. The wound edges should be debrided and lavaged prior closure. A multilayer closure (5-6 layers) is used to eliminate as much dead space as possible.\(^2\) One or two layers of 2-0 monofilament absorbable suture are placed in the deep muscle layer in a simple continuous pattern. Then, 6-8 vertical mattress tension relieving sutures of 0 monofilament absorbable material are preplaced along the laceration at approximately half its depth. One or two more layers of 2-0 monofilament absorbable suture are placed in the superficial muscle layer in a simple continuous pattern. Then lingual mucosal layer is then apposed with either a simple interrupted, vertical mattress or combination of the two. The deep vertical mattress sutures are then tied individually.

Partial glossectomy is performed by first sharply amputating the devitalized portion of the tongue with a scalpel. A mucosal-to-mucosal closure is recommended but not imperative.\(^2\) A transverse wedge of musculature should be excised and the created space closed in multiple layers similar to the laceration repair technique described above omitting the vertical mattress tension suture layer.
Complications

Short term complications of repair or partial glossectomy may include excessive swelling of the tongue, dehiscence, and drooling. In cases of repair of a devitalized tongue, necrosis may be observed necessitating partial glossectomy.

INCISOR AVULSION FRACTURES

Avulsion type fractures involving the mandibular or premaxillary incisor teeth are common injuries in the horse. They typically occur in young horses, but may be seen in horses of any age. Although these injuries appear quite devastating, most carry a good prognosis with appropriate treatment. Interdental wiring is a relatively simple technique that provides adequate support to facilitate healing of many of these avulsion fractures. All displaced fractures are candidates for surgical repair and non-displaced fractures usually will benefit from stabilization. Without repair, functional deficiencies and cosmetic blemishes may result. Although intraoral wiring does not result in complete rigid stability, this technique does provide adequate support leading to satisfactory fracture healing.

Special Equipment Needed

Repair of avulsion fractures of the incisors using interdental wiring techniques requires little specialized equipment. 18-gauge stainless steel wire is generally adequate for fixation but 16-gauge may be indicated in some fractures. A hand held chuck with a 1/16 inch Steinmann pin is usually sufficient to make holes for wire passage. Alternately, a hand-held battery powered drill can be used. Small bone curettes, 14- gauge needles, wire twisters and wire cutters are also needed to complete repair. In some instances a speculum is needed, but the author finds it cumbersome and counterproductive in most cases.

Repair

Most repairs can be performed standing but some may warrant general anesthesia. Standing repair is best performed with the patient standing in stocks. Sedation is recommended in all cases so that the horse remains calm. Sudden jerking of the head during the preparation or repair process can lead to iatrogenic damage to the soft tissue attachment of the fracture fragments. A nose twitch may be used if additional restraint is needed. Regional anesthesia is needed to desensitize the rostral mandible or maxilla. For mandibular fractures, anesthesia of the mental nerves should be performed and, for maxillary fractures, the infraorbital nerves should be anesthetized. Theses nerves can be effectively anesthetized by injecting five milliliters of local anesthetic into their respective foramen. General anesthesia should be reserved for more complicated repairs or patients with dispositions unsuitable for standing repair. Disruption of the repair can occur secondary to trauma sustained during recovery from anesthesia therefore recovery should be assisted when possible. The fracture site should be cleaned of debris and copious lavage with dilute (0.1-0.2%) povidone iodine solution should be performed. Loose, obviously devitalized bone fragments should be removed to prevent sequestra formation. Loose teeth should be preserved as many will survive or, if necessary, can be removed at a later date. Reduction of the fracture is usually easily accomplished with digital pressure. Avulsed
incisors are secured to teeth adjacent to the fracture line. This is accomplished by making holes with a chuck and Steinmann pin just under the gum line between the teeth of the avulsion fragment and teeth of the adjacent bone. A wire is then passed in cerclage fashion through the holes so that the wire ends are to the buccal surface. Inserting 14 gauge needles into the holes to facilitate wire passage may be helpful. The ends can then be twisted applying compression to the fracture line. A minimum of two wires (at least one on either side of the fracture) should be used to stabilize the fracture and ideally they should overlap. Depending on the fracture configuration, the canine teeth and/or second premolars can be incorporated in the repair. Post-operatively, the patient should not be allowed to graze for 2-4 weeks. Otherwise, a normal diet can be resumed. Normal activity, including training or performance, can be resumed provided the client is cautioned to avoid trauma to the mouth region. Fracture healing should be complete in 6-8 weeks at which time the wires can be removed.

Complications
Although short term complications are common, the long term prognosis for a successful functional and cosmetic outcome is favorable. Wire loosening or failure, sequestra formation, osteomyelitis, and/or complete fixation failure are complications sometimes encountered following repair of incisor teeth avulsion fractures by intra oral wiring. In young foals, brachygnathasim has also been reported. Wires can be tightened or replaced as needed and sequestra removed as they develop. Complete fixation failure may warrant repair by another fixation method.

SUMMARY
Injury to the oral cavity can occur in any age of horse but tends to happen more frequently in younger horses. Depending on the type of injury, specific challenges have to be addressed for a method of repair to be successful. The excellent blood supply to the oral cavity does promote healing and inhibits infection in an extensively contaminated location. General anesthesia is recommended to facilitate repair of most lacerations while the majority of incisor teeth avulsion fractures can be repaired in the standing, sedated horse. Although complications do occur, successful repair of most of the injuries described here is easily accomplished by the general practitioner.
REFERENCES


