

CASE REPORT

Repair of Bovine and Equine Mandibular Fractures

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Summary

Clinical findings, surgical repair and postsurgical care of a unilateral fracture of the mandible of a bull and of a bilateral mandibular fracture in a horse are described. Compression plating limited the pain suffered by the animals and resulted in a quick return to function of the mandibles.

*Résumé***Réparation de fractures mandibulaires, chez un taureau et un cheval**

Cet article décrit les observations cliniques, la réparation chirurgicale et les soins post-opératoires relatifs à une fracture unilatérale du mandibule d'un taureau et à une fracture bilatérale du mandibule d'un cheval. L'utilisation de plaques de compression atténua la douleur endurée par ces animaux et accéléra le processus de guérison.

Introduction

Fractures of the horizontal and vertical rami of the mandible of large animals are rarely encountered. This is because a very considerable force is necessary to fracture the mandible in this area, which is well protected by the masseter and pterygoid muscles (4).

Clinical signs are usually sufficient for a diagnosis of mandibular fractures, but radiographs aid considerably and help to determine the feasibility of correction as well as the method to be followed.

The handling of fractures of the body of the mandible in large animals presents a particular problem with respect to providing for feed and water intake as well as the immobilization of the fracture.

During the past year, two patients with fractures of the mandibles were presented to the Large Animal Clinic at the Provincial Veterinary Centre in Fredericton, New Brunswick.

Because of the potential breeding value of a bull and the show quality of a horse, it was decided to investigate and attempt surgical correction of these fractures. These cases are discussed below. They are of additional interest because of the location of the fractures.

Case One*History*

A four year old Holstein bull from a nearby breeding unit was presented to the clinic five days after having sustained an injury of unknown origin to the right side of the head. The animal had not eaten nor drunk voluntarily since the injury had occurred and no improvement was evident. The animal was being fed horse pellets soaked in warm water and administered by stomach tube.

Clinical Examination

The animal was depressed, thin and moderately dehydrated. Saliva

drooled from the mouth. The mandible was hanging loose, with the right ramus approximately 2 cm lower than the left. An offensive odor was emanating from the mouth. The animal would not permit physical manipulation of the mandible, but a large soft warm swelling was evident over the right masseter muscle.

Radiographic Examination

Radiographs were taken of the right side of the mandible. A vertical fracture of the horizontal ramus of the mandible was found at the level between the second and third molar (Figure 1). The rostral part of this ramus was displaced one centimeter ventral to the caudal part.

Surgical Repair

The procedure was conducted under general anaesthesia, this was induced by administering xylazine¹ (0.44 mg/kg) intravenously (i.v.). The patient was placed in left lateral recumbency on a large rubber mat to intubate the trachea and anesthesia



FIGURE 1. Mediolateral projection. The vertical fracture of the right horizontal ramus of the mandible of the bull is between the second and third molar (arrow).

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¹Rompun, Haver-Lockhart Laboratories, Division of Bayvet Corporation, Mississauga, Ontario.

was maintained with halothane.² The area over the right masseter muscle was clipped and surgically prepared. Sterile drapes were applied and the skin incision was made on the ventrolateral aspect of the ramus, extending from the level of the first premolar to the angle of the ramus. The facial cutaneous muscle was then incised. The facial artery and vein and the parotid duct and nerve were isolated and separated from the surrounding tissue to prevent damage to these structures. The masseter muscle and part of the sternomandibular muscle were then incised to expose the ramus of the mandible. Blood vessels were ligated with 00 polyglycolic acid³ suture material. The ramus was then exposed for a width of approximately 3 cm, exposing clearly the fracture.

A 19.0 x 203.2 mm eight hole stainless steel compression bone plate was applied to the ventrolateral surface of the ramus using 2.6 mm bone screws according to previously described methods (2, 3). Since the injury had occurred seven days prior to surgery, the presence of fibrous tissue and early callus made realignment and compression of the mandible difficult.

The plate was placed as close to the ventral border of the ramus as possible in order to prevent damage to the roots of the teeth and their nerve and blood supply by the screws, without compromising stability.

Using a four layer closure technique, simple interrupted, number one chromic catgut sutures⁴ were inserted in the deep and superficial layers of the masseter muscle and the sternomandibular muscle. Simple continuous, number zero chromic catgut was used to close the facial cutaneous muscle. A synthetic nonabsorbable suture material⁵ in a simple interrupted pattern was used for skin closure.

The animal struggled considerably during the recovery period due to a right foreleg radial nerve paralysis which resulted, presumably, from four hours of anaesthesia and the weight of this large bull. Recovery from the paralysis was complete by the sixth day after the operation. Procaine penicillin G (880 units/kg) and dihy-

drostreptomycin (11 mg/kg)⁶ intramuscularly (i.m.) were administered for the first five postoperative days.

Results

The day after surgery the bull drank approximately 22 L of water. By the third postoperative day the patient was drinking approximately 75 L of water per day.

On the second postoperative day, the bull ate a few horse pellets. On the third postoperative day, he was offered and ate about 5 kg of an 18% commercial dairy feed, along with a small amount of hay. He was eating and drinking satisfactorily by the fifth day and was therefore discharged. The owners reported the bull to be on full feed and gaining a considerable amount of weight by the end of the fourth week.

Six weeks later the bull had gained approximately 75 kg. A slight swelling was present over the right masseter region. Radiographs were taken (Figure 2). The calcification at the fracture site indicated that healing was taking place but was not complete.

Semen was collected from the bull eight weeks after surgery. Fifteen months have elapsed since the operation was performed and the bull is being regularly used as a donor in the artificial insemination unit.

Case Two

History

A three year old Appaloosa gelding was referred to the clinic after having sustained an injury to the mandible. The owner believed that the animal had been kicked by another horse. The animal was seen by the local veterinarian a few hours after the injury occurred. At that time a fractured lower right third incisor was removed and antibiotics were administered. Subsequently the animal was unable to eat or drink and was referred to our clinic.

Clinical Examination

The horse was alert but somewhat thin and "tucked up" in the abdomen. The rostral part of the mandible was displaced with the left side about 1 cm lower than the right. The tongue protruded about 3 cm from the mouth. The mucosa of the protruding portion was dry, but when pinched, the tongue was withdrawn into the oral cavity. An abrasion of the skin approximately 4 cm x 1.5 cm was present opposite the right lower third incisor. This was consistent with the owner's suspicion that the horse had been kicked.

The vestibule of the mouth was filled with decaying food, giving rise to an offensive odor. The right lower third incisor had been fractured at the

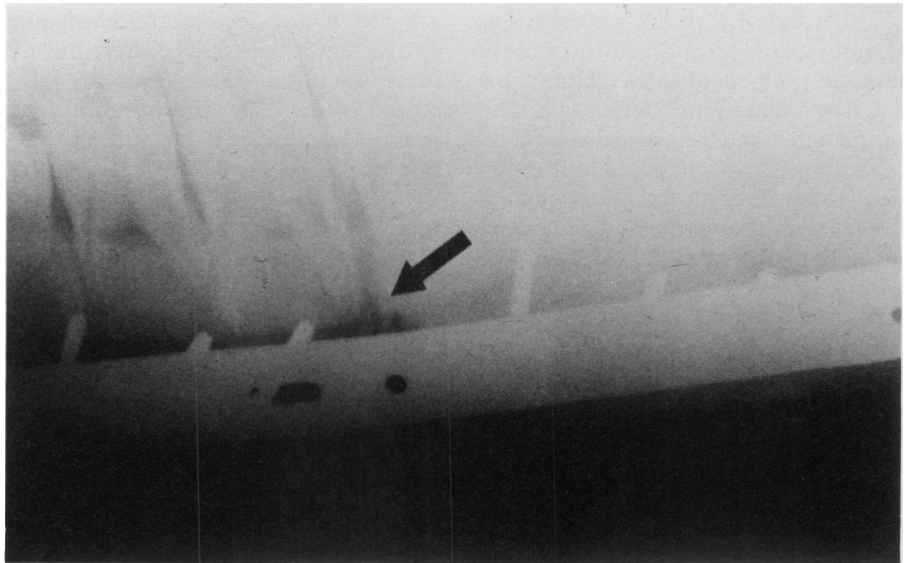


FIGURE 1. Mediolateral projection. The vertical fracture of the right horizontal ramus of the mandible of the bull is between the second and third molar (arrow).

²Fluothane, Ayerst Laboratories, Montreal, Quebec.

³Dexon, Davis and Geck, Cyanamid Canada Limited, Montreal, Quebec.

⁴Surgical gut, Medium Chromic, Davis and Geck, Cyanamid Canada Limited, Montreal, Quebec.

⁵Vetamide, Eastern Laboratories Ltd., Scarborough, Ontario.

⁶Peni-Strep, Armitage Carroll, London, Ontario.

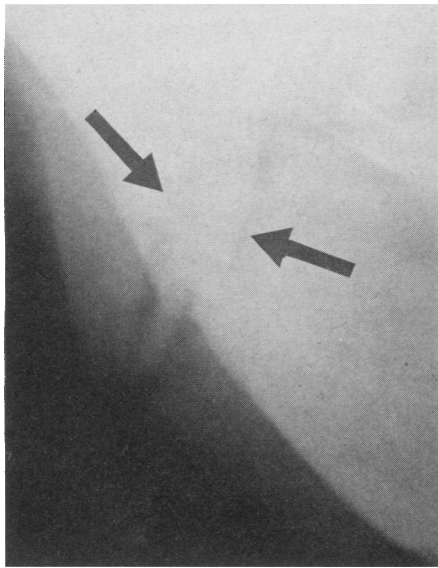


FIGURE 3. Mediolateral radiograph of the right horizontal ramus of the mandible of the horse. The fracture is at the level of the second molar (arrows).

neck leaving the root imbedded in the alveolus. The animal would not allow a thorough physical examination of the mouth due to pain. When offered a warm bran mash and water, the horse showed interest but was unable to eat or drink. The area over the masseter muscle on the left side was moderately swollen and warm.

The animal was given 1.1 mg/kg of xylazine i.v. to allow further examination of the mandible with the horse sedated. Pressure directed medially on the left masseteric region would cause the mandible to slip medially about 0.5 cm in the region of the temporomandibular articulation.

Radiographic Examination

A vertical fracture of the horizontal ramus of the right mandible was found at the level of the second molar (Figure 3), and a fracture of the horizontal ramus of the left mandible (Figure 4) was revealed. Here the fracture line ran ventrodorsally from the ventral border of the ramus to just below the root of the second molar. From here the fracture line ran rostrocaudal ventrodorsally, just below the root of the third molar, to the dorsal border, approximately 5 cm beyond the third molar. Radiographs were taken of the left temporomandibular articulation but abnormalities were not found.

Diagnosis

In view of the above findings a diagnosis of fractures of left and right horizontal rami of the mandible was established. Subluxation of the left temporomandibular articulation was suspected due to the medial movement of the vertical ramus of the mandible when pressure was applied. Due to the earlier satisfying experience with Case No. 1, and because of the owner's sentimental attachment to the horse, it was agreed that surgery would be attempted.

Surgical Repair

Because of the availability of the equipment from the local human hospital and its successful employment in Case No. 1, it was decided to use the Richards-Hirschhorn compression bone plating system in the repair of these fractures.

Two days after being admitted, the patient was prepared for surgery. A preanaesthetic of 1.1 mg/kg of xylazine was given i.v., followed by 5 mg/kg of sodium thiamylal⁷ i.v. to induce anaesthesia. The animal, placed in right lateral recumbency, was intubated and anaesthesia maintained with halothane. The left surgical area was clipped and scrubbed; this was followed by the application of 50% alcohol and 10% acetone solution⁸ and sterile drapes.

A skin incision was made on the ventro lateral aspect of the ramus extending from the level of the first premolar to the angle of the rami. The facial cutaneous muscle was incised. The parotid duct and facial artery and vein were isolated and separated from surrounding tissues so as to allow the bone plate to be maneuvered under these structures without damaging them. The superficial and deep layers of the masseter muscle were then incised down to the ramus of the mandible. Blood vessels were ligated using 00 polyglycolic suture material.⁹ The masseter muscle was peeled from the lateral surface of the rami to allow a 3 cm wide exposure of the ramus. The fracture was easily palpable and clearly visible.

A 19.0 x 203.2 mm eight hole Richards-Hirschhorn compression bone plate was then applied to the ventrolateral surface of the ramus using 2.6 mm bone screws, exercising care in avoiding damage as described in Case No. 1.

A four layer closure technique was employed. Simple interrupted sutures of number one chromic catgut were inserted in the deep and superficial layers of the masseter muscle, followed by a simple continuous suture pattern with zero chromic catgut for the facial cutaneous muscle. The skin was closed with a simple interrupted pattern using

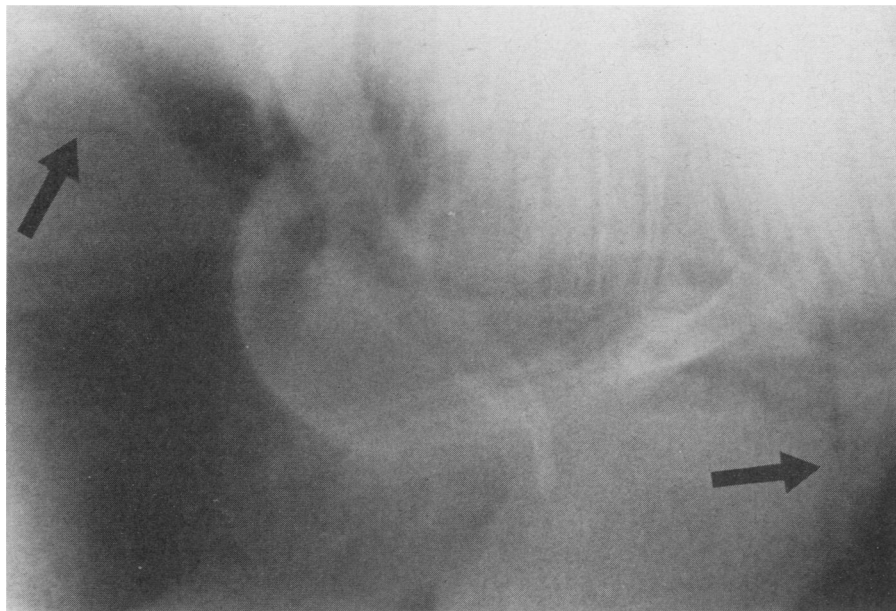


FIGURE 4. Mediolateral radiograph of the left horizontal ramus of the mandible of the horse. The fracture is indicated (arrows).

⁷Bio-Tal, M.T.C. Pharmaceuticals, Hamilton, Ontario.

⁸Metatint, Emergency First Aid Services Ltd., Montreal, Quebec.

⁹Dexon, Davis and Geck, Cyanamid Canada Inc., Montreal, Quebec.

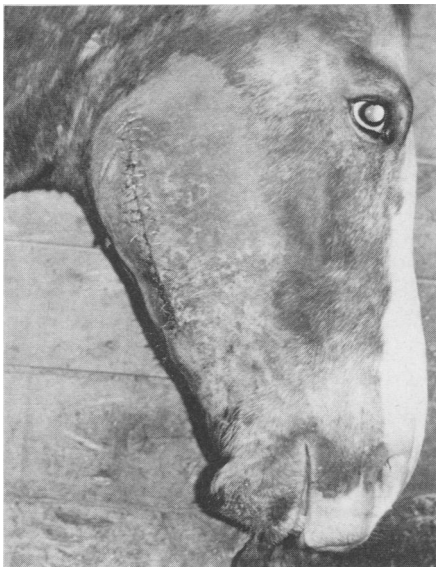


FIGURE 5. The surgical site on the right side of the horse, one day postsurgery.

a synthetic, non-absorbable suture (Figure 5).

A dressing was placed over the closed incision and the animal was turned to left lateral recumbency.

The same surgical procedure was performed to stabilize the fracture of the right ramus using a 19.0 x 177.8 mm bone plate and screws.

A felt head hood was employed for protection during the recovery period. Once the horse started to struggle, xylazine (0.4 mg/kg) was administered i.v. to aid in a smooth recovery. Once recovered, the patient was given 1 mL tetanus toxoid¹⁰ i.m. Procaine penicillin G (880 units/kg) and dihydrostreptomycin (11 mg/kg) were administered intramuscularly for the first five days. The diet consisted of commercial horse pellets soaked in warm water and administered via stomach tube twice a day for the first five postoperative days.

Results

On the second postoperative day the horse drank a small amount of water and by the fifth day it was considered that the horse consumed enough water. On the third postoperative day, the patient was nibbling on a few horse pellets and by the seventh day he was eating enough pellets to maintain body weight. Moistening the pellets made it more difficult for the horse to pick them up.

Three weeks postsurgery, an abscess was found beneath the skin on the right rostroventral border of the horizontal part of the ramus. This was lanced and cleansed and it healed.

Following surgery, the tongue continued to protrude. This was observed to occur less frequently and for shorter intervals until it was no longer observed by the end of the sixth week.

At six weeks after surgery the animal was alert and had gained approximately 150 kg.

The mouth could only be opened with a speculum to the extent of about 8 cm without eliciting severe discomfort. The horse was unable to eat hay at this time. This limitation was attributed to injury to the supporting structures of the left temporomandibular articulation. A firm swelling of this area was still evident.

Radiographs were taken at this time (Figure 6). There was good healing with minimal callus formation. The horse was discharged with instructions for reexamination in four months. The owner reported a few days after release that the horse was able to eat grass and a small amount of hay.

Discussion

Surgical correction was decided upon in Case No. 1 because the animal was becoming weak and it was in considerable pain and had shown no improvement during the seven days following the fracture. It was decided to undertake surgery in Case No. 2 because of the poorer prognosis of the nonstabilized bilateral fractures in this

case. It was felt that surgical correction, as opposed to allowing the fractures to heal on their own, accelerated return to use of the mandibles and shortened the period of pain that the animals would have undergone.

Surgery in this area is complicated by the large muscle mass of the masseter and its vascularity, along with the location of the parotid duct and nerve and the facial artery and vein in this area (1).

Due to the length of this and other surgical procedures, it is necessary to have the animal on a well-padded table to minimize nerve damage. Also, trauma to the head is minimized with the use of a head hood.

Providing adequate nutrition prior to surgery and during the recuperation is necessary until the animal is able to consume feed and water on its own.

The periodic protrusion of the tongue in one of these cases was due to paralysis from the original trauma; this is reported to occur in cases of this type (4).

It is the author's hope that the above description may encourage other practitioners to undertake surgical repair of such mandibular fractures, as the results and the appreciation of the owners are most gratifying.

Acknowledgments

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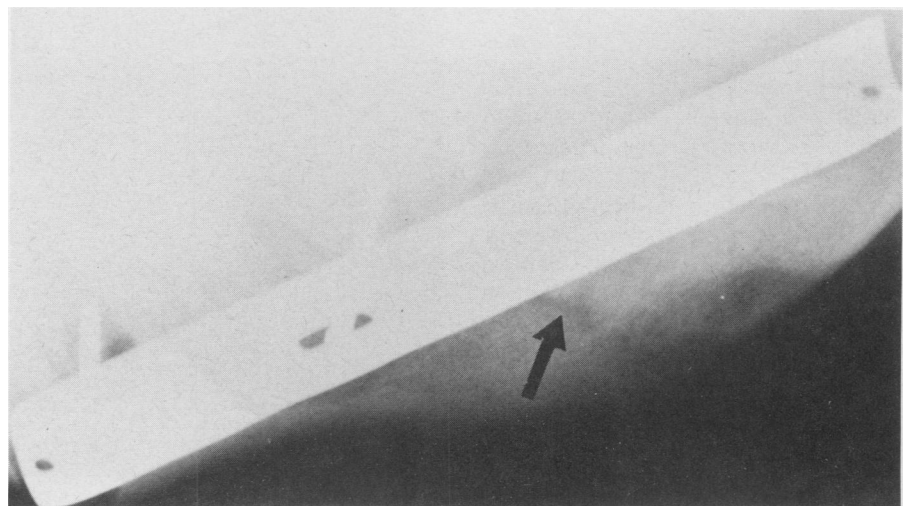


FIGURE 6. Mediolateral radiograph of the right horizontal ramus of the mandible of the horse. The plate and healing of the fracture with minimal callus formation are evident (arrow).

¹⁰Convac T-Tox, Connaught Laboratories Limited, Veterinary Division, Willowdale, Ontario.

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