

Bovine Mandibular Fractures

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ABSTRACT

A retrospective study of bovine mandibular fractures was conducted. An increased incidence in males, beef breeds and animals less than one year of age was identified when the study group of 17 was compared to the total bovine case load. Manipulation during dystocia was the most common cause of fractures. Four neonates had rostral mandibular fractures. Fractures caudal to or involving the premolars were restricted to animals over a year of age.

Treatment was attempted in ten of the seventeen cases, with euthanasia or slaughter elected in the remaining seven cases. Of the five cases treated by internal fixation, all four neonates died from conditions related to septicemia.

Key words: Mandible, fracture, bovine.

RÉSUMÉ

Fractures mandibulaires, chez des bovins

Cet article présente une étude rétrospective de 17 cas de fractures mandibulaires, chez des bovins. Elle a permis d'en constater une incidence plus élevée chez les mâles, les sujets de races de boucherie et les sujets âgés de moins d'un an, par comparaison avec le nombre total de bovins hospitalisés au cours de la période couverte par l'étude précitée. Les manipulations au cours d'une dystocie se révélèrent la cause la plus fréquente des fractures; elles provoquèrent celle de la symphyse mandibulaire, chez quatre veaux naissants. Les fractures situées vis-à-vis ou en arrière des prémolaires

n'affectaient que des sujets âgés de plus d'un an.

On opta pour la réduction, dans seulement dix des 17 cas; on recommanda par ailleurs l'euthanasie ou l'abattage, dans les sept autres. Des cinq cas traités au moyen d'une fixation interne, les quatre nouveau-nés précités moururent de conditions reliées à une septicémie.

Mots clés: mandibule, fracture, bovin.

INTRODUCTION

Mandibular fractures in cattle have received little attention in the literature, with the exception of isolated case reports (1-5). In order to provide

recommendations for the owner, more information must be obtained regarding the nature of mandibular fractures in the cow and the prognosis with different types of therapy. Records of cattle with a diagnosis of fracture of the mandible were reviewed for signalment, etiology, fracture type, therapeutic technique, and outcome, in order to characterize etiological factors and identify prognostic trends.

MATERIALS AND METHODS

All records of cattle with a diagnosis of fracture of the mandible admitted to the Western College of Veterinary Medicine over a 15 year period ending December 31, 1983 were reviewed.

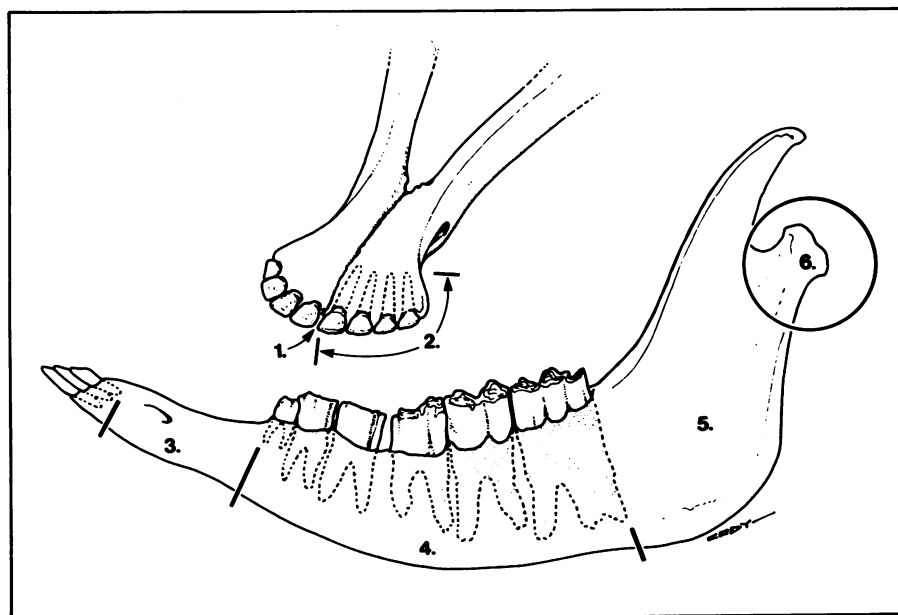


FIGURE 1. Schematic representation of the bovine mandible for classification of fractures by region: 1) symphyseal, 2) incisor, 3) interdental, 4) molar, 5) vertical ramus, 6) temporomandibular joint.

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Data related to age, breed, sex, fracture etiology, fracture location and type, therapeutic techniques and response, discharge status and necropsy findings were summarized.

The mandible was divided into six regions for description of fracture location (Figure 1). Any fracture line which exited through the proximolabial side of the symphysis was classified in region 1. Regions 2 and 4 involve teeth or tooth roots. Fracture lines entering more than one region were classified in each applicable region.

Progress following discharge was evaluated after conversation with the owner by telephone.

RESULTS

The records of seventeen cattle with a diagnosis of fracture of the mandible were found. Diagnosis was based on physical examination in 6 cases and another 11 cases had supporting radiographic signs. Physical diagnosis was based on palpation of fragment motion or crepitation with manipulation, visualization of fracture fragments, or malalignment of a segment of the mandible.

Age, sex, and breed distribution of the 17 cases are listed in Table I. There were no significant differences in age, sex, or breed distribution when the study population was compared to the total population of 778 cattle admitted for fractures of any kind during the study period. Distribution in all three

parameters did vary significantly when the 17 mandibular fracture cases were compared with the total bovine case load ($n = 33,411$) admitted to the hospital during the study period. There was a significantly higher percentage of males, beef breeds and animals less than one year old in the groups of cattle with mandibular fractures and fractures in general when compared to the overall bovine hospital population ($p < 0.010$).

An etiology was identified in records from nine cases (Table I). Trauma due to intrauterine manipulation was the sole source of fractures in neonatal calves (Cases 1-4). Two animals (Cases 11 and 12) had osteomyelitis associated with the fracture but the temporal relationship between fracture and osteomyelitis was uncertain.

None of the 17 cases had been treated prior to admission. The colostrum intake in two calves (Cases 1 and 2) was uncertain and they received colostrum on admission, four to six hours after birth. The colostrum intake of the other two neonates (Cases 3 and 4) before and after admission was not described.

Information specifying the location and type of fracture was available from clinical and/or radiographic reports in 16/17 cases (Table II). Crepitation and instability were described in the remaining record (Case 10), but a specific fracture site was not menti-

oned and the case was not included in the summary of fracture sites or types. Twenty-three separate mandibular fractures were identified in the 16 animals. Fractures were identified in four of the six regions shown in Figure 1. There was no significant difference in the relative frequency of fractures between the four sites; however, fractures in the molar region were limited to cattle over one year of age. Both mandibles were fractured in eight cases, while fractures were limited to a single mandible in seven. The sixteenth case had a single fracture of the symphysis. Of the seven cases with unilateral fractures, three had fractures in more than one region. Open fractures ($n = 11$) were over five times more common than closed fractures ($n = 2$) in the 13 records which specified this fracture characteristic.

Surgical treatment of the fractures was attempted in only five cases; the four neonatal calves and the one month old calf (Table II). The fractures were open and located rostral to the premolars in all five cases. Repair techniques used were a modified Kirschner-Ehmer apparatus (Cases 1 and 5), bilateral intramedullary pins (Cases 3 and 4) and cerclage wires (Case 2).

Five cases received therapy for fracture related lesions (Table II). A fractured premolar was removed in one case (Case 17). Treatment was limited to debridement and lavage of gum lacerations in two cases (Cases 6 and 11) and suturing of gum lacerations in one case (Case 16). The fifth case (Case 13) was discharged with instructions to administer a penicillin/streptomycin combination intramuscularly for ten days.

The discharge status for initial admission is shown in Table II. Of 17 cases, three died in the hospital, two were euthanized, four were sent to slaughter without treatment and eight were discharged alive. The live discharge rate from initial admission for the 17 cases was 47.0%. The three animals which died were neonatal calves which developed diarrhea two to ten days following admission (Cases 1, 3 and 4). Despite supportive fluid and antibiotic therapy, they died 6-19 days following admission. One cow (Case 11) with a mandibular fracture and osteomyelitis was euthanized due

TABLE I
SIGNALMENT AND FRACTURE ETIOLOGY OF CASES OF BOVINE MANDIBULAR FRACTURES

Case Number	Age at Presentation	Sex	Breed	Fracture Etiology
1	3 hours	M	Hereford X	Dystocia
2	4 hours	M	Charolais	Dystocia
3	24 hours	F	Hereford X	Dystocia
4	24 hours	M	Hereford	Dystocia
5	1 month	M	Shorthorn	NK ^a
6	2 months	M	Charolais	NK
7	2 months	M	Shorthorn	Ran into wall
8	5 months	M	Angus X	NK
9	10 months	F	Simmental	NK
10	11 months	F	Charolais	Ran through wash rack
11	12 months	F	Charolais	NK
12	12 months	F	Charolais	NK
13	18 months	M	Chianina	Hit by car
14	24 months	M	Hereford	NK
15	24 months	F	Charolais	Fell off cliff
16	36 months	M	Simmental	NK
17	48 months	M	Charolais	Struggle in stanchion

^aNK = information not known

TABLE II
FRACTURE DESCRIPTION, DISCHARGE STATUS AND FOLLOW-UP FROM CASES OF BOVINE MANDIBULAR FRACTURES

Case Number	Fracture Location/Type			Treatment Technique	Discharge Status	Follow-up
	Region	Side	Open			
1	3	L+R	Yes (L)	Modified K-E	Died	—
2	1	—	NK ^a	Wire	Alive	Died 3-4 days after discharge
3	2	L+R	Yes (L+R)	IM pins	Died	—
4	3	L+R	Yes (L+R)	IM pins	Died	—
5	1	—	Yes	Modified K-E	Alive	Healed well sold as 2 year old purebred bull
6	3	L+R	NK	Debrided and topical dressing	Alive	Sold as yearling
7	1	—	Yes	None	Slaughter	—
8	2	L+R	NK	None	Slaughter	—
9	1	—	No	None	Slaughter	—
10	2	L	NK	None	Slaughter	—
11	NK	L+R	No	None	Alive	Sold in sale day after discharge, lost to follow up
12	1	—	NK	Debrided and lavaged	Euthanized	—
13	3	L+R	Yes (L+R)	None	Alive	Admitted as 2 year old for vaginal laceration
14	4	R	Yes	None	Alive	NK
15	3	L	Yes	Antibiotics	Alive	NK
16	4	L	No	None	Slaughter	—
17	1	—	NK	None	Euthanized	—
18	4	L	Yes	Sutured gum laceration	Alive	Rechecked 11 days later; osteomyelitis with loss of teeth, sent to slaughter
19	2	L+R	Yes (L+R)	Removed fracture premolar	Alive	NK

^aNK = information not known

to the severity of the fracture and poor general condition. The second cow which was euthanized had been found at the base of a cliff and had sustained multiple rib and pelvic fractures in addition to the mandibular fracture.

A follow-up was available on five of the eight cases which were discharged alive. The single neonatal calf which survived hospitalization (Case 2) died within a week of discharge after developing diarrhea. One bull (Case 16) which had been treated by suturing gum lacerations was readmitted 11 days after discharge following complete wound dehiscence and loosening of the incisors with osteomyelitis at the fracture site. Slaughter was elected at this time. Of the remaining three animals, all were doing well at follow-up from one to two years after discharge. Therefore, of the 12 cases presented with known outcomes, only three (25.0%) survived longer than one month following admission.

Postmortem examinations were performed on the three animals which died and the two which were euthanized in the hospital.

In addition to the mandibular fractures, enteritis was a common feature at necropsy in the three neonatal calves. Case 1 also had disseminated intravascular coagulation, focal suppurative nephritis and tubular nephrosis. Case 3 had multiple healing rib fractures, fibrinous pleuritis, pulmonary edema and congestion, serosanguinous pleural effusion and fibrinonecrotic enteritis. Case 4 had a catarrhal enteritis. The mandibular fracture in case 1 was still unstable at necropsy 18 days following surgery due to wire migration, while the fracture in case 3 was stable with early callus formation five days after surgery. Postmortem findings confirmed the clinical diagnoses in the two animals which were euthanized (Cases 11 and 15).

DISCUSSION

The significant variation in age, sex, and breed distribution in cattle with mandibular fractures when compared to the total bovine case load appears to represent the typical signalment of cat-

tle admitted to this hospital for evaluation of fractures in general, rather than a specific predisposition for mandibular fractures in young, male, beef cattle. The age of the animal does show some correlation with the etiology, fracture type, therapy selected and perhaps eventual outcome of mandibular fractures. Obviously, only neonates were at risk of fracture due to intrauterine manipulation. These same neonates were, as a group, more likely to be treated by internal fixation at this hospital. This may be accounted for by a number of factors including the expected speed of healing in young animals, the relative technical ease of exposure and stabilization, the iatrogenic nature of the injury, the lack of immediate economic value, and expected lower cost. The poor survival rate (1/5) of animals treated by internal fixation in this study, again, appears to be related to age. Although the stress of surgery may have been a factor in the development of the enteritis and/or septicemia in each of these calves, repair failure was not a direct

cause of death in any of the four cases. These results should emphasize, however, the particular importance of ensuring adequate, early colostrum intake as well as adequate nutritional maintenance in such calves if any treatment is contemplated.

The tentative relationship of age and fracture location observed in this study is consistent with the available literature on both bovine and equine mandibular fractures. In this study, all fractures were rostral to the premolars (Regions 1, 2 and 3) in animals of a year or less of age, while five out of six animals over a year of age had fractures involving the premolar/molar region (Region 4). Of five bovine and 41 equine cases of mandibular fracture previously documented (1-17), only seven animals, all over a year of age, sustained fractures caudal to the interdental region. It is not known if this is a result of structural changes of the mandible and teeth with maturation, or the result of a difference in types or sites of fracture forces encountered with age. Certainly, the forces applied during manipulation of the head in dystocia would be concentrated on the rostral mandible while the traumatic forces described for older cattle in this study may have been of a more diffuse nature.

Trauma was the primary identified cause of fractures in this study. Osteomyelitis was observed on admission in association with two fractures, however, the original relationship to the fracture is uncertain. Infection may have been the primary lesion leading to a pathological fracture or may have developed secondary to an open fracture, as occurred with case 16.

The absence of fractures caudal to the molars may reflect a failure of diagnosis rather than an actual predisposition for more cranial fractures. Fractures in the temporomandibular region were suspected in two cases

(Cases 9 and 10) but could not be confirmed radiographically. The presence of single, unilateral fractures in four cases would suggest that accompanying rostral or caudal fractures were not identified, since it would be mechanically difficult to create a single, isolated fracture. Closer examination of the more caudal regions may reveal a higher prevalence of fractures than indicated by this study.

The limited case numbers, limited available follow-up and the high death loss in calves from causes unrelated to the treatment technique, prevent accurate evaluation of the relative prognosis with surgical or more conservative techniques. Literature available on the equine species indicates that a number of surgical techniques are highly successful, particularly with more rostral fractures (4-7,11,13-16). While there are differences in the mechanics of prehension and mastication between bovine and equine species which may modify the stresses encountered by a fracture, the primary complications identified in this study were related to management of concurrent problems such as nutrition and septicemia. The development of osteomyelitis with tooth loss despite debridement in case 16 and its presence in two other cases at the time of presentation (Cases 11 and 12) indicates that osteomyelitis should be a concern in therapy of bovine open mandibular fractures, despite the relative resistance to infection in wounds of the oral cavity. Careful attention to these problems would be expected to improve the prognosis, allow a better evaluation of the repair techniques themselves and provide a better basis for counselling owners.

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