Surgical Management of Humerus Fracture in Calf by Using Wire and Interlocking Nails

A clinical report submitted in partial satisfaction of the requirement for the fulfillment of the degree of Veterinary Medicine (DVM)

A Clinical Report Submitted by

Rakibul Alam Prachurja

Roll No: 18/41

Registration No: 03001

Intern ID: 39

Session: 2017-18

Faculty of Veterinary Medicine

Chattogram Veterinary and Animal Sciences University

Chattogram-4225, Bangladesh

November 2023

Surgical Management of Humerus Fracture in Calf by Using Wire and Interlocking Nails

A clinical report submitted as per approved styles and contents

Approved by

Supervisor

Dr. Md Ridoan Pasha

Assistant Professor

Department of Physiology, Biochemistry and Pharmacology

Faculty of Veterinary Medicine

Chattogram Veterinary and Animal Sciences University

Chattogram-4225, Bangladesh

November 2023

Table of Contents

Table of Figures

List of Abbreviation

CVASU Chattogram Veterinary and Animal Sciences University.

mg/kg Milligrams per kilogram

ml Milliliters

DCP Dynamic Compression Plate

Abstract

Humerus fractures in cattle are rare but challenging for veterinary surgeons due to the critical role of the humerus in weight-bearing and mobility. This case study explored the successful surgical management of a calf having a comminuted fracture left distal humerus shaft using wiring and nail interlocking techniques. The study discusses the clinical presentation, radiological diagnostic evaluation, surgical approach, and post-operative care and follow-up of the case. The results indicated a favorable outcome, with the calf regaining limb function and bearing weight after surgery. The discussion highlighted the importance of tailored treatment strategies considering the fracture's characteristics, the animal's condition, and economic factors. This case report emphasized the significance of prompt and appropriate surgical intervention to preserve calf health and facilitate functional recovery in humerus fractures.

Keywords: Humerus, Fracture, Recovery, Calf, Interlocking nail

Chapter 1: Introduction

Less than 5% of all fracture types and 18% of all long bone fractures in cattle are humeral fractures, which are a rare occurrence (Rakestraw, 1996). Veterinary surgeons face particular difficulties while treating calf humerus fractures since the humerus is essential to an animal's ability to bear weight and move.

Humerus fractures can be caused by a variety of traumatic events, such as falls, collisions, or other mishaps. In many cases, surgery is required to relieve discomfort and restore limb function. A number of therapeutic approaches have been put out to address humeral fractures in ruminants. Stall rest, intramedullary pins, interlocking nails, and plates are a few of these (Hickman et al., 1957). Given the poor prognosis, euthanasia has been suggested for adults frequently (Tulleners, 1986). The size, age, temperament, and economic worth of the animal, in addition to the kind and location of the fracture and the surgeon's prior experience, all influence the course of therapy. Without surgical intervention, humerus fractures can cause chronic lameness, reduced function, and possibly even more serious issues including stiff joints and muscle atrophy. Because damaged calves may not attain their full market value or productive potential, these variables can have a direct influence on the profitability of cattle farming enterprises.

This case study examines the use of wiring techniques in the effective surgical management of a calf's humerus fracture. This study was aimed to provide light on the successful therapy of such difficult fractures in bovine patients by describing the clinical presentation, diagnostic evaluation, surgical approach, and post-operative results of a particular case. This example highlights the need of prompt and suitable surgical intervention for the preservation of the health and functional recovery of calf with humerus fractures.

Chapter 2: Case Presentation

Case history and Observation

A 54kg, 2.5 months old male Shahiwal calf was brought to the Shahedul Alam Quadary Teaching Veterinary Hospital (SAQTVH), Chattogram Veterinary and Animal Sciences University (CVASU) with a history of injury to its left forelimb, causing it to lose its ability to bear weight. Each of the physiologic parameters—heart rate, respiration rate, mucous membrane color, and level of hydration—was within normal limits but the rectal temperature was 103.8°F which was slightly elevated.

Radiographic examination

A digital radiography system was used to do the radiographic examination. The X-ray revealed a comminuted oblique mid-diaphyseal left humerus fracture of the calf.

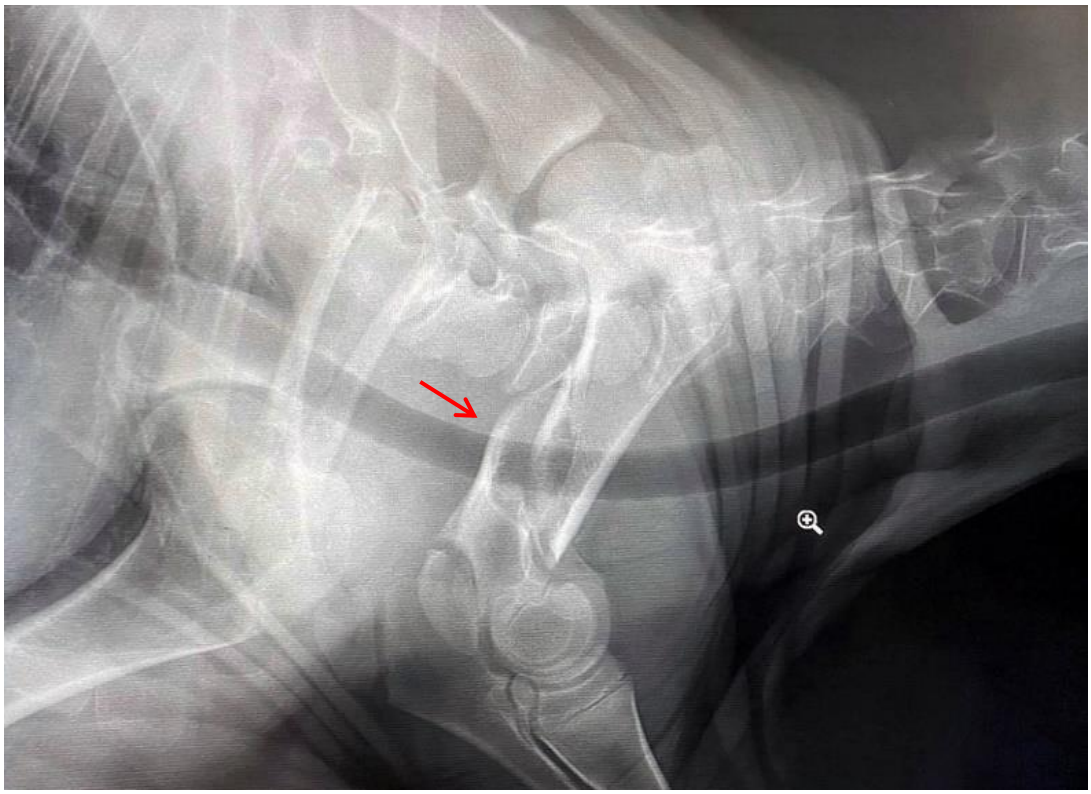

Figure 1: Radiograph showing comminuted fracture of left distal humerus shaft

Patient Preparation and Anesthesia

Shaving was performed on the forearm area. The area was scrubbed with Savlon® (Chlorhexidine Gluconate, Cetrimide Solution) three times, Povidone iodine three times, and 70% alcohol three times. The cow is restrained in right lateral recumbency. The calf was sedated by using diazepam (Easium®) @ 0.5mg/kg body weight intravenously. Local anesthesia (line block) was performed by using Lidocaine HCL (Jasocaine®) @6mg/kg body weight subcutaneously along the incision line. Fluid therapy with normal saline (NS®) was started @ 10ml/kg/hour intravenously.

Figure 2: Local anesthesia is given at the incision line by line block anesthesia technique

Surgical Management

The entire left forelimb underwent thorough preparing for aseptic surgery. The forearm muscles were accessed by gently making an incision along the skin in the anesthetic area. The subcutaneous tissue and superficial fascia were then separated to reveal the Biceps brachii, Brachiocephalicus, Deltoid, and Triceps brachii muscles. The muscles were cut to expose the fractured humerus, taking care to avoid major blood arteries and nerves, such as the radial nerve. The removed bone fragment was then drilled alongside the proximal and distal bone fragments. After that, orthopedic wires were used to hold the fractured bone pieces together and realign them with the damaged piece. Two interlocking screws were then positioned precisely, taking into account the size of the calf. After that, the bone pieces had to be carefully positioned in relation to the muscle tissues, and the fascia had to be sutured in a straightforward, continuous pattern using vicryl. The subcutaneous tissue was also sutured using vicryl in a similar manner. A horizontal mattress design was carefully sewed into the skin. Povidone iodine was used extensively to clean the entire suture line. At last, the entire forelimb was wrapped using a modified Thomas splint method.

Figure 3: Incision of skin exposing fascia

Figure 4: Incision of muscles to expose fractured bone

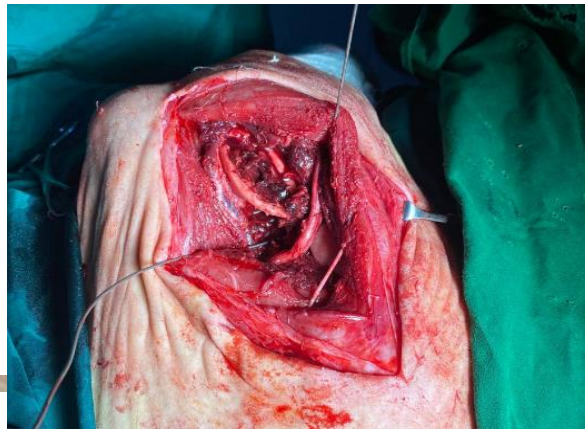

Figure 5: Exposing the fracture after incising muscles

Figure 6: Drilling removed bone fragment

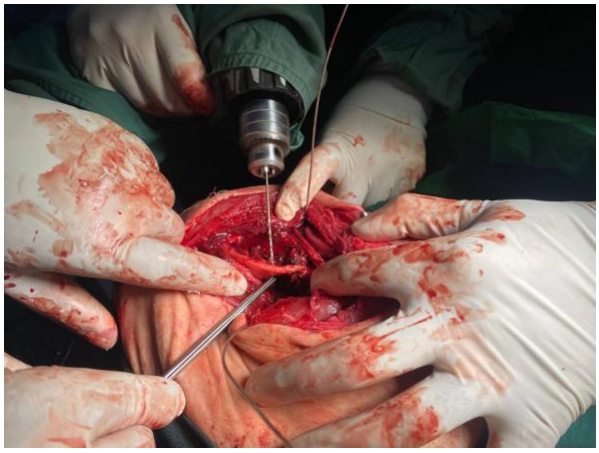

Figure 7: Drilling the bone for wiring

Figure 8: Wiring through bone fragments

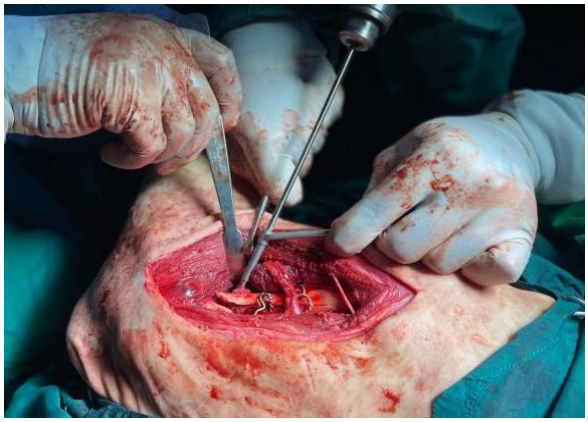

Figure 9: Drilling screw in the bone fragment

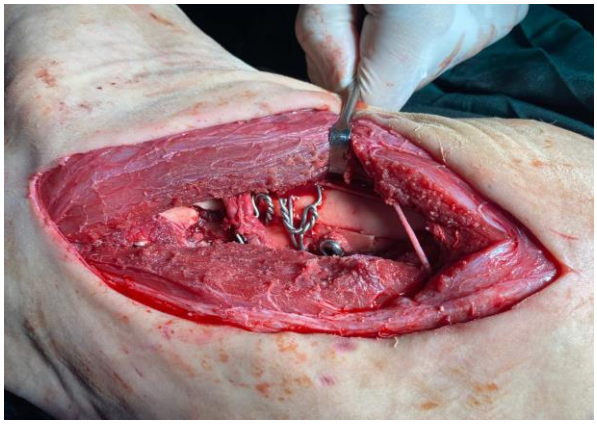

Figure 10: Adjusting the humerus position after finishing the wiring and interlocking with nails

Figure 11: Muscles are apposed by suturing

Figure 12: Muscles are apposed by vicryl in simple continuous pattern

Figure 13: Subcutaneous suture is done by vicryl

Figure 14: Horizontal suture is done on skin by nylon

Figure 15: Modified Thomas splint used in calf

Figure 16: Radiography of left humerus of calf after surgery

Post-operative Care

The calf was given careful post-operative care after the surgery. The patient received intramuscular injections of a fluoroquinolone antibiotic (Marbo vet®) at a dosage of 2 mg/kg body weight for seven days. Additionally, patients received dosages of a non-steroidal anti-inflammatory drug (Fixin vet®) at 1.2 mg/kg body weight and an antihistaminic (Hista vet®) at 1 mg/kg for five and six days, respectively. A careful application of 5% Povidone Iodine ointment was made twice a day for 21 days in order to prevent external bacterial infection of the surgical incision. In order to ensure that the calf healed and recovered properly, the surgical site was carefully examined after two weeks, and the skin suture was carefully removed.

Follow-up and Recovery

In order to ensure that the calf healed and recovered properly, the surgical site was carefully examined after two weeks. Then the skin suture was carefully removed after ensuring no complications in surgical wound. After 45 days, the patient fully recovered and started to bear weight by left forelimb.

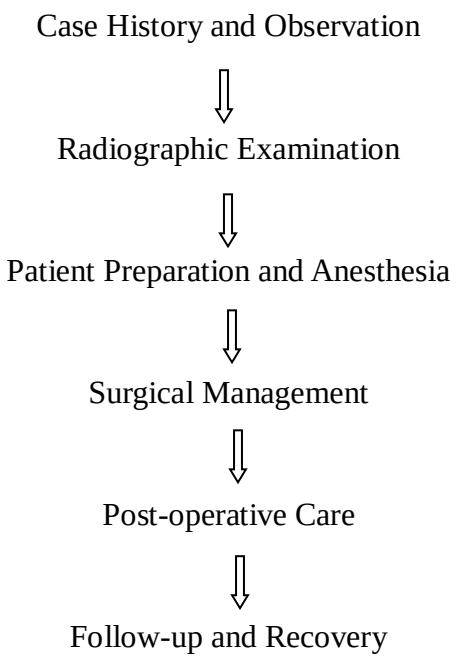

Figure 17: Chronology of Work

Chapter 3: Result

The wiring and interlocking nails were favorably received by the calf, and the fracture healed entirely. No alterations in the interlocking nail's configuration or bone lysis were noted during the postoperative clinical or radiological exams. No signs of nerve or blood vessel injury or deformities from excessive weight bearing were present. There were no significant side effects, such as osteomyelitis. There were no post-operative complications found. By the fifteenth day, the cattle had worked with their limbs touching the ground, and 45 days later, the calf started bearing weight.

Chapter 4: Discussion

Circumstances, expectations, and the considerable impact of economic issues complicate the management of fractures in cows. Fortunately for them, most cattle are compliant patients who typically spend a lot of time lying down during recovery, preventing overloading of bone implants (Crawford and Fretz, 1985). Because they have more blood vessels in their bones and a more mature osteogenic layer in the periosteum, cattle also have better capacity for bone healing. Additionally, because of their higher weight bearing, they are unlikely to experience issues in the unaffected limbs (St-Jean and Anderson, 2014).In this instance, early stabilization of the fracture at the scene using an interlocking screw and wiring improved the prognosis by keeping a closed fracture from opening up, stopping more fracture fragmentation, and lessening fracture end eburnation. According to reports, internal fixation procedures for cattle have included DCPs (St-Jean and Anderson, 2014), clamp rod internal fixators (Gamper et al., 2006), and intramedullary pinning (Nichols et al., 2010). Certainly, when comparing the surgical approach of interlocking nails and wiring techniques for cattle fracture management, several considerations come into play. Interlocking nails offer robust stabilization, preventing the fracture from opening up and reducing further fragmentation, thereby enhancing the overall prognosis. Compared to external fixation techniques, internal fixation techniques offer better fracture reduction, interfragmentary compression, and biomechanical stability but are more costly and more invasive (St- Jean and Anderson, 2014).. However, this method tends to be more invasive and expensive, requiring careful consideration of the financial implications and the potential impact on the cow's well-being. It is crucial to balance the benefits of reduced invasiveness and lower costs with the potential drawbacks related to stability and potential complications during the recovery period. Ultimately, the choice between these two techniques must be guided by the specific circumstances of the fracture, the overall health of the cow, and the economic factors involved. A comprehensive evaluation of the individual case, in consultation with experienced veterinary professionals, can aid in determining the most appropriate course of action.

Limitation

The limitation of this surgical procedure is that the success rate couldn't be calculated as there was the absence of previous literature on the surgical approach to humerus fracture of the calf in Bangladesh.

Conclusion

Eventually, this case report illustrates how a careful surgical approach—more especially, the wire technique was used to successfully treat a calf's humerus fracture. In addition, the careful monitoring and The calf's gradual return to being able to support its own weight is a good outcome that highlights how well the selected intervention worked to promote successful fracture healing and functional restoration. The present case report underscores the significance of tailored treatment strategies that take into account the unique attributes of the fracture, the animal's state, and the financial limitations. These factors are critical in ascertaining the most suitable course of action for the effective management of humerus fractures in cattle.

References

Crawford WH. Fretz PB (1985): long bone fractures in large animals a retrospective study. Veterinary Surgery:14:295-302

Ferguson JG (1982): Management and repair of bovine humeral fractures. Compend Contin Educ Pract Vet 4:5128-135,

Ferguson, J. D. (1997): Surgical conditions of the proximal limb, pp. 262-276. In: Lamenesss in Cattle, 3rd ed. (Greenough. P. R. ed.), W. B. Saunders Company. Philadelphia.

Gamper S. Steiner A. Nuss K, et al (2006): Clinical evaluation of the Crif 4.5/5.5 system for long-bone fracture repair in cattle. Vet Surg:35:361–368.

Hickman J (1957): The treatment of fractures in farm animals, Vet. Rec 69:1227-1236

Inas N. M Mostafa. A Habak and H Harb (2012): Biomechanical studies on femoral fracture repair fixed by different fixation methods in dogs. J. American Sci., 8: 216-222

Nichols S. Anderson DE, Miesner MD, et al (2010); Femoral fractures in cattle: 26 cases (1994-2005). Aust Vet 1:88:39-44

Rakestraw, P. C. (1996) Fractures of the humerus. Vet. Clin. North Am. Food Anim Pract. 12: 153-168.

St-Jean G. Anderson DE (2014): Decision analysis for fracture management in cattle. Vet Clin North Am Food Anim Pract :30:1-10

Tulleners EP (1986). Management of bovine orthopedic problems. Part 1: Fractures. Compend Contin Educ Pract Vet 8:$69-$80

Acknowledgments

All glory belongs to "Allah," who both created everything in nature and made it possible for me to finish my studies. It gives me great pleasure to convey my sincere gratitude and debt of gratitude to my supervisor, Dr. Md Ridoan Pasha, Assistant Professor, Chattogram Veterinary and Animal Sciences University, Department of Physiology, Biochemistry and Pharmacology, for his academic advice, insightful suggestions, unwavering inspiration, and encouragement during my entire study tenure. I am also grateful to Dr. Bibek Chandra Sutradhar, Professor, Department of Medicine and Surgery for the support and inspiration during the surgical procedure.

I would like to convey my sincere appreciation and thanks to Professor Dr. A. K. M. Saifuddin, Director of External Affairs, and Professor Mohammad Lutfur Rahman, Dean, Chattogram Veterinary and Animal Sciences University, for establishing this kind of research work as a necessary part of the internship program.

Finally, I would like to acknowledge and thank my beloved family for their support and encouragement throughout my journey. They never ceased to inspire me and without their gracious assistance.

In closing, I would like to express my gratitude to all of the participants in the course and my regret for not mentioning every one of them by name.

The Author

Biography

I am Rakibul Alam Prachurja. I was born in Nimtola, an area of Chattogram district. I passed my Secondary School Certificate (SSC) examination from Hatey Khari School and College, Chattogram in 2015 and Higher Secondary Certificate (HSC) examination from Govt. Cambrian College, Chattogram in 2017. I enrolled for Doctor of Veterinary Medicine (DVM) degree in Chattogram Veterinary and Animal Sciences University (CVASU), Chattogram, Bangladesh in 2017-2018 session. In the near future, I would like to work and have interest in research field in Epidemiology.