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Surgical correction of bilateral compound mandibular fracture in a 7-day-old calf by acrylic external skeletal fixation

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Abstract

A seven-day-old neonatal calf was presented to the Department of Veterinary Surgery and Radiology, Veterinary College Hebbal, Bengaluru, with a history of mandibular trauma due to improper handling of the lower jaw with an eye hook during dystocia. On physical examination revealed dropped lower jaw, drooling of saliva, functional impairment and fractured ends were seen at horizontal ramus of mandible. Based on clinical findings case was tentatively diagnosed as compound bilateral mandibular fracture and decided for surgical correction. Animal was restrained in lateral recumbency and sedated with Xylazine HCl and Mandibular nerve block with 2% lignocaine along the length of mandible. Fractured fragments were reduced and stabilized with transcortical end threaded pins and anchored to a custom-molded acrylic external bar using endotracheal tube, creating a rigid external skeletal fixator that provided robust coaptation. Sixty days post-operatively, the animal showed uneventful recovery with full resumption of normal feed intake.

Keywords: Mandibular fracture, neonatal calf, acrylic external skeletal fixation, transcortical pin

Introduction

Mandibular fractures although relatively uncommon in ruminants (Ducharme, 2004) ^[2], represent the most frequently encountered cranial fractures in cattle, with the interdental space and the molar region of the horizontal ramus being the most affected sites (Lischer *et al.*, 1997) ^[3]. Severe contusions, traffic accidents and the use of snare for forced extraction of foetus could cause mandible fractures (Dirksen, 1978; Turner, 1984; Nuss *et al.*, 1991) ^[1, 9, 5]. Calves with fractures in the rostral region of both mandibles within the interdental space often experience substantial displacement. This condition resulted in jaw drooping, feeding difficulties, excessive salivation, and functional impairment, necessitating surgical intervention (Susan and Norm, 2004) ^[7]. The principal objective of surgical repair is the temporary immobilization of fracture fragments to restore painless mastication and rumination until healing through callus formation achieves permanent stabilization (McIlwraith and Jennings, 1984) ^[4]. Multiple fixation techniques had been described for bovine mandibular fractures, including figure-eight wiring, screw fixation, U-bar splints, bone plating (Ducharme, 2004) ^[2], and intramedullary pinning (Wallace, 1971; Ducharme, 2004) ^[10, 2]. However, complications such as osteomyelitis, alveolar periostitis, and sequestrum formation were frequently associated with these fractures and might compromise functional recovery (Lischer *et al.*, 1997) ^[3].

Materials and Methods

A Seven-day-old calf was presented to the Department of Veterinary Surgery and Radiology, Veterinary College Bengaluru, with a history of mandibular trauma caused by mishandling with an eye hook during dystocia (Fig. 1). Physical examination revealed there was a dropped lower jaw, hypersalivation, exposure of fractured bone ends, and functional impairment. Based on history and clinical signs the case was tentatively diagnosed as bilateral compound mandibular

fracture and decided for surgical correction. The calf was restrained in lateral recumbency and sedated with Inj. Xylazine HCL (0.05mg/kg b.wt. I.M.) and surgical site was prepared aseptically using 5% povidone iodine with surgical spirit. Mandibular nerve block using 2% Lignocaine was carried out. Following debridement of necrotic soft tissue, contaminated wound edges, and devitalized bone, the fracture ends were exposed and anatomical reduction was achieved manually. A 2.5mm end threaded negative profile transcortical pins were inserted in ramus of mandible in a parallel orientation (Fig. 2). An 8 mm endotracheal tube was used as the connecting bar, the pins were anchored into the tube (Fig. 3) and secured with cold-cure dental acrylic to create a custom-molded rigid external skeletal fixator (Fig. 4). Wound margins were apposed using Polyamide suture No. 1 in a simple interrupted pattern. Post operatively, calf was administered with Inj. Ceftriaxone tazobactam (10mg/kg b.wt.I.V.) BID for five days, Inj. Meloxicam (0.3mg/kg b.wt.I.V.) SID for three days.



Fig 1: Trauma to the mandible



Fig 2: Insertion of 2.5mm transcortical pins



Fig 3: ET tube used as external connecting bar



Fig 4: Molding of cold cure dental acrylic

Results and Discussion

The surgical technique provided immediate stabilization of the mandibular fragments. Post-operatively, the calf was bright, alert, and able to consume liquid feed within 48 hours. By day 30, the external skeletal fixator construct remained stable, with no evidence of pin loosening or local infection, and the animal resumed prehension and mastication of solid feed. On 60th post operative day clinical evaluation confirmed complete functional recovery with rigid stability at the fracture site, and radiographic assessment revealed satisfactory callus formation and bridging of the fracture gap (Fig. 5) and osteolytic changes observed at one pin insertion site in mandible which healed post operatively with debridement.



Fig 5: On 60th post operative day complete healing with callus formation

Mandibular fractures in calves, particularly bilateral compound types, present a significant challenge due to the limited bone stock, presence of developing teeth, and constant exposure to oral microflora (Ducharme, 2004; Lischer *et al.*, 1997) [2, 3]. In neonatal calves, internal fixation methods such as bone plating or intramedullary pinning are often impractical due to small bone dimensions, potential injury to developing tooth buds, and risk of implant failure (Wallace, 1971; Susan and Norm, 2004) [10, 7]. Traditional wiring and U-bar splints, although effective in simple fractures, may not provide adequate stability in compound and bilateral fractures (Dirksen, 1978; Turner, 1984) [1, 9]. External skeletal fixation offers several advantages in such cases, including minimal invasiveness, preservation of blood supply, easy access for

wound management, and the ability to achieve rigid stabilization even in contaminated fractures (Troostle *et al.*, 1998; Shires, 1994) [8, 6]. In the present case, use of transcortical negative-profile pins combined with an acrylic connecting bar anchored in an endotracheal tube provided a lightweight, inexpensive, and custom- molded construct, which was well tolerated by the calf. Daily pin insertion site care with povidone iodine minimized infection, and fracture healing progressed uneventfully. These findings support earlier reports that external skeletal fixation is a practical and cost-effective alternative for compound mandibular fractures in bovines, particularly neonates (Nuss *et al.*, 1991; Ducharme, 2004) [5, 2]. The technique requires minimal specialized equipment, can be performed under field conditions, and provides robust stabilization until fracture healing is achieved.

Conclusion

The present report demonstrates that acrylic external skeletal fixation using transcortical negative- profile pins and an endotracheal tube-acrylic bar construct provided an effective, economical, and minimally invasive method for stabilizing bilateral compound mandibular fractures in neonatal calves. This technique achieved rapid functional recovery, allowed early return to normal feeding, and avoided complications commonly associated with internal fixation in young ruminants. Given its simplicity, low cost, and adaptability to field conditions, acrylic external skeletal fixation represents a practical alternative to traditional fixation methods for managing complex mandibular fractures in calves.

Conflict of Interest

Not available

Financial Support

Not available

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