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Non-surgical management of congenital flexural tendon deformity in a neonatal calf: a case report

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ABSTRACT

A two-day-old non-descript male calf was presented with severe bilateral congenital flexural deformity of the fetlock joints. Instead of surgery, conservative management was adopted. A carved polystyrene block was secured behind the fetlock joint, while a dorsal bamboo splint was applied over cotton padding to stabilize and align the limb. Bandage tension was adjusted daily with close monitoring for complications. The calf showed progressive clinical improvement, normal weight-bearing, and unrestricted locomotion within one month. Early non-surgical splinting using low-cost materials provides an effective alternative to tenotomy in resource-limited field practice.

Keywords: Knuckling, Congenital flexural deformity, Tendon, Congenital deformity, Fetlock, Calf

Introduction

Congenital flexural tendon deformities (CFTDs) are common musculoskeletal anomalies in neonatal calves, significantly affecting their ability to stand and walk (Chakraborty *et al.*, 2023) [1]. These deformities are characterized by shortened musculotendinous units (Sağlam, 2021) [2], particularly involving the superficial and deep digital flexor tendons (Abhishek *et al.*, 2024) [3]. They most commonly affect the fetlock or carpal joints, resulting in knuckling which leads to an abnormal stance or gait (Anderson *et al.*, 2008) [4]. These deformities affecting both the forelimbs and hindlimbs, although they predominantly involve the forelimbs (Rashmi *et al.*, 2018) [5] and are generally bilateral (Weaver *et al.*, 2005) [6].

The causes of CFTDs are multifactorial. Several factors—including species, breed, geographic location, season, and other environmental conditions—have been implicated in the occurrence of this disease. Furthermore, fetal malnutrition during gestation, abnormal fetal positioning, and disproportionate fetal growth relative to the uterine environment are considered potential contributors to its aetiology (Sağlam, 2021) [2]. Also flexural deformities have been closely linked to imbalances in iron, zinc, and vitamin D, highlighting the importance of addressing these deficiencies in pregnant dams (Chakraborty *et al.*, 2023) [1]. Classification is based on severity: in mild cases, calves walk on their toe tips; in moderate cases, weight is borne on the dorsal hoof surface; in severe cases, the calf stands or walks on the pastern or fetlock joint (Sağlam, 2021; Rashmi *et al.*, 2018) [2, 5]. Early identification and prompt treatment of flexural deformities are crucial, as delayed intervention leads to tissue contracture and reduced responsiveness over time (Ram Niwas *et al.*, 2020) [7].

History

A 2-day-old non-descript male calf was presented with a congenital deformity of both the forelimbs. The calf bore weight directly on the flexed fetlock joints as it was unable to stand on the toes or dorsal surface of the hooves (Figure 1). Despite the postural abnormality, the calf showed a normal appetite, was alert, and had no systemic abnormalities. Physical examination revealed severe flexion of the fetlock joints with moderate rigidity when extension of the said joint was attempted ruling out ankylosis. Based on the physical examination, the case was diagnosed to be that of severe flexural contraction of the fetlock joints necessitating immediate orthopaedic intervention.

Treatment

Due to economic constraints and non-compliance of the owner for surgery, a non-surgical conservative approach was initiated with the goal to realign the fetlock joint gradually allowing tendon elongation via mechanical correction.

A conservative approach was adopted with the objective of reducing tendon contraction using locally sourced materials. A firm thermocol (polystyrene foam) cube was shaped appropriately and placed posterior to the affected fetlock and interphalangeal joints to provide targeted support and counteract the flexural force

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(Figure 3). This passive resistance reduced pressure on the joint promoting correction of the abnormal stance. Also a bamboo splint was applied dorsally along the limb from the hoof to the mid-forelimb, reinforcing joint stability. Generous cotton padding was used for cushioning to prevent pressure necrosis (Figure 3). The bandage tension was adjusted daily to extend the contracted tendons and enhance joint positioning. The calf was monitored daily for alignment, skin integrity, circulation, and comfort.

To alleviate discomfort and reduce soft-tissue inflammation associated with mechanical stretching, the calf was administered supportive non-steroidal *anti*-inflammatory therapy during the initial days. In addition, the calf was given daily oral calcium and multi-vitamin supplement to support bone strength and address possible nutritional deficiencies.

Result

Improvement was observed within ten days of initiation of treatment. The calf was seen bearing weight on the dorsal surface of the hooves by day 10 followed by weight-bearing on its toes by day 18 (Figure 4). The forelimbs regained normal position with full weight-bearing and locomotor function by the end of the month (Figure 5). The calf exhibited normal standing, walking, and running with no sign of discomfort (Figure 6).

Discussion

Congenital flexural tendon deformities (CFTDs) of severe degree are commonly managed via surgical tenotomy of the superficial and deep digital flexor tendons (Rashmi *et al.*, 2018; Abhishek *et al.*, 2024) [5, 3]. However, surgical intervention poses substantial challenges under field conditions. Tenotomy carries risks of muscle and tendon atrophy, adhesion formation, decubital wounds, post-operative hyperextension (Rashmi *et al.*, 2018; Anderson *et al.*, 2008; Sato *et al.*, 2020) [5, 4, 8], surgical site infection and wound dehiscence. Additionally, the need for aseptic surgical environments, repeated antibiotic therapy, and intensive wound care imposes an economic burden that live-stock owners often refuse.

This case demonstrates that severe CFTDs can be corrected non-surgically when intervention begins promptly after birth also observed by Sağlam (2021) [2]. During the first few days of life, neonatal tendons and periarticular tissues exhibit high biological compliance, allowing gradual mechanical lengthening and remodelling without tendon transection (Sağlam, 2021; Chakraborty *et al.*, 2023) [2, 1].

The choice of splinting materials was crucial to the outcome of this case. The combination of carved polystyrene foam (thermocool) and a rigid dorsal bamboo splint provided an effective, readily available, low-cost biomechanical solution. The firm thermocol block served as an anatomically conforming palmar cushion that distributed focal pressures across the flexor aspect of the joint, preventing pressure necrosis, while simultaneously acting as a fulcrum to resist reflex knuckling. Concurrently, the dorsal bamboo splint maintained normal skeletal alignment and stabilized the limb's weight-bearing axis, allowing gradual mechanical lengthening of the contracted flexor tendons.

The timeline observed here—transitioning from flexed-joint knuckling to dorsal-hoof weight-bearing by day 10, toe-bearing by day 18, and full clinical resolution by day 30—mirrors the physiological rate of soft tissue remodeling documented by Sağlam (2021) [2]. Consistent monitoring was paramount. Because neonatal skin is delicate and prone to bandage pressure, adequate padding and routine monitoring are essential to prevent sores and swelling over bony

prominences (Anderson *et al.*, 2008) [4]. Daily dressing changes permitted direct inspection of perfusion and tissue integrity and also allowed incremental increases in bandage tension as tendon compliance improved. Ultimately, diligent owner compliance with daily bandage care and early reporting of complications was essential to the success of this non-surgical protocol under field conditions.

Conclusion

This case highlights that severe congenital flexural tendon deformities in neonatal calves can be successfully managed using structured, non-surgical protocols. Usage of low-cost, readily available materials such as thermocol and bamboo splints for mechanical support, along with consistent monitoring and bandage adjustments led to full recovery. This technique offers a practical and cost-effective alternative to surgical correction, particularly in rural or resource-limited settings. Timely recognition and management are key to preventing permanent disability and reducing the need for surgical intervention.

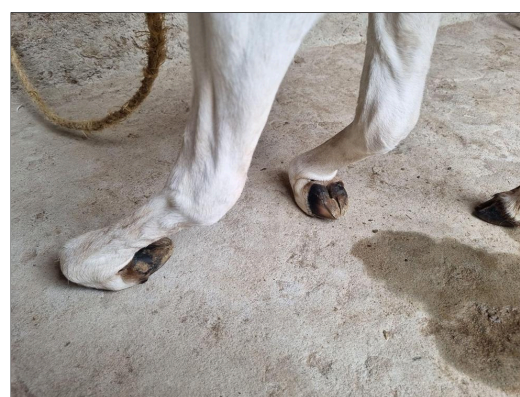


Figure 1. Close-up view of distal forelimbs showing severe bilateral flexural deformity with extreme knuckling at the fetlock joints.



Figure 2. Full-body presentation depicting abnormal posture and restricted mobility



Figure 3. External coaptation with carved polystyrene foam (thermo-col) buttress, dorsal bamboo splint and generous cotton padding.



Figure 5. complete recovery showing correct plantigrade foot placement, and normal weight-bearing.



Figure 4. Intermediate recovery phase showing significant reduction in flexural contraction with realignment of the metacarpophalangeal axis and active toe-bearing.



Figure 6. Full-body presentation depicting normal posture on day 30.

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