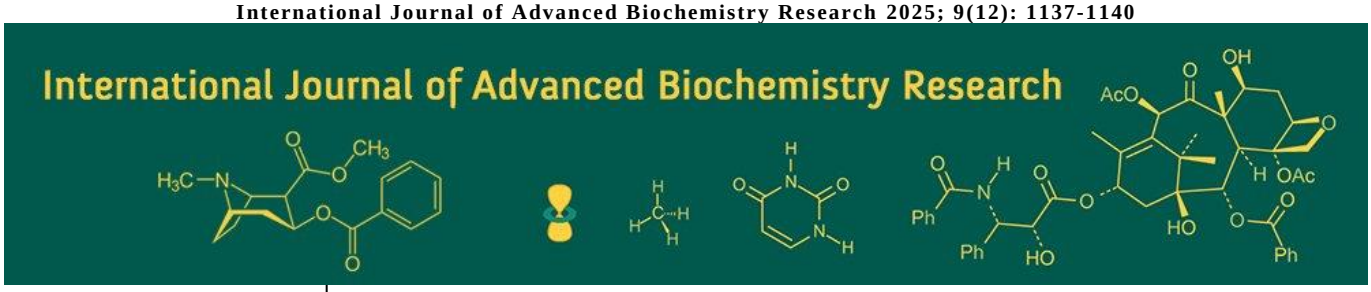

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Surgical management of Achilles tendon rupture in a non-descript Caprine kid

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Abstract
A two-month-old female non-descript goat kid was brought to veterinary dispensary following an accidental injury caused by a door hinge, leading to the sudden onset of complete inability to bear weight on the right hind limb. Detailed orthopedic evaluation indicated disruption of the right Achilles tendon, evidenced by abnormal hock angulation and loss of limb support. Surgical correction was undertaken to restore tendon continuity. The ruptured tendon ends were reconstructed using a three-loop pulley suture technique to ensure secure fixation and adequate tensile strength. Postoperative stabilization was achieved by immobilizing the entire affected hind limb with a plaster of Paris cast to promote optimal healing conditions. Strict movement restriction and routine postoperative care were maintained throughout the recovery period. After 50 days, the cast was carefully removed, revealing satisfactory tendon healing without complications. A structured physiotherapy regimen was subsequently implemented for 15 days to improve joint mobility, muscle strength, and functional limb usage. Gradual and consistent improvement in locomotor function was observed during rehabilitation, ultimately resulting in complete restoration of normal weight-bearing and gait. This study demonstrates that timely surgical intervention combined with effective external immobilization and planned rehabilitation can lead to successful functional outcomes in Achilles tendon injuries in young animals.

Keywords: Achilles tendon, goat, immobilization, tenorrhaphy, three-loop pulley suture

Introduction
In ruminants, the Achilles tendon, commonly referred to as the Common Calcaneal Tendon (CCT), is a robust band of connective tissue and the largest tendon in the body, is particularly prone to injury because of its superficial position and relatively poor blood supply. This tendon is vital for hock extension and enables normal activities including standing, walking, and jumping. It is formed by the convergence of tendons from five muscles, resulting in three major tendinous components derived from the gastrocnemius, superficial digital flexor, biceps femoris, gracilis, and semitendinosus muscles (Dyce *et al.*, 2009) [6]. Functionally, the gastrocnemius muscle plays a key role in extension of the hock joint and flexion of the stifle joint; however, these movements do not occur at the same time (Sisson and Grossman, 1953) [12]. In ruminants, rupture of the Achilles tendon or gastrocnemius muscle represents a severe clinical condition and may arise from excessive mechanical stress, especially in hilly terrains, due to accidental trauma (Anderson *et al.*, 1996) [1] such as lacerations from sharp objects, road traffic accidents, and injuries sustained during fights or aggressive encounters (Dal-Bó *et al.*, 2016) [5] or intentional injury like maiming. Moreover, in cows affected by post-partum paralysis or hypocalcaemia, repeated efforts to stand can impose excessive strain on the tendon, predisposing it to rupture (Tyagi and Singh, 2010) [15]. Repair and clinical management of a severed tendo Achillis in large animals present considerable difficulty, whereas in small ruminants is quite easy due to the less body weight. The main goal of treatment is to restore sufficient tensile strength so that the animal can effectively support body weight (Raghunath *et al.*, 2014) [10]. Successful management of such cases requires meticulous tendon repair combined with adequate immobilization of the affected limb using appropriate supportive devices to facilitate proper tendon healing (Mahajan and Gupta, 2016) [8]. Previous studies have shown that the formation of new tendon tissue typically requires a minimum period of 90 days (Kumar *et al.*, 2002) [7]. Additionally, successful surgical outcomes depend on maintaining limb immobilization for at least six weeks following tendon

repair (Worth *et al.*, 2004) [16]. This report documents the successful surgical repair and post-operative management of an Achilles tendon injury in a non descript kid.

History and clinical examination

A two-month-old female non-descript kid weighing 3 Kg was brought to Veterinary dispensary Mukkudal of Tirunelveli district of Tamil Nadu with the history of being unable to bear weight in right hindlimb after hitting by door hinge for the past 12 hrs and the right hock was dropped (Fig. 1). The feed and water intake, urination and defecation were normal. On physical examination, there was a mild lacerated wound above the right hock on caudal aspect. A swelling was noticed above the hock joint and an area of relaxation/gap was felt in the tendon's continuity. In addition, flexor tension of the digits was absent on flexing the hock joint with stifle extension. On clinical examination, all the physical parameters like temperature, heart rate and respiration rate were normal. Thus, the case was diagnosed as ruptured right tendo Achilles and the surgical reconstruction was attempted.

Treatment

The kid was sedated with xylazine hydrochloride at 0.1mg/Kg intramuscularly and the kid was casted on left lateral recumbency. The surgical site was prepared aseptically. Local anaesthetic Lignocaine hydrochloride was administered around the surgical site at the dose rate of 3 mg/Kg. Linear incision was made parallel to the rupture tendo achilles on the caudal aspect and the severed tendon ends were exteriorized (Fig. 2) and the margins were debrided. By keeping the hock joint in the extension position, the cut ends were brought near for suturing. Tenorrhaphy was carried out by three loop pulley suture using vicryl No.1-0 (Fig. 3). The skin was apposed by simple interrupted pattern using sutures silk No.1 (Fig. 4). The surgical wound was cleaned and plaster of paris was applied as external coaptation to prevent tension on the affected tendo Achilles (Fig. 5). A window was created in the plaster of paris for regular dressing of the suture site. Postoperatively, antibiotic amoxycillin was administered at the dose rate of 20mg/kg intramuscularly, and analgesic meloxicam was administered at the dose rate of 0.5 mg/kg intramuscularly for 5 days. Skin sutures were removed on 10th postoperative day. Plaster of paris was removed after 50 days (Fig. 6). The kid recovered progressively and was able to bear weight after 65 days (Fig. 7).

Fig 1: Kid showing dropped right hock

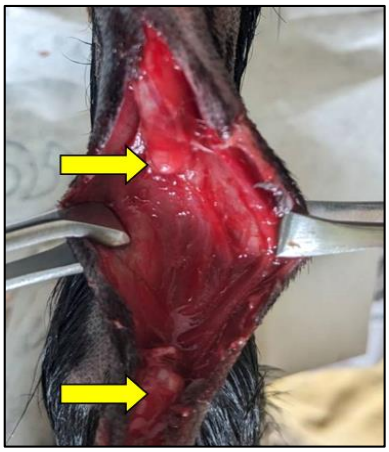

Fig 2: Severed ends of tendo Achilles

Fig 3: After Tenorrhaphy using three-loop pulley suture

Fig 4: After skin closure

Fig 5: Plaster of Paris external coaptation application after tenorrhaphy

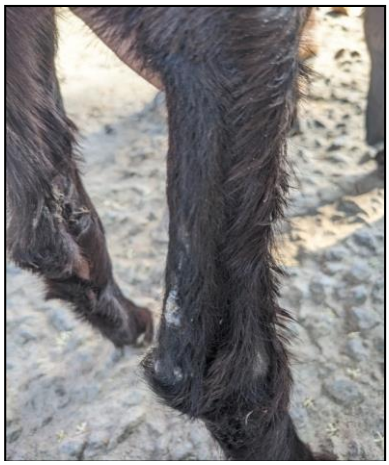

Fig 6: Day 50 postoperative

Fig 7: Day 65 postoperative

Fig 8: Day 90 postoperative

Discussion

The majority of achilles tendon injuries in animals are attributed to traumatic causes or aggressive encounters. Rupture of the tendon leads to pain and functional impairment, typically resulting in a characteristic plantigrade posture, where flexion of the tarsal joint occurs simultaneously with extension of the stifle joint (Reinke *et al.*, 1993; Mahajan and Gupta, 2016) [11, 8]. For acute Achilles tendon ruptures, primary surgical repair through tenorrhaphy is considered the treatment of choice. The fundamental principles of tendon surgery include strict aseptic technique, gentle tissue handling, use of fine non-reactive sutures, and proper immobilization of the affected area throughout the healing process (Tyagi and Singh, 2010) [15]. In this case, the animal was presented at prompt time without any delay, hence immediate tenorrhaphy was done. In case of delayed cases, regular dressing was recommended to promote the formation of granulation tissue prior to the commencement of tenorrhaphy. For debridement, finely powdered copper sulfate can be used, as it serves as an astringent, chemical debrider, antiseptic, germicidal, fungicidal, virucidal agent, and promotes tissue growth (Behera *et al.*, 2012) [2].

Immediate suturing is generally the preferred treatment for tendon injuries, aiming to create a strong repair that resists gap formation at the anastomosis site and provides adequate support during healing. The chosen suture pattern should preserve tendon blood supply and minimize the risk of adhesions (Moores *et al.*, 2004) [9]. Suture material must be inert, strong, easy to handle, and able to maintain tensile strength until the tendon regains its own strength. Usually, Monofilament polypropylene or nylon is commonly recommended for tendon repair, and the largest size that can be passed through the tendon without causing damage is preferred (Bloomberg, 1993) [4]. Very larger suture material sizes may provoke excessive tissue reaction and impair healing (Spinella *et al.*, 2010) [14]. Gap formation at the repair site can significantly delay tendon healing, and tendons with gaps exceeding 3 mm are at higher risk of rupture during the first six weeks post-surgery (Moores *et al.*, 2004) [9]. Alternative suture materials such as steel wire, polydioxanone, or polyglyconate can also be used according to species, age and weight. In this case, No. 0 Vicryl was used, which offered sufficient tensile strength throughout the healing period. Vicryl, an absorbable suture made of polyglactin 910, is widely used in tendon repair nowadays, particularly for extensor tendons. Research indicates that it provides adequate tensile strength during the critical healing period and may allow better joint mobility compared to some non-absorbable sutures, such as Prolene. Being absorbable, Vicryl reduces the risk of long-term complications like granuloma formation, while offering temporary support until the tendon regains its own strength which is essential to minimize adhesions and optimize functional recovery (Mahajan and Gupta, 2016) [8].

To immobilize the limb following tenorrhaphy, previous studies have utilized methods such as transarticular external skeletal fixators (TESF), calcaneo-tibial bone screws, and various splints or casts (Behera *et al.*, 2012) [2]. In the present case, a plaster of paris cast with window maintaining fetlock extension was applied to reduce tension along the suture line, preventing gap formation and facilitating faster healing. The cast window in this case allowed for regular wound dressing without compromising immobilization. The animal was able to bear weight on the affected limb with the support of a plaster of paris cast.

The prognosis for returning to prior levels of activity depends on factors such as the age, extent of skin injury, the severity of tendon and ligament damage, and whether synovial structures are involved (Belknap *et al.*, 1993) [3]. Since the kid is very young in this case, the recovery was soon than expected. In this case, since the tendon was completely transected, sutures and immobilization devices were removed on the 50th day post-operation. The animal was then allowed mild exercise in an enclosure for 15 days. Plaster of paris casts, may lead to challenges such as impaired wound care, muscle atrophy, and pressure sores

(Marchevsky *et al.*, 2001) [13]. In the present case mild muscle atrophy was encountered during plaster of paris removal, but it was managed by gradual physiotherapy/limb flexion exercises and hot fomentation were performed during the final 15 days. Full recovery was achieved through a period of controlled, gentle exercise. In conclusion, the three-loop pulley technique using vicryl suture material was found to be effective for tenorrhaphy. Postoperative stabilization of the limb with a plaster of paris cast incorporating a window is essential to ensure complete tendon healing and satisfactory clinical recovery.

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