



Review Article

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## *Updates in Management of Achilles Tendon Rupture: Simple Literature Review*

Gadah Ahmed Alshahwan<sup>1\*</sup>, Anas Mohammed Alomair<sup>2</sup>, Nawaf Abdalwahab Almondil<sup>2</sup>, Abdullah Fahmi Al Khars<sup>3</sup>, Ashjan Saleh Akram<sup>4</sup>, Abdulaziz Lutfi Alkorbi<sup>5</sup>, Mohamed Abdullah Alsehly<sup>5</sup>, Hatim Abdulali Alshaikh<sup>6</sup>, Faisal Khalid Alabdali<sup>7</sup>, Abdulrahman Mohammed Alshehri<sup>7</sup>

<sup>1</sup>Department of Medical Science, Faculty of Medicine, Alfaisal University, Riyadh, Saudi Arabia

<sup>2</sup>Department of Medical Science, Faculty of Medicine, Al Jouf University, Al Jouf, Saudi Arabia

<sup>3</sup>Department of Medical Science, Faculty of Medicine, King Faisal University, Al Ahsa, Saudi Arabia

<sup>4</sup>Department of Medical Science, Faculty of Medicine, Taibah University, Madina, Saudi Arabia

<sup>5</sup>Department of Medical Science, Faculty of Medicine, King Saud University, Riyadh, Saudi Arabia

<sup>6</sup>Department of Medical Science, Faculty of Medicine, King Abdulaziz University, Jeddah, Saudi Arabia

<sup>7</sup>Department of Medical Science, Faculty of Medicine, Tabuk University, Tabuk, Saudi Arabia.

\*Email: [ghada.shahwan5@gmail.com](mailto:ghada.shahwan5@gmail.com)

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### ABSTRACT

**Background:** Achilles tendon rupture (AT) is considered a subversive injury for the young athletes since its full recovery takes 12 months. In addition to this, there is escalation in the risk of re-injury of the same tendon. **Objective:** In this review, we aim to assess and evaluate Achilles tendon rupture mechanism of injury, and its diagnosis and management published in the current literature. **Method:** A comprehensive search was done using biomedical databases including Medline, and PubMed, for studies concerned with evaluation of Achilles Tendon Rupture published in English language. **Keywords used in our search through the databases were** "Achilles Tendon Rupture Mechanism and Pathophysiology", "Achilles Tendon Rupture Management", and "Achilles Tendon Rupture Diagnosis". **Conclusion:** The incidence of Achilles tendon rupture among athletes is common and increasing. Determining the best management option is still controversy among orthopedic surgeons. Open surgery is associated with the lowest rates of re-rupture incidence, but increase risk of other complications. Percutaneous repair was found to have a low complications rate in comparison to open surgery, but it is associated with increased risk of sural nerve injury. The recent studies have clearly demonstrated the effectiveness of functional rehabilitation techniques, with biotherapy as potential future for development.

**Key words:** Achilles tendon Injury, Diagnosis, Management.

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### INTRODUCTION

Achilles tendon is considered as one of the thickest tendons in the human body. Also, it is one of the most commonly injured tendons. It is a frequent injury among patients presenting to orthopedic clinics, the incidence estimated to be 31 per 100 000 per year, and its most common in the young to middle age groups with mean age ranging from 37 to 44 years [1, 2]. The male-to-female ratio was about 6:1 [3, 4]. In a recently published study regarding athletes [5], age and sex were not found to be strong risk factors for Achilles tendon rupture (ATR). This could be due to increased participation in sports by females and older people [6]. At the moment, the orthopedic surgeons are in debate about the optimal management approach for ATR [2]. Conservative management consists of applying equinus cast for six to eight weeks to bring the edges of the ruptured tendon together to enhance the healing. Conservative management is associated with escalation in the risk of re-rupture

and is reserved for less active patients. Operative management is more suitable for younger, more active patients, and has more convenient functional outcomes, with lower re-rupture rates but higher complication rates. Deng et al. mentioned that risk of re-rupture was equal to 3.7% in patients treated surgically and 9.8% in nonsurgical treated patients [7]. Amendola et al. found that the risk of AT re-rupture rate is 3.6% in surgically treated patients compared with 8.8% patients treated conservatively [8]. In this review, we aim to assess and evaluate the recently published literature that discussed different diagnostic and management approaches.

In order to collect the most reliable resources, we performed comprehensive search using biomedical databases; Medline and PubMed, for studies concerned with evaluation of Achilles Tendon Rupture published in English language. Keywords used in our search through the databases were “Achilles Tendon Rupture Mechanism and Pathophysiology”, “Achilles Tendon Rupture Management and “Achilles Tendon Rupture Diagnosis.” More relevant articles were recruited from references lists scanning of each included study. No software was used, the data were extracted based on a specific form containing title of the study, name of the author(s), objective, summary, results and conclusions.

### Anatomy and Pathogenesis

ATR occurs as a result of poor mechanics and tendon degeneration. AT low blood supply, mainly in the area 2 to 6 cm from the calcaneal insertion can accelerate degeneration process which can lead to spontaneous rupture. Usually, the process of degeneration occurs in old age, but in the younger athletes the AT rupture process is accelerated by the combination of macro- and microtrauma related to high training loads and shorter recovery phases.

### Diagnosis

- **History**

The most common complain of the patients is sudden snap in the lower calf associated with acute and sharp pain. The patients usually report the history of sensation like shot, stamp or cut off in the lower calf. In some few cases, patients could move, but they cannot run, stand on toes or climb stairs. The patients' history in Achilles tendon rupture may also include recurrent calf or Achilles tendon-area pain, previous rupture of the affected tendon, absence of plantar flexion in the effected foot, swelling of the calf, recent use of fluoroquinolones, or corticosteroid injections. Kraemer et al. mentioned that patient with family history of ATR, has an increased risk of having ATR by 5-fold [9].

- **Examination**

During examination of a patient suspected to have AT rupture, it is advised to follow the following approach in order not to miss any significant sign.

**Look:** Swelling and ecchymosis are variable and not reliable.

**Feel:** Palpate the entire gastrocsoleus complex for tenderness, nodules, swelling, warmth, atrophy and tendon defects.

**Move:** Patient with ATR will have difficulties to stand on the toes, absence or weak planter flex.

**Table 1.** The special tests that can help in AT Rupture.

Test	Description
<b>Simmonds-Thompson Test</b>	The patient on prone position, squeezing of calf produce no motion. In normal settings planter flexion of foot will occur.
<b>Hyper- dorsiflexion Sign</b>	High range of passive dorsiflexion of the foot, while the patient in prone position and both knees flexed at 90 degree.
<b>O'Brien Needle Test</b>	A 25 gauge needle is inserted proximal to the calcaneus thru skin of calf muscle, when the Achilles tendon is intact motion of the hub of the needle in a direction opposite that of the tendon during passive dorsiflexion and plantarflexion.

- **Imaging studies**

In the patients with unclear clinical signs, imaging can confirm the diagnosis. Imaging is not indicated in an acute setting to establish the diagnosis. A radiological finding of a ‘partial tear’ should be assumed as a complete Achilles tendon rupture along with the clinical history.

Ultrasound is a quick, cheap, non-invasive imaging modality with 100%, and 89.9% sensitivity and specificity, respectively [10]. Additionally, the ultrasound has the ability to assess the patient's type of tear (Complete or Partial ATR) [11- 13]. It should be noted that MRI is the gold standard and modality of choice for evaluation of the patients with ATR [14].

### Management

Orthopedic surgeons are in a debate about the optimum management approach in ATR patients. There are two lines of management in ATR: surgical and non-surgical. Both lines of management are accepted and depend on the patient condition. In cases of late diagnosis, the use of non-surgical management will carry a great risk of re-rupture due to the lack of apposition of the tendon ends due to scarring and retraction. Therefore, surgical repair is advised [15].

- **Non- surgical**

The goal of conservative management is to restore and keep the alignment between the two ends of the ruptured Achilles tendon in order to facilitate the healing process. Non-operative regimens commonly involve immobilization with rigid casting or functional bracing. The foot should be kept in a full equinus position (30° namely full plantarflexion) for 8-12 weeks. Then, it can be evaluated to assess the healing process and the ability of weight bearing. No significant literature has discussed the differences between applying the cast above or below the knee [16].

- **Surgical**

Orthopedic surgeons are in a debate about the best surgical approach for management of ATR. Concerns about which school to follow (open or percutaneous), suture repair method and suture type are always presented. Authors supporting operative intervention have suggested that the normal tension and length of the tendon can be restored only under direct visualization during an open repair [17, 18]. Additionally, gastrocnemius augmentation involves raising a flap 2 cm wide by 8 cm long which is reflected across the repair and sutured. The Plantaris tendon can also be used. Pajala et al. [19] evaluated the role of tendoachilles repair in management of ATR and found no benefits between augmented and simple end-to-end repair.

Open repair is also believed to be associated with a lesser chances of re rupture and to allow an earlier return of ankle movement following removal of the cast. The disadvantages of surgical intervention include morbidity from wound problems and anesthesia as well as higher costs.

Khan RJ et al. discussed that the use of percutaneous repair is associated with a lower wound infection rates in comparison to open surgery which increases the chances of having a better healing process. This can be attributed to the minimally invasive incisions on the medial and lateral aspect of Achilles tendon and a suture passer [20]. Sural nerve injury is commonly reported during percutaneous repair surgery [21].

## DISCUSSION

### Optimum Management Option

No published data has established the optimal line of management of AT rupture. Khan RJ et al. mentioned that the rate of AT re-rupture is higher (13%) in the patients treated with non-surgical approach in comparison to the patients treated with surgery (4%) [19, 22].

McComis et al. [23] evaluated the concept of functional bracing in management of ATR in a small group of patients. They found that the brace is associated with limited dorsiflexion of the ankle, but helped in immediate weight-bearing and active plantar flexion.

The results have been difficult to be compared directly as there has been no widely accepted scoring system according to which both subjective and objective outcomes can be assessed. Leppilahti et al. [24] addressed this issue by modifying the criteria of Boyden et al. [25] to create a point scoring system to evaluate the effectiveness of functional bracing in management of ATR. They found that 79% of patients treated with functional bracing had an acceptable results in comparison to the surgical group of the patients.

Surgical management can be associated with different complications, such as wound infection (4%), fistula formation, skin necrosis, suture granuloma and damage to the sural nerve [19, 26]. All of them may be avoided with plaster or simple immobilization.

Percutaneous operative repair is associated with a complications profile superior to that of both conservative and open operative repair. Moreover, the published studies report a re-rupture rate of 2% [19, 26].

### **Function Bracing Re-rupture Rate Risk in Compare to Operative Repair**

Studies involving functional bracing suggested that disparity between surgical and conservative management may not be marked as originally suspected. More recent studies showed that re-rupture rates in the patients treated operatively vs. functional bracing are comparative [19, 27, 28]. Kotnis et al. [13] elected to manage conservatively only those patients whose gap in full equinus was less than 5 mm. All others were managed operatively. They found that no significant difference in AT re-rupture rates were seen [13]. Wallace et al. [29] included a total of 875 non-operatively treated Achilles tendon ruptures patients in their study. They found that AT re-rupture rate was 2.9%.

### **High Performing Athletes**

There was a discussion about the advantages of surgical intervention in high performing athletes. The logical thinking for this argument is the possibility loss of power or push off strength with conservative management which is decreased by surgical repair. In general, most studies found that using specific conservative treatment and rehabilitation regimes do not identify a functional advantage to operative repair [28].

### **Biological Adjuncts**

Recent literature has evaluated the role of various biological agents in management of ATR. Knobe M et al. mentioned that Fibrin sealant which is a blood derived product can lead to an anatomical reconstruction that can be compared to suture repair. For a period of 63-week follow-up, they mentioned that in comparison to suture repair, no difference was found in the outcomes and prognosis [30]. Alvitri et al. evaluated the role of platelet rich fibrin (PRF), which has the ability to accelerate tendon cell proliferation and healing process through stimulation of the synthesis of type I collagen in management of ATR. They demonstrated that the patients who were treated with surgical repair plus PRF had a better end results in comparison to the patients who were treated with surgery alone [31]. Additionally, X. Yang et al. evaluated a total of 323 in their systemic review to assess the role of various therapies in management of ATR. They found that the recent literature has demonstrated the role of biotherapy in management of ATR and its significant effect in improving the final outcomes [32].

## **CONCLUSION**

Achilles tendon rupture occurs more frequently in young athletes, mostly females as a result of repeatedly micro and macro trauma to the tendon. In old age, the rupture is accelerated by the degenerative process which occurs as a result of reduction in the blood supply. In order to assess Achilles tendon rupture, the treating physician should do a complete history and physical examination. Radiological imaging study can have a role in further evaluation of unclear case. Achilles tendon rupture management approach consists of conservative and operative approaches. An operative approach is preferred in young athlete injury as it has a lower risk for re-injury.

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