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Achilles Tendon Rupture In Recreational Athletes - Hobby-Ending Incident or Easily Treatable Injury? Current Insight Into Risk Factors, Treatment Options and Recovery Strategies

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Abstract

Introduction and aim of study: Achilles tendon rupture (ATR) is a significant injury, particularly for athletes. If not managed properly, it can lead to complications and hinder athletic performance. This study aims to synthesize existing knowledge on risk factors, treatment, and recovery associated with ATR, helping identify the optimal treatment pathway for a prompt return to sports. It will also highlight prevalent risk factors, aiding in injury prevention for patients and healthcare professionals.

Materials and methods: This literature review summarizes data from PubMed, Google Scholar, and other scientific sources on ATR. Key search terms included “Achilles tendon rupture treatment,” “risk factors,” “Achilles tendon injuries,” and “physiotherapy in ATR.”

Results: Various risk factors for ATR were identified, with some later proven irrelevant, while others remained significant. Treatment options include both non-operative and operative

management, with minimally invasive techniques showing the best outcomes, however each method can be employed in specific indications. The recovery period typically lasts around six months, with rehabilitation being a key component. Other alternative methods and their benefits are being explored.

Conclusion: Optimal outcomes for ATR treatment are achieved through operative intervention, particularly minimally invasive surgery, paired with early rehabilitation. Physical therapy, blood-flow restriction training, and stretching can aid return to sport. Considering risk factors in all patients, especially athletes in contact sports, is crucial. The correct management of Achilles tendon rupture, consisting of early diagnosis, surgical treatment and appropriate rehabilitation, allows recreational athletes to return to their previous sports with a level of performance similar to that prior to the injury.

Keywords: Achilles tendon rupture (ATR), risk factors, treatment, rehabilitation, return to sport

Introduction and aim of study

Despite being the strongest and largest tendon in the human body [1], Achilles tendon ruptures (ATRs) are still one of the most common injuries among athletes [2], with an annual incidence of 5 to 50 injuries per 100,000 people [7]. Due to the increasing popularity of different sports disciplines as a part of daily routine, we can observe a higher incidence of that injury [1]. The typical description of a patient affected with this condition is a 30 to 40-year-old male [2], recreational athlete who participates occasionally in popular sports, such as soccer or running [1]. Recreational activities account for 75% of ATRs, whereas competitive sports only account for 8 % to 20% of all injury cases [3]. That can be due to the lack of proper endurance, knowledge and technique during training. The mean ratio of male to female ATRs is 6:1, however, it varies from 2:1 to 12:1 [3]. Nowadays this ratio can decrease due to greater participation of women in competitive sports [2].

The Achilles tendon is a part of the gastrocnemius-soleus complex and is formed through the merging of tendinous portions of those two muscles. As they descend, they tend to form a spiral structure, which forms an insertion in calcaneal tuberosity [4]. Due to the anatomy of the Achilles tendon, it can be subjected to tensile loads up to eight times body weight during running [4]. The rupture mostly occurs 2 to 6 cm from its calcaneal insertion,

probably because of the underdeveloped blood supply of that area and peak forces put into the midportion of the tendon [4]. Muffulli et al. suggested three common mechanisms of injury, which are push-off mechanism (53% of injuries), sudden dorsiflexion of the ankle (17%) and rapid dorsiflexion of a plantar flexed foot (10%) [5].

ATRs can be divided into two groups: chronic and acute [6]. Chronic ruptures result from overuse of the tendon during strenuous sports activities, such as running or jumping. The most common histopathological finding in those cases is tendinopathy, which can severely decrease tendon strength and lead to partial or complete rupture if left untreated [6]. Acute ruptures occur spontaneously, mostly during sports activities (75% of acute ATRs) [6]. This type of rupture occurs mostly during sudden, violent movement. The exact cause of spontaneous ruptures is most probably multifactorial and a great number of potential risk factors are suggested, such as previous injuries, use of specific drugs, comorbidities, lifestyle or genetic factors [8].

ATR can be treated both conservatively or surgically [9]. Both approaches have advantages and drawbacks, however they are commonly used nowadays. Several meta-analyses were performed to decide whether one of these strategies is superior [9]. Because of the lack of conclusive agreement over preferable treatment option, the rehabilitation and recovery strategies are becoming increasingly more significant among researchers [1].

The primary aim of this review is to provide current insight into possible causes, risk factors, treatment possibilities and optimal recovery strategies for ATR among recreational athletes, based on the most recent studies available considering this topic.

Materials and methods

For this review, a comprehensive search of articles available in various scientific databases such as Google Scholar, PubMed and others was conducted. The search included terms such as: "Achilles tendon rupture treatment", "Achilles tendon rupture risk factors", "Achilles tendon injuries", "Physiotherapy in Achilles tendon rupture" and similar. The articles selected were limited to those published in English. They were then narrowed down to recent and relevant articles.

Results

Risk Factors

In literature, there are many factors mentioned as a possible cause of the increased risk of ATR [8,14]. Some of them are non-modifiable such as age, sex, race and genetics. According to recent meta-analyses, the risk of ATR is more significant in older patients but also patients in the third decade of their life. The younger risk group is susceptible to injury because of improper training regimes and higher physical loads during exercises. The older risk group is prone to injuries because of overall degeneration of tendons as well as because of common comorbidity in this group [14,15]. As previously stated male sex is more prone to this injury with the mean ratio of male to female ATRs being 6:1 [3]. Men have lower compliance properties and a greater Achilles tendon stiffness which reduces their capacity to adapt during exercise, potentially increasing the risk of injury [31]. When it comes to race it was found that Black race tends to be more predisposed to ATR. Genes connected to a higher prevalence of Achilles injuries are the ones coding collagen synthesis (G1023T, COL5A1) and another one coding metalloproteinase that degrades the extracellular matrix (MMP3) [15].

Chronic inflammation of the Achilles tendon is widely discussed as an important underlying cause of potential future rupture [4]. The progressive overload, inadequate regeneration between training sessions, and lack of proper knowledge or technique of exercising can lead to a build-up of microdamage of the Achilles tendon [2]. If left neglected, the microdamage can accumulate and cause partial and complete rupture [6]. The degenerative changes are commonly found in histopathological examination in spontaneous ATRs - those include high vascularity, collagen disorganization and hypercellularity [1]. Dakin et al. examined biopsies obtained from patients with ATRs and discovered pro-inflammatory profiles and molecular changes typical for chronic inflammation [29]. Researchers also studied a connection between previous injuries and the risk of future ATR. Park et al. found that patients in their 30s after acute rupture are significantly more prone to the next rupture in the contralateral Achilles tendon [34], whereas Krill et al. noticed an increased risk of this incident in patients with previous year foot injuries [35].

A group of possible risk factors are metabolic disorders, such as diabetes, obesity and hyperuricemia. When it comes to diabetes a group that is specifically prone to injuries are women with long-lasting and poorly controlled diabetes mellitus type 2 [10]. Studies show that lasting diabetes leads to structural changes in the Achilles tendon due to the

recomposition of collagen and elastic fibers as well as reducing the amount of capillaries leading to a decreased blood supply [13]. Also, excess glycation end products are being stored in tendons leading to altering their structure and stability [16,22]. Diabetes mellitus may cause chronic Achilles tendon inflammation by proinflammatory cytokine release when the primary disease is poorly controlled [15].

Obesity affects Achilles tendons on many levels. Inadequate body weight multiplies the risk of rupture due to increased load on the Achilles tendon leading to its chronic degeneration [22]. Peak stress during calf muscle contractions can reach up to 6 to 12 times body weight per tendon. Logically every excess kilogram of body weight increases the load accordingly [28]. Additionally, the presence of bioactive peptides in systemic circulation (e.g. chemerin, leptin, adiponectin) causes chronic, sub-clinic inflammation of the tendon. Obesity is usually associated with hypercholesterolemia which alters protein synthesis and disrupts tendon composition [22]. In hyperuricemia, monosodium urate crystals are deposited in tendons predisposing them to rupture by inducing tendon inflammation [30].

Active smoking is a controversial risk factor. The amount of evidence of smoking significance on ATR incidents specifically is insufficient [8]. Nevertheless, many studies show that tobacco use causes a major degeneration level of the tendinous tissue and exacerbates the tendinopathy process, leading to more serious injuries [8,32]. Patients with hyperparathyroidism are also prone to many different musculoskeletal disturbances including ATR or rotator cuff tears [33].

Comorbid conditions pertaining to muscular and connective tissue are also risk factors for tendon ruptures as they weaken the tendinous tissue causing its fragility. Most significant to ATR occurrence disorders are rheumatic diseases such as Rheumatoid Arthritis, Systemic Lupus Erythematosus, Ankylosing Spondylitis or Systemic Sclerosis. Other diseases of great importance are genetic connective tissue disorders like Marfan Syndrome or Ehlers-Danlos Syndrome and inflammatory myopathies [14,36].

Drugs were also considered as potential ATR risk factors - especially steroids, fluoroquinolones, statins and oral bisphosphonates. Two studies considered the influence of different administration methods of steroids on the total risk of injury [11,12]. They found no increased risk for oral [11,12] and inhaled [12] steroids, however, they discovered a possible correlation between local usage of steroids and Achilles rupture [11].

Fluoroquinolones are widely considered as drugs affecting the risk of tendon rupture. Multiple studies found a significant connection between fluoroquinolones and ATR risk [17-

20,24,25,26]. The co-usage of corticosteroids with fluoroquinolones was also suggested to significantly increase cumulative risk [17-19,25]. Spoendlin et al. examined the impact of statin use on tendon rupture incidence, but they found no statistically significant increase in the risk of that injury, irrespective of gender, age, statin dose, or treatment duration [23]. Orally-administered bisphosphonates were considered to decrease the overall toughness of the Achilles tendon, but in a study performed by Spoendlin et al., the increased risk was not observed during this type of treatment [27].

Achilles Tendon Rupture RISK FACTORS	
Modifiable	Non-modifiable
Chronic inflammation of Achilles tendon	Male sex
Obesity	Black race
Metabolic disorders (hyperuricemia, diabetes)	Advanced age
Fluoroquinolones and steroids use	Genetic factors
Engaging in contact, high-impact sports	Co-existing non-metabolic diseases
Improper training regimen	

Table 1. Modifiable and non-modifiable risk factors of Achilles tendon rupture.

Treatment options

The treatment of ATR is still raising great interest among researchers and clinicians, who are trying to find common ground regarding the most optimal method. Throughout the years, numerous options and techniques were created and nowadays they can be assigned to one of the two main groups: nonoperative (achieved mostly with cast immobilization and functional bracing) or surgical treatment.

The surgical approach can be further divided into an open repair (longer incision, greater tendon exposure, better access for operator) or minimally-invasive techniques (shorter incision, lower tendon exposure) [7]. Recent studies available in the literature concerning ATR treatment are mostly focused on comparing those three main options with each other.

Ochen et al. [9] performed a meta-analysis including 29 studies (10 trials and 19 observational studies) with a total number of 15,862 patients (944 from trials and 14,918 from observational studies). They observed a statistically significant reduction of re-rupture incidents in patients treated surgically (2.3%) compared to nonoperative treatment (3.9%). On the other hand, the operative treatment resulted in a higher complication rate than nonoperative (4.9% vs. 1.6%) - the most common ones were wound/skin infections, deep vein thrombosis and sural nerve injury. Infections were more specific complication after surgery (incidence of 2.8%), whereas deep vein thrombosis was more associated with the nonoperative method (incidence of 1.17%).

In a meta-analysis performed by Seow et al. [40] nonoperative approach, open repair and minimally invasive surgery were compared. Their results showed the superiority of surgical treatment in terms of re-rupture rate, however, nonoperative treatment resulted in a lower rate of complications (mostly infections). Moreover, they observed a similar rate of re-ruptures between open repair and minimally-invasive techniques, but the latter also reduced the incidence of complications.

Shi et al. [41] analyzed 2480 patients included in 38 randomized controlled trials comparing outcomes of the three approaches mentioned above with two recovery protocols (traditional standard rehabilitation and accelerated functional rehabilitation), which gave a total number of six therapeutic protocols. In their study, they observed a lower re-rupture rate in operative protocols (both the open repair and minimally invasive surgery) compared to the conservative ones. Minimally-invasive surgery resulted in fewer complications and a faster return to sport, especially when applied together with accelerated functional rehabilitation. What is interesting, Shi et al. noticed no statistically significant difference in sural nerve injury between open repair and minimally invasive surgery.

A similar meta-analysis was conducted by Wu et al. [42] - they compared open repair, minimally-invasive surgery and conservative treatment combined with either early immobilization or accelerated rehabilitation. Data was taken from 29 randomized controlled trials with 2060 patients participating. Results showed that a combination of nonoperative treatment and early immobilization resulted in a significantly higher complication rate, whereas minimally-invasive surgery with accelerated rehabilitation had the best outcome in terms of proper functionality and reduction of complications rate.

Attia et al. [43] decided to compare specifically open repair with minimally-invasive surgery with a meta-analysis of 10 randomized controlled trials with 522 patients. They

noticed no significant difference in re-rupture rate and functional outcome, however, results showed a higher risk of skin/wound infections, ankle stiffness and longer surgery time in open repair, and a greater risk of sural nerve injury with temporary palsy after minimally-invasive surgery.

Su et al. [44] performed a very interesting analysis regarding the cost-effectiveness of surgical and conservative treatment of ATR. In average scenarios, the nonoperative approach was more economically optimal in the general population. On the other hand, the cost-effectiveness was increasing in the case of patients performing physically demanding jobs or young athletes due to maximized outcome utility.

Achilles tendon rupture TREATMENT APPROACHES			
	NONOPERATIVE	**OPEN REPAIR**	**MINIMALLY-INVASIVE SURGERY**
ADVANTAGES	• non-invasive • lower complications rate • lower treatment cost	• better functional outcome • lower re-ruptures rate • shorter recovery than NOP	• better functional outcome • lower re-ruptures rate • lower complications rate than OR • shorter recovery than NOP and OR
DISADVANTAGES	• worse functional outcome • higher re-ruptures rate • longer recovery	• more invasive than NOP and MIS • higher complications rate than NOP and MIS • higher treatment cost than NOP	• more invasive than NOP • higher complications rate than NOP • higher treatment cost than NOP • less available • longer learning curve for surgeon

Table 2. Comparison of three main treatment approaches of ATR (*NOP-nonoperative treatment, OR-open repair, MIS-minimally-invasive surgery*).

Injury recovery and return to sport

Rehabilitation and physical therapy

The recovery process following a severe injury such as an ATR is a complex undertaking that requires the input of a multidisciplinary team comprising professionals from the fields of rehabilitation, physiotherapy and sports medicine. The outcome of the rehabilitation process is influenced by the patient's BMI, nutritional status, comorbidities and

athleticism. Other important factors are injury aetiology, applied treatment and delay in reporting to the doctor [1]. Unfortunately, the evidence base for an optimised rehabilitation regimen and the trajectory of recovery following ATRs remains limited.

According to a recent comprehensive analysis by Domiziano Tarantino et al., early functional rehabilitation and early weight bearing provide better results than the traditional approach consisting of at least 2 weeks of immobilization [1]. Patients who received early multidirectional rehabilitation presented better results in returning to work and pre-injury activities [1] and also developed fewer complications overall than the control group immobilized in a cast [38]. Immediate rehabilitation provided shorter recovery time and improved patient satisfaction. Studies show that rehabilitation regimes starting early help to more successfully restore normal ankle range of motion by avoiding abnormal Achilles tendon elongation or contracture [38].

The most important part of holistic rehabilitation is a proper kinesiotherapy regimen within the first 2 weeks since the surgical intervention. It is suggested that a patient should perform exercises under the physiotherapist's supervision starting with early ankle motions, weight-bearing and strengthening the surrounding muscles in the first week. Then, after verticalization with the use of needed medical equipment, it is recommended to include whole-body conditioning and strengthening exercises as well as focusing on ankle range-of-motion [7,38]. It is beneficial to combine traditional kinesiotherapy with additional treatments that facilitate recovery. It is recommended that additional treatments, including massage, electrical stimulation, stretching, neuro-muscular stimulation, physical therapy, cryotherapy and aqua therapy, be employed in conjunction with rehabilitation to facilitate the healing of damaged tendons [21,39].

Previously, there was a concern that early weight bearing might increase the probability of tendon re-rupture. No evidence was found to suggest that early weight bearing has an adverse effect of such kind [37]. Indeed, numerous studies have demonstrated that early return to motion reduces the risk of recurrence compared to immobilisation and casting an injured leg [1].

Alternative recovery therapies

Therapy strategies in ATR management include Platelet-Rich Plasma (PRP) injections. The effectiveness of this method in the treatment of patients with an ATR has been the subject

of controversy. PRP, containing growth factors, was expected to accelerate the healing process [21].

VISA-A scale is used to assess patient functioning after the completion of treatment and evaluate the severity of symptoms of chronic Achilles tendinopathy patients. It mostly assesses pain and tendon stiffness during daily exercises. The lower the score the more severe symptoms and more limitations in function. In the systematic review by Madhi MI et al. VISA-A score was higher in patients who were administered PRP injections suggesting that it might provide better patient outcomes [47].

The above results contradict Huang D et al. work where no better scores were observed in the VISA-A scale assessment between placebo and injection groups [46].
In some studies PRP injections alleviated the pain, improving patients' recovery experience and decreasing the amount of painkillers needed [46].

However, in most trials, PRP injections did not improve treatment outcomes to a statistically significant degree. Injections don't seem to have a significant effect on tendon healing, final range of motion after rehabilitation, tendon elongation, or time of return to sport [45, 47].

Another innovation in ATR recovery therapy is Blood Flow Restriction Training (BFRT). This is a training method designed to mimic the conditions of muscle ischaemia, similar to a fatigued muscle after resistance exercise, by partially restricting arterial blood flow. Muscle cells under such stress swell, increase fibre recruitment and promote cell proliferation as an adaptation process to ischaemic stimuli [48].

With the use of BFRT substantial strength gains were observed and the muscle size was greater. The results of this training method were unachievable with normal aerobic and resistance training [48].

Return to previous activities

According to a meta-analysis by Tarantino et al., the average percentage of professional athletes returning to competitive sports after ATR is approximately 70%. However, these athletes have often had to adapt their game technique and tend to have shorter careers. Data suggest that in the non-professional setting, the proportion of patients returning

to their previous sporting activities is even higher, reaching up to over 90% of ATR sufferers [1]. Sports with the highest risk of re-rupture are football, basketball and soccer, which is why these sports are not recommended for people who have had ATR and have not previously participated in them.

Following guidelines, patients can return to normal sports activity no earlier than 16 weeks after the injury for non-contact sports and after 20 weeks for contact sports. The mean time needed for recovery after the incident is 6 months [1,49].

Discussion

Throughout the years many potential risk factors were suggested to have a causation in this injury. Some of them were proven as statistically significant, however, a great number of studies were conducted on a small population of patients with ATR and therefore the strength of evidence is low or very low [8]. The group of patients with modifiable risk factors, who can be protected from potential tendon rupture, deserve special attention from clinicians. Chronic inflammation and tendinopathy are considered to be one of the most important causes of ATR, therefore patients presenting symptoms such as Achilles tendon pain, marked swelling or warmth after an activity should be especially screened for other clinically significant risk factors, which can increase the possibility of ATR in the future. The management of risk factors such as chronic inflammation, obesity, diabetes and hyperuricemia can be achieved through the implementation of an appropriate lifestyle change, an adequate training regimen and the scheduling of medical screening examinations at the recommended frequency. Due to the current increased popularity of amateur sports in society, awareness should be raised about the importance of not neglecting the first symptoms of Achilles tendon inflammation and following proper training programmes, which can prevent athletes from further overuse of tendon resulting in rupture.

The use of some drugs should be carefully considered in athletes from a risk group of future ATR. We found that some medications, such as fluoroquinolones, and corticosteroids (especially administered locally or orally combined with fluoroquinolones) can cause tendon damage if used chronically. It is evident that the benefits of using these drugs mostly outweigh the potential increased risk of ATR. Nevertheless, if the option of an alternative medication group exists, it should be given significant consideration.

It is essential to acknowledge the existence of non-modifiable risk factors, including male sex, advanced age, black ethnicity and genetic mutations such as G1023T, COL5A1 and

MMP3. Some studies have indicated that specifically, a group of 30-year-olds may also be at elevated risk due to their engagement in risky behaviours during training.

Additionally, concomitant diseases such as rheumatoid arthritis, systemic lupus erythematosus, ankylosing spondylitis, systemic sclerosis, Marfan syndrome, or Ehlers-Danlos syndrome, as well as inflammatory myopathies, are significant contributing factors to the risk of developing ATR. While the occurrence of these conditions is not entirely preventable, the implementation of appropriate medical care and treatment can effectively reduce the likelihood of developing ATR.

Recreational athletes suffering from ATR have nowadays a broad variety of different treatment options. All of the most common approaches (nonoperative treatment, open repair, minimally-invasive surgery) have a role to play in modern medicine. In our study, we presented the results of six meta-analyses regarding the issue of the most effective ATR treatment. In most cases, these studies presented similar results. The surgical approach results in a lower rate of re-ruptures and allows for a faster return to sport [9,40-42]. On the other hand, the conservative approach was shown to decrease the rate of potential early complications (such as skin/wound infection, deep vein thrombosis, and sural nerve injury), which are more common phenomena after surgical treatment [9,40-42]. The complications incidence can be decreased when choosing minimally-invasive surgery over open repair - the studies show no significant difference in re-rupture rate between those methods, however smaller incision, shorter surgery time and less co-occurring tissue inflammation can contribute to the superiority of minimally invasive surgery. The sural nerve injury with temporal palsy following surgical treatment is also a common complication. The studies yielded divergent results regarding this issue - some of them suggest that sural nerve injury is more common in minimally invasive surgery [43], whereas other analyses showed no significant difference between the two surgical approaches [41]. Inconsistencies may stem from the experience and precision of particular surgeons, which can be an important variable affecting the rate of sural nerve injury incidence. Minimally invasive surgery provides a narrowed surgical field view and therefore can result in a greater chance of accidental nerve damage. Minimally-invasive surgery with following accelerated functional rehabilitation is suggested to be the best approach for recreational athletes, providing superior post-operative recovery, the most optimal functional outcome and the greatest chance of a quick return to sport with performance similar to a pre-injury period [41]. The implementation of that treatment can be difficult in some cases due to possibly limited accessibility of minimally

invasive techniques, which can be a consequence of the higher total cost of such a solution [44] and a longer learning curve than open repair. Nonoperative treatment of ATR should be mostly considered in patients with no need for the best possible functional outcome (for example older patients with multiple comorbidities) due to the lower risk of complications. Based on our findings the recommended treatment for recreational athletes, who are willing to return to their previous performance, is an operative approach (especially minimally invasive). It is worth mentioning that one of the most important factors in proper Achilles tendon treatment is early management of injury - neglected rupture (more than 4 weeks since injury) limits possible treatment options and can lead to significant and irreversible loss of function [51].

When it comes to long-term recovery therapy the most important seems to be the implementation of an appropriate early rehabilitation regimen including early ankle motion exercises and early weight bearing with the use of medical devices like crutches and orthoses. Such an approach helps to achieve faster and more comprehensive functional recovery than that achieved through conventional immobilization without increasing the risk of re-rupture [38]. Additionally physical therapy treatments, massages and stretching can help in recovery as well as reduce the risk of some complications [1].

The use of alternative recovery therapies, specifically platelet-rich plasma injections, has been demonstrated to have no clinically significant impact on the treatment of ATR.
The efficacy of this method is inconclusive, with the majority of studies failing to demonstrate a significant impact of PRP injections. It can only be considered a preventative measure for patients with chronic Achilles tendinopathy to avoid ATR.

A promising training method with greater benefits than traditional aerobic and strength exercises may be blood-flow restriction training (BFTR). The BFTR method has been observed to result in greater gains in muscle size and strength. It seems to be a safe and efficacious method of training in the context of musculoskeletal disorders such as ATR.

The mean percentage of individuals with ATR who resume their previous level of sporting activity ranges from approximately 70% in professional athletes to over 90% in non-professional athletes. It can be concluded that with an appropriate rehabilitation regimen almost every patient post-ATR can participate in their favourite sport again. The mean time needed for recovery and return to sport is 6 months.

Recovery can be disrupted by the occurrence of complications. The most common issues include tendon re-rupture, wound infection, deep vein thrombosis, and tendon

elongation which reduces the ability of plantar flexion in the affected limb. Such difficulties can impede the return to optimal fitness and prolong the rehabilitation period. To avoid complications, it is important to follow an appropriate recovery plan, maintain hygiene around the wound, take anticoagulant medication and receive appropriate treatment to relax the tissues around the tendon [50].

Conclusion

Achilles tendon rupture is one of the most common injuries among recreational athletes. If left neglected, it can lead to significant loss of function and performance. Over the years, a variety of techniques and approaches have been developed, which can be categorised as non-operative treatment, open surgical repair or minimally invasive surgery. Minimally invasive surgery can provide the most optimal functional outcome, shorter postoperative recovery, faster return to sport and the highest chances of regaining previous physical performance. Long-term rehabilitation plays a crucial role in proper tendon healing and it should be based on an accelerated recovery programme with early weight bearing and ankle motion exercises under the supervision of a professional physiotherapist. It is also important to consider the risk factors associated with Achilles tendon rupture in all patients presenting with any Achilles tendon disorder, particularly in professional and non-professional athletes engaged in contact sports. Nowadays, the correct management of Achilles tendon rupture, consisting of early diagnosis, surgical treatment and appropriate rehabilitation, allows recreational athletes to return to their previous sports with a level of performance similar to that before the injury.

Disclosure

Author's contribution

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