

# Maximizing Return to Sports After Achilles Tendon Rupture in Athletes



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## KEYWORDS

- Achilles tendon rupture • Return to play • Athlete • Sports injury • Tendonitis • Sports medicine

## KEY POINTS

- Achilles tendon ruptures are devastating injuries to the athlete with return-to-sport rates around 70% and some risk for diminished performance postinjury.
- Surgical management is often favored for athletes, but evidence is limited in this population.
- Functional rehabilitation protocols are critical regardless of operative or nonoperative management.
- Return-to-play protocols are sparse and varied because of ambiguous definitions of return-to-sport criteria in the literature.
- Optimal sport-specific return-to-play milestones should be defined to guide the rehabilitation of injured athletes.

## INTRODUCTION

Achilles tendon ruptures (ATR) are common injuries that can affect those not only at the apex of athleticism, but also those that only irregularly engage in athletic endeavor. Generally speaking, frequent athletic activity is a risk factor for ATR.<sup>1</sup> Historically, most of these injuries occurred in young (25–35 years) active men. However, it seems that the mean age at which patients rupture their Achilles tendons has increased with time, as has the proportion of women sustaining these injuries.<sup>2</sup> Although the optimal

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treatment of an ATR has been and continues to be a subject of some debate, a consistent truth is that, irrespective of how the rupture is treated, patients can take upward of a year to return to preinjury levels of function.

In higher level athletes and certainly in professional athletes, the bias continues to be toward surgical treatment. This trend is most likely because with surgical repair the tension of the tendon is directly restored and most of these patients are young and healthy, perhaps minimizing the risk of surgical treatment, namely wound healing issues. Moreover, these patients are likely to have every facet of treatment optimized postoperatively in terms of rehabilitation. However, even in this setting, it often takes professional athletes 6 months or longer to return to preinjury function, if they are even able to attain that level. Therefore, these injuries in any patient constitute a significant blow to physical capability that necessitates a long period of functional recovery.

Formal return to play (RTP) criteria have been developed for some orthopedic injuries, most notably anterior cruciate ligament reconstruction, although many of these guidelines are still being developed.<sup>3</sup> However, objective criteria for RTP still do not exist for many injuries, which can make decisions regarding RTP difficult. The higher the level of sport, the higher are the stakes, and the pressure on medical professionals to get athletes back to play as quickly as possible. In this review we look at the current state of ATR treatment and assess expected outcomes after Achilles rupture in athletes, and what data exist with regards to RTP for ATRs.

## OPERATIVE VERSUS NONOPERATIVE MANAGEMENT IN THE ATHLETE

Any discussion of ATR treatment has traditionally been framed by the balance between the risk of rerupture with nonoperative treatment on the one side versus the risk of wound issues with operative treatment on the other. In athletes, operative treatment is often favored because, given the long recovery with these injuries, a rerupture would be a disaster for an athlete. Although it could be reasonably argued that a wound complication would be no less a disaster, the reality is that most athletes and certainly most professional athletes are in excellent health, potentially mitigating the risk of wound issues. A second concept may play some role in treatment decisions. There is some evidence to suggest that strength is better after surgical repair of an ATR. Perhaps the most influential recent article on Achilles rupture treatment is that by Willits and colleagues<sup>4</sup> This study supported nonoperative treatment, noting no significant difference in rerupture rate between operative and nonoperative treatment arms. However, these authors did note that the surgical patients were significantly stronger than the nonoperative ones at final follow-up. Some other authors have noted this trend as well,<sup>5</sup> although the literature suffers from a lack of consistent means of reporting strength data in follow-up of these patients. A large meta-analysis found that surgical and nonsurgical treatment had equivalent rates of rerupture when the nonsurgical treatment included functional rehabilitation.<sup>6</sup> However, the authors noted that when such early range of motion was not used, surgery reduced the rerupture rate by more than 8%. It should be noted this study did not differentiate between athletes and nonathletes. A final reason that may influence why most athletes are treated surgically is simply that there is an assumption among these patients that surgical treatment is most appropriate and "better." Although it is no doubt the job of the physician to educate the patient as to his or her options, a patient that has decided on surgery will likely ultimately find a surgeon that will do it.

## EARLY FUNCTIONAL REHABILITATION

One aspect of treatment that seems to lower the rate of rerupture among patients with this injury without regard to whether the patient is treated operatively or nonoperatively is early functional rehabilitation. There are now reams of data showing that early weight-bearing and early functional rehabilitation leads to stronger new tendon formation and better ultimate functional outcomes.<sup>7–11</sup> Many treatment protocols do not differentiate much between operative and nonoperative treatment when it comes to the rehabilitation progression. As a gross simplification, rehabilitation focuses on motion for roughly the first 2 months and then strengthening thereafter.

## RETURN TO PLAY PROTOCOLS

Clearly, these injuries are significant ones that severely affect an athlete's ability to function at a high level. However, the goal of surgeon and athlete alike is to try to minimize this impact. To that end, some authors have suggested optimal RTP protocols for these patients. Grävare Silbernagel and Crossley<sup>12</sup> offered a starting point with their proposed program for RTP with noninsertional Achilles tendinopathy by codifying a protocol and a proposed progression. However, they did not precisely define what return to sport means nor did they provide exact criteria for determining if that occurred. The lack of an explicit definition for "return to sport" and measurable criteria for tracking progress pervades the literature as noted in a recent systematic review, making interpretation and comparison of outcomes difficult.<sup>13</sup> Furthermore, the application of programs for tendinopathy is limited because of the obvious fact that Achilles tendinopathy, although on the same continuum of disease, is not the same as an Achilles rupture.

Any proposed RTP protocols should include some ability to assess where a patient is in their recovery relative to where they should (or want to) be. Return to sport should be defined in the context of the athlete's sport and level of participation. As described by the consensus statement by Arden and colleagues,<sup>14</sup> RTP can be thought of as a continuum progressing sequentially from return to participation, return to sport, and finally, return to performance. Objective criteria should be used when possible. In the context of Achilles rupture, the Achilles tendon Total Rupture Score has been used widely as an outcome measure. This score is a patient-reported outcome instrument consisting of 10 questions that has demonstrated clinical utility for measuring outcomes after ATRs.<sup>15</sup> Hansen and colleagues<sup>16</sup> noted that a patient's Achilles tendon Total Rupture Score at 3 months after injury could predict a patient's ability to return to sports at 1 year. Establishing these objective benchmarks is a critical step toward being able to provide the most useful criteria for RTP. Others have noted that males, patients with Achilles pain at rest at 3 months, and patients with lower physical functioning and calf endurance at 6 months all have delayed recovery of calf endurance at 1 year.<sup>17</sup> Although these data may be skewed slightly given the relative infrequency of ATRs in females, Achilles pain at rest at 3 months could identify those patients at risk for slower recovery so that some intervention could be made to try to fortify their recovery.

Explicit criteria and protocols for RTP are generally lacking at this point for ATR. Time-based guidelines have suggested resumption of noncontact sports 16 weeks after injury and contact sports 20 weeks after injury, but these recommendations are not evidence based.<sup>14</sup> Fanchini and colleagues<sup>18</sup> offered a case report of an Italian professional soccer player in an effort to provide a potential protocol. Indeed, this report mainly highlights the vast difference between the resources at the disposal of a professional athlete versus almost anyone else, because the attention paid to this one

athlete is likely not possible for most of the public and most amateur athletes. Despite that, it does provide for some sense of how the progression should work and what the stages of recovery are. A similar case report with a graduated RTP program was published with a case report of an Olympic bobsled athlete who competed in the Winter Olympics 29 weeks following injury with good results at 2-year follow-up.<sup>19</sup> Finally, there has been one systematic review with meta-analysis on this topic. The mean RTP rate across all included studies was about 80%. However, the authors noted that those studies that were more objective about how RTP was defined were generally associated with lower RTP rates, and perhaps unsurprisingly, measures that evaluate RTP are variable and inconsistent.<sup>20</sup>

## PERFORMANCE FOLLOWING ACHILLES TENDON RUPTURE

Many authors have looked at the effect of an ATR on professional athletes in various sports. Parekh and colleagues<sup>21</sup> assessed the epidemiology and outcomes of ATRs in the National Football League (NFL), retrospectively reviewing 31 ATRs over a 5-year period (1997–2002). In this cohort, only 68% of athletes were able to return to sport and those that did generally returned at a lower level of efficacy compared with preinjury. Another study used the NFL Orthopedic Surgery Outcomes Database looking specifically at all injuries over a 10-year period (2003–2013). Achilles tendon repair, along with patellar tendon repair, led to significantly fewer games played postinjury than other injuries. Moreover, Achilles repair along with anterior cruciate ligament reconstruction, patellar tendon repair, and tibia intramedullary nail led to significant decreases in performance in the first year after injury, although the Achilles repair patients returned to preinjury performance levels in the second and third year postinjury.<sup>22</sup> Jack and colleagues<sup>23</sup> most recently and comprehensively assessed ATRs in the NFL using publicly available performance data. A total of 71 of 95 players included in the study were able to return to competition (72.4%) and those that returned had shorter postoperative careers than matched control subjects. The authors also noted a player's ability to return to a certain level of performance depended in large part on the player's position, with running backs and linebackers performing significantly worse than their preoperative levels.

Achilles ruptures have also been assessed in other sports. Amin and colleagues<sup>24</sup> assessed 18 players from the National Basketball Association that had ATRs over a 23-year period (1988–2011). The injuries had a profound negative impact on the athletes, because only 61% were able to return to competition and those that did return showed a significant decrease in playing time and performance. Further data have shown that Achilles tendon repair is associated with the lowest RTP rates of any orthopedic surgical procedure among National Basketball Association players.<sup>25</sup> Other authors have assessed ATRs in Major League Baseball. Given the nature of the sport, the incidence of ATRs is significantly less than in sports, such as basketball and football, that require frequent eccentric contractures. However, only 62% of position players that sustained ATRs were able to RTP.<sup>26</sup>

A few studies from Europe have assessed athletes from other sports. Maffulli and colleagues<sup>27</sup> compiled data on 17 elite athletes from sports as diverse as badminton and martial arts, although most of the athletes were soccer players. All athletes were able to return to competition, although one was not able to compete at the same level as before the injury and one other had to make permanent adaptations to their technique to compensate after injury. The authors did not assess performance capacity objectively and return to competition was ultimately a binary variable. ATRs have

been found to be uncommon in soccer, a somewhat unexpected finding, although there are little data on postinjury performance in these patients.<sup>28</sup>

Less severe Achilles pathology has been shown to negatively impact performance. In a related study, Amin and colleagues<sup>29</sup> found that Achilles tendinopathy without rupture also resulted in fewer minutes of playing time and decreased performance metrics, although the difference was not as profound as with complete rupture. Similarly, Hardy and colleagues<sup>30</sup> found only 71% of patients were able to return to their prior level of sports participation 1 year following calcaneal debridement with or without detachment/reattachment of the Achilles for insertional tendinopathy.

Synthesizing much of this data, Trofa and colleagues<sup>31</sup> assessed the major professional sports in the United States for ATRs over a 24-year period. Only established professional athletes were included and matched control players were used to assess the effect of the injury on the player's estimated career trajectory. Only 70% of athletes were able to RTP and those that did return played at a lower level than matched control subjects at 1 year after injury. Performance normalized relative to control subjects by 2 years after injury. This finding suggests that, if an athlete can continue as a professional into the second year after injury, his or her statistics would not be different from what would have been expected had they not suffered the injury.

## SUMMARY

ATRs are devastating injuries for athletes that require a long recovery and may not allow athletes to achieve the heights of athletic ability that they had before the injury. The understanding of RTP in these injuries is in its infancy. Currently, there are no validated guidelines for returning an athlete to sport and the decision rests on clinical judgment and collaboration between the clinician, physical therapist, trainer, and the athlete. As the understanding of this injury and its management in the athlete expands, the negative impact of these injuries may be lessened to some degree.

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