

Achilles Tendon Ruptures in Two Male Athletes in NCAA Division I: Report of Two Cases

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ABSTRACT

Major tendon ruptures are rare, with an Achilles tendon rupture (ATR) being the most frequent type. Reported cases most commonly involve male recreational athletes who have increased body mass indexes and are between ages 30 and 50 years. We describe two male athletes in Division I of the National Collegiate Athletic Association who underwent surgical repair for treating an ATR associated with running-related activities. In contrast to other cases, both patients had normal body mass indexes. These two cases identify high-level athletes who underwent operative Achilles tendon repair and returned to their sport at a similar level or high level of post-college athletic activity with promising strength and function.

Keywords: Achilles Tendon, Collegiate Athlete, Tendon Rupture, Ankle

INTRODUCTION

Tendon ruptures rarely occur in the athletic population and most frequently involve the Achilles tendon.¹ The injury incidence rate of an Achilles tendon rupture (ATR) is 12 in 10,000 (0.12%)² and typically affects men between ages 30 and 50 years.^{1,3-5} Recreational athletes account for 75% of ATRs, whereas competitive athletes account for 8% to 20%.⁶ The activities that most commonly result in ATR include ball and racquet sports, such as basketball and racquetball.^{1,3} Owing to eccentric loading forces, sprinting and jumping mechanisms can also result in ATR.² Other risk factors for ATR include previous rupture of the Achilles tendon, tendon degeneration, muscle fatigue, and increased body mass index (BMI, kg/m²).^{4,7,8}

ATR can be treated operatively or nonoperatively. During the past 3 decades, multiple studies have reported operative treatments with lower rates of re-rupture and increased strength at 2 years, whereas nonoperative treatment results in fewer complications

(eg, deep vein thrombosis and infection).⁹⁻¹¹ In the past 5 years, studies have challenged whether any outcome difference exists between operative and nonoperative treatment. Several meta-analytic studies have noted similar re-rupture rates between the two options.^{12,13} However, when treating young high-level athletes, operative procedures are preferred because of the reported increased strength, lower re-rupture rate, and perceived option to perform limited active assisted ankle range of motion earlier in the postoperative period.¹⁴

Subsequently, the preference of operative treatment in athletic patients may be attributed to quicker time to return to play and a perceived early functional improvement. In a literature review of open Achilles repairs, four trials compared early ankle mobilization to immobilization.¹⁵ The authors found that early mobilization shortened the recovery time and allowed patients to return to work and sports sooner.

Despite the preference and noted benefits of operative treatment, professional athletes who have returned to play (69%) can require 2 years to return to pre-injury levels of competition.¹⁶ In collegiate athletes, this recovery time represents a considerable portion of their college career. We describe two college-aged, competitive male athletes in Division I of the National Collegiate Athletic Association (NCAA) who presented with traumatic ATR.

CASE REPORTS

Case 1

A 22-year-old male NCAA Division I long jumper (BMI, 22.4) presented with pain in his right ankle. He was competing in a track and field meet after a warmup. During the running approach to his third long jump, he felt a pop in the back of his right leg and stopped his attempt. No pain was felt at that time. He attempted the jump again and felt a much larger snap, followed by

his right leg collapsing during the running phase of the long jump. He was unable to bear weight on his right leg after this injury. The patient noted some tightness in his right Achilles after practicing for his event a few days before the meet. However, he stated that it was only a mild discomfort. There was no other significant history of risk factors including steroid injections in that leg or recent fluoroquinolone use.

On physical examination, the right ankle was hyperdorsiflexed with swelling over the posterior portion. There was a palpable gap noted a few centimeters from the calcaneal attachment of the Achilles tendon. He was unable to actively plantarflex his ankle, and the findings of the Thompson test were positive for ATR. An injury assessment of an ATR was made at this time. A limited diagnostic ultrasound revealed at least a partial full-thickness rupture of the right Achilles tendon. Radiographs showed no notable findings. Magnetic resonance imaging (MRI) was not obtained because of the timing between the injury and the surgical treatment.

At 5 days after the initial injury, an open Achilles tendon repair was performed, with intraoperative findings confirming the ATR. The open repair was performed with the patient in the prone position, using a posterior longitudinal approach. A Bunnell-type suture technique was utilized, and four Ethibond 5-0 sutures (Ethicon, Somerville, NJ) were placed into the ruptured tendon ends. All four suture ends (eight strands) were tied independently. A running 2-0 nylon epitendinous stitch was placed circumferentially around the suture line, and the leg was splinted in 10° plantar flexion for 1 week. At about 7 days postoperatively, gentle range of motion was performed to tolerance with the athletic trainer (LH) assisting and never stressing the repair. The athletic trainer actively mobilized the skin to help decrease adhesions. A heel lift was placed into a walking boot, and the patient began immediate weight bearing to tolerance. The lift was removed about 4 weeks postoperatively.

At 10 months postoperatively, the patient reported to his former athletic trainer (LH) that he had nearly full ankle motion. Additionally, he noted that the strength and speed of ankle contraction were slightly greater than those of the uninjured ankle, as measured by the physical therapist. The patient returned to full recreational running with no perceived deficit. He also played in a recreational volleyball league without any jumping concerns. However, he perceived that his vertical jump was about 3 inches less than it was before the injury. At this time, he did not return to long jumping or sprinting because his NCAA eligibility ended the season that he had the injury.

Case 2

A 19-year-old male NCAA Division I lacrosse goalie (BMI, 22) presented to our clinic with swelling and hyperdorsiflexion in the posterior right ankle



Figure 1. Initial presentation in case 2, showing swelling in the posterior right ankle with hyperdorsiflexion. (Note: the red birthmark on the right ankle is unrelated to the injury.)

(Figure 1). The patient was running a conditioning test after a warmup that consisted of repeated 20-yard runs at increasing speeds. About half way through the test, the patient planted at the end line, turned, and pushed off to run back to the line where he had started. He then felt a pop and sharp pain in the back of his right ankle. He reported that it felt as if someone had stepped on the back of his heel and pulled off the back of his cleat. The patient tried to continue running but was unable to bear weight immediately. Seven days before the conditioning test, he had done 5 consecutive days of heavy conditioning followed by 2 days of rest. During those 7 days, he noted general leg soreness and tightness in both of his hamstrings and calves. There were no other notable risk factors for ATR (eg, steroid injections or recent fluoroquinolone use).

On physical evaluation, the Achilles tendon was palpable at the insertion point but there was a gap near the midpoint. The patient was unable to actively plantarflex his ankle, and the Thompson test was positive for ATR. Radiographs did not reveal any notable findings. However, findings of a diagnostic ultrasound confirmed a partial full-thickness rupture of the right Achilles tendon, and an MRI revealed a complete ATR. At 16 days after the initial injury, an open Achilles tendon repair was performed by the same surgeon in case 1 (JS) and in the same manner. Intraoperatively, a complete ATR was confirmed.

At 1 month postoperatively, the patient reported minimal pain and was able to dorsiflex his injured right ankle to a neutral position. At 6 months postoperatively, his right ankle range of motion was nearly equal to that of the injured ankle (Figures 2A through 2D). Furthermore, his dorsiflexion strength (hand-held dynamometer) was greater on the injured ankle compared to the uninjured ankle (18.7 lb and 17.7 lb, respectively). At this time, he could perform a two-step plant and cut during running activities, and he ran a modified full sprint during practice. He returned



Figure 2. Photographs at 6 months postoperatively in case 2. Shows sagittal views of the A) uninjured left and B) injured right ankles in maximum plantar flexion. Additionally, shows coronal views in C) standing flat-footed position and D) maximum plantar flexion.

to being a NCAA Division I lacrosse goalie without restrictions during scrimmage and game situations.

DISCUSSION

The current cases described two collegiate male athletes with normal BMIs who presented with ATR associated with running-related activities, with no other notable risk factors other than possible muscle fatigue. Because of their young age, our two patients now have an increased risk for additional ATRs. The rate of re-rupture is 16.6% for athletes aged 30 years or younger at the time of the first injury.¹⁶ ATR can be a career-altering injury that negatively affects an athlete's ability to return to competitive play.^{17,18}

The decision to operatively or nonoperatively treat ATR can be challenging, particularly with highly competitive athletic patients. Both of our NCAA Division I patients underwent operative repair and returned to their sport at a similar level or high level of post-college athletic activity. In our opinion, shared decision making tended to favor operative treatment, which potentially resulted in a stronger repair, decreased chance for re-tear, and opportunity to resume athletic activity. In the current cases, the certified athletic trainers were able to mobilize the patients early and institute early modalities, range of motion, and pool therapy activities without the limitations associated with casting or bracing. In conclusion, these two cases show that surgical management for treating acute ATR may return college athletes to their sport or post-graduation high level of activity, with promising strength and function, in a reasonable timeline.

REFERENCES

1. White DW, Wenke JC, Mosely DS, Mountcastle SB, Basamania CJ. Incidence of major tendon ruptures and anterior cruciate ligament tears in US Army soldiers. *Am J Sports Med.* 2007;35(8):1308-1314.
2. Hess GW. Achilles tendon rupture: a review of etiology, population, anatomy, risk factors, and injury prevention. *Foot Ankle Spec.* 2010;3(1):29-32. doi: 10.1177/1938640009355191.
3. Schepesis AA, Jones H, Haas AL. Achilles tendon disorders in athletes. *Am J Sports Med.* 2002;30(2):287-305.
4. Raikin SM, Garras DN, Krapchev PV. Achilles tendon injuries in a United States population. *Foot Ankle Int.* 2013;34(4):475-480. doi: 10.1177/1071100713477621.
5. Lemme NJ, Li NY, DeFroda SF, Kleiner J, Owens BD. Epidemiology of Achilles tendon ruptures in the United States: athletic and nonathletic injuries from 2012 to 2016. *Orthop J Sports Med.* 2018;6(11):2325967118808238. doi: 10.1177/2325967118808238.
6. Leppilahti J, Orava S. Total Achilles tendon rupture: a review. *Sports Med.* 1998;25(2):79-100
7. Wertz J, Galli M, Borchers JR. Achilles tendon rupture: risk assessment for aerial and ground athletes. *Sports Health.* 2013;5(5):407-409. doi: 10.1177/1941738112472165.
8. Jiang N, Wang B, Chen A, Dong F, Yu B. Operative versus nonoperative treatment for acute Achilles tendon rupture: a meta-analysis based on current evidence. *Int Orthop.* 2012;36(4):765-773. doi: 10.1007/s00264-011-1431-3.
9. Jiang N, Wang B, Chen A, Dong F, Yu B. Operative versus nonoperative treatment for acute Achilles tendon rupture: a meta-analysis based on current evidence. *Int Orthop (SICOT).* 2012;36(4):765-773.

10. Bhandari M, Guyatt GH, Siddiqui F, et al. Treatment of acute Achilles tendon ruptures: a systematic overview and metaanalysis. *Clin Orthop Relat Res.* 2002;(400):190-200.
11. Willits K, Amendola A, Bryant D, et al. Operative versus nonoperative treatment of acute Achilles tendon ruptures: a multicenter randomized trial using accelerated functional rehabilitation. *J Bone Joint Surg Am.* 2010;92(17):2767-2775. doi: 10.2106/JBJS.I.01401.
12. Wang D, Sandlin MI, Cohen JR, Lord EL, Petrigliano FA, SooHoo NF. Operative versus nonoperative treatment of acute Achilles tendon rupture: an analysis of 12,570 patients in a large healthcare database. *Foot Ankle Surg.* 2015;21(4):250-253. doi: 10.1016/j.fas.2015.01.009.
13. Soroceanu A, Sidhwa F, Aarabi S, Kaufman A, Glazebrook M. Surgical versus nonsurgical treatment of acute Achilles tendon rupture: a meta-analysis of randomized trials. *J Bone Joint Surg Am.* 2012;94(23):2136-2143. doi: 10.2106/JBJS.K.00917.
14. Maffulli N, Longo UG, Maffulli GD, Khanna A, Denaro V. Achilles tendon ruptures in elite athletes. *Foot Ankle Int.* 2011;32(1):9-15. doi: 10.3113/FAI.2011.0009.
15. Brumann M, Baumbach SF, Mutschler W, Polzer H. Accelerated rehabilitation following Achilles tendon repair after acute rupture: development of an evidence-based treatment protocol. *Injury.* 2014;45(11):1782-1790. doi: 10.1016/j.injury.2014.06.022.
16. Rettig AC, Liotta FJ, Klootwyk TE, Porter DA, Mieling P. Potential risk of rerupture in primary achilles tendon repair in athletes younger than 30 years of age. *Am J Sports Med.* 2005;33(1):119-123.
17. Trofa DP, Miller JC, Jang ES, Woode DR, Greisberg JK, Vosseller JT. Professional athletes' return to play and performance after operative repair of an Achilles tendon rupture. *Am J Sports Med.* 2017;45(12):2864-2871. doi: 10.1177/0363546517713001.
18. Amin NH, McCullough KC, Mills GL, et al. The Impact and functional outcomes of Achilles tendon pathology in National Basketball Association players. *Clin Res Foot Ankle.* 2016;4(3):pii:205.