ABSTRACT

Treatment for Achilles tendon ruptures in athletes is controversial. Surgical fixation has lower rates of re-rupture and confers increased strength and function, whereas conservative treatment has lower risks of wound complications. We review the literature on the optimal treatment for Achilles tendon rupture in athletes.

Key words: Achilles tendon; athletes

INTRODUCTION

Achilles tendon rupture was first reported in 1575.1 Its incidence has increased since then.2 75% of Achilles tendon ruptures occur during sporting activities, particularly those involving jumping or twisting motions.3–6 The ruptures used to occur in men in their 40s,7 and the male-to-female ratio was about 6:1.8,9 In a more recent study in athletes,10 age and sex no longer had as strong influence on the rupture rate. This could be due to increased participation in sports by females and older people.11

The optimal treatment for Achilles tendon rupture remains controversial. Conservative treatment involves early application of an equinus cast for 6 to 8 weeks to approximate the edges of the ruptured tendon together to promote healing. It has a higher rate of re-rupture and is reserved for less active patients. Operative (open and percutaneous) treatment is usually for younger, more active patients, and has more favourable functional outcomes, with lower re-rupture rates but higher complication rates.

Before the 20th century, treatment for Achilles tendon ruptures was primarily conservative. In the 60s, open surgery achieved better outcome but with higher complication rates.12 In the 70s, this trend shifted toward conservative treatment, owing to increasing complications and wound infections with operative techniques.13 Poor wound healing remains the most common complication of open repair, and is likely to be due to incision on poorly vascularised tissue.14 Athletes have higher expectations and

Address correspondence and reprint requests to: Maria Stavrou, 6 Nevern Square, Flat 3, SW5 9NN, London, United Kingdom. Email: mstavrou1@gmail.com
demands, higher re-rupture rates after conservative treatment are therefore unacceptable. Percutaneous techniques enable lower rates of wound infections while maintaining lower re-rupture rates. In recent studies, non-operative intervention is advocated.\textsuperscript{15,16} We reviewed the literature on the optimal treatment for Achilles tendon rupture in athletes.

**LITERATURE REVIEW**

In a study of 92 Achilles tendon ruptures,\textsuperscript{17} outcomes in terms of function and range of motion were similar after surgical (n=86) and non-surgical (n=6) treatment, but complications were significantly more frequent in the surgical group. It was concluded that the risk of surgery and anaesthesia was not worthwhile, given the similar outcome. Nonetheless, there were limitations in the study, as the patients were not randomised, the distribution of patients was uneven, and prophylaxis for deep vein thrombosis was not routinely used.

In a study comparing 6 non-operative to 7 operative patients in terms of plantar flexion strength after treatment,\textsuperscript{18} conservative management of fresh ruptures and old unhealed ruptures offered advantages over surgical intervention. One wound complication occurred in the operative group. The weakness of this study included the small patient number and no evaluation of functional level before and after injury.

In a study of 79 patients with Achilles tendon ruptures treated operatively (n=48) and non-operatively (n=31),\textsuperscript{19} there were 2 wound infections in the operative group, and 7 re-ruptures in the non-operative group. 31 of the 79 patients had played sports competitively, 9 of them were treated non-operatively and could not return to sports, whereas the remaining 22 were treated operatively and had returned to competitive sports. Surgery was recommended for more active patients. Nonetheless, the study was not randomised, and the non-operative cases were from another hospital. Some of the Achilles tendon ruptures were misdiagnosed and early application of the equinus cast (essential for successful non-operative treatment) may not have been undertaken.\textsuperscript{20}

In a prospective randomised study of 105 patients treated non-operatively (n=60) and operatively (n=45),\textsuperscript{8} most patients were young (mean age, 41 years) and active. 80% of the ruptures occurred during sports. Re-ruptures were significantly more common in the non-operative group (8% vs. 4%), but the operative group had higher rates of complications, pain, and stiffness, whereas strength and function were similar in both groups. Non-operative treatment was recommended owing to the higher rates of complications after surgery. Nonetheless, randomisation was based on which orthopaedic team was on-call, which may have introduced selection bias. The grade of the surgeon was also not mentioned, nor was the delay in treatment for the non-operative group.

Failure to apply the equinus cast within 48 hours of injury results in poor outcome.\textsuperscript{20} Re-rupture rates were comparable in 73 patients with Achilles tendon rupture treated surgically or non-surgically. Patients treated non-operatively had quicker return to work and sporting activities, whereas patients treated operatively had higher re-rupture rates (3.9% vs. 1.9%) and wound infection rates. Nonetheless, a standardised surgical technique was not used; different suture materials were used and immobilisation periods varied. This may have introduced variables and accounted for a higher re-rupture rate in the operative group. Thus, non-operative treatment was recommended if the injury was diagnosed and treated within 48 hours.

In a prospective randomised study of 111 patients treated operatively (n=56) and non-operatively (n=55),\textsuperscript{21} 83% of the patients were sportsmen who played an average of 3.6 hours per week. Surgery involved suturing of the tendon using the Bunnell method and repair of the paratendon. The operative group had 3 (5.4%) re-ruptures and 2 infections, whereas the non-operative group had 7 (13.4%) re-ruptures, one further re-rupture, and one case of extreme residual lengthening. Calf and ankle plantarflexion strength was significantly better in the operative group. 57% of the operative group returned to sports at the same level, compared with 29.1% in the non-operative group. Thus, operative treatment was recommended for all active patients.

In 196 consecutive patients with Achilles tendon ruptures treated with an equinus cast for 8 weeks (n=173) or an operation (n=23),\textsuperscript{22} no re-rupture occurred in the operative group. In the non-operative group, the re-rupture rate was 7%, which was almost 50% less than in another study.\textsuperscript{23} Early application of the equinus cast could have accounted for the lower re-rupture rate. Nonetheless, the activity level of the patients (hours per week) was not mentioned.

In a review of 125 papers (5056 Achilles tendon ruptures) published between 1966 and 2000,\textsuperscript{24} data were extracted using a standardised scoring system. Main outcome measures included complication rate (including re-rupture rate), strength, time to return to work, and rate of return to sports. The re-rupture
rate was 9.8% in the conservative group and 2.2% in the operative group. The overall postoperative complication rate was as high as 20%. This was due to poor surgical techniques in early papers. Patients in the operative group were more likely to return to sports and work. Older studies tended to recommend non-operative treatment and score lower. In high demand patients, operative intervention was the treatment of choice. In addition, percutaneous fixation resulted in high rates of sural nerve injury and wound complications.\(^{25}\) The percutaneous technique was inferior to open end-to-end Bunnel suturing, and had higher rates of complication (sural nerve injuries being the most common) and re-rupture (33\%).\(^{26}\)

In a prospective randomised study of 40 recreational sportsmen (mean age, 40.7 years) undergoing open (end-to-end Bunnel suturing) or percutaneous repair,\(^{27}\) outcome was similar in terms of subjective satisfaction and isokinetics. There were 2 (10%) cases of delayed healing in the open group, and one re-rupture (5%) in the percutaneous group. All diagnoses were made using ultrasonography.

In a meta-analysis of 800 patients in 12 trials comparing operative (open or percutaneous) with non-operative (casting or functional brace) treatments for Achilles tendon rupture,\(^{28}\) operative treatment conferred lower risks of re-rupture (relative risk [\(RR\)] = 0.27; 95\% confidence interval [\(CI\)], 0.11–0.64) but higher rates of other complications (\(RR\) = 10.60; 95\% \(CI\), 4.82–23.28). These included infection, adhesions, and disturbed skin sensibility. Percutaneous repair conferred a lower complication rate than open repair (\(RR\) = 2.84; 95\% \(CI\), 1.06–7.62).

In another meta-analysis of 777 patients in 8 randomised controlled trials,\(^{29}\) the non-operative group had significantly higher re-rupture rates (\(Z\) = 3.33, RR = 0.4, \(p<0.01\)). The operative group had higher rates in terms of moderate complications (\(Z\) = 4.27, RR = 8.95, \(p<0.01\)) and minor complications (\(Z\) = 5.59, RR = 13.38, \(p<0.01\)). Moderate and minor complications included delayed wound healing, infection, granuloma, sural nerve injury, and adhesion of the skin to the Achilles tendon. Nonetheless, there was no significant difference in terms of total or major complications, which included pulmonary embolism, deep vein thrombosis, pneumonia, deep wound infection, and any complication necessitating re-operation (including tendon lengthening). Functional outcome in terms of return to previous levels of sporting activities and ankle joint range of movement in the 2 groups was not significantly different, except that the operative group returned to work earlier.

**CONCLUSION**

Elderly and low-demand patients with risk factors for infection (e.g. diabetes or smoking) should be treated non-operatively. For patients who partake in sporting activities and wish to return to similar levels of function, operative intervention is superior in terms of strength and returning to sports, with a lower risk of re-rupture.

**DISCLOSURE**

No conflicts of interest were declared by the authors.

**REFERENCES**

1. Pare A. Les Ouvres. 9th ed. Lyon Claude Rigaud et Claude Obert; 1633.