The history of conservative management of acute Achilles tendon ruptures - "the other Northern Irish protocol"

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Even as long ago as Achilles himself in the Trojan wars, ruptures of the Gastro-soleus tendon have been treated non-operatively. More recently after diagnosis of a ruptured Achilles tendon, the treatment pendulum has swung between conservative and operative management. Historically, conservative management was advocated because it avoids the risk of wound healing problems and Sural nerve injury. For 25 years, the orthopaedic teams in Belfast have been running a service treating these common injuries conservatively and achieving good results[1]. This article reviews the modern evidence for the non-operative treatment of these injuries and gives guidance on how to do this well.

The evidence to support the conservative management for the majority of patients with acute tendo-achilles (TA) ruptures has been steadily accumulating. Since 1996, all patients with a ruptured TA from across the province of Northern Ireland were referred into a specialist clinic. Wallace *et al*[1] published their large study demonstrating that conservatively managed ruptures had a low re-rupture rate of 2%, which was similar to surgical repair. The functional outcomes were excellent, with all 945 patients returned to work within three months of completing a functional rehabilitation protocol. All returned to pre-injury sporting levels and 99.4% had good to excellent subjective assessment scores. This has been supported by subsequent studies.

The SMART (Swansea Morriston Achilles Rupture Treatment) Programme was established in 2008 in which acute ruptures with a gap of 10mm or less were treated in an initial cast and then functional bracing. Those with a wider gap underwent surgical repair. Hutchinson *et al*[2] reported re-rupture rates of 1.1% for conservatively treated patients and similar re-rupture rates and functional outcomes (ATRS) after nine months. Keating *et al*[3] published their long-term results 15 years after non-operative treatment of patients in a previous randomised trial, which showed no difference in outcome measures, satisfaction scores nor of re-rupture rates.

When is non-operative treatment appropriate?

Achilles tendon ruptures mostly occur in men in the 30 to 40-year-old range, affecting 11 to 37 per 100,000 population with an estimated 11,000 people each year in the UK. >>

The number of 'weekend warriors' greatly outweighs the number of elite athletes. Non-operative management is the commonest treatment for these patients with lower functional demands.

It is vital that the tendon ends are brought close together within a few days. Most evidence is based on the tendon ends being reduced within a maximum of two weeks and ideally within 48 hours. Ultrasound assessment has become more widely available across the UK and many acute hospitals have a protocol for rapid access to confirm the diagnosis and to assess the gap between the two tendon ends with the ankle in full plantarflexion. Checking the reduction of the tendon ends by ultrasound could be considered akin to checking bone ends by radiographs. The current question is, what gap is acceptable for conservative treatment?

In the long-term review, Lawrence *et al*[4] showed that a gap in the Achilles tendon of more than 10mm led to an over-lengthened Achilles tendon and subsequent reduction in strength. Whilst a wider gap correlated with a sudden drop off in strength, this did not correlate with worse patient reported outcome measures. Furthermore, work from Reading has shown that worse functional outcomes were achieved after non-operative treatment in patients with a gap greater than 10mm[5].

Today, there is no clear consensus on the size of gap to decide between operative and conservative treatment. During polling at the BOFAS Consensus Meeting in 2018, 42% of consultants routinely offered operative treatment for TA ruptures with a 10mm gap whilst 96% offered operative treatment when the gap measured 20mm.

When is non-operative treatment not appropriate?

The consensus is that surgery is appropriate for the high-level athlete and for patients presenting after a delay of several weeks. Athletes, such as jumpers, basketball players or sprinters require maximal push-off strength, which is achieved through correct tendon length and tension. Lantto *et al*[6] showed that surgery led to faster and better recovery of isokinetic calf muscle strength. It should be noted that for physically active non-elite athletes, conservative measures should still be considered. But when faced in clinic with an amateur athlete, there remains the unsolved question of what is a 'high level' athlete?

An open surgical technique is still the mainstay for most surgeons due to easy visualisation of Sural nerve as well as the apposition of the tendon itself, with ease of setting the correct tension, as well as the ability to perform adjunctive reconstruction procedures in cases of significant tendon retraction. Several meta-analyses have shown a lower risk of wound complications following minimally invasive surgery, such as using a specially designed device to aid insertion of the sutures (Achillon, PARS device). Percutaneous surgery is now less popular due to the reported higher risks from blind damage to the Sural nerve. Patients after operative fixation have also been shown to benefit from functional rehabilitation rather than cast immobilisation.

Surgical repair needs to be considered when faced with a re-rupture, rupture at the insertion or a ruptured Achilles tendon after a delayed presentation, which is generally accepted as six to eight

WEEK 0	**Present to A&E** 1. Equinus cast 2. VTE risk assessment
WEEK 0 - 2	**Early Fracture/Orthopaedic clinic** 1. Diagnosis confirmed with Simmonds triad +/- Ultrasound 2. Confirm suitability for conservative care 3. Complete two weeks in equinus cast 4. Non-weight-bearing
WEEK 2 - 8	**Functional rehabilitation** 1. Fixed angle boot + two heel wedges or variable angle boot 2. One heel wedge to be removed each week 3. Full weight-bearing 4. Boot removed for skin care and gentle ROM Exercises
WEEK 8 - 10	**Wean from boot** 1. Full weight-bearing 2. Active ROM & strengthening 3. Discharge to physiotherapy

Table 1: The Northern Irish Acute Achilles Tendon Rupture Protocol.

weeks after the primary event. However, even within these groups non-operative treatment may be preferred for those with severe medical co-morbidities or low functional demand. These situations will require referral to the local foot and ankle surgeon, who can employ specialist techniques involving tendon augmentation or fixation with bio-tenodesis screws. Arthroscopic transfer of the flexor hallucis longus tendon has been described to give push off power without wound complications for patients with very poor skin cover.

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What is the best way to manage Achilles ruptures conservatively?

Early detection and early placement of the injured ankle into an equinus position is important to give the orthopaedic surgeon the option to manage the rupture without surgery. Most acute hospitals will have a protocol in the Emergency Department and subsequent referral for assessment. Table 1 shows an example of a typical protocol, which will need to be adapted to accommodate local practices, e.g. availability of ultrasound and availability of variable angle walker boots.

Historically an above knee cast was applied to control the whole gastrocnemius complex, but there is no requirement for this. Common practice became a below knee cast for eight weeks. This initially started in maximum equinus and would be repeatedly changed to bring the foot to plantigrade. Only then would full weight-bearing commence.

In most centres, serial casting has been superseded by functional rehabilitation in a removable boot. Whilst functional rehabilitation protocols vary, the principles remain the same: early but limited range of movement in an orthotic device with early weight-bearing as soon as practical. This loading encourages a biological response through an inflammatory process stimulating collagen fibre arrangement and vascularity of the tendon, all of which ultimately aids tendon healing. In 2020 the UKSTAR study reported their findings from a pragmatic multi-centre trial involving 540 patients randomised between serial casting and functional rehabilitation7. There was no difference in Achilles Tendon Rupture Score (ATRS) at nine months or re-rupture rates. The mean total health and personal social care cost was £1,181 for the plaster cast group and £1,078 for the functional brace group.

Regardless of whether conservative or operative measures are chosen, venous thromboembolism (VTE) is a complication reported in around 7.5% of patients with TA ruptures. It is therefore an important issue to address. NICE recommend pharmacological VTE prophylaxis with low molecular weight heparin for people with lower limb immobilisation whose risk of VTE outweigh their risks from bleeding. Therefore, all patients should be risk assessed and if not otherwise contraindicated, thromboprophylaxis should be given as they have an extended period of significantly reduced mobility.

Conclusion

In summary, all patients should be assessed clinically for the Simmond's triad. Ultrasound is increasingly readily available to assess the reduction of the tendon gap. But if not, clinical examination to palpate approximation of tendon ends is often sufficient. Functional bracing with early weight-bearing is the first line treatment for almost all patients sustaining TA ruptures. All patients should be risk assessed for venous thromboembolism. Operative treatment should be reserved for patients who require maximal push-off strength, patients with a wide gap of probably over 10mm, a re-rupture or those who have presented late. Thanks to the early work of Wallace *et al*[1], the orthopaedic community in Northern Ireland have become accustomed and comfortable with the conservative management of acute TA ruptures and are satisfied with their good patient functional outcomes, which has subsequently been supported in the worldwide literature. ■

References

References can be found online at www.boa.ac.uk/publications/JTO.