Audit

Repair of acute rupture of the Achilles tendon: a new technique using polyester tape without external splintage

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Introduction: A new method of treating acute rupture of the Achilles tendon using polyester tape is reported. This requires no postoperative splintage, allows earlier mobilisation and prompt return to work and sport.

Patients and Methods: Thirty patients were reviewed prospectively and at a mean of 3 years from surgery.

Results: The average time of return to work, full weight-bearing and to driving was 40 days, 45 days and 49 days, respectively. The average time for return to sport was 122 days. Three patients required further surgery, two for infected wounds and one for scar release. There was one sural nerve injury. Twenty-two patients regained a normal range of ankle and subtalar movement, with the mean power of plantar flexion 84% of the opposite side. Of the 22 patients who played sport, 14 were still performing at the same or a higher level. There were no re-ruptures over this period.

Conclusions: The technique is straightforward and avoids splintage. It also conveys other short- and long-term advantages over more established methods.

Key words: Achilles tendon rupture – Surgical treatment

Traditionally there have been two approaches to the treatment of acute ruptures of the Achilles tendon – operative and non-operative. The former has been suture followed by casting for 6–8 weeks¹ with full mobilisation and return to sporting activity taking 6 months or more.² Conservative treatment has consisted of casting or functional bracing for up to 3 months followed by partial weight-bearing, prolonged rehabilitation and abstention from sporting activity.^{1,3–5}

Operative management may be associated with a lower re-rupture rate (2–5% compared with 5–17%)¹ and better muscle strength when compared with conservative treatment. There is, however, a significant surgical

morbidity (up to 10%),¹ and a need for considerable protected weight-bearing and restriction of activities for up to 6 months. We report a new technique of repair which is straightforward to perform and permits early rehabilitation with full weight-bearing by 6 weeks. It does not involve bracing or casting and may allow full return to sporting activity at 3 months.

Patients and Methods

The prone patient receives a general anaesthetic and intravenous antibiotic prophylaxis. Under tourniquet control, a 2 cm posteromedial incision is made close to the

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Figure 1 Position of drill hole in os calcis.

site of rupture and the proximal part of the tendon is identified. A 0.5 cm incision is made on the medial side of the calcaneum in line with the insertion of the tendon (Fig. 1) through which a 3.5 mm drill is passed through the calcaneum horizontally to exit by a similar incision on the lateral side.

A polyester tape (Neoligaments, Leeds-Keio CTP 20 or 10 mm x 800 mm) is passed through this channel from the medial side using a probe. The two ends are passed subcutaneously along the borders of the calcaneum to enter the distal tendon stump. They are then crossed in the distal stump to exit at the rupture (Fig. 2). The medial end is left short and the lateral end is passed using the probe through the proximal tendon to create a Bunnell-type suture. Four stab incisions are made in the skin over the probe as it is passed to allow passage of the tape which is tensioned so that the ankle will dorsiflex to neutral but not beyond. The tape is knotted and the knot buried within the damaged tendon ends using vicryl sutures. The tendon sheath is closed where possible and the skin sutured.

The patient is mobilised non-weight bearing the day after surgery. Active plantar flexion is permitted from day 1 but dorsiflexion is not allowed beyond neutral. The

patient is normally discharged 2-3 days postoperatively. At 2 weeks, the patient is allowed to partially weight-bear with a sorbothane heel cup (1.2 cm) inside the shoe and a 1.2 cm heel raise. Active plantar flexion is continued and active dorsiflexion is allowed. At 6 weeks, full weight-bearing is permitted and the shoe raises are removed.

Driving is permitted once the patient can fully weight-bear and unrestricted activity is allowed at 3 months.

Patients were followed up at 2, 6 and 12 weeks and then at a mean of 3 years from their injury. At the time of the latest follow-up, patients were asked about pain, swelling, stiffness using an analogue scale of 1 = no symptoms, 2 = mild, 3 = moderate and 4 = severe. Sporting activity was recorded using a Tegner score. Patients were also assessed for their ability to stand on tiptoes on the injured side; the calf circumference was measured at three points and the power of isometric plantar flexion of the hind and midfoot measured using a device designed at the Biomechanics Laboratory in the University of Leeds. Range of movement of the ankle was also measured and compared with the normal side. Three patients unable to attend for clinical review were contacted by telephone.

Results

Thirty patients (7 women, 23 men) were operated on over a period of 7.75 years. The mechanism of injury was

Figure 2 Position of skin incisions and route of tape through tendon.

Table 1 Symptoms at follow-up

Symptoms	Pain	Stiffness	Swelling
None	14	14	22
Mild	11	10	3
Moderate	1	2	1
Severe	0	0	0

squash (8), badminton (4), on long-term steroids (3), running (2), basketball (2), aerobics (2), football (2), and miscellaneous (7). The mean age was 44.5 years (range, 26–73 years), mean weight was 78.7 kg (range, 52–108 kg), and mean height was 1.72 m (range, 1.58–1.84 m). The mean delay to operation from the injury was 4.7 days (range, 0–18 days). Two patients required bilateral reconstruction.

The median time to partial weight-bearing was 14 days (range, 7–44 days) and the median time to full weight bearing was 42 days (range, 24–122 days). The median time to driving and return to work was 49 days (range, 11–123 days) and 35.5 days (range, 4–227 days), respectively, and the median time for return to sport was 5 months (range, 3–7 months).

The patients were reviewed at mean of 3.25 years (range, 6 months to 8 years) after surgery. One patient had moderate pain in the ankle and 2 patients had moderate stiffness, one of whom also demonstrated moderate swelling (see Table 1). Of 24 patients who had previously engaged in sporting activity, 14 had returned to the same level of activity or higher (mean Tegner score preoperatively 3.7 and postoperatively 3.0). Four patients had chosen to reduce their level of sporting activities and two patients were still undergoing rehabilitation.

Two patients could not stand on tiptoes on the injured side. One had mistakenly been treated using the Leeds-Keio ligament rather than the tape and the other had bilateral reconstruction. There was a small reduction in the mean calf circumference on the injured side compared with the uninjured side (1.87 cm; $P < 0.05$). The mean power of plantar flexion of the injured side was 87.8% (SD 18.9) of that on the uninjured side.

Only one patient had reduced range of movement but this was as a result of a subsequent tibial fracture on the same side. Six patients had slightly increased dorsiflexion compared with the normal side. One of these was the man treated with the ligament rather than the tape and he was the only one of these patients with a functional deficit. One patient, with bilateral reconstruction had significantly increased dorsiflexion on one side. He fell 6 weeks following surgery and forced dorsiflexion of that ankle. He experienced severe calf pain following this, but the repair remained intact.

Complications

Three patients required further surgery, one for tethering of the scar and one for infection over the medial drill hole requiring local excision of the tape 4 months following surgery. The third experienced some skin breakdown over the knot requiring partial excision of the tape 10 weeks following surgery. He was fully weight-bearing 3 weeks later. All three patients had no long-term sequelae. One other patient had persistent sural nerve deficit 18 months following surgery.

Discussion

This is the first time a technique which requires no external splintage has been reported with long-term results. There is only one other reference in the literature which we could find where no external splintage was used following surgery. This was only a provisional report on 5 patients and there has been no further report.⁷

The absence of external splintage is considered to be a major advantage over traditional methods. Mobilisation is rapid allowing full weight-bearing within 6 weeks and a return to driving and work within a similar time-scale. This compares favourably with other series^{1,6} where return to work has been as long as 2–3 months. The return to sport potentially within 5 months is far shorter than other reported series,^{1,3–6} where return to sport is usually after a minimum of 6 months and often up to 1 year.

The calf circumference difference was similar to that previously reported but perhaps the most encouraging aspect in this series was the high proportion of patients who had normal dorsiflexion. Most series^{4,6} cite at least a third of patients with a significant increase in dorsiflexion. In our study, only 6 (20%) had an increase in dorsiflexion only one of whom had a functional deficit. The patients reported that they considered they walked with a spring in their step indicating healing without significant lengthening. Of patients, 10–15% experienced intermittent discomfort around the drill holes in the calcaneum but this usually resolved within 6 months. Only four patients had significant complications 3 of whom (10%) required re-operation. None of these had long-term sequelae suggesting that this method is at least as safe as other operative interventions.

To date, there have been no re-ruptures. If our patients in a parallel study concerning reconstructive surgery for chronic ruptures of the Achilles tendon are included in the overall analysis, there have been no re-ruptures in 46 patients over a period of 10 years. In 1973, an editorial in *The Lancet*⁸ queried whether operative treatment of Achilles tendons was ever justified. In 1989, a second editorial in *The Lancet*⁹ suggested that the way forward for treatment of acute ruptures of the Achilles tendon was to find a way to

avoid external splintage. This method has allowed the treatment of Achilles tendon ruptures to progress in this direction. The major attraction for the patients was that there was no external splintage at all. This has implications in the early return to driving and also in the elderly patients where external splints can lead to considerable difficulties for the patient in mobilising. A recent study¹⁰ using a percutaneous route with a similar patient mix still showed a delay of return to work of 6 weeks compared to the 5 weeks in our series and surgical complications in two patients. This, however, still required 6 weeks of postoperative splintage which patients dislike and we believe is unnecessary if this technique used.

Conclusions

This new technique which requires no external splintage facilitates rapid rehabilitation and an early return to work and sport. In the long term, the results are maintained and with few complications.

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