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Surgical repair of Achilles tendon rupture

Comparison of surgical with conservative treatment

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Abstract Achilles tendon suture combined with a triceps surae tendon tip-over graft was performed in 314 patients with acute rupture of the Achilles tendon between 1980 and 1991. Analysis of these cases showed a low tissue complication rate compared with that reported in the literature. An average of 8.1 years after repair, 223 patients were examined using Holz's scale of clinical assessment after Achilles tendon repair. The results were 'good' in 87.4%, 'fair' in 11.2% and 'poor' in 1.4%. The re-rupture rate was very low (0.4%). These results are better than the re-rupture rate after surgical repair with solely end-to-end suture or after conservative immobilizing or conservative functional treatment. In conclusion, these data show that the fascial reinforcement is a valuable complement to the tendon suture.

Introduction

The treatment of acute rupture of the Achilles tendon remains controversial. Surgical repair is advocated by many authors as the incidence of re-rupture is low and the functional result is superior compared with that after conservative treatment by cast immobilization [1–4, 9, 10]. Recent studies suggest that conservative functional treatment in a newly developed boot (Vario-Stabil shoe) produces similar clinical results compared with operative treatment [6, 8]. In this retrospective study, the complications associated with the surgical treatment and the long-term results are presented. This has been compared with results of conservative immobilizing and conservative functional management as reported in the literature.

Materials and methods

This review, spanning a 12-year period from 1980 to 1991, involved 314 patient's charts. All patients, 81% of whom were male, were treated with primary surgical repair of their acute ruptured Achilles tendon. The average age of the patients at the time of the operation was 38 (range 12–76) years with the majority of the patients (41%) in their thirties. The ruptures were left sided in 57%. Sport activity was the major cause of rupture. The distribution of the causes is shown in Table 1.

The diagnosis of Achilles tendon rupture was based on the history and clinical assessment. Thirty patients (9.6%) had experienced heel cord symptoms prior to rupture. Clinical examination identified a palpable defect in all patients, and none was able to do a heel raise. X-ray films were obtained as a routine to rule out bony injuries or avulsion of the Achilles tendon.

Most patients (86%) underwent surgical repair between the 2nd and 7th day after injury after local haematoma and swelling had settled. In 12% of cases the diagnosis had been missed by the primary examining physician, which caused a delay in the operative treatment. All patients were immobilized in a below-knee cast with the foot in equinus position until surgery. The site of rupture was 2–7 cm above the insertion of the os calcis in the majority (96%) of cases. In the remaining patients the rupture was at the musculotendinous junction.

Table 1 Causes of Achilles tendon rupture

	Patients (n)	Percentage
Sports		
Soccer	88	28
Tennis	38	12
Volleyball	22	7
Squash	22	7
Athletics	22	7
Skiing	9	3
Others	34	11
Not sport-related activities		
Walking, misstep, Climbing stairs	79	25
Total	314	100

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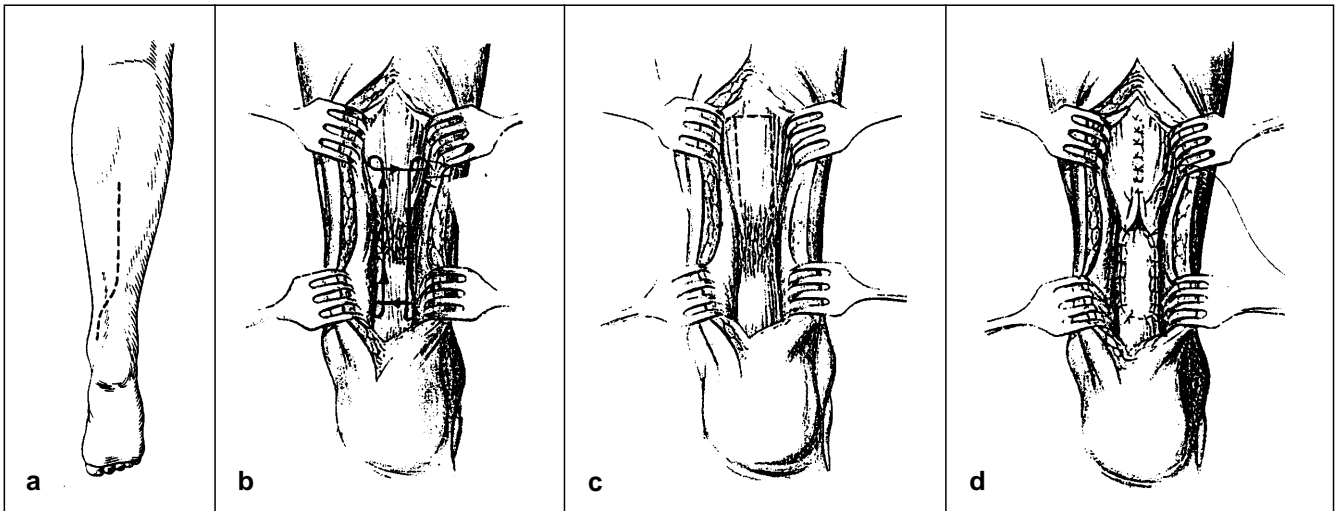


Fig. 1 Surgical procedure for Achilles tendon rupture. **a** Skin incision starting from the medial aspect of the heel up to the middle of the calf, preserving the lesser saphenous vein and the sural nerve. **b** Adaption of the tendon with absorbable material using the Kessler end-to-end method. **c** Dissection of a distally based tendon strip from the tendinous sheath of the triceps surae muscle. **d** Folded over fascial strip, which envelops and reinforces the sutured Achilles tendon.

Surgical technique

The operations were performed under general anaesthesia in a prone position. A tourniquet was always used. A straight skin incision starting from the medial aspect of the heel up to the middle of the calf, preserving the lesser saphenous vein and the sural nerve, was made. The paratenon was then carefully dissected. The tendon was adapted with an absorbable material using the Kessler end-to-end method in 20° plantar flexion of the ankle. A fascial reinforcement was then performed. A distally based tendon strip 2 cm wide and 7 cm long was dissected from the broad tendinous sheath of the triceps surae muscle. This was then folded over and sutured to the distal stump such that the repair site was enveloped by a fascial strip (Fig. 1).

The postoperative management was standard. For the first 4 weeks after surgery an above-knee cast was applied with the knee in 20° flexion and the ankle in 20° equinus position. The cast was then changed to a below-knee walking cast for 2 weeks, and patients were allowed to increase weight-bearing gradually. After

cast removal, a heel-lift was added to the shoe for 2–3 months. Sport activities were not allowed for 3 months after the operation. Patients were seen 6 weeks postoperatively for cast removal and then discharged.

The hospital notes of the 314 patients were reviewed to analyse complications after Achilles tendon repair with fascial reinforcement. Of these, 223 patients were assessed after an average of 8.1 (range 2.3–10.4) years using Holz's scale [1]. The detailed description of this scale is reproduced in Table 2.

Results

The review of the 314 case notes revealed that 25 patients (8%) had complications related to the surgical procedure (Table 3). Ten patients had a deep infection requiring further operative treatment, which involved debridement and in 8 cases, flap surgery. In 9 patients there was delayed wound healing without any form of surgical intervention. Four patients suffered sural nerve injuries which recovered. In 2 patients a sinus developed which required debridement and was closed primarily. The 3 patients (1%) who suffered deep vein thrombosis were treated with heparinization and developed no short- or long-term complications.

At final follow-up 223 patients (= 71% of the 314 cases) could be assessed. The remaining 91 patients were lost to follow-up and could not be contacted (our hospital,

Table 2 Rating score at follow-up examination after surgical repair of Achilles tendon rupture

Points	1	2	3
Gait	Limp	Mild limp	Normal
Ankle motion (net loss of plantar flexion)	Decreased $\geq 10^\circ$	Decreased $\geq 5^\circ$	Symmetrical normal range
Ability to stand on tiptoe on the injured leg	Not possible	Mild weakness	Normal strength
Complaints (pain, weakness, tender scar)	Considerable	Minor	None
Sporting activities	Not possible	Possible with restrictions	Unrestricted

Table 3 Complications after 314 Achilles tendon repairs with fascial reinforcement

	Patients (n)	Percentage
Surgical complications		
Deep infection	10	3.2
Delayed wound healing	9	2.9
Sural nerve injury	4	1.3
Sinus formation	2	0.6
Non-surgical complications		
Deep vein thrombosis	3	1.0

Table 4 Long-term results of 223 patients who had Achilles tendon repair with fascial reinforcement

	Points	Patients (<i>n</i> = 223)	Percentage
Good	12–15	195	87.4
Fair	8–11	25	11.2
Poor	< 7	3	1.4

being located in an university town, caters to a lot of students, many of whom move away at the end of their studies). Based on Holz's scale [1] the results have been graded as 'good', 'fair' and 'poor'. In our series, 195 patients (87.4%) achieved a 'good' result, the rest being 'fair' or 'poor' (Table 4).

In the 223 patients who underwent follow-up examination, one re-rupture was noted which occurred as a result of a misstep 10 weeks after the operation; this was re-repaired. No adhesion of the scar to the underlying tendon was noted. None of the patients revealed secondary weakness of the Achilles tendon at the follow-up examination.

Discussion

Review of the literature has shown the lack of a standard method of postoperative assessment after Achilles tendon rupture. We have compared our clinical results to those of Holz [1] as we used the same scale of assessment. Our results of 87% 'good' are superior the 58% reported by Holz, who used solely end-to-end suture of the tendon. From these results it appears that fascial reinforcement by a tip-over graft may influence the long-term result of primary Achilles tendon repair. Although a better assessment of strength could be obtained with objective isokinetic testing (with e.g. Cybex or Lido device), this was not possible for logistic and financial reasons.

Our over-all complication rate of 9% is lower than the 11%–15.1% reported in literature (Table 5), while the deep

infection rate of 3.2% is comparable to the 0.7%–3.6% [1, 2, 4, 7, 10].

We have been unable to find any reference to Holz's scale in the final assessment of clinical function after conservative therapy with cast immobilization for ruptured Achilles tendon. It is therefore difficult to compare the clinical results. Our re-rupture rate of 0.4% is, however, lower than the 10.6%–17.7% reported following conservative therapy with cast immobilization [3, 9].

Compared with the re-rupture rate after surgical repair with only end-to-end suture of 1.4%–2.5% [1, 2, 4, 7, 10] the results with an additional fascial reinforcement are superior. We accept that there is a possibility that re-rupture occurred in the patients we lost to follow-up. With a 0.4% re-rupture rate in 223 patients, the probability of a similar event in the other patients appears to be low.

During the last decade the use of fibrin sealing for surgical therapy of a ruptured Achilles tendon has emerged as an alternative technique. The results of repair with fibrin were better than those after only end-to-end suture of the tendon with respect to the complication and re-rupture rate, along with the functional and cosmetic aspects [5].

In our study we immobilized the affected limb after repair of the Achilles tendon in an above-knee cast for 4 weeks. In keeping with modern trends of the use of a below-knee cast or the use of functional devices in postoperative management, we have now changed the protocol to a below-knee cast immobilization for 6 weeks.

Conservative functional therapy with a newly developed boot (Vario-Stabil shoe) has been shown to be an appropriate modality of treatment of acute Achilles tendon rupture. The most recent studies with a greater number of patients revealed a re-rupture rate after conservative functional therapy of up to 5.3% [6].

At present, the surgical and conservative functional treatments of acute Achilles tendon rupture appear to be controversial. In the future, the advantage of both procedures might be combined, so that surgery with postoperative functional treatment perhaps offers the optimal management.

Table 5 Complications and re-rupture rate after Achilles tendon rupture

Reference	Number of cases	Therapy surgical (suture)	Therapy surgical (fibrin sealing)	Therapy conservative immobilization	Therapy conservative functional	Overall complication rate (%)	Deep infection (%)	Re-rupture rate (%)
Holz [1]	561	×				12.4	2.4	2.1
Nistor [4]	2674	×				11.0	3.0	2.0
Zwipp [10]	153	×				11.8	0.7	2.0
Rothenbühler [7]	139	×				12.9	3.6	1.4
Krüger-Franke [2]	420	×				15.1	3.6	2.5
Redaelli [5]	20		×					5.0
Lea [3]	66			×				10.6
Wills [9]	226			×				17.7
Reilmann [6]	132				×			5.3
Thermann [8]	28				×			0
This study	314	×				9.0	3.2	
This study	223	×						0.4

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