Immobilization in neutral versus equinus position after Achilles tendon repair

A review of 32 patients

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In this retrospective study, we compared Achilles tendon ruptures treated with augmented repair and equinus cast and ruptures treated with end-to-end suture and immobilization of the ankle in neutral position. No differences in the outcome or complication rate were found. We recommend that Achilles tendon rupture should be treated by the simplest method, i.e., end-to-end suture and immobilization of the ankle in neutral position.

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We have compared immobilization of the ankle in neutral position after Achilles tendon repair with conventional immobilization in equinus position.

Patients and methods

In the years 1980–1991, 39 patients (31 male, 8 female) with Achilles tendon rupture were treated in our hospital (annual incidence 20/10 000 inhabitants). Their average age was 46 (22–81) years. 1 patient had bilateral injuries with a 1-year interval. 25 of the injuries were sports related (13 in volleyball), 5 work related, and 8 happened in plain walking, usually involving stepping in a hole or missing a step in stairs. The history was unknown in 2 cases. About half of the patients had academic or white collar professions. Treatment was given within 10 days in 34 cases, while in 5 the injury was first either misdiagnosed or the patient had not consulted a physician earlier, and correct treatment was thus delayed for up to 17 weeks.

18 of the ruptures were treated with conventional immobilization (Group C). The surgical technique involved augmentation of the sutured tendon, a Lindholm-plasty (1959) was used in 12 cases and plantaris-tendon plasty in the rest. The leg was immobilized with the ankle in 20°–40° equinus in a below-the-knee cast. Equinus casts were worn an average of 3 (2–5) weeks, and another heel-supported short walking cast with neutral ankle position was worn until 6 weeks after the operation. Gradual weight bearing was begun immediately after changing of casts. After cast removal, patients were allowed to mobilize the leg freely. Physical therapy was given to 3 patients since recovery after cast removal was delayed.

22 injuries were treated with a modified method (Group M). A 10 cm skin incision lateral to the tendon was used, and simple end-to-end attachment with 1 or 2 Bunnell-sutures and small adaptive sutures was performed. In 2 cases with delayed diagnosis and treatment, however, gastrocnemius aponeurosis flaps were used for augmentation, since in those cases, the tendon ends were difficult to appose. The leg was placed in a short heel-support walking cast, with the ankle in neutral position. The casts were worn for 6 weeks and replaced or repaired only if needed. The patients were allowed to bear some weight on the immobilized leg as soon as they were discharged from the hospital (usually within 2 days), and full weight bearing was allowed after 2 weeks. Normal gait was encouraged immediately after cast removal.

Patients in both treatment groups were allowed to gradually resume sports activities 4–6 months after surgery.

Selection of the patients in the 2 treatment groups was random, since only 2 of the 4 surgeons performing such operations used the M method. The treatment applied was therefore dependent on which surgeon was on duty on the day of admission.

A letter of invitation to follow-up examination was sent to the patients 1–12 years after the operation. 32 of the 39 original patients accepted the review (3 had died, 1 could not be reached and 3 did not respond to the invitation). The 2 treatment groups were similar in age and sex distribution. The average follow-up period

Table 1. Findings in 32 patients at follow-up. Mean *SD*

	Group M (n 18)		Group C (n 14)	
Ankle mobility (degrees)				
Dorsal flexion				
injured	13	*5.7*	15	*6.9*
		**		*
uninjured	8	*3.4*	9	*4.4*
Plantar flexion				
injured	44	*20*	45	*9.6*
uninjured	48	*16*	53	*16*
Diameter of the Achilles tendon (mm)				
injured	22	*4.8*	22	*3.8*
		***		***
uninjured	15	*3.2*	14	*1.8*
difference	7.0	*1.8*	8.7	*2.3*
Maximal circumference of calf (cm)				
injured	36	*3.6*	36	*5.5*
uninjured	37	*3.3*	36	*6.2*
difference	0.8	*0.7*	0.7	*0.7*

*$P < 0.05$, **$P < 0.01$, ***$P < 0.001$

was 4 (1–12) years in Group M and 7 (2–12) years in Group C. The subjective final outcome of the treatment and time of returning to sports and work were recorded. The diameters of the injured and uninjured Achilles tendons were measured using ultrasound. The maximal circumference of the calf on both sides was also measured. Range of active motion in the ankle joints was measured by first drawing lines at 90° angle on the medial aspect of the foot and ankle with the patient standing on both feet, and then measuring the angle at full plantar and dorsal flexion in supine position.

All variables between the 2 treatment groups were compared using the Student's *t*-test; only the data from the 32 patients who were followed up were used.

Results

In Group M, 3 cases had wound infections. After debridement and removal of unabsorbable sutures, the recovery was uneventful in 2 cases. The third patient, a 63-year-old man, developed tendon necrosis and re-rupture. He died of rectal cancer shortly thereafter. 1 patient had a tenolysis performed about 2 years after primary surgery due to chronic paratenonitis.

In Group C, 4 patients had minor complications such as mild infection, sural nerve lesion or severe pain after changing the cast from equinus to neutral position. 1 patient underwent a tenolysis operation due to persisting pain in the tendon 2 years after the operation.

Most patients considered their recovery total or almost total. 2 patients in Group M and 1 in Group C felt their activity level restricted by persisting pain or calf muscle weakness. The average sick-leave after operation was 2 months in both groups. In Group M, 13 of the 14 previously athletically-active patients returned to their previous level of sport after an average of 10 months. In Group C, 9 of 11 previously active returned after an average of 11 months.

The average diameter of the operated tendon in Group M was 7.0 mm or 47 percent larger than that of the contralateral tendon, while this difference was 8.7 mm (63 percent) in Group C ($P > 0.05$; Table 1). The average greatest circumference of the calf was 0.8 and 0.7 cm smaller in Groups M and C. The range of active ankle motion was similar in both groups (Table 1).

Discussion

Although factors involved with Achilles tendon healing and the etiology and pathogenesis of the injury have been frequently studied and reported, no studies on preferable mode of immobilization could be found in the literature. Studies of other tendons show, however, that applying tension on the sutured tendon quite early in the process of healing, after a period of primary immobilization, promotes fast recovery of tensile strength (Mason and Allen 1941, Ketchum et al. 1977, Woo et al. 1981, Enwemeka 1989). Experience with flexor tendons of the hand have shown that extensive tension increases adhesion formation, most likely due to ischemia (Ketchum et al. 1977). In the Achilles tendon, some adhesion formation can, however, be tolerated, since range of motion and need for smooth gliding is limited. In this study, adhesions between skin scar and tendon could be observed in many patients, but in almost all cases the range of motion in the ankle joint was normal. Some tendon elongation could be seen in almost all patients, as the injured ankle could be dorsiflexed somewhat further than the contralateral ankle. This was equal in both groups; thus, applying tension early did not cause extra elongation, in accordance with previous results on rabbit Achilles tendon healing (Nyström 1983).

Re-rupture of surgically treated Achilles ruptures varies from 0 to 4 percent (Nistor 1981, Wills et al. 1986, Carden et al. 1987). In this study, the only re-rupture occurred after severe necrotizing wound infection due to poor general health of a patient suffering from rectal cancer. Thus, the choice of operative technique was of no importance as far as the risk of re-rupture was concerned.

Our study suggests that good results in Achilles tendon rupture treatment can be obtained by using the simplest method of surgery, end-to-end suture, and immobilization with the ankle plantigrade.

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