Function after Achilles tendon rupture in the elderly

25 patients older than 65 years followed for 3 years

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ABSTRACT – We retrospectively analyzed the function after Achilles tendon rupture in 25 patients older than 65 years, 3 (1–5) years after the initial treatment. The patients' median age at the time of injury was 71 (65–86) years. The initial management was surgical in 14 patients and non-surgical (8-week immobilization) in 10, 1 patient was not treated.

The ratio of the number of heel-raises on the injured to the uninjured side was median 0.64 (0–1.14), showing a reduction in performance. However, in both surgically- and non-surgically-treated patients, the subjective impairment was mild, and the patients were able to perform most walking activities. Only 9 patients reached their previous activity level. Co-morbidity was frequent: 17 patients had other diseases that affected their performance.

14 complications occurred in 11 patients. 5 patients sustained a rerupture (4 following initial closed treatment with plaster), 1 a deep venous thrombosis and 4 had superficial infections requiring antibiotic treatment. 1 patient sustained a fibular nerve injury following compression by the plaster cast and another a sural nerve injury during the operation. 2 patients had symptoms due to adhesions between the tendon and the skin.

We conclude that Achilles tendon rupture in patients older than 65 years reduces lower limb function and that complications are common following surgical and non-surgical treatment.

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The treatment of Achilles tendon rupture is still controversial. The outcome and complications are well documented in studies mainly involving patients active in sports (Nistor 1981, Cetti et al. 1993, Lo et al. 1997). Epidemiological data from Malmö, Sweden, have shown an incidence curve with two peaks (Möller et al. 1996), one in young, middle-aged subjects and one in the 70s. We have found no studies on the outcome in elderly patients with Achilles tendon rupture. We report the functional outcome and complications after Achilles tendon rupture in 25 patients older than 65 years.

Patients and methods

243 Achilles tendon ruptures were registered between 1992 and July 1997 in two hospitals, Huddinge University Hospital and Sahlgrenska University Hospital/Östra, with a catchment area of more than 500,000 people. 31 (13%) of the ruptures occurred in 29 patients older than 65 years. 2 patients had died, 1 with bilateral injury was too ill to participate, and 1 could not be traced. Of the remaining 25 patients (median age 71 (65–87) years, 21 men), all answered the questionnaire and 23 were examined by an independent observer, who had not been involved in the treatment of the patient. 2 patients refused to undergo the physical examination.

The physician on call decided on the initial treatment together with the patient. Local tradition and the general health of the patient mainly influenced the decision of the management. 1 patient received no treatment, 14 were treated surgically with end-to-end sutures followed by 8 weeks in a below-the-knee plaster cast and 10 were treated

Table 1. Stratification of the patients according to initial treatment

Treatment	n	Male	Co-morbidity	Age median	Age range
Surgical	14	11	9	72	65–79
Non-surgical	10	9	7	71	65–86

non-surgically with either a cast or brace for 8 weeks (Table 1). 1 of these patients had bilateral injuries and was treated with a cast on one side and a brace on the other. The untreated patient had rheumatoid arthritis and had been taking methotrexate and cortisone for a long time. The retrospective follow-up period was 39 (13–65) months.

All patients received a questionnaire, divided into two parts. One part consisted of general questions concerning overall health, medical problems and activity. The second part concerned the Achilles tendon injury with emphasis on treatment, complications and current problems. The patient's subjective opinion of the treatment and its outcome was assessed by visual analogue scales (VAS, 0–100 mm) with 100 representing the best possible. Impairment in performance of the lower extremity was assessed by 5 criteria: walk on even surface, walk on uneven surface, climb up stairs, walk down stairs and walk for 30 minutes without pain in the Achilles tendon region. An estimation was made on one VAS scale for each question. The sum of the 5 VAS measurements (0–500 mm) is presented and indicates the subjective impairment in function.

The clinical examination consisted of evaluation of the ankle motion, skin sensitivity, the homogeneity of the tendon and adherence between skin and tendon. No imaging assessments were done.

The endurance of the calf muscles was evaluated by comparing the number of heel-raises (above 2.5 cm) the patient managed on the injured side with that on the uninjured side. The ratio injured/uninjured side is presented. The height was controlled by photocells. When the heel was lifted over the photocell, a click-sound was generated to a speaker and the heel-raise was counted. A metronome was used to obtain a frequency of 40 heel-raises per minute. This method of endurance measurement of the calf muscles has been validated and reported in Achilles tendon rupture patients by Häggmark et al. (1986).

Co-morbidity was classified as any disease affecting the circulatory system, lungs, malignant tumor or rheumatoid arthritis.

Statistics

The results are presented as median and range values.

Statistical analysis was performed for the entire group of patients regarding the hypothesis concerning no differences in the calf muscle endurance of the injured, compared with the uninjured side by using the paired two-sided Student's t-test. The results in surgically- and non-surgically-treated patients were analyzed by non-parametric statistics by using the Mann-Whitney U-test. A probability level of < 0.05 was considered significant.

Results (Tables 2 and 3)

Calf muscle endurance with the heel-raise test showed a ratio of the injured/uninjured side of 0.64 (0–1.14; n 18) ($p = 0.002$). 5 patients could not perform the test on either side.

The median value of subjective impairment in function from the five VAS questions was 471 (190–500) mm. 9 of the 25 patients reached the same level of activity as before the injury.

14 complications occurred in 11 patients: 5 reruptures, 1 deep venous thrombosis, 4 infections, 2 nerve injuries and 2 had a symptomatic adherence between the tendon and skin.

Of the 14 surgically treated patients, 5 had no symptoms from their Achilles tendon and 6 had returned to their previous activity level. Complications among these 14 patients included 1 rerupture, 3 superficial infections responding to antibiotic treatment, 1 injury to the sural nerve and 2 patients who had adherent tendon and skin.

10 patients were treated non-surgically, 3 were asymptomatic. 3 had returned to their previous activity level. 4 sustained a rerupture and all 4 were treated surgically. 2 patients developed complications from the plaster cast, 1 had a fibular nerve injury following compression and another a skin injury with superficial infection. 1 patient had deep venous thrombosis.

Table 2. Individual data of the 25 patients included in the study

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
1	m	70	c	n	1	n		n			ni	y	0.15	244
2	m	71	c	n	7	n		n	y [a]	s		y		256
3	m	86	c	n	1	n		n				y		190
4	m	74	c	y	12	n		n				y	0.87	490
5	m	69	c	n	4	n		y	y	s		y	1	461
6	m	65	c	y	14	n		n	y	s		n	1	485
7	m	66	c	n	1	n		y				n	0.79	349
8	m	76	b	n	14	n		n				y	0	
9	m	78	c	y	30	y	a	y	y	s		n	0	485
10	f	71	c,b	n	>180	n		n			d,in	y		238
11	m	72	s	y	6	y	c	y				y	0.07	485
12	m	65	s	n	1	y	c	y			in	y	0.88	475
13	m	75	s	y	7	y	c	n				y	1	485
14	m	71	s	y	1	n		y				n	0.9	490
15	m	65	s	n	3	y	c	n				n	0.27	315
16	m	79	s	n	1	y	ca	n	y	s	ni	y		250
17	m	75	s	y	1	y	c	y				n	0.91	500
18	m	69	s	n	21	y		n				y	0	430
19	m	70	s	y	7	y	pt	y			a	y	1.14	486
20	m	65	s	n	1	n		y				y	0.49	460
21	f	76	s	n	[b]	y	c	n			in	y		
22	f	69	s	n	30	n		n			in,a	y		500
23	m	75	s	n	30	n		n				n	0.39	474
24	f	75	s	n	>180	n						n		438
25	m	70	0	n	>180	y	c	y				y	0	379

A Patient no.
B Sex
C Age
D Treatment
  c cast
  b brace
  s surgery
E Asymptomatic
  y yes
  n no
F Days to treatment
G Symptoms before rupture
  y yes
  n no
H Treatment of previous symptoms
  c inj. corticosteroids
  ca cast
  pt physical therapy
  a antiinflammatory medication
I Returned to previous level of activity
  y yes
  n no
J Rerupture
  y yes
K Treatment of rerupture
  s surgical
L Complications
  a adherence tendon to skin
  d deep venous thrombosis
  in infection
  ni nerve injury
M Co-morbidity
  y yes
  n no
N Heel-raise injured/uninjured
O Functional impairment
  0–500, see text

[a] rerupture twice, both surgically treated
[b] medical records missing

The patient who did not receive any treatment could not perform a heel-raise on the injured side.

Discussion

The number of elderly Achilles tendon rupture patients is probably increasing, since the mean age of the population is increasing. Furthermore, the incidence of all Achilles tendon ruptures has been increasing in Scandinavia (Leppilahti et al. 1996, Möller et al. 1996).

Mechanical load during sports is a major factor in the middle-aged recreational athlete (Nillius et al. 1976, Nistor 1981). Other factors such as aging and co-morbidity may explain the bi-modal distri-

Table 3. Summary of results in surgically- and non-surgically-treated elderly persons with Achilles tendon rupture presented as median and range values. From the top: a) the ratio of heel-raises of the injured to the uninjured side, b) the sum of five questions with VAS measurements regarding functional impairment where 500 represents no difficulty in performing walking activities, and VAS assessment of the subjective opinion of c) the treatment and d) its outcome, with 100 representing an optimal result

	Surgically-treated (n 14)	Non-surgically-treated (n 10)	P-value
Calf endurance performance	0.49 (0–1.14)	0.79 (0–1)	0.63
Subjective impairment in function	475 (250–500)	349 (190–490)	0.21
Subjective opinion of treatment	92 (24–100)	72 (4–96)	0.20
Subjective opinion of outcome	89 (25–100)	23 (4–97)	0.10

bution curve related to age. The blood supply decreases in the aging human Achilles tendon (Håstad et al. 1958/59, Åström and Westlin 1994), which may diminish its nutritional supply. With age, the tendon collagen volume increases and the glycosaminoglycans and water content decrease (Ippolito et al. 1980), which affect the tensile properties. Age significantly affects the ultimate tensile strength and the tangent of the modulus of elasticity (Lewis and Shaw 1997). A preexisting Achilles tendon disorder may precede the rupture. In a study of 397 patients with Achilles tendon rupture, all tendons were classified as pathological by their microstructure (Kannus and Józsa 1991). Histological studies of patients with achillodynia and tendinosis have shown a correlation between increased tendon pathology and increasing age (Åström and Rausing 1995, Movin et al. 1997).

In our series, 11 of 25 patients had had local symptoms in the Achilles tendon region and 7 had been treated with local cortisone injections. The use of corticosteroid injections is controversial, since there is no convincing evidence for or against their use in Achilles tendon disorders (Read and Motto 1992, Shrier et al. 1996, Kannus and Natri 1997).

The elderly patients in our study had a high frequency of co-morbidity (17/25), which affected the performance. Tendons subjected to low activity have abnormally grouped collagen fibrils (Józsa 1984), which may add to the reduced mechanical properties of the tendon. Furthermore, the co-morbidity probably influenced the initial treatment and the prospects of for rehabilitation. Retrospective comparison of the results of surgical versus non-surgical management therefore has obvious limitations.

The main reason why the non-surgically-treated patients were displeased with the outcome of the treatment was that 4 of 10 patients had a rerupture and were operated on.

The objective measurement of calf muscle endurance showed a reduction to two-thirds of the uninjured leg. However, the subjective impairment was low and the patients could perform most walking activities with only minor difficulty. This was consistent with Nistor's (1981) findings that the reduction in plantar flexion strength appears to have little clinical importance.

We found 14 complications (including 5 reruptures) in 11 of the 25 elderly patients, which is higher than in a literature review of patients of all ages with Achilles tendon rupture (Lo et al. 1997).

Achilles tendon rupture may be missed in as many as 25% of patients (Ballas et al. 1998). This was evident in our series of 9/25 patients having a delay of more than 1 week to treatment. Carden et al. (1987) recommended that Achilles tendon rupture should be treated with plaster in full equinus when it is diagnosed within 48 hours, and by operation when the diagnosis has been delayed for more than 1 week. None of the patients treated with plaster who subsequently sustained a rerupture in our series had been treated within 48 hours.

We found that the treatment of Achilles tendon rupture in patients older than 65 years was associated with many complications. The calf muscle endurance was reduced to two-thirds of the uninjured side, but the reduction seemed to have limited clinical importance, since the patients could perform most walking activities. However, most

of them did not return to their previous level of activity.

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