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## Operative treatment of chronic Achilles tendinopathy

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**Abstract** Seventy-six patients with Achilles tendinopathies ( $n=86$ ) operated between 1980 and 1995 were retrospectively evaluated at an average follow-up of 13 (5–21) years. Total or gross partial ruptures were excluded. Patients' average age at surgery was 38 (18–58) years. The majority of patients were active in competitive or recreational sports. Tendinopathies were classified in peritendinitis, tendinosis, insertional tendinopathies, and mixed forms. The surgical technique depended entirely on the pathology encountered. For 32 cases of peritendinitis, results were excellent in 26, good in four, and poor in two. For eight cases of tendinosis, results were excellent in four and good in four. For 34 cases of insertional tendinopathy, results were excellent in 22, good in four, fair in four, and poor in four. For 12 cases of mixed tendinopathies, results were excellent in ten and good in two. Forty-nine patients (52 cases) were able to return to sport at the desired level.

**Résumé** Soixante-seize malades avec une tendinopathie d'Achille ( $n=86$ ) ont été opérés entre 1980 et 1995 et évalués rétrospectivement à un délai moyen de 13 (5–21) années. Les ruptures totales ou partielles importantes ont été exclues. L'âge moyen des malades à la chirurgie était 38 (18–58) années. La majorité des malades était des sportifs soit de loisir soit de compétition. Les tendinopathies ont été classés en: péri-tendinites, tendinites, tendinopathies d'insertion de et formes mixtes. La technique chirurgicale dépendait de la pathologie. Sur 32 péri-tendinites, les résultats étaient excellents pour 26, bon pour quatre et mauvais pour deux. Sur huit tendinites, il y avait quatre excellents et 4 bons résultats. Sur 34 tendinopathies d'insertion, les résultats étaient excellents

pour 22, bon pour quatre, juste pour quatre, et mauvais quatre. Sur 12 tendinopathies mixtes, les résultats étaient excellents pour dix et bon pour deux. Cinquante-deux malades étaient capables de revenir au sport au niveau désiré.

### Introduction

Disease of the Achilles tendon and its contiguous structures are the most common overuse syndromes, not only among athletes but also among people not involved in sports.

Perugia et al. [10], and later Puddu et al. [12], classified Achilles tendon pathology in a group of distinct entities according to clinical and histological findings: peritendinitis, tendinosis, insertional tendinopathies, and mixed forms (tendinosis and peritendinitis associated with insertional tendinopathies) [11]. Peritendinitis involves inflammation only in the paratenon, a richly vascularized structure. Pure tendinosis is characterised by areas of degeneration of the tendon tissue, including foci of mucoid, fatty, cartilaginous, or calcified metaplasia, and is frequently associated with partial or total ruptures of the Achilles tendon. In insertional tendinopathies, microtears of the bone tendon junction can occur, resulting in a chronic degenerative process. Moreover, the retrocalcaneal bursa, located between the posterior angle of the calcaneus and the Achilles tendon, may become inflamed and hypertrophic. The prominence of the calcaneus increases local pressure on the bursa, leading to inflammatory reaction and painful swelling on the ventral side of the Achilles tendon.

In spite of rest from exercise and various forms of conservative treatment, some patients with tendinopathy of the Achilles tendon continue to have symptoms and, thus, operative treatment may be necessary. This study presents the long-term results of operative treatment of patients with chronic Achilles tendinitis. Furthermore we evaluated the ability of the patients to return to their pre-injury level of training and sports.

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## Materials and methods

Between 1980 and 1995, 95 patients with 107 affected tendons were treated surgically at our institution. Seventy-six patients with 86 affected tendons were available for follow-up. In six patients the operation was bilateral, and in four patients both tendons were operated on at different occasions. Patients with total or gross partial rupture of the Achilles tendon were excluded from the study.

Patients' age at surgery ranged from 18 to 58 (average 38) years. Fifty-nine were male and 17 female. The majority were active in competitive or recreational sports prior to surgery. Patient distribution according to levels of sports was 36 competing athletes, 24 active recreational athletes, and 16 sedentary (no sport). Duration of pre-operative symptoms ranged from 6 to 120 (average 63) months.

At an average follow-up of 13 (5–21) years, patients were questioned about their level of activity, symptoms compared with pre-operative status, and overall evaluation of the result. A physical examination was also performed.

In accordance with Perugia's classification [11], patients were divided into four categories according to clinical as well as surgical findings. The first group consisted of 32 patients with peritendinitis, affecting the tendon from 2 to 6 cm above the calcaneal insertion. The second group included eight patients with pure tendinosis. The third group consisted of 34 patients with insertional tendinopathy and symptoms localised to the retrocalcaneal bursa and posterior aspect of the calcaneus at the level of the Achilles insertion. The fourth group, with insertional tendinopathy associated with peritendinitis, tendinosis, or both, consisted of 12 patients.

A classification scale graded from 0 to 4 was used to evaluate subjective symptoms pre- and post-operatively. All patients were requested to estimate their subjective symptoms pre-operatively and the current status of their operated Achilles tendon (Table 1).

Post-operative results were evaluated according to the criteria used for evaluation of surgical treatment of patellar tendinopathy [3] (Table 2).

## Surgical technique and surgical findings

A longitudinal incision, medial to the Achilles tendon, was used in all cases. The extension of incision and the surgical technique used depended entirely on the observed lesion.

In patients with peritendinitis, the tendon sheath was usually found to be hyperaemic, thickened and fibrous, as well as adherent to the tendon. This tissue was freed from the underlying tendon and excised. We were careful to leave the fatty tissue and mesotenon attached anterior to preserve the blood supply.

In patients with tendinosis and intratendinous pathological processes, the tendon was carefully inspected and palpated for areas of thickening, defects or softening. A longitudinal division of the tendon was performed and the degenerated focus removed. In nine cases where an old partial tear was found, debridement was performed. The tendon was repaired by side-to-side suture. In cases with advanced degeneration, we reinforced the tendon with flaps of healthy tendon.

In patients with insertional tendinopathy, the tendon insertion was carefully inspected. The deepest fibres of the tendon were released from the calcaneus and any calcification or metaplastic tissue removed. The retrocalcaneal bursa was completely excised. Usually it was enlarged and sometimes filled with fibrinous loose bodies. The postero-superior angle of the calcaneus was removed and the edges carefully smoothed. Finally it was ensured that there was no impingement of the calcaneus on the anterior side of the Achilles tendon. Drilling of the junction area and scarification of the tendon near the osteo-tendinous junction was done. In all groups a short leg plaster was used post-operatively for 2–4 weeks with weightbearing permitted after 2 weeks. In cases where excision or tendon repair had been used, immobilisation was continued up to 6 weeks. After cast removal motion exercises were started, emphasising passive dorsiflexion. A gradual program of swimming and stationary bicycling, along with isometric and isotonic strengthening of the calf muscles, was prescribed. Jogging was usually permitted at 8–12 weeks. Full return to a competitive level was allowed by 4–5 months.

## Results

At follow-up there were 62 excellent, 14 good, four fair and six poor results. When we classified the results according to diagnosis, it was found that in the group with peritendinitis, there were 26 excellent, four good, and two poor results. In the group with tendinosis, there were four excellent and four good results. In the group with insertional tendinopathy, there were 22 excellent, four good, four fair and four poor results. In the group with insertional tendinopathy associated with peritendinitis or tendinosis, there were ten excellent and two good results.

**Table 1** Classification of Achilles tendon tendinopathies according to symptoms

Stage 0	No pain
Stage 1	Pain only during sport with no limitation of sport performance
Stage 2	Pain during sport, limiting sport participation, and sometimes at rest (particularly on rising in the morning)
Stage 3	Pain also during daily activities
Stage 4	Intolerable and constant pain

**Table 2** Criteria used for evaluation of post-operative results

Excellent	Stage 0 Pain free, able to return to previous level of sports or exertion Full ROM
Good	Stage 1 Occasional pain on exertion or after training, able to return to previous level of sports or exertion Full ROM
Fair	Improvement, but the final result as in Stage 2 or higher Pain, but lesser than pre-operatively, participation in sport activities or performance decreased Mild limitation of ROM
Poor	No improvement, as painful as before the operation, participation in sport activities ended and in exercise or work markedly reduced due to the operated tendon Limitation of ROM

Return to sport at the desired level of activity was observed in 52 cases. There were 49 with unilateral involvement and three with both tendons involved, two operated bilaterally at the same time. Three patients who pre-operatively were involved in sports activities gave up sport due to reasons other than the operated tendon.

## Discussion

In the treatment of tendinopathy of the Achilles tendon, Snook [13], Kvist [8] and, subsequently, Clancy [1] in their preliminary studies reported good results after simple surgical release by splitting and partial resection of the diseased peritendinous tissue. In these studies there was remarkable discrepancy between poor and good results. Differences in patient selection may explain deviating results. The authors report various surgical procedures and describe various lesions; however, their findings are inconsistent and difficult to interpret due to lack of an adequate description and a generally accepted terminology of the observed changes.

Kvist [8] emphasised chronic para-tendonitis as a major cause of Achilles tendinopathy. The study was well documented with respect to changes in the paratenon, and results were excellent in 169 (84%) cases. The treated patients were a large number of top-ranking athletes in international competitions. Surgery consisted of simple release of the tendon by splitting, and partial resection of the affected peritendinous tissue. Nelen et al., in 1989 [9], presented excellent/good results in 86% of the 93 cases of pure peritendinitis. Treatment consisted in release of the fascia of the lower legs as well as the paratenon. A resection of the affected tendon tissue was performed in 50 cases of pure tendinosis. In 26 cases side-to-side suture was performed, with excellent/good results in 73%. In 24 cases a turned-down tendon flap procedure was performed, with excellent/good results in 87%.

The classification proposed by Perugia et al. [11] and later reported by Puddu et al. [12], which we adopted in the present study, identifies three distinct forms of tendinopathies with different aetiology: peritendinitis (mainly inflammatory), tendinosis (mainly degenerative) and insertional tendinopathy (mainly mechanical). However, a relationship between the two forms affecting the tendon has been found. In previous biopsies of peritendineal tissues taken intra-operatively in Achilles peritendinitis patients, Perugia et al. [11] found marked degenerative and obstructive vascular changes. They suggested that if the tendon was allowed to suffer from hypoxia due to obstructive vascular changes, degenerative changes of the tendon tissue itself may arise. We could speculate that—as in two of the cases reported here—in several unsatisfactory results in Achilles peritendinitis, tendon degeneration with mild partial rupture of the tendon has sometimes been treated as chronic, pure peritendinitis. This suggests that simple release of peritenoneum should probably be performed before any intra-tendineal degeneration occurs. It must be emphasised that, in cases of

pure peritendinitis, a surgical release of the paratenon is sufficient, but this is not true for peritendinitis associated with tendinosis. In peritendinitis associated with tendinosis, it is very important to promote tendon healing using multiple longitudinal incisions in order to encourage revascularization. It is widely accepted that degeneration of the tendon can lead to partial or total rupture and, because small ruptures may be difficult to recognise both clinically and ultrasonographically, a careful inspection of the tendon belly is always recommended. Should a partial tear be identified, adequate repair is recommended.

Denstad and Roaas [2] reported about 90% satisfactory results in cases of pure tendinosis with partial Achilles tendon ruptures treated with the resection of the affected tissue, side-to-side suture and a turned-down tendon flap. The results reported by Kvist [8], Nelen [9] and Denstad and Roaas [2] are more in agreement with those presented here.

Regarding insertional tendinopathy reports on surgical treatment are difficult to interpret because of lack of adequate and generally accepted terminology. Most authors acknowledge the co-existence of various lesions.

A biomechanically altered relationship between calcaneus and the Achilles tendon in insertional tendinopathy has been suggested to be the cause of the condition. Haglund [4] first gave the most accurate description through focusing on anatomical variants of the postero-superior portion of the calcaneus and its relation to the Achilles bursa and tendon. Friction typically results in secondary inflammation of the bursa in the retrocalcaneal region, especially if there are alterations in the normal bony configuration of the calcaneus [5]. Moreover, muscular over-stress itself may, in time, produce degenerative and metaplastic changes of the bone-tendon junction, typical for insertional tendinopathies, with micro-tears of the tendon junction and areas in which the tendon fibres seem to be torn and fragmented in the same way as in epicondylitis, jumper's knee, etc.

Some authors have reported good results after a simple partial resection of the posterior upper corner of calcaneus [6, 7]. In their opinion there is no difference in pain relief whether a large or small resection is used, but large resections can lead to more severe late complaints [5, 6, 7]. It is also recommended that all ridges of the calcaneus be carefully removed and rasped smooth so that no prominence is left posterior.

On the basis of our experience, we believe that insertional tendinopathy is a complex condition consisting of various lesions mainly related to overuse and to impingement of the anterior portion of the tendon against the postero-superior corner of calcaneus.

Therefore, the anatomical structures surrounding the affected osteo-tendinous junction are extremely important. The surgical treatment should include excision of the retrocalcaneal bursa, resection of the posterior superior corner of calcaneus, removal of degenerated tissues and calcifications, if any, drilling of the junction area and scarification of inferior part the tendon near the osteo-tendinous junction.

The present study shows that the techniques used lead to acceptable results, as also suggested by previous studies [10, 11]. Furthermore, the ability of 87% of patients to return to their pre-injury level of training and sports confirms this.

In 2001 Tallon et al. [14] proposed a methodology score for studies on the surgical outcome of chronic Achilles tendinopathies. This included several criteria (study size, mean follow-up, number of different surgical procedures, type of study, diagnostic certainty, etc.). Our study, although a retrospective study, adhered to these basic guidelines set by such methodology, such as number of patients and, above all, by length of follow-up, which to the best of our knowledge is one of the longest in surgical treatment of Achilles tendinopathies.

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