

Tendon transfer for lateral ankle and subtalar joint instability

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Seventy-three patients suffering from lateral instability of the ankle joint, bilateral in 6 cases and combined with subtalar instability in 25, were operated on using the distal part of the peroneus brevis tendon. The tendon was pulled through two bore canals in the lateral malleolus and fixed in a bore hole in the calcaneus. The direction of the tendon in relation to the calcaneus and the talus was varied depending upon the type of instability.

At 9 and 24 months follow-up, all but 2 patients had substantial reduction of the radiographically measured instability. No subtalar instability could be disclosed, and all the patients could return to normal levels of activity.

The operation can be recommended for chronic lateral ankle and subtalar joint instability.

Chronic instability of the ankle may follow ruptures of the lateral ankle ligaments or be associated with general joint laxity. Subtalar instability occurs at a frequency of 10-25 percent in patients suffering from lateral ankle instability (Gillespie and Boucher 1971, Brantigan et al. 1977, Riegler 1984). The Evans and Watson-Jones reconstructive procedures for ankle instability do not stabilize the subtalar joint well (Nicholas 1974, Brantigan et al. 1977).

We present an operative procedure that can stabilize the ankle or the subtalar joint, or both.

Patients and methods

Seventy-nine ankles, 42 left and 37 right, in 73 patients were included in a prospective study during the period July 1982 through January 1984. Thirty-five patients were women and 38 were men with a median age of 25 (16-61) years. All the patients had a history of supination trauma to the

ankle with a mean duration of symptoms of 2 (0.5-17) years. The main indication for the operation in all the cases was instability suffered during daily activities and/or sports. Seventy-five ankles were painful and 44 had swelling during or after activity. At the radiographic examination before the operation, 30 ankles had an abnormal talar tilt and anterior displacement, 35 ankles had an abnormal tilt only, and 14 ankles had anterior displacement. Only patients without therapeutic effect of conservative treatment, such as taping, wedges on the shoes, and/or physiotherapy, were included.

Preoperatively and at the follow-up studies, the patients were examined clinically and radiographically with standardized methods to disclose anterior rotational talar displacement and talar tilting (Larsen 1986). The method described by Lindstrand and Mortenson (1977) was used to measure the anterior displacement on the radiographs, with a displacement index of 93 as the borderline value. When measuring the talar tilt, a lateral open angle of 6 or more degrees was considered as pathologic. Only patients with a pathologic anterior displacement and/or talar tilt were included.

Subtalar instability was disclosed clinically in 22 patients before the operation and intraoperatively

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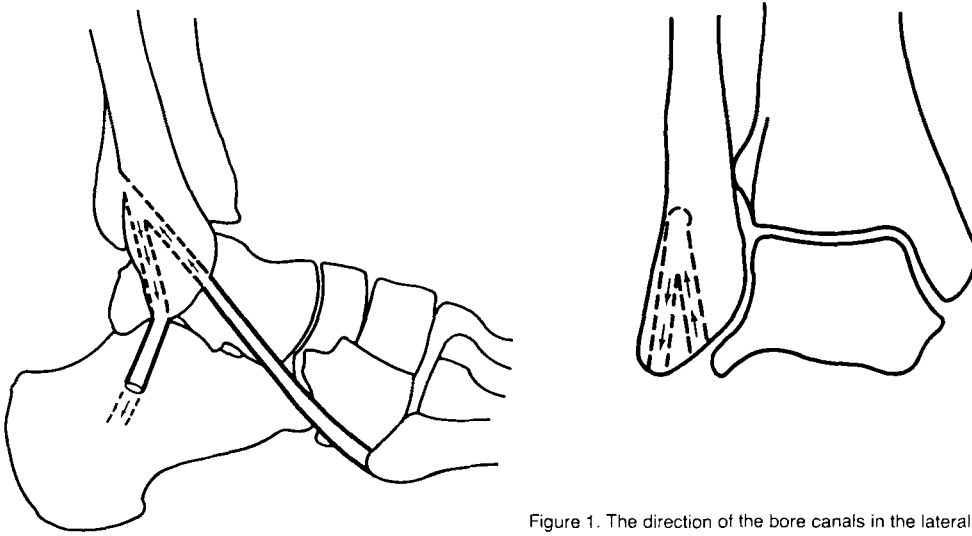


Figure 1. The direction of the bore canals in the lateral malleolus.

in 3 patients. The instability was manifested by excessive motion of over 45° of the hind part of the foot in supination. The sex distribution was 21 women and 4 men.

Operative procedure. The patient lies on the opposite side. The ankle and subtalar joints are exposed through an incision posterior and distal to the lateral malleolus. The subtalar instability is evaluated to determine the optimal direction of the tendon insertion into the calcaneus. The peroneus brevis tendon is dissected and freed of muscle fiber and transected 8 cm above the apex of the lateral malleolus. The proximal part of the dissected tendon is sutured to the peroneus longus tendon. The anterior part of the peroneus brevis tendon sheath is incised over the extensor brevis muscle to allow the tendon to move 1-2 cm forward. Two bore canals are drilled in the malleolus, one directed posterior and proximally starting at the original insertion of the talofibular ligament, and the second directed proximally starting at the insertion of the calcaneofibular ligament. Both canals end in the peroneal groove 4 cm above the apex of the malleolus. Before pulling the tendon through the canals, the correct neutral position of the ankle joint is secured, with special emphasis on possible anterior rotational displacement of the talus. The end of the tendon is then situated in a drill hole in the calcaneus and

secured with one or two Dexon® sutures (a staple would be a good alternative). A good subcutaneous covering is important to avoid adhesions between the skin and the tendon graft.

A plaster cast below the knee, with slight pronation of the foot, is applied for 6 weeks, the last 3 weeks with full weight bearing. After removal of the plaster cast, physiotherapy is instituted, and 12 weeks postoperatively all activities are allowed without restrictions.

Follow-up. The median time until the first follow-up was 9 (6-14) months and to the second 24 (18-46) months. All the patients attended the first follow-up, whereas at the second follow-up, 4 patients had to be interviewed on the telephone. None of these patients had had postoperatively instability symptoms, pain, or swelling, and they

Table 1. Subjective symptoms before operation and at the last follow-up

	Before operation	At follow-up
Ankle instability	79 ^a	2
Pain	75 ^b	9 ^c
Swelling	44	2

^a Also subtalar instability in 25 cases.

^b Minor pain in 22 ankles.

^c Minor pain in 8 ankles.

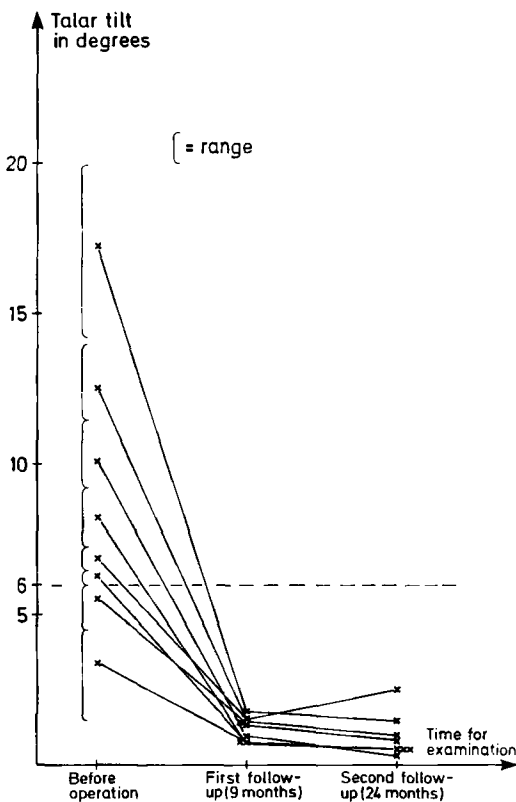


Figure 2. The talar tilting, in degrees, of the ankles before operation and at follow-up. The results divided into groups including 10 cases. Median values are shown.

were all active in sports. For statistical calculations, only records from the first follow-up were included in the study.

The Mann-Whitney test, with a significance level of $P < 0.05$, was used.

Results

At radiographic examination at 9 and 24 months' follow-up, the talar tilt was reduced ($P = 0.0001$; Figure 2). Average values at 9 months were 1.2 (0.0–5.0) degrees and at 24 months 1.0 (0.0–8.0) degrees.

Evaluation of the anterior displacement showed also substantial reduction ($P = 0.0001$); the change between 9 and 24 months was not significant (Figure 3). The patients with the highest preoperative displacement indices had higher values than the rest of the patients also at follow-up;

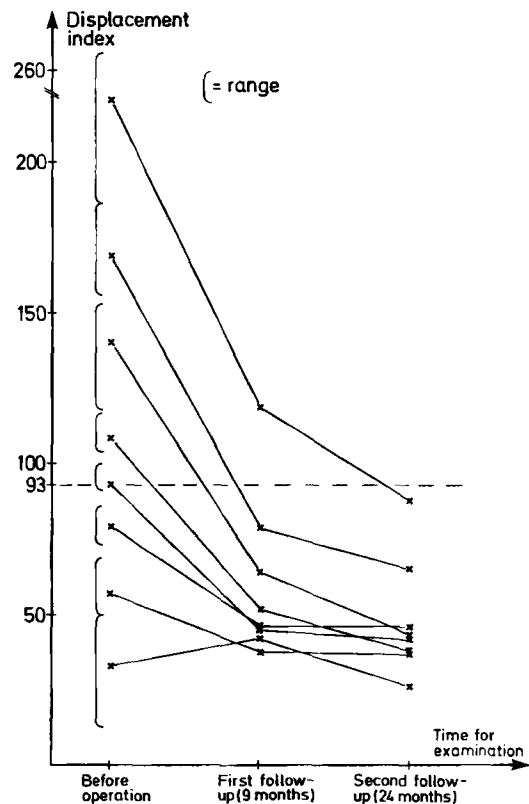


Figure 3. The anterior displacement indices of the ankles before operation and at follow-up. The results divided into groups of 10 cases. Median values are shown.

patients suffering from arthrochlasia dominated this group.

A 24-year-old man had sustained a new, serious ankle distortion upon falling down from 2 meters' height 14 months after surgery. At the last follow-up, he complained of instability in sport performances and had to tape the ankle (talar tilt 8° , index 103). At 24 months' follow-up, 8 patients had pathologic anterior displacement, but only 2 patients had an increase compared with the first follow-up. At the last follow-up, only the patient with the new distortion trauma had pathologic talar tilting. The subtalar joint was in all the cases stable at both follow-ups.

At the last follow-up the accumulated active talocrural and subtalar supination in patients with normal subtalar mobility was reduced 10 (0–30) degrees, and in patients with associated subtalar instability, 30 (15–50) degrees, but in no cases was it accompanied by subjective discomfort. All the

Table 2. Sports activity in the patients before operation and at the last follow-up

	Before operation	At follow-up
Normal activity	9	64
Stopped	56	1 ^{a)}
Never sports	8	8

^{a)} Because of low back pain.

other movements were unaffected as compared with the preoperative status.

After the operation, all the patients, except 1 with low back pain, could return to normal activity including sports (Table 2). Return to sports took place a median of 14 (9-52) weeks after the operation.

There were nine complications from the operation. Deep thrombosis occurred in 2 patients: both recovered uneventfully. Hypesthesia of the fifth toe was found in 4 patients. A painful calcification beneath the lateral malleolus at one of the bore holes was removed. There was one superficial infection. One patient suffered dysesthesia in the scar.

Discussion

The advantage of the present operation procedure is the good stabilizing effect on both the ankle and the subtalar joint in contrast to the Evans and Watson-Jones procedures, which only stabilize the ankle joint (Gillespie and Boucher 1971, Brantigan et al. 1977, Solheim et al. 1980, Riegler 1984). In contrast to the Windfeld (1953) and similar procedures, the drill holes are located at the insertions of the original ligaments, and the peroneus brevis tendon is hidden in the bone. The calcaneal end of the tendon can be placed as most suitably for the individual case depending on the type of instability. Even in peroneal subluxation (Solheim et al. 1980), the end of the transected tendon can correct the condition.

Most important is the subjectively good functional stability allowing return to normal levels of activity and sports quite quickly. Due to differences in reporting, it is difficult to compare the

results of the various methods of operation. Nevertheless, the functional results seem better or equal to most reported results (Windfeld 1953, Lee 1957, Broström 1966, Ottosson 1978, Hedeboe and Johannsen 1979, Sefton et al. 1979, Solheim et al. 1980, Orava et al. 1983, van der Rijt and Evans 1984, Snook et al. 1985).

Supination may almost necessarily be limited by other than dynamic methods (Huggler 1978) or direct suture of the ligaments (Broström 1966). However, as previously pointed out by Ottosson (1978) and Orava et al. (1983), and like in this series, the limitation in supination does not seem to be a functional problem.

The presence of some radiographically visible instability is not necessarily accompanied by functional instability (Hedeboe and Johannsen 1979, Tropp 1985). This in combination with the achieved supination stability can probably explain the good functional results in 8 patients with some residual anterior displacement. Also Johannsen (1978) showed discrepancies between the examinations for talar tilting and anterior displacement, and concluded that the two types of examinations were complementary to each other. Rasmussen and Tovborg (1981) found the anterior displacement to be a relatively inconstant type of instability. The intraoperative correction of the talar rotation – which is easiest to obtain when the patient is positioned on his side – is most important for eliminating possible anterior displacement.

Even though most of the patients were young and active in sports, there was no deterioration of the ligamentous stability between the two follow-up studies. This accords well with the findings in the experimental study of Attarian et al. (1985) that peroneal tendon grafts were stronger than grafts prepared from the ligaments of the ankle joint. The tendon used for the ligamentous reconstruction is undoubtedly deprived of its vascular supply, but elongation of the tendon was not demonstrated at the examinations.

Only a few complications, but none serious, were experienced. The affections of the sural nerve occurred in 4 patients in the early part of the series; later on, the tendon sheath was always incised close to the extensor brevis muscle and bone.

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