Talocrural arthrodesis with absorbable screws

12 cases followed for 1 year

Esa K. Partio[1], Eero Hirvensalo[1], Esko Partio[2], Seppo Pelttari[3], Kirsi Jukkala-Partio[1], Ole Böstman[1], Antero Hänninen[3], Pertti Törmälä[4] and Pentti Rokkanen[1]

In 11 patients, 12 arthrodeses of the ankle joint were performed by using absorbable self-reinforced poly-l-lactide (SR-PLLA) or polyglycolide (SR-PGA) screws. 8 patients had posttraumatic arthrosis, 3 rheumatoid arthritis, and 1 rigid flexion contracture of the ankle due to neuropathy. The average follow-up time was 14 (7–22) months. Solid fusion was achieved in 11 of 12 cases in 9 (6–16) weeks.

[1]Department of Orthopedics and Traumatology, Helsinki University Central Hospital, Helsinki; [2]Department of Surgery, Jokilaakso District Hospital, Jämsä; [3]Department of Surgery, Kainuu Central Hospital, Kajaani; and [4]Biomaterials Laboratory, Tampere University of Technology, Tampere, Finland
Correspondence: Esa K. Partio, M.D., Metsätähdentie 34 B, SF-01350 Vantaa, Finland. Tel +358–08571646
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With a special self-reinforcing technique, it has been possible to manufacture absorbable polymeric, polyglycolide (PGA) and polylactide (PLA) fixation devices that are firm enough for the fixation of cancellous bone fractures and osteotomies (Törmälä et al. 1988).

We report the early results of the first 12 talocrural arthrodeses fixed with absorbable screws.

Patients and methods

From December 1989 to March 1991, totally 12 consecutive arthrodeses in three hospitals were performed in 11 patients and have been followed prospectively (Table 1). Case 10 is the same as Case 4, and in her left ankle the talus was nearly totally destroyed by rheumatoid arthritis; a modified Blair fusion was performed in this foot.

Table 1. Talocrural arthrodesis

Case	Age	Sex	Indication	Side	A	B	C	D	E	F
1	56	F	Rheumatoid arthritis and poor ankle position	L	1	G	+	(+)	10	22
2	59	F	Posttraumatic arthrosis	R	–	G	+	+	6	20
3	27	M	Posttraumatic arthrosis and ankle valgus	R	2	G	+	+	6	20
4	70	F	Rheumatoid arthritis	R	1	P	–	–	–[a]	18
5	30	M	Posttraumatic arthrosis and poor ankle position	R	2	G	+	(+)	16	17
6	47	M	Posttraumatic arthrosis and tibiofibular synostosis	R	2	G	+	+	12	12
7	52	F	Posttraumatic arthrosis and widening of the syndesmosis	L	2	F	+	+	12	11
8	69	M	Posttraumatic arthrosis and ankle valgus	L	2	G	+	(+)	6	11
9	24	F	Hypertrophic neuropathy and flexion contracture of the ankle	L	–	G	+	+	8	11
10	71	F	Rheumatoid arthritis and near totally destroyed talus	L	3	F	+	(+)	12	7
11	55	F	Posttraumatic arthrosis	L	2	G	+	+	8	7
12	56	F	Posttraumatic arthrosis and ankle valgus	R	2	G	+	+	6	7

A Earlier operation
1 Subtalar arthrodesis
2 Operatively treated ankle fracture
3 Contralateral ankle arthrodesis

B Clinical result
G good
F fair
P poor

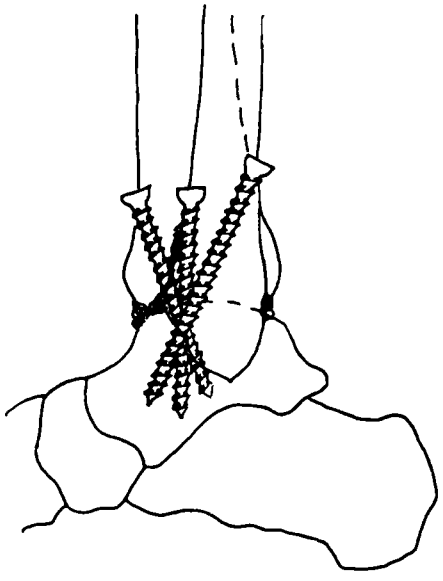
C Radiographic union
+ solid union
– nonunion

D Radiographic position
+ exact
(+) improved
– reoperated on

E Weeks until union

F Months of follow-up

[a]Cases 4 and 10 are the same patient. Union occurred in the right ankle after reoperation.



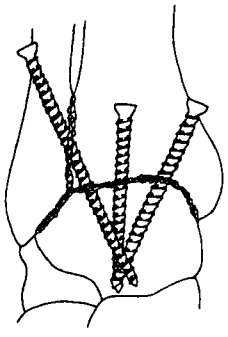


Figure 1. The operative technique. Note the oblique direction of the screws from the tibia and fibula to the talus. Three drill channels were made: one from the fibula through the tibia into the talus, and one medially and one anteriorly from the tibia into the talus. The channels were tapped with a special device and a special countersink was used. The screws were inserted into the drill channels with a special screwdriver. The excess of the head of the screw was excised with a small oscillating saw if necessary.

Implants

The SR-PGA screws used in this study have been manufactured (Bioscience Ltd, Tampere, Finland) of polyglycolide (raw material from Dexon® suture, Davis & Geck, London, England) and the SR-PLLA screws of poly-l-lactide (mol wt of raw material 260,000 from CCA, Biochem, Gorinchem, Holland) by a special self-reinforcing technique. The nominal inner diameter of the screws was 3.2 mm, the nominal outer diameter 4.5 mm, and the length 25–70 mm.

Operative technique

Medial and lateral approaches were used. On the lateral side the anterior tubercle of the tibia was removed for a bone graft to achieve a good exposition to the tibiofibular joint. Using a cutter, all the cartilage of all the articular surfaces of the ankle joint was removed to the subchondral bone. The distal part of fibula was excised and used as a bone graft. Also on the medial side, all the cartilage was removed. The medial malleolus was shortened if necessary. The talus was fixed firmly to the tibia and the fibula to the tibia and to the talus with the clamps before inserting the screws (Figure 1). In 1 patient, it was necessary to cut the fibula 7 cm above the talocrural joint; and in another patient, the anterior approach was used instead because of the synostosis in the tibiofibular joint. In the first seven operations, SR-PGA screws were used; in the next three operations, both SR-PGA and SR-PLLA screws were used; and in the last two operations, SR-PLLA screws alone were used. A padded, short plaster cast was applied for 6 to 8 weeks, and full weight bearing was allowed from the second postoperative day.

The results have been analyzed at 3 weeks, 6 weeks, 3 months, 6 months, and 12 months at the outpatient department. The result was considered good if the walking distance had improved and the ankle was painless during normal daily activities. The result was considered fair if mild pain was complained of during daily activities, and poor if the ankle was painful and the patient needed drugs or the union had not occurred. The fusion has occurred if the tibiotalar joint was clinically stable and the radiograph showed trabeculae through the joint. The position of the fusion was accepted as exact if it was near the neutral position.

Results

Union occurred in 11 out of 12 cases in 6 to 16 (average 9) weeks (Table 1). Case 4 had at the 6 months' check-up a painless ankle and the walking ability had improved, but radiographically the fusion was obviously fibrous. At the 1-year check-up, the patient complained of mild pain, and a slight motion was noticed in the ankle joint. The reoperation with bone grafting was performed at the same time as the arthrodesis operation of the left ankle (Case 10). Both arthrodeses were fixed with SR-PLLA screws instead of SR-PGA screws, which were used in the first operation. The union was observed at the 3 months' check-up in both feet.

One superficial infection and one scar necrosis were observed. The deformity of the ankle joint was improved in all of those patients who had it preoperatively. Three patients returned to their previous work and 2 changed to lighter work. Six

Figure 2. Case 2 preoperatively and 1 year postoperatively showing the solid union and mild arthrosis of the subtalar joint. Observe the subtalar joint 1 cm above the tip of the fibula in the AP radiograph. The clinical result was good.

patients were already retired preoperatively. There was one mild transient tissue reaction to the implants, which is well known from earlier studies (Böstman et al. 1990, Santavirta et al. 1990).

Discussion

Metallic screws have been used with various techniques in the fixation of an ankle arthrodesis (Marcus et al. 1983, Breitfuss et al. 1989, Dennis et al. 1990, Holt et al. 1991, Mann et al. 1991). The stiffness of metallic screws may lead to nonunion if the screws are inserted in a way that prevents stress transfer to the uniting bone surfaces. In our technique the absorbable screws were inserted obliquely from the tibia and fibula to the talus directing the stress to the uniting joint, and full weight bearing was allowed immediately. The high union rate (11 out of 12) achieved in our study was favorable when compared with the results achieved earlier (Marcus et al. 1983, Breitfuss et al. 1989, Dennis et al. 1990, Holt et al. 1991, Mann et al. 1991). The only nonunion in our series was fixed with SR-PGA screws, but in this case the activity of rheumatoid arthritis might have played a role by destroying a part of the talus.

The main benefit of this method is that the length of the leg can be nearly maintained and the removal of fixation devices can be avoided.

Acknowledgements

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