Details of the Assessment and Blinding Procedures

Edema

Each day, blinded physiotherapists performed three consecutive figure-of-eight-20 measurements of the affected ankle. The mean of the three measurements was then carried out. Figure-of-eight-20 measurements of the unaffected ankle at baseline preoperatively and at baseline postoperatively were also obtained and served as a correlate for the affected ankle in the healthy state[29]. Therefore, a measure of edema for the affected ankle was calculated by the difference in figure-of-eight-20 measurements of the affected ankle to the unaffected ankle[26,29].

Range of Motion

Inpatient, active ankle plantar flexion and dorsiflexion were assessed with the use of a hydro-goniometer (Plurimeter, Dr. J. Rippstein, La Conversion, Switzerland)[30]. The patient was supine on the examination bed and the knee was fully extended. At the six-week follow-up, passive ankle plantar flexion and dorsiflexion were assessed with the patient in a prone position with the knee flexed at 90°.

Blinding Procedures for Edema and Range of Motion Assessments

Edema and range of motion were both assessed every morning at 8:15 A.M. by the physiotherapist who was blinded to the patient's treatment. To blind the examiner to the intervention used for edema reduction, all devices or materials were removed one hour before the measurement session started. Furthermore, the examination of the patients was performed in a separate examination room to which the patients were brought by wheelchair with the affected leg in a horizontal position. Every six months, two different physiotherapists were responsible for all measurements. All therapists were trained equally in figure-of-eight-20 and range of motion measurements.

Number of Inpatient Days

Preoperative readiness for surgery was assessed daily with the wrinkling test[31] by the responsible surgeon. The number of preoperative inpatient days until possible operation was recorded accordingly. The number of postoperative inpatient days was recorded according to the following predefined discharge criteria: the patient is able to walk on crutches for 20 m, the wound is dry, and the wound is not irritated.

Self-Perceived Outcome

The self-perceived outcome was assessed with the German version of the Short Form-36 (SF-36)[32] and with the Foot and Ankle Ability Measure (FAAM)[33,34], which we translated into German. The FAAM is a self-reported outcome instrument to assess physical function for individuals with foot and ankle-related impairments, whereas the SF-36 is a generic measure of health.

Sub-Bandage Pressure (Bandage Group)

To measure the obtained sub-bandage pressure, a small sensor (flexible air-filled pressure bladder, 30 × 38 mm, Kikuhime sub-bandage measuring device [TT MediTrade, Soro, Denmark]) was placed at ankle level before bandaging. To blind the physiotherapist, the Kikuhime measuring device was turned upside down during bandaging, and the applied pressure was recorded after completion of the bandage. Afterwards, the sensor was gently removed by tearing it out of the bandage. ■

Copyright © by The Journal of Bone and Joint Surgery, Incorporated

http://dx.doi.org/10.2106/JBJS.K.00939

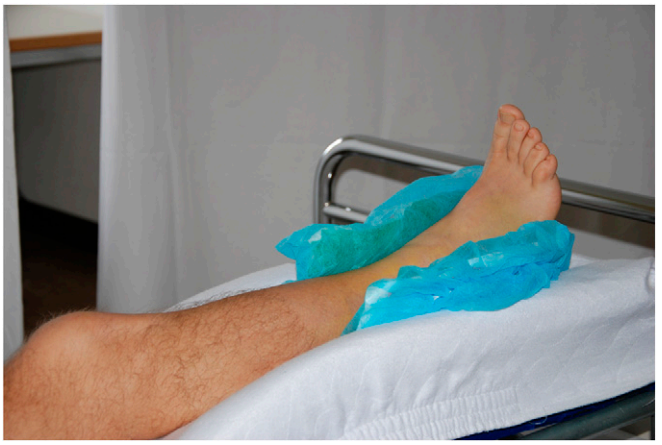
Fig. E-1A

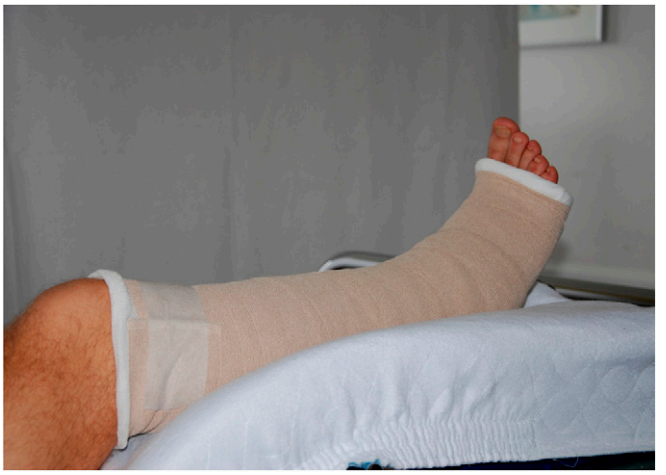
Fig. E-1B


Fig. E-1C

Figs. E-1A, E-1B, and E-1C Postoperative applications. **Fig. E-1A** Postoperative application of ice gel packs (control group). **Fig. E-1B** Postoperative application of multilayer compression bandage (bandage group). **Fig. E-1C** Postoperative application of A-V Impulse compression (impulse compression group).

Copyright © by The Journal of Bone and Joint Surgery, Incorporated

http://dx.doi.org/10.2106/JBJS.K.00939

TABLE E-1 Eligibility Criteria

Criteria
Inclusion
Age of eighteen to sixty-five years
Inpatient status
Acute ankle or hindfoot fractures (malleolar-tibial, calcaneus-tibial, talus-tibial, and pilon-tibial fractures), including fractures temporarily stabilized with an external fixator)
No walking aids before trauma
Monotrauma
Preoperative and/or postoperative edema
Preoperative inclusion if delay of surgery is due to ankle edema or if the fracture is stable enough for the temporary removal of the orthosis
Exclusion
Diabetes mellitus
Lymphedema
Peripheral arterial occlusive disease
Decompensated heart failure or renal insufficiency
Acute bacterial infection
Severe osteoporosis
Pathological fractures
Known tumors
Postthrombotic syndrome
Thrombosis
Open fractures
Polytrauma, cerebral trauma
Neurological deficiencies
Use of diuretics
Pregnancy
Alcohol or drug abuse
Psychological disorders

Copyright © by The Journal of Bone and Joint Surgery, Incorporated

http://dx.doi.org/10.2106/JBJS.K.00939

TABLE E-2 Demographic Characteristics and Baseline Data for Preoperatively Included Patients

	Control Group (N = 19)	Bandage Group (N = 16)	Impulse Compression Group (N = 11)
Age* *(yr)*	46 (22 to 65)	35 (19 to 59)	26 (21 to 58)
Weight* *(kg)*	80 (54 to 110)	79 (61 to 100)	77 (55 to 90)
Body mass index* *(kg/m^2)*	25 (22 to 38)	27 (21 to 33)	25 (19 to 29)
Sex†			
Male	11	11	8
Female	8	5	3
Time to first measurement* *(hr)*	22 (10 to 111)	20 (11 to 57)	27 (11 to 70)
Edema at preoperative baseline* *(mm)*	33 (9 to 64)	30 (5 to 59)	21 (11 to 56)
Fracture types†‡			
OTA 42-A	1	0	0
OTA 43-B	0	1	2
OTA 43-C	0	0	0
OTA 44-A	1	1	0
OTA 44-B	10	8	3
OTA 44-C	5	2	4
OTA 72-A	0	1	0
OTA 72-B	1	1	1
OTA 72-C	1	1	0
OTA 73-C	0	1	1

*The values are given as the median, with the range in parentheses. †The values are given as the number of patients. ‡The fracture types were classified according to the OTA (Orthopaedic Trauma Association) classification[40].

Copyright © by The Journal of Bone and Joint Surgery, Incorporated

http://dx.doi.org/10.2106/JBJS.K.00939

TABLE E-3 Demographic Characteristics and Baseline Data for Postoperatively Included Patients

	Control Group (N = 22)	Bandage Group (N = 20)	Impulse Compression Group (N = 13)
Age* *(yr)*	40 (19 to 65)	37 (19 to 59)	44 (21 to 64)
Weight* *(kg)*	78 (50 to 110)	77 (48 to 100)	77 (55 to 95)
Body mass index* *(kg/m^2)*	25 (20 to 43)	27 (21 to 33)	27 (19 to 31)
Sex†			
Male	13	13	10
Female	9	7	3
Edema at postoperative baseline* *(mm)*	31 (11 to 66)	31 (14 to 63)	26 (7 to 45)
Fracture types††			
OTA 42-A	1	0	0
OTA 43-B	0	1	2
OTA 43-C	0	1	0
OTA 44-A	1	1	0
OTA 44-B	12	11	5
OTA 44-C	6	3	5
OTA 72-A	0	1	0
OTA 72-B	1	0	0
OTA 72-C	1	1	0
OTA 73-C	0	1	1

*The values are given as the median, with the range in parentheses. †The values are given as the number of patients. ‡The fracture types were classified according to the OTA (Orthopaedic Trauma Association) classification[40].

Copyright © by The Journal of Bone and Joint Surgery, Incorporated

http://dx.doi.org/10.2106/JBJS.K.00939

TABLE E-4 Secondary Outcomes

	Control Group*	Bandage Group*	Impulse Compression Group*	P Value†
Range of motion *(deg)*				
Plantar flexion				
First postoperative day (baseline)	33 (28; 37)	30 (28; 35)	40 (30; 45)	0.47
Second postoperative day	35 (30; 42)	35 (30; 40)	38 (30; 44)	0.92
Third postoperative day	39 (30; 44)	40 (35; 50)	43 (29; 50)	0.70
Fourth postoperative day	35 (24; 40)	38 (30; 45)	38 (24; 40)	0.41
Fifth postoperative day	31 (30; 41)	37 (31; 47)	37 (25; 40)	0.59
Six weeks postoperatively	35 (30; 42)	35 (30; 42)	35 (30; 50)	0.87
Dorsiflexion‡				
First postoperative day (baseline)	−16 (−21; −14)	−18 (−21; −14)	−15 (−22; −10)	0.34
Second postoperative day	−10 (−15; −5)	−10 (−18; −5)	−13 (−15; −6)	0.93
Third postoperative day	−8 (−10; 0)	−15 (−17; −5)	−10 (−10; 0)	0.03§
Fourth postoperative day	0 (−11; 0)	−10 (−16; −5)	−10 (−10; −5)	0.28
Fifth postoperative day	−10 (−16; 3)	−15 (−20; −3)	−9 (−10; −4)	0.23
Six weeks postoperatively	5 (0; 10)	0 (−4; 9)	10 (0; 10)	0.32
Edema# *(mm)*				
Six weeks postoperatively	17.3 (8.3; 37.2)	15.3 (5.5; 27)	16.8 (8.7; 28.6)	0.68
Pain** *(points)*				
Preoperative	21 (9; 32)	31 (17; 49)	16 (11; 33)	0.15
Postoperative	27 (14; 42)	19 (8; 34)	28 (9; 47)	0.49
Six weeks postoperatively	6.3 (0; 10)	0 (0; 6.3)	0 (0; 11)	0.24
Patient satisfaction†† *(points)*				
Preoperative	66 (53; 88)	82 (59; 96)	65 (50; 88)	0.55
Postoperative	70 (43; 85)	74 (54; 84)	38 (0; 73)	0.07
Twelve weeks postoperatively	80 (67; 90)	85 (74; 93)	70 (59; 76)	0.10
One year postoperatively	90 (80; 96)	83 (64; 95)	87 (54; 100)	0.78
No. of inpatient days				
Preoperative	4.0 (2.5; 6.0)	4.0 (3.8; 4.3)	4.0 (3.0; 5.5)	1.0
Postoperative	4.0 (3.0; 6.0)	3.0 (2.3; 4.0)	4.0 (2.5; 6.5)	0.21

*The values are given as the median, with the 25% and 75% quartiles in parentheses. †The p values refer to between-group differences across all three study groups, based on Kruskal-Wallis tests. ‡Negative numbers for dorsiflexion represent plantar flexion (e.g., the amount of deficit toward zero). §A significant difference at $p < 0.05$ was determined between the control group and the bandage group, according to the Mann-Whitney test (adjusted alpha = 0.017); there were no other significant differences in any other outcome between any of the groups. #The values are based on the figure-of-eight-20 method. **The values are based on the visual analog scale from 1 to 100 points, in which 0 points reflected the better score. ††The values are based on the visual analog scale from 1 to 100 points, in which 100 points reflected the better score.

TABLE E-5 Standardized Co-Interventions (All Patients)

Standard pain medication, according to the World Health Organization, contained paracetamol (Dafalgan), metamizol (Novalgin), and, if necessary, opiates in addition
No nonsteroidal anti-inflammatory drugs were allowed
Nadroparin (Fraxiparin) was used for the prophylaxis against venous thrombosis
Preoperatively: immobilization of the ankle joint with the dorsal part of a custom-made orthosis (VACOped vacuum orthosis; OPED, Steinhausen, Switzerland) or with external fixator; bed rest
Postoperatively: directly after surgery, all patients received ice packs; group-specific treatment interventions started at the first postoperative day; VACOped orthosis was used during nights and for mobilization (walking)*; standardized physiotherapy once a day (assisted ankle dorsiflexion and plantar flexion, instructions for ankle and toe exercises, walking on crutches with partial weight-bearing of 15 kg)

*In the bandage group, when the lower leg of a patient did not fit properly into the VACOped orthosis, then only the rigid part of the orthosis was used.