

Early weight bearing of malleolar fractures

A prospective randomized investigation of early versus late weight bearing in 46 patients with fracture of the lateral malleolus was performed. In 43/46 patients an exact operative reconstruction of the ankle mortise could be achieved using pins, staples and cerclage (Cedell, 1967). Radiographic and stereophotogrammetric analysis of the ankles after 3 months showed no significant differences, nor did the clinical follow-up.

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There is broad agreement that dislocated ankle fractures need accurate reduction and stabilization (Cedell 1967, Hughes et al. 1979, Lindsjö 1981, Willenegger 1961). For many years, interest has been focused on the lateral malleolus because of its utmost importance for the congruency and function of the ankle mortise (Leeds & Ehrlich 1984, Ramsay & Hamilton 1976, Yablon et al. 1977). After operation on these fractures, immobilization in a plaster cast without weight bearing has often been used (Cedell 1967, Leeds & Ehrlich 1984, de-Souza et al. 1985, Bauer et al. 1985). Early weight bearing, however, would no doubt facilitate rehabilitation for many patients and might also benefit the nutrition of the cartilage minimizing inactivity osteopenia.

We have compared early and late weight bearing after operation on fractures of the lateral malleolus.

males with a mean age of 44 years. Age and sex distribution were comparable in both groups.

Excluded from the study were those who preferred not to participate, those under the age of 18 years, those presumably unable to cooperate – e.g., alcoholics, drug addicts, senile patients – and those with other concomitant injuries interfering with the postoperative program.

The fractures were classified according to Weber (1972) and Lauge-Hansen (1942) (Table 1). There were 20 fractures of the posterior tibia margin, 10 in each group. None of these fractures included more than one third of the articular surface. After the patients had been included in the study, postoperative radiographs revealed a fissure in the medial malleolus in 4 patients.

All patients in this study were operated on using cerclage wires, staples, and pins (Cedell 1967). The operations were performed by all the staff surgeons.

Radiographic examination including roentgen

Patients and methods

A prospective study of ankle fractures was performed from March 1984 to March 1985. The study was approved by the ethics committee at Karolinska Institute. Included in this study were 46 patients with dislocated fractures of the fibula with peroperatively verified ruptures of the anterior tibiofibular ligament. At the end of the operation, by instruction in a sealed envelope, each patient was randomly allocated to either early weight bearing, i.e., from the first postoperative day ($n = 24$), or late weight bearing, i.e., from the fourth postoperative week ($n = 22$). A below-knee cast was used in both groups for a period of 7 weeks. There were 22 males and 24 fe-

Table 1. Fracture classification (ankles stereophotogrammetrically analysed are given in brackets)

		Early weight bearing	Late weight bearing
Weber	B	18 (9)	18 (10)
	C	6 (4)	4 (4)
Total		24 (13)	22 (14)
Lauge-Hansen			
Supination-eversion	II	10 (6)	9 (6)
	III	6 (2)	4 (1)
	IV	2 (1)	5 (3)
Pronation-abduction	III	2 (2)	1 (1)
Pronation-eversion	III	3 (1)	1 (1)
	IV	1 (1)	2 (2)
Total		24 (13)	22 (14)



Figure 1. The ankle joint, showing implanted tantalum markers and osteosynthesis devices.

stereophotogrammetric analysis was used to evaluate fracture and ankle mortise stability postoperatively. Postoperative residual displacement was analysed using the classification proposed by Cedell (1967). Roentgen stereophotogrammetric examinations were performed postoperatively, after 3 and 7 weeks, and after a minimum of 3 months. Detailed descriptions of the roentgen stereophotogrammetric technique and calculations have been published by Selvik (1974) and Kärrholm et al. (1984). Due to imperfect technique when inserting the balls, roentgen stereophotogrammetric analysis could only be performed in 27 patients (Tables 1 and 4). In 23 of these cases a complete analysis of both translation and rotation movements was performed. In the remaining 4 cases, only calculations concerning translation movements could be performed.

At follow-up the range of talocrural motion in loaded dorsal and loaded plantar flexion (Lindsjö 1981) was recorded and expressed as a percentage of the uninjured ankle. Ankle and calf circumferences were measured.

For subjective evaluation the patients, 3 and 6 months postoperatively, filled in a questionnaire concerning pain at rest and at weight bearing, stiffness, swelling, stair climbing, walking and running capacity, and presumed use of supports. Working capacity and capacity for sports and activities during leisure time were also evaluated. A linear analogue scale with the extreme "perfectly normal ankle" set at 100 per cent and the other extreme "totally disabling ankle" set at 0 per cent was also used (Olerud & Molander 1984).

Forty-six patients were included in this study. Two patients, both belonging to the early weight-bearing group, were lost to follow-up.

For statistical analysis, the Student's *t* test and the chi-square test were used. $P < 0.05$ was considered significant.

Results

All the fractures healed properly and no reoperation was performed. No infections occurred. Time spent in the hospital averaged 4 days in both groups.

Regarding both objective (Table 2) and subjective results, the two groups did not differ. Postoperative residual displacements were rare in both groups (Table 3). Fracture redislocation with a widening of the ankle mortise of less than 2 mm was revealed in two cases, both belonging to the late weight bearing group. In one of these cases, roentgen stereophotogrammetric analysis was performed revealing a dorsal rotation of 6.6° and an outward rotation of 3.9°, a shortening of the fibula

Table 2. Results. Mean values (SD) in percentage of uninjured side

	Early weight bearing		Late weight bearing	
	3 months (n=18)	6 months (n=22)	3 months (n=17)	6 months (n=19)
Ankle circumference	104 (4)	103 (3)	104 (4)	103 (3)
Calf circumference	98 (3)	99 (2)	97 (2)	98 (2)
Loaded dorsal flexion	74 (17)	86 (11)	64 (25)	82 (17)
Loaded plantar flexion	76 (13)	88 (10)	78 (14)	89 (13)

Table 3. Postoperative residual displacement – Cedell classification

	Early weight bearing (n=24)	Late weight bearing (n=22)
Lateral malleolus		
anatomic	23	20
good	1	2
poor	0	0
Posterior tibial fragment		
anatomic	7	7
good	3	2
poor	0	1

of 0.9 mm, and a widening of the mortise of 1.0 mm. Roentgen stereophotogrammetric analysis showed only small movements in the ankle mortise during rehabilitation (Table 4).

Discussion

When operations on ankle fractures have been performed according to the AO principles, some authors have advocated early weight bearing in a cast after a few days of active

Table 4. Roentgen stereophotogrammetric analysis at 3 months compared with the postoperative analysis. Mean values (SD)

	Early weight bearing (n=13)	Late weight bearing (n=14)
<i>Movements of the lateral malleolus in relation to the tibia.</i>		
Widening of the ankle mortise (mm)	0.3 (0.5)	0.3 (0.6)
Proximal translation of the lateral malleolus (mm)	0.0 (0.6)	-0.1 (0.5)
Ventral translation of the lateral malleolus (mm)	0.0 (1.0)	0.1 (0.8)
Varus angulation of the lateral malleolus (degrees)	0.6 (1.4)	0.6 (0.8)
Dorsal angulation of the lateral malleolus (degrees)	0.9 (1.3)	0.4 (1.1)
Outward rotation of the lateral malleolus (degrees)	0.8 (2.8)	1.6 (2.4)

Movements of the lateral malleolus in relation to the proximal fibula.

Compression of the lateral malleolar fracture (mm)	0.4 (0.6)	0.2 (0.4)
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movements (Lindsjö 1981). On the other hand, in other studies using the same operative technique, early weight bearing has not been allowed (Bauer et al. 1985, Leeds & Ehrlich 1984, deSouza et al. 1985). A randomized study comparing early and late weight bearing after operation for ankle fracture has not, to our knowledge, been published previously.

The operative technique used in this study also aims at exact reconstruction of the ankle joint, but with the use of a minimum of osteosynthesis devices, such as small staples, pins, and wires. This technique has been considered "adaptive" and most often early weight bearing has not been advocated (Cedell & Wiberg 1962, Cedell 1967). Early weight bearing, however, has also been used (Olerud 1985).

In only 2 older patients with osteoporosis and belonging to the late weight bearing group was a redislocation of the lateral malleolus revealed on radiograms.

Roentgen stereophotogrammetric analysis supported the conclusions drawn from ordinary visual analysis of the radiograms that only minimal motions could be revealed in the ankle mortise. No differences were found between the early and late weight bearing group.

At 3 and 6 months follow-up, we had expected less calf atrophy and residual ankle swelling, as well as less rigidity, in the early weight bearing group as reported by Lindsjö (1981); but no such differences between the two groups could be found.

Our results strongly indicate that with the use of this operative technique, using a minimum amount of osteosynthesis devices, an exact reconstruction of the ankle mortise can, as a rule, be achieved with sufficient stability to allow immediate postoperative weight bearing in a walking cast.

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