LATE LENGTHENING OF THE FIBULA FOR MALALIGNED ANKLE FRACTURES

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We describe a technique of lengthening osteotomy of the fibula for the late treatment of symptomatic malaligned or malunited fractures of the ankle. Good results at two to three years were achieved in five of six cases despite delays of up to four years from the original injury. The method can prevent progressive instability and degenerative arthritis.

A malunited fracture-dislocation of the ankle, with fibular shortening and lateral shift of the talus, often gives a poor outcome, with pain, swelling or stiffness (Brodie and Denham 1974). Degenerative arthritis may develop (Müller et al 1979) since lateral displacement of the talus by only 1 mm causes a 42% reduction in the tibiotalar contact area, increasing the stress on the articular cartilage (Ramsey and Hamilton 1976). Both Offierski et al (1982) and Weber and Simpson (1985) have reported that late corrective osteotomy of the fibula before irreversible degenerative changes have occurred will produce good results.

We report patients with fracture-dislocation of the ankle in which initial treatment had resulted in poor alignment. Lengthening osteotomies of the fibula, using the AO small distractor, improved the clinical and radiological outcome.

PATIENTS AND METHODS

Details of the six patients are given in Table I: in two of them soft tissue damage had originally delayed operative treatment for four weeks; in three there had been late displacement after nonoperative treatment and in one, internal fixation had been performed after an inadequate reduction.

The latter four patients all had chronic pain; the

Fig. 1

An AO small distractor with four 2.5 mm threaded Kirschner wires.

Fig. 2

Radiograph at operation showing distraction of the fracture and the application of a plate. The 'spike' on the medial articular surface of the fibula is level with the subchondral bone of the tibia.

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lengthening osteotomy of the fibula was performed four months to four years after the original injury.

Operation. The distal fibula is exposed at the fracture site and scar tissue is excised. A small AO distractor (Synthes) is applied to the anterior surface of the fibula using two pairs of 2.5 mm threaded Kirschner wires (Fig. 1).

then used to restore the normal fibular length as assessed clinically and radiographically. We also check talar reduction, and ensure that the medial 'spike' of the fibula is level with the subchondral bone plate of the tibia (Fig. 2). A corticocancellous graft is then forced between the fracture ends and compression applied with the distrac-

Table I. Details of six patients, with treatment and outcome, overall the results were good except in case 5, which showed a fair result

Case	Age and sex	Weber type fracture	Delay to fibular osteotomy (months)	Follow-up (years)	Result (see text)			
					Radiographic		Clinical	
					Reduction	O/A	Symptoms	Signs
1	81 F	B, open	1	2	Good	+	3	3
2	33 F	B*	8	3	Good	+	4	3
3	61 F	C, open	4	3	Good	++	4	3
4	19 M	C	4	2	Good	0	4	3
5	47 F	C, open	1†	3	Poor (tibial tilt)	0	2	3
6	32 M	C*	52	2	Good	0	4	3

* deltoid ligament rupture

† also needed tibial osteotomy

The distal pair are placed in 10° external rotation to provide for the internal rotation of the distal fragment usually needed to correct the deformity. If the fracture has united a transverse osteotomy is performed. After manual correction of rotation, the distractor is applied and the proximal pair of wires is inserted. Distraction is

tor. The fibula is stabilised with a carefully-shaped one-third tubular plate of adequate length and a diastasis screw is inserted when necessary. The distractor is removed. If the medial malleolus was also displaced it is reduced and fixed with cancellous screws (Fig. 3).

Early mobilisation is encouraged until the wounds

Fig. 3a

Fig. 3b

Fig. 3c

Case 1, after an open trimalleolar fracture-dislocation. Figure 3a – At four weeks, after several manipulations, surgical treatment having been delayed by other injuries and medial soft tissue loss. Figure 3b – One month after internal fixation with fibular lengthening, the congruity of the mortise has been restored. Figure 3c – Two years later, the patient has a good clinical result though there are minor degenerative changes.

have healed, when a below-knee walking cast is applied for four to eight weeks. In one case immobilisation lasted 10 months because of delay in the union of an incompletely reduced tibial plafond fracture.

Clinical assessments were performed at two to three years, grading subjective and objective results from 0 to 4 points (Joy, Patzakis and Harvey 1974), and using the sum to record the outcome as good (6 to 8 points), fair (4 to 5) or poor (0 to 3). The radiographic reduction of the fracture was graded as good, fair or poor (Joy et al 1974) and degenerative change in the ankle (Magnusson 1944, Table II) as 0, +, ++ or +++.

RESULTS

Both the clinical and the radiographic results were good in five of the six cases. One patient had only a fair clinical result because of a poor reduction with residual tilt and displacement of a tibial plafond fracture. This was despite an apparently normal ankle mortice. Minor degenerative changes were evident in two patients and moderate changes in one: these changes did not appear to be progressive. All the patients were satisfied with their final results.

DISCUSSION

The outcome of a fracture-dislocation of the ankle reflects the severity of the injury (de Souza, Gustilo and Meyer 1985) and especially the initial talar displacement, the type of fracture and the presence of damage to the deltoid ligament (Joy et al 1974). Maximum recovery depends on anatomical reduction (Brodie and Denham 1974; Pettrone et al 1983; Leeds and Ehrlich 1984), and the key to this is reduction of the lateral malleolus to restore normal length and produce correct alignment of the talus within the mortice (Yablon, Heller and Shouse 1977). Residual displacement of the talus greatly reduces congruity and leads to degenerative changes (Ramsey and Hamilton 1976; Müller et al 1979).

Anatomical reduction can best be maintained by rigid internal fixation. In three of our cases initial reduction was lost when, after plaster immobilisation for six to 10 weeks, unprotected walking before union occurred caused late displacement.

Speed and Boyd (1936) first reported that fibular osteotomy could correct shortening and external rotation, provided that postoperative immobilisation was adequate to maintain the corrected position until union. The successful use of internal fixation for this purpose has given good results (Hughes 1976; Offierski et al 1982; Marti and Gitz 1984; Weller, Knapp and Eck 1984; Weber and Simpson 1985). Weber (1981), describing the radiographic features of the 'sprung mortice', showed that osteotomy was needed to restore fibular length and

rotation. Hughes (1976) found that the patient's age, the type of initial treatment and the delay before corrective surgery did not affect the result, but Offierski et al (1982) considered that a poor result was likely if the delay was greater than six months or if degenerative arthritis was already present. Weber and Simpson (1985) stated that poor results were due either to the presence of significant degenerative change or to faulty operative technique and not to delay nor to the original degree of lateral shift of the talus.

Table II. Radiological classification of degenerative changes (from Magnusson 1944)

Grade	Findings
+++	Joint space almost invisible
++	Joint space half normal (uninjured side) or marked osteophytes and sclerosis
+	Slight narrowing, slight marginal osteophytes or slight sclerosis
0	No narrowing, osteophytes or sclerosis

Our results show that lengthening osteotomy of the fibula can produce considerable improvement even after four years. None of our patients had significant degenerative changes before correction. Later minor radiographic degeneration in three of our six cases did not appear to be progressive; it may have been an unavoidable result of damage to the joint at the original injury which would be expected to become apparent within one or two years (Cox and Laxson 1952). When advanced arthritic changes are present, arthrodesis of the ankle rather than reconstruction may be indicated (Weber and Simpson 1985).

We found the AO small distractor useful to separate the fracture fragments and to provide stability during bone grafting and plating.

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