THE RESULTS OF ANKLE ARTHRODESIS

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The results are presented of 47 compression arthrodeses of the ankle performed for osteoarthritis in 44 patients. In 26 cases the transverse anterior incision of Charnley had been used and in 21 cases medial and lateral incisions with division of the malleoli.

Complications included infection (19%), non-union (14.9%) and malposition requiring a further procedure (8.5%). Three patients (6.4%) eventually had an amputation. Clinical assessment using a standard grading method showed that the functional result was not related to the angle of plantar flexion of the ankle, but was related to the varus/valgus position of the heel, the neutral position being associated with the best results. The anterior approach was more reliable in avoiding varus or valgus of the heel.

For many years arthrodesis has been a standard surgical treatment for osteoarthritis of the ankle. However, the results vary and there is a high incidence of complications (Boobbyer 1981; Lance et al 1971). Over 20 different methods have been described (White 1974) but few comparative data are available.

The intention of this study was to examine the results of compression arthrodesis of the ankle performed by two different methods, in order to identify the factor associated with a favourable result.

PATIENTS AND METHODS

The results of compression arthrodesis of 47 ankles performed for osteoarthritis in 44 patients have been studied. Two approaches were used: group 1 (21 ankles) had longitudinal medial and lateral incisions and group 2 (26 ankles), had a transverse anterior incision (Charnley 1951). In both groups the position was maintained by two Steinmann pins and compression clamps, followed by two to three months in plaster.

Forty-three ankles were assessed clinically and four by review of the notes and radiographs. The patients were interviewed and examined and new radiographs were taken of the ankle and foot. The protocol of Mazur, Schwartz and Simon (1979) was used to obtain an objective, standard assessment. This uses a 100-point scale: 50 points for pain, 40 for function and 10 for

movement. Statistical analysis was by the Wilcoxon rank sum and chi-squared tests.

RESULTS

Details of the patients are given in Table I.

Complications. Nine patients (19%) developed infection, usually around the pin sites, but all resolved with antibiotics. Seven ankles (14.9%) failed to unite: two patients had further operations to obtain union, one had

Table I. Details of the two groups of patients having compression arthrodesis of the ankle

	Approach	
	Bimalleolar longitudinal (group I)	Transverse anterior (Charnley) (group II)
Mean age in years $\pm$ s.d.	49.6 $\pm$ 14.7	48.2 $\pm$ 12.8
Men/women	13/8	17/9
Mean follow-up in months	50.1	63.7
Range	18 to 96	18 to 128
<i>Complications</i>		
Amputation	1	2
Non-union	4	3
Infection	4	5
Malposition	3	1
Number examined	15	19
Mean Mazur score $\pm$ s.d.*	73.0 $\pm$ 8.9	77.35 $\pm$ 6.3
<i>Heel position†</i>		
Neutral	8	17
Valgus/varus	7	2

*difference between groups $p > 0.05$

†difference between groups $0.01 < p < 0.05$

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a Syme's amputation, and the rest declined more surgery. The initial position of the fusion was incorrect in four patients (8.5%): two required manipulation under anaesthesia and two had revision operations. Three patients (6.4%) had an amputation: one was Syme's amputation for non-union and two were below-knee amputations, one for persistent pain and one because of a plaster sore.

Clinical results. Excluding those with non-union and/or

flexion was not related to the quality of the end result (Fig. 2) but the position of the heel in the coronal plane was important. The mean Mazur score for ankles with the heel in neutral was 73.9; in those with valgus or varus heels it was 67.4 ($p < 0.05$). Both pain and function were worse in the latter group. A much higher proportion of ankles with neutral heels were seen after the transverse anterior approach ($p < 0.05$, Table I).

Fig. 1

Varus/valgus position of the heels examined.

Fig. 2

Relation of Mazur score to the amount of ankle plantarflexion.

amputation, all but two patients felt they had been improved by the operation, although they all had some residual symptoms, most commonly aching in the foot after use, and inability to run. Nearly all had difficulty in walking barefoot and on rough ground.

The position of ankle plantarflexion in men varied from 0° to 25° (mean 16.9, s.d. 5.8); in women it varied from 8° to 30° (mean 16.6, s.d. 6.0). The heel was in neutral position in 24 patients, in valgus in six and in varus in four (Fig. 1).

There was no subtalar movement in 20 ankles, it was reduced in 11 and normal in three. No cases of midtarsal hypermobility were seen and the forefeet were normal apart from two patients with varus heels who had callosities over the fifth metatarsal heads.

Radiography. In 34 primary arthrodeses, there was radiographic evidence of subtalar osteoarthritis in 23; this was mild in eight, moderate in 12 and severe in three. Of the midtarsal joints, 18 were normal, seven showed slight degeneration, seven moderate changes and two had severe osteoarthritis.

Factors affecting the result. The angle of ankle plantar-

No differences were found between the sexes and between patients of different ages or different lengths of follow-up. The radiographic appearance of the subtalar and midtarsal joints bore no relation to either the range of movement found on examination or the Mazur score.

DISCUSSION

The results of this study are similar to those previously reported, with a rate of non-union comparable to that of larger series (Johnson and Boseker 1968; Lance et al 1971; Morrey and Wiedeman 1980; Ahlberg and Henricson 1981; Boobbyer 1981). Where the results differ is in the effect of the position of arthrodesis. Most authors consider that the angle of ankle plantarflexion is important and usually recommend a neutral or nearly neutral position (Ratliff 1959; Morrey and Wiedeman 1980). In this present series there was no relation between the Mazur score and the ankle position up to 30° of plantarflexion.

A striking finding was the effect of the position of the hindfoot in the coronal plane. Any varus or valgus of

the heel was associated with a much higher chance of an unsatisfactory result. A varus heel has been associated with forefoot callosities (Mazur et al 1979) and with increased hindfoot symptoms (Morrey and Wiedeman 1980), but the relation of neutrality of the heel to the general function has not been previously reported.

Conclusions. Ankle arthrodesis can give potentially very good results in patients with disabling ankle arthritis, but the patient should be warned that there may be some residual symptoms and disability. For this reason, and also because there is a significant risk of complications

(including amputation), arthrodesis should be reserved for patients in whom severe pain is the main complaint. When performing the operation, it may be more important to avoid a varus or valgus position of the heel than to aim for any particular angle of plantarflexion. It also seems that the approach described by Charnley is a more reliable way of achieving this aim.

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