REVIEW OF RESULTS OF ANKLE FRACTURE FIXATION IN ALEXANDRA HOSPITAL (SINGAPORE) BETWEEN JANUARY 1987 – APRIL 1990

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ABSTRACT

In 67 consecutive cases of ankle fracture treated operatively in Alexandra Hospital in Singapore, 35 ankles (53.7%) were available for review of the post-operative results. Thirteen fractures were of AO type A, 13 were type B and 9 type C. These patients had a minimum follow-up period of 16 months. They were assessed subjectively with a questionnaire and objectively by measuring the ankle movements. Good or excellent subjective results were obtained in 71% of the patients, while functional ankle scores were good or excellent in 88.5% of cases. Some restriction of ankle motion was present in 33.9% of patients. Difficulty in squatting was the most common complaint.

Keywords: *ankle, fractures, subtalar, movements, osteoarthritis*

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INTRODUCTION

Ankle fracture is one of the most discussed subjects in Orthopaedic traumatology. It has been established by many studies[1-5] that fracture type and accuracy of reduction are the most important factors that determine the outcome of fracture management. Danis[6] had advocated accurate reduction and rigid internal fixation of these fractures so that the joint can be mobilised early and joint motion restored. Since then, many controlled studies have confirmed the advantage of accurate fixation over conservative treatment. Early motion[7-9] would allow cartilage regeneration to occur and prevents early osteoarthrosis.

The aim of this review is to assess the results of the ankle fractures which were accurately reduced and rigidly fixed.

MATERIALS

A total of 67 patients with ankle fractures were openly reduced and internally fixed in the study period. The usual indications were:

1. unacceptable displacement more than 2mm,
2. incongruency of the talo-malleollar articulation, and
3. all AO type C fractures.

Only 34 patients with 35 ankles were available for review. This included one patient with both ankles fractured in different accidents. A total of 33 patients were not assessed (see Table I). A large number of foreign workers were seen in this hospital. Fourteen of these patients had left the country at the time of review. Three patients were not in the country at the time of the study, fifteen patients could not be contacted and one patient had unsatisfactory reduction. This was a 56 year-old lady with osteoporosis. She did not seek treatment until a month after injury and accurate reduction was not possible by then.

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Table I – Non-respondents

	no
Foreign workers (returned to home country)	14
Overseas study	3
Not contactable	15
Unsatisfactory reduction	1

The anterior-posterior and lateral X-rays of the ankle were done. Satisfactory reduction was defined in this review as:

(1) preservation of the talo-malleolar parallelism,
(2) articulating surface displacement of less than 2 mm.

Only patients who satisfied these criteria were reviewed.

The mean age of the patients was 34.9 years (range: 16 to 68 years). Sex distribution had expectedly a male predominance. The ratio of male to female was 2.8:1.

Road traffic accidents was the most common way in which these patients were injured (see Table II). Ten of the 13 road traffic accidents involved pedestrians and 3 of these injuries involved motorcyclists.

Table II – Mode of injury

	no
Road traffic accidents	13
Industrial accidents	9
Home accidents	5
Sport	3
Others	5

The AO Classification of Fractures[10] was used in this review. All the patients in the AO type A was of the A2 subtype. This subtype was a single fracture of medial malleolus (see Table III). In type B, there is equal distribution of B1 and B2 subtypes. 88.9% of type C were of the C1 subtype.

Twenty-three patients (65%) were operated early, within 8 hours, including 5 open fractures. None had delay in operation of more than 7 days. Ninety-four percent of these patients had their fracture operated upon using recommended AO techniques (Table IV). However, one patient had stapling of the medial

Table III – AO TYPE

Subtype / Type	1	2	3	Total
	No (%)	No (%)	No (%)	No (%)
A	0	13 (100%)	0	13 (100%)
B	6 (46.2%)	6 (46.2%)	1 (7.6%)	13 (100%)
C	8 (88.9%)	0	1 (11.1%)	9 (100%)

Table IV – Type of implants

	no
Medial Malleolli	
(1) Malleolar screw	7
(2) Cancellous screw	14
(3) Tension band	4
(4) Staples	1
Lateral Malleolli	
(1) 1/3 tubular plate	21
(2) 3.5mm DCP plate	1
(3) Rush rod	1

malleolus and another had rush-rodding of the lateral malleolus. Screw fixation is the most common method employed for the medial malleolus and plating most common for the lateral malleolus.

METHODS

The patients were assessed by interview. The subjective and functional ankle scores were recorded[11,12].

(1) The subjective score assesses patient's satisfaction with the operated ankle. The patient was asked to assign a score according to how he felt the operated ankle was compared to the normal side.
(2) The functional ankle score determines the ankle status in daily activities. This uses a scoring system involving nine common activities. (see Table V).
(3) The ankle dorsiflexion, ankle plantarflexion, inversion and eversion were measured. Dorsiflexion was measured by making the patient lean forward with the foot on a chair until the heel is almost lifted off as described by Olerud[12]. The reference points of measurement are the fibula and the sole. Ankle plantarflexion was measured when the heel is lifted until the head of metatarsus are almost off the chair. (Fig 1)

Inversion and eversion were measured with a special spirit level attached to a board (Fig 2). The patient was prone with the knee flexed at 90 degrees and the foot plantigrade. By rotating the foot and the spirit level together, these movements can be measured.

Ankle and subtalar joint movements were analysed according to the percentage of maximum motion of the contralateral ankle that the operated ankle could achieve.

Post-traumatic osteoarthritis was assessed by comparing anterio-posterior and lateral views of the ankles taken at the time of review. Severity was graded according to radiological assessment of joint space reduction[13] (Table VI).

Table V – Functional ankle score

Symptoms	Severity	Points
1. Pain	None	25
	While walking on uneven surface	20
	While walking on even surface	10
	While walking indoor	5
	Constant and severe	0
2. Stiffness	None	10
	Present	0
3. Swelling	None	10
	Evenings only	0
4. Stair climbing	No problems	10
	Impaired	5
	Unable	0
5. Running	Possible	5
	Impossible	0
6. Jumping	Possible	5
	Impossible	0
7. Squatting	No problems	5
	Unable	0
8. Support	No support	10
	Taping, wrapping	5
	Stick, crutches	0
9. Work, Activity of daily living	Same as before injury	20
	Loss of tempo	15
	Changed to a simpler job/part-time	10
	Disabled, strongly impaired work capacity	0

Total score = 100
Excellent : 90-100 Fair : 50-74
Good : 75-89 Poor : Less than 50

Table VI – Radiological grading of post-traumatic osteoarthritis

Grade 1	: < 50% Joint space decrease
Grade 2	: > 50% Joint space decrease
Grade 3	: Bone to bone contact
Grade 4	: Bone loss

Fig 1 – Loaded ankle plantarflexion

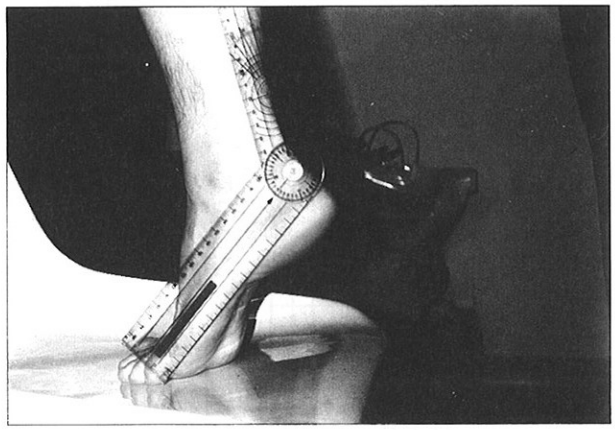
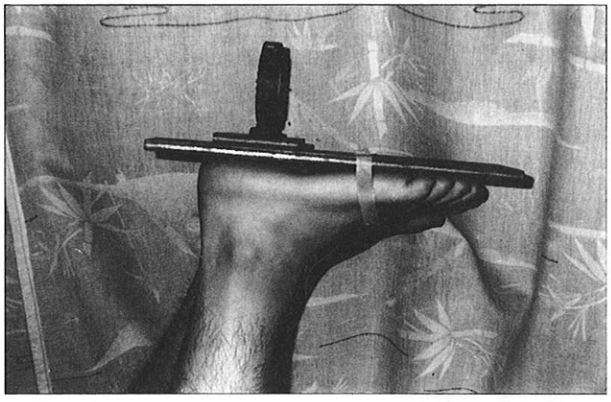


Fig 2 – Measurement of subtalar movements



RESULTS

Subjective Scores

Seventy-one percent of the patients had assigned good or excellent score to their operated ankles (Table VII).

Functional ankle scores

88.5% of the patients had achieved good or excellent functional ankle scores (Table VIII).

Table VII – Subjective Scores

Scores	No of Patients	%
Excellent	7	20
Good	18	51
Fair	9	26
Poor	1	3

Table VIII – Functional Ankle Scores

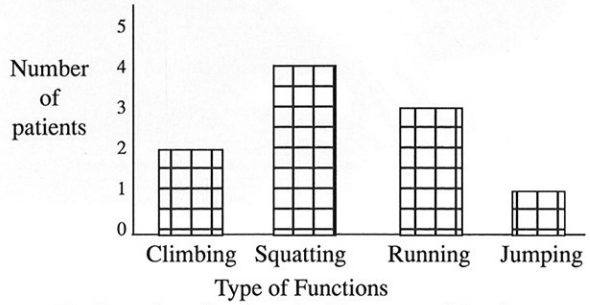
Scores	No of Patients	%
Excellent	19	54
Good	12	34
Fair	4	12
Poor	0	0

Range of Movement

(A) Dorsiflexion

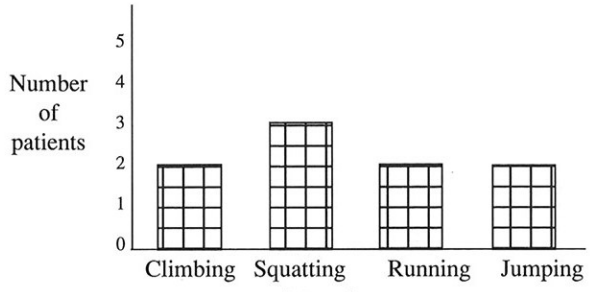
Range of motion was divided into 3 groups according to the percentage of maximum motion of the contralateral ankle that the operated ankle could achieve. Analysing ankle dorsiflexion, 26 patients (75%) had more than 75% of the contralateral ankle motion. Nine patients (25%) had from 25% to 75% of the contralateral ankle motion.

Fig 3 – Functional disability in 5 patients with ankle dorsiflexion of more than 75% of the contralateral ankle



Total number of patients in this group = 26 patients

Fig 4 – Functional disability in 3 patients with ankle dorsiflexion of 25% to 75% of the contralateral ankle



Total number of patients in this group = 9 patients

In the group with more than 75% of the contralateral ankle motion, 5 patients or 19% of the group had some impairment in function (Fig 3). However in the group with 25% to 75% of the contralateral ankle motion, a larger proportion ie 33% of the group had impairment in function (Fig 4).

(B) Inversion and Eversion

Table IX – Range of inversion and eversion as a percentage of the contralateral ankle

	> 75%	25% – 75%	< 25%
Inversion	25 patients	10 patients	0
Eversion	23 patients	12 patients	0

Twenty-five patients (71%) had more than 75% of the contralateral ankle inversion and 23 patients (65%) could achieve more than 75% of the contralateral ankle eversion. No patient could not achieve at least 25% of the contralateral ankle eversion.

Post-traumatic osteoarthritis

At the time of review, none of our patients had post-traumatic osteoarthritis as defined by the criteria above. This may be due to the short period of follow-up.

DISCUSSION

Many papers have shown that accurate reduction with rigid fixation gives consistently better results than non-operative methods in the treatment of ankle fractures. However, there are few papers that deal with problems faced by the patients with accurately reduced ankle fractures.

Our patients were recalled 18 months after surgery. In this study, we have chosen to assess these patients both subjectively and objectively.

Subjectively, two parameters were looked into ie the subjective scores and functional ankle scores. Subjective scores were assessed on an analogue scale and the patient was asked to assign a score according to how well the operated ankle was compared to the contralateral ankle. The analogue scale method of assessment had been analysed by Revill et al[14] and found to be reliable and reproducible. Seventy-one percent of our patients rated their ankle as good or excellent subjectively.

The functional ankle score was utilised in assessing the ankle in daily activities. Nine parameters were assessed. Eighty-nine percent of the patients had good or excellent results.

Loaded ankle movement is a method of ankle movement measurement which is gaining recognition as a standard[12]. This method simulates physiological stress on the ankle. The knee is relaxed to eliminate the action of the soleus in ankle movements.

Ankle dorsiflexion of more than 10° is generally compatible to normal walking and more than 20° is needed for sporting activities[12]. We consider the absolute value of ankle movement as a poor indication of how severe the impairment is present. This is because of the wide range of normal movements seen in our patients. We measured the movement according to the percentage of the movement of the normal ankle achieved. In one patient with bilateral ankle fractures, the range of movement of both ankle is the same.

We considered those patients with more than 75% of the contralateral ankle movement as good, 25% to 75% as fair and less than 25% as poor. Three-quarters of our patients had good ankle dorsiflexion, one-quarter had fair movement and none poor results.

As expected, there are greater proportion of functional problems in the 'fair' movement group (33%) than 'good' movement group (19%). About 70% of the patient could achieve at least more than 75% of the contralateral ankle. The reason for the restrictions in movement is not obvious.

In conclusion, more than 70% of our patients with satisfactorily reduced ankle fractures had excellent or good subjective results. However one-third of our patients had significant limitation of ankle dorsiflexion of more than 25% of the contralateral ankle.

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