SHORT TERM OUTCOME AFTER FRACTURE OF THE ANKLE AT THE UNIVERSITY TEACHING HOSPITAL, LUSAKA

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SUBMITTED AS PARTIAL FULFILMENT FOR THE AWARD OF MASTER OF MEDICINE (ORTHOPAEDIC) OF THE UNIVERSITY OF ZAMBIA

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CERTIFICATION

This is to certify that this dissertation by Henry Mugala is ready for examination for the award of the Master of Medicine Degree (in Orthopaedic Surgery) by the University of Zambia.

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APPROVAL

This dissertation by Henry Mugala has been approved as fulfilling part of the requirements for the award of the Master of Medicine Degree (in orthopaedic surgery) by the University of Zambia.

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ACKNOWLEDGEMENTS

It is with much gratitude that I acknowledge the expert guidance of Professor John Jellis, Professor of Orthopaedics Surgery at the University of Zambia.

I am also indebted to Ms. Abigail Phiri and Mrs. Sepo Kusiyo for their kind assistance in typing and re-typing this text.

I also wish to thank Mr. Chewe and his staff of the medical illustration of the University Teaching Hospital for their willingness and kind permission to use their facilities.

Lastly I am grateful to my wife Rose for her unwavering support.

DECLARATION

I hereby declare that the work presented in this study for the degree of Master of Medicine (orthopaedic surgery) has not been presented either wholly or in part for any other degree and is not currently submitted for any other degree.

Signed:.....

Student

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Supervisor

TERMINOLOGY

1.	Sarmiento Type Cast	-	A below knee plaster cast with the anterior part extending to the inferior pole of the patella and which is firmly moulded to the proximal tibia.
2.	Osteoporosis	-	Reduction in the amount of bone mass leading to fracture after minimal trauma.
3.	Syndesmosis	-	A strong ligament at the distal end between the tibia and fibula. It merges with the tough interosseous membrane joining the length of the fibula to the tibia.
4.	Ankle Mortise	-	Ankle Joint
5.	Pillon Fracture	-	Impaction Fracture
6.	Osteoarthritis	-	Non inflammatory degenerative disease of the articular cartilage.

ABREVIATIONS

SE	-	Supination External Rotation
PE	-	Pronation External Rotation
SA	-	Supination Adduction
PA	-	Pronation Abduction
AO	-	Swiss Association for the Study of Internal Fixation
MUA	-	Manipulation under Anaesthesia
POP	-	Plaster of Paris
ORIF	-	Open Reduction and Internal Fixation
HIV	-	Human Immuno Deficiency Virus

SUMMARY

In the University Teaching Hospital, fractures of the ankle joint are common and like in most developing countries the majority of ankle fractures are treated non-operatively. This is because of the shortage of resources and also that of the required expertise. Results of the outcome of non-operative treatment is generally considered inferior to operative treatment. It is therefore important to examine our current practices and measure the outcome.

Forty patients with ankle fractures were included in the study. Each patient had a proforma filled, in which the type of fracture was classified both according to the Danis-Weber classification and the Lauge-Hansen classification. Also noted was the type of treatment given and the appearance of the immediate post-operative radiographs. At between three and six months the outcome was measured using a subjective and objective scoring system and where possible a repeat radiograph was taken and the reduction noted to see whether it had been maintained or whether it had worsened. The common type of fracture found was Weber type B and supination external rotation. Most of the patients with ankle fractures were managed non-operatively and most had returned to work by three months. The clinical outcome of most patients was acceptable although radiologically only 9 out of 17 had radiographs that showed a maintained reduction.

INTRODUCTION

Ankle fractures are common and occur at any age. In the young and active they are associated with vigorous activity. In the elderly osteoporosis produces weak bones and fracture of the ankle may follow relatively minor trauma [2]. The ankle joint is an important weight bearing joint hence inadequately treated fractures will result in pain from osteoarthritis in the long term. This is because small changes in joint shape by bony or ligamentous damage may result in loss of joint congruity. In cadaveric studies it has been shown that lateral displacement of as little as 1 – 2 mm is associated with an approximately 40% reduction in contact area and a corresponding 40% increase in peak pressures and possibly malunion in inaccurate reductions will cause early osteoarthritis. This fact underlines the importance of correct and accurate reduction and maintenance of reduction in the treatment of ankle fractures. Therefore whichever method is used as long as accurate reduction is achieved and maintained a favourable outcome can be expected.

In the University Teaching Hospital and most institutions in the developing world most ankle fractures will most likely be managed non-operatively. The reasons for this will probably be that firstly, there is inadequate orthopaedic expertise to deal with such a common problem. Secondly, there is usually shortages of appropriate implants and instruments as these are expensive to acquire. Thirdly apart form shortage of basic equipment, shortages of consumables are not uncommon.

Fourthly, the high prevalence of HIV in our set up is a deterrent in frequent use of metal implants because of the increased risk of infection, which may lead to a worse problem of osteomyelitis. It seems therefore easier to manage ankle fractures non-operatively. However the outcome of whatever method is adopted is more important. That is why it is necessary to assess results of any treatment method to determine the acceptability of the outcome. The long-term outcome will obviously be more representative of the actual outcome than the short term outcome, although the short term outcome may well be an accurate prediction of the long term outcome.

In the University Teaching Hospital there are five surgical units which take turns in handling all surgical emergencies that are admitted to the Casualty Department. This includes Orthopaedic Trauma cases like ankle fractures. Ankle fractures are therefore handled and initially managed by general surgeons. They only refer to the Orthopaedic units whenever they think that a particular will need open reduction and internal fixation.

In this study pre-operation radiographs of patients with ankle fractures were examined to determine the accuracy of reduction. At between 3 and 6 months after treatment repeat radiographs were taken to see whether the reduction had ben maintained or not. A clinical outcome was also assessed at this time.

LITERATURE REVIEW

1. ANATOMY OF THE ANKLE JOINT

The ankle joint is formed by the tibia above with a medial extension called the medial malleolus. Laterally there is the lateral malleolus of the fibula [2]. Below is the dome of the talus. The inferior surface of the tibia articulates with the talar dome. The stability of the ankle depends on its bony shape and also on the integrity of the ligaments which together with the bones form a ring[3]. The ligaments are concentrated about the malleoli from which they fan out to attach to the talus and calcaneus.

The tibia is bound firmly to the fibula by strong anterior and posterior tibio-fibular ligaments and a very strong interosseous ligaments (the syndesmosis) which merges with the tough membrane joining the length of the fibula to the tibia. From the medial malleolus the deltoid ligament, a very strong ligament fans out to the navicular, calcaneus and the talus. The lateral ligaments of the ankle consist of three distinct bands. These three ligaments are the posterior talofibular, calcaneofibular and the anterior talofibular ligaments.

2. CLASSIFICATION

Fractures of the ankle can be classified in several ways. The two most commonly used classifications are the Lauge - Hansen and the Danis – Weber systems. The Lauge Hansen system describes one direct injury pattern that is more of a pillon fracture and four indirect injury patterns. Several sub-categories exist within each of these four broad groups of

fractures [17] . The indirect injuries are described by letters. The first letter relates to the position of the foot at the time of injury and the second letter relates to the external force applied. The foot may be in supination [S] or pronation [P] and the external force applied may be external rotation [E] or abduction and adduction [A]. The four types of injury are therefore supination - external rotation [SE], supination - adduction [SA], pronation – external rotation [PE], and pronation abduction [PA] .

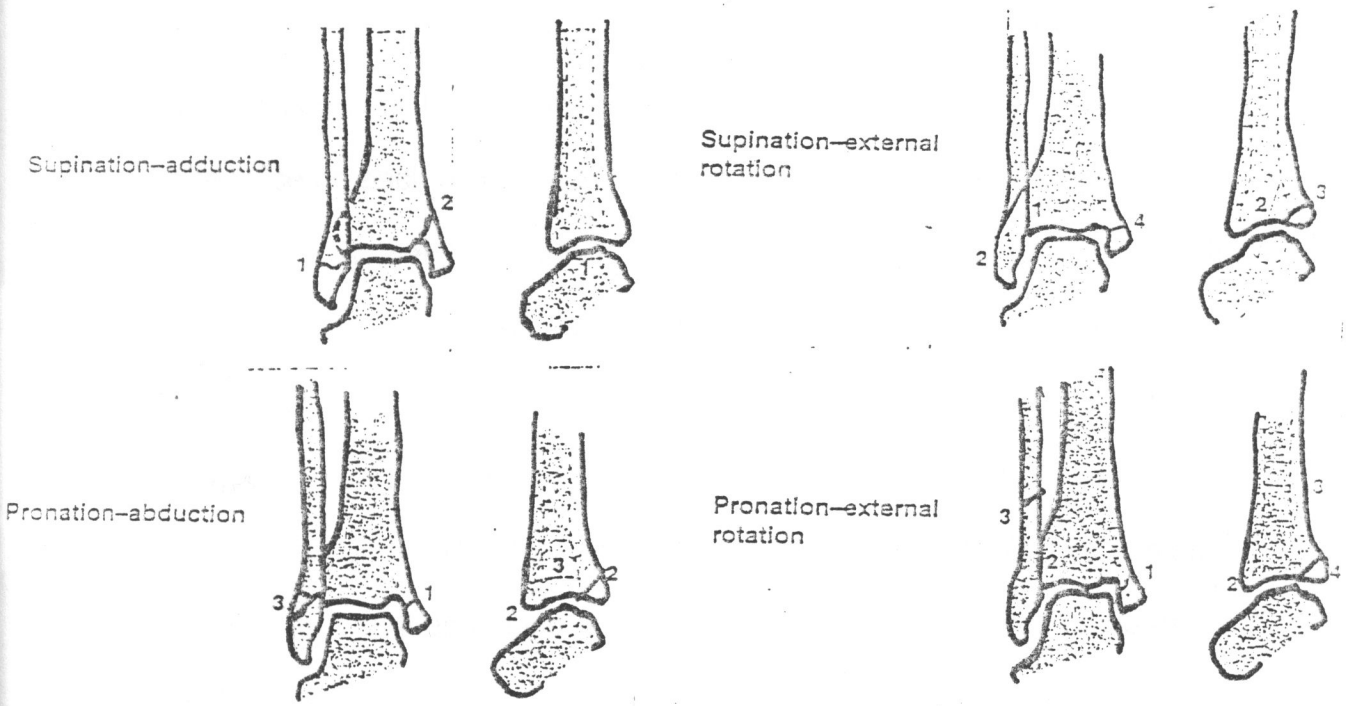
This classification is useful in that it reminds the surgeon that such injuries are a combination of bony and ligamentous elements. It is also useful in non-operative treatment in that manipulation of the fracture should aim to reverse that of the initial deforming force. This classification has not been shown to be of prognostic significance, however and does not help in the initial decision about how to treat a fracture[2].

The Danis-Weber system is a more simplified classification. This classification describes the height of the fracture on the fibular as being key to decision making. Because the lower end of the fibular slopes away from the talus, restoration of length of the fibular is crucial to ankle stability.

The Danis-Weber system consists of 3 types of ankle fractures. Type A injuries consist of fibular pull off and a medial push off implying a true adduction injury. Type B is the most common and involves fracture of the fibular above the tibial plafond involving the syndesmosis, but the proximal fragment of the tibia is held in place at the syndesmosis. The medial

malleolus or collateral ligaments may be affected. In Type C fractures, the fibular is injured above the syndesmosis, these fractures are less common than Type B and are invariably unstable.

Lauge-Hansen classification



3. BIOMECHANICS

The range of motion of the ankle joint allows for dorsiflexion and plantar flexion, internal and external rotation, and inversion and eversion. Normal range of motion varies but is approximately 20^0 dorsiflexion to 30^0 plantar flexion. Adduction – abduction is approximately 10^0 and internal and external rotation of the joint is about 17^0 [16]. Motion is sliding most of the range. Studies have shown that motion from full dorsi or plantar flexion begins with a period of distraction over part of the joint surface, followed by sliding through most of the range and ending with a period of joint surface compression or jamming.

The force on each ankle joint during a two-leg stance in perfect balance is half the body weight. Usually the forces tend to be higher as muscle tension acts to maintain equilibrium. At the ankle joint, the body is balanced on the apex of the dome like talus, so that even in two leg stance, forces are increased at the ankle joint by a constant interplay of dorsiflexion and plantar flexion muscles needed to maintain this unstable equilibrium. As these muscles are nearly perpendicular to the plane of the ankle joint, forces on the joint rise by approximately the amount of their tension. In single leg stance, the entire body weight is applied to the joint and even higher muscle stabilising forces are required in both frontal and sagittal planes. The joint force situation in the ankle joint is relatively complex because the forces are not all directed towards direct

compression of the joint; as the foot rises on the toes a shearing component of the force assumes increasing importance.

4. MANAGEMENT OF ANKLE FRACTURES

Management decisions in the treatment of ankle fractures are based on the expected outcome of each method and the patients' requirements. The management of a professional athlete may be different from that of a 65 year old retiree with the same injury [4]. Other important considerations are the experience of the surgeon and also the available facilities at the hospital.

In most centres a management protocol specifies indications for conservative or surgical approach depending on a particular fracture. Based on the Danis-Weber classification, Type A fractures that involve only the tip of the lateral malleolus and which are undisplaced in the initial radiograph are usually stable and may be held in a simple below knee cast. Type B fractures can be treated either operatively or no-operatively. For a young patient with gross displacement internal fixation is easier. Less severely displaced fractures can be treated non-operatively. Type C fractures often require operative treatment[2]. Other authors base their management decision on whether the fracture is stable or unstable, stable or mild forms are treated non – operatively and unstable forms are treated surgically. The stability of fractures of the ankle is determined by the fact that the ankle mortise is a ring formed by bone and ligaments. Disruption of the ring at more than one point makes the fracture potentially unstable.

In the past 30 years in Europe, the treatment of unstable fractures has become more surgically oriented with various studies demonstrating the benefits of operative treatment of unstable fractures. The reason advanced for this is that treatment of unstable fractures by open reduction and internal fixation usually allows accurate reconstruction, which prevents malunion and results in improved long-term outcome[6]. In general, therefore most authors are agreed that the results of operative management with anatomical reduction and internal fixation are superior to closed reduction and casting for unstable fractures[7,8,14] . It must however be remembered that by open reduction a closed fracture is changed into an open fracture in a favourable environment. This increases the chances of infection which may lead to a delayed or non-union of the fracture. This problem is particularly real in places where there is a high prevalence of HIV infection as in Lusaka. The cost of surgical operation and implants is considerable and far exceeds the per capital health budget in Zambia. In addition many implants require removal after the fracture has healed. This requires a second anaesthetic and operation with its associated risks.

Closed reduction of ankle fractures can be accomplished by manipulation but to maintain the anatomical reduction is difficult. The slipping of a reduced fracture usually starts three to four days later when the swelling begins to subside. The problem therefore in treatment of ankle fractures by non-operative means is not so much how to reduce the fracture, but

how to make sure it will stay reduced. Non-operative treatment of ankle fractures is therefore more exacting and requires three or four check-ups with radiographs to ensure that no loss of position has occurred[6]. The most important radiograph after closed reduction of an ankle fracture is one taken one week later because it is not too late to achieve a perfect result if operation or remanipulation is undertaken[9]. Ankle fractures that have been treated non-operatively are best managed initially in an ankle above knee cast to control the fibula although early or primary use of a functional Sarmiento type cast in a good compromise. The cast is usually required for six to eight weeks[4].

OBJECTIVES

1. To determine the types of fracture of the ankle in the University Teaching Hospital.
2. To determine how fractures of the ankle are treated in the University Teaching Hospital.
3. To determine how soon after treatment patients with ankle fractures return to normal duties.
4. To examine any relationship between symptomatology and x-ray appearance after treatment.

RATIONALE

Fractures of the ankle are common and commonly mismanaged (1). Inadequate treatment of ankle fracture often leads to disabilities both in the short and long term, thus affecting the patient socially and economically because of the period it takes for them to return to normal duties. Treatment options are controversial with basically two schools of thought. One favours open reduction and internal fixation and the other school prefers closed reduction. Whichever method is chosen what matters is the outcome, that is how soon the patient is able to return to normal duties. In the developing world, because of lack of resources and shortage of expertise conservative management is mostly practiced. Audit of the outcome of our management of ankle fractures is necessary to enable us to assess our performance and possibly review and revise our current methods of treatment and teaching to achieve better results. To our knowledge no such study has been undertaken in the University Teaching Hospital.

PATIENTS AND METHODS

Forty patients with fractures of the ankle admitted to the five Surgical Units in the University Teaching Hospital (UTH), Lusaka between April 1998 and March 1999 were included in the study. Twenty-two of the patients were men and 18 were women. Their ages ranged from 6 to 70 years (mean 35 years). Personal details noted included name, age, sex, weight, occupation and address. Other details noted were the date of injury, date of admission, mechanism of injury and whether the fracture was open or closed.

Preoperative radiographs of the injured ankle were examined and grouped according to both the Danis Weber and Lauge- Hansen classification. The degree of the shift of the talus was also measured as the perpendicular distance (lateral or medial) from the weight bearing line which is a line drawn precisely down the centre of the tibia in anterior-posterior radiographs. If the talus is in its normal position the weight bearing line should pass through the centre of the talus.

From the case notes, the date of operation, the name and grade of the operating surgeon and the operative treatment used was noted. Postoperative radiographs were assessed for the accuracy of the reduction of the fracture immediately after operation. The criterion used was that modified from those of Phillips et al (6).

The reduction was deemed satisfactory if the following criteria was satisfied:

1. < 2mm displacement of the medial malleolus

2. < 2mm lateral displacement of lateral malleolus
3. < 5mm posterior displacement of the lateral malleolus
4. < 2mm difference between the medial clear space and the interval between the talus and the tibia plafond
5. < 2mm displacement of the posterior malleolus if the fragment was 25% or more of the anteroposterior length of the tibial articular surface.

Unsatisfactory reduction was classified as minor if the above criteria was not satisfied or major if the talar shift was more than 5mm. The outcome of the treatment was measured any time between 3 and 6 months after treatment. A subjective scoring system as suggested by Joy in 1974 was used to measure the outcome (See appendix). In addition the date when the patient resumed normal duties was recorded and at each follow up the radiographic appearance was noted to assess whether the reduction had been maintained or the position worsened. The frequency of each injury type was then noted and also the most frequent type. Treatment methods were listed and the frequency of each method noted.

To measure the subjective result each patient answered questions as outlined in the scoring system. Five categories of subjective complaints were used and scores assigned four being the best score and zero the worst. In evaluating the objective results five scoring categories were defined based on range of motion, tenderness and deformity (see appendix). The final clinical result was determined by averaging the objective and subjective scores for each patient and

using these average scores to define good, fair and poor results, a good result was three or more, fair results two to 2.5 and a poor result less than two.

All the radiographs and the clinical outcome were evaluated and assessed by this researcher.

RESULTS

1. **Fracture Types:**

The frequency of injury types is as shown in tables I and II. With regard to the Danis-Weber classification, type B was the most frequently occurring ankle fracture type followed by type C. There were very few type A fractures. With regard to the Lauge-Hansen classification the type with the highest number was the supination external rotation (SE) followed by the pronation abduction (PA) type of injury, then the supination adduction (SA) and lastly pronation external injury type. The histograms accompanying the tables further demonstrate this observation.

Thirty-seven were closed fractures and only three were open fractures. In three patients initial radiograph could not be traced.

TABLE 1

Frequency of injury types Denis-Weber (AO classification)

(n=37)

Injury type	**Patients**
Type A	2
Type B	32
Type C	3

RESULTS

Figure 1.

FREQUENCY OF INJURY TYPES
(DANIS WEBER CLASSIFCATION)

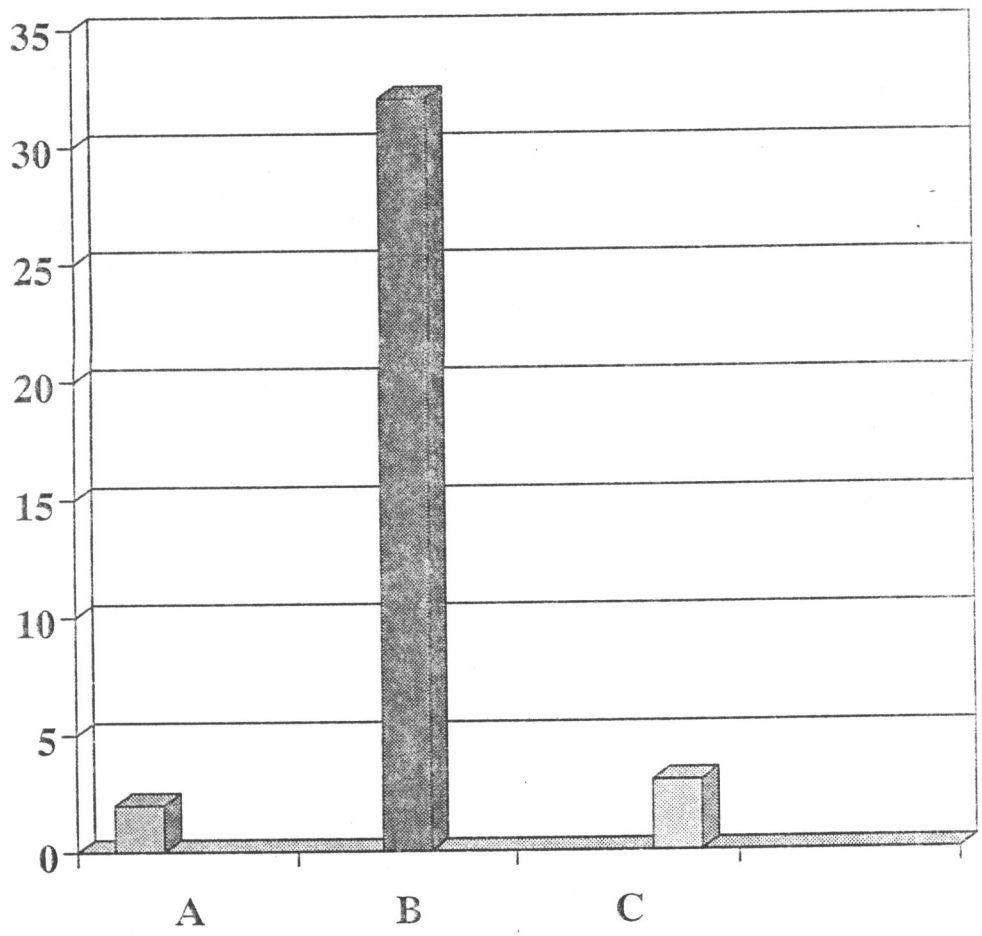


TABLE 2

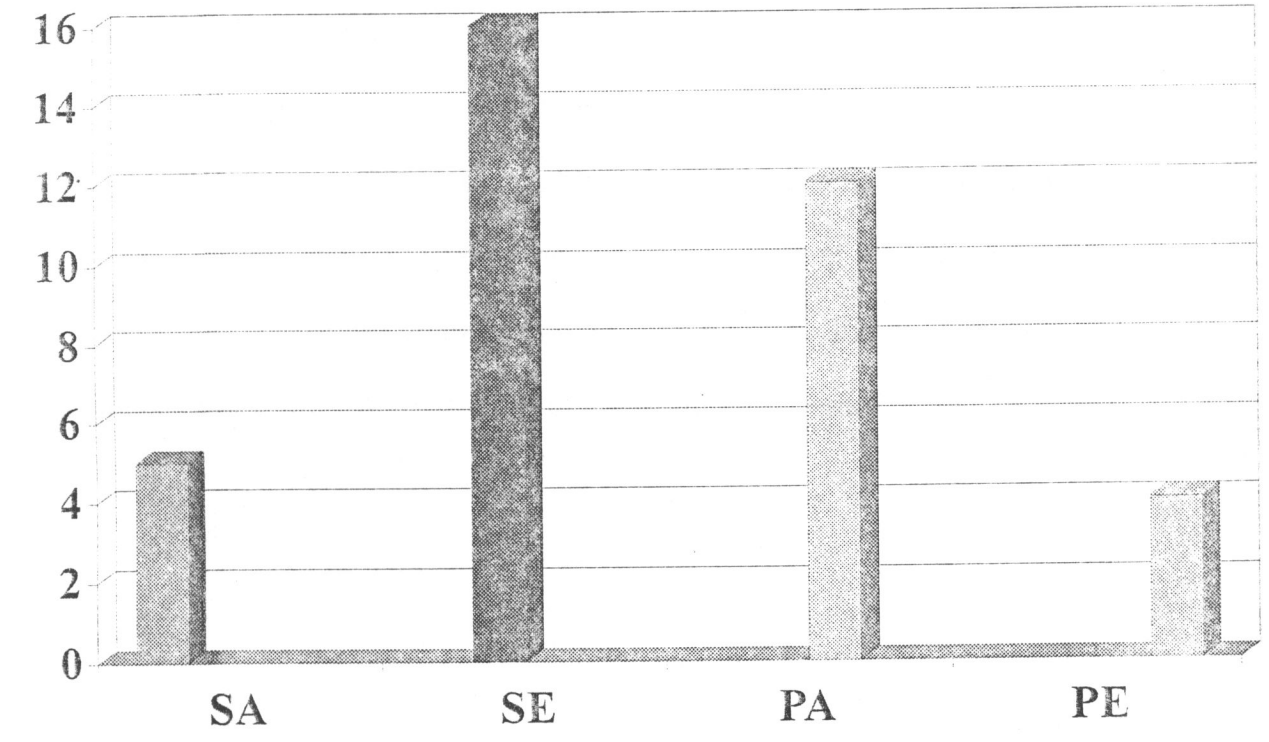
Frequency of injury (Lauge-Hansen classification) (n=37)

Injury type	**Patients**
Supination – adduction (SA)	6
Supination – external rotation (SE)	15
Pronation – abduction (PA)	12
Pronation external rotation (PE)	4

Figure 2

FREQUENCY OF INJURY TYPES (LAUGE-HANSEN CLASSIFICATION)

SUPINATION-ADDUCTION (SA)
SUPINATION-EXTERNAL ROTATION (SE)
PRONATION-ABDUCTION (PA)
PRONATION-EXTERNAL ROTATION (PE)



ient

Injury type

2. **Treatment methods**

More patients (71%) had a back slab applied initially and were kept in bed with the foot elevated. Once the swelling was reduced, the cast was completed and the patient discharged non-weight bearing using crutches. One patient had manipulation done without radiographs and had to have a repeat manipulation under anaesthesia (MUA) because check radiographs showed an unacceptable displacement. Another patient had an MUA, but no check radiographs were done and the patient never came back for follow up. Eight of the patients had undisplaced ankle fractures. Only one had nothing done but an application of a (POP) cast. The other seven had MUAs done. Of these, one showed a worse radiographic appearance than the first after three months. Only one patient was treated by open reduction and internal fixation. In five patients the notes were either missing or there was no record of the treatment theatre notes.

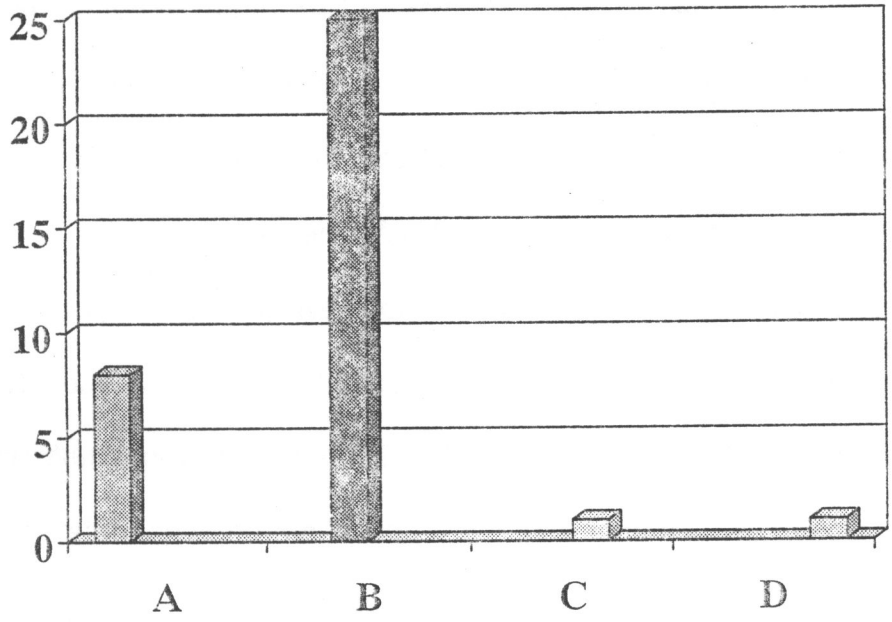
TABLE 3

Frequency of Treatment Methods (n=35)

Treatment Method	Patients
MUA + Complete POP	8
MUA + Backslab followed by complete POP	25
POP (No MUA)	1
ORIF (Failed MUA)	1

igure 3

Frequency of Treatment Method



Patients

Treatment Method

A MUA + Complete POP

B MUA + Backslab Followed by complete POP

C POP (no MUA)

D ORIF(Failed MUA)

3. Duration between injury and return to normal duties

Fifteen patients were followed up for a period between three to six months. All except two had returned to normal duties by six months. These two were one with an infected open ankle fracture and one who had late displacement at five months post injury. The range of time of return to normal duties was between three and six months. The average time for returning to normal duties was four months. The most frequent period for returning to normal duties was three months (see table 4)

TABLE IV

Duration of return to normal duties (n = 15)

Duration (in months)	Patients
3	6
4	1
5	2
6	4
6+	2

4 Clinical Outcome

Of the 40 patients recruited in the study only 17 were available for follow up at between 3 and 6 months from the time of fracture.

Thirteen of the 17 patients had good results, two patients had fair and another two patients had poor results.

Fifteen patients had radiographs during follow up. Of these, the reduction was maintained in nine Three showed worsening of the position. Two patients had failed reductions right from the start.

TABLE V

FINAL CLINICAL RESULT OF FOLLOW UP PATIENTS (n = 17)

Result	**Patients**
Good	13
Fair	2
Poor	2

Figure 4.

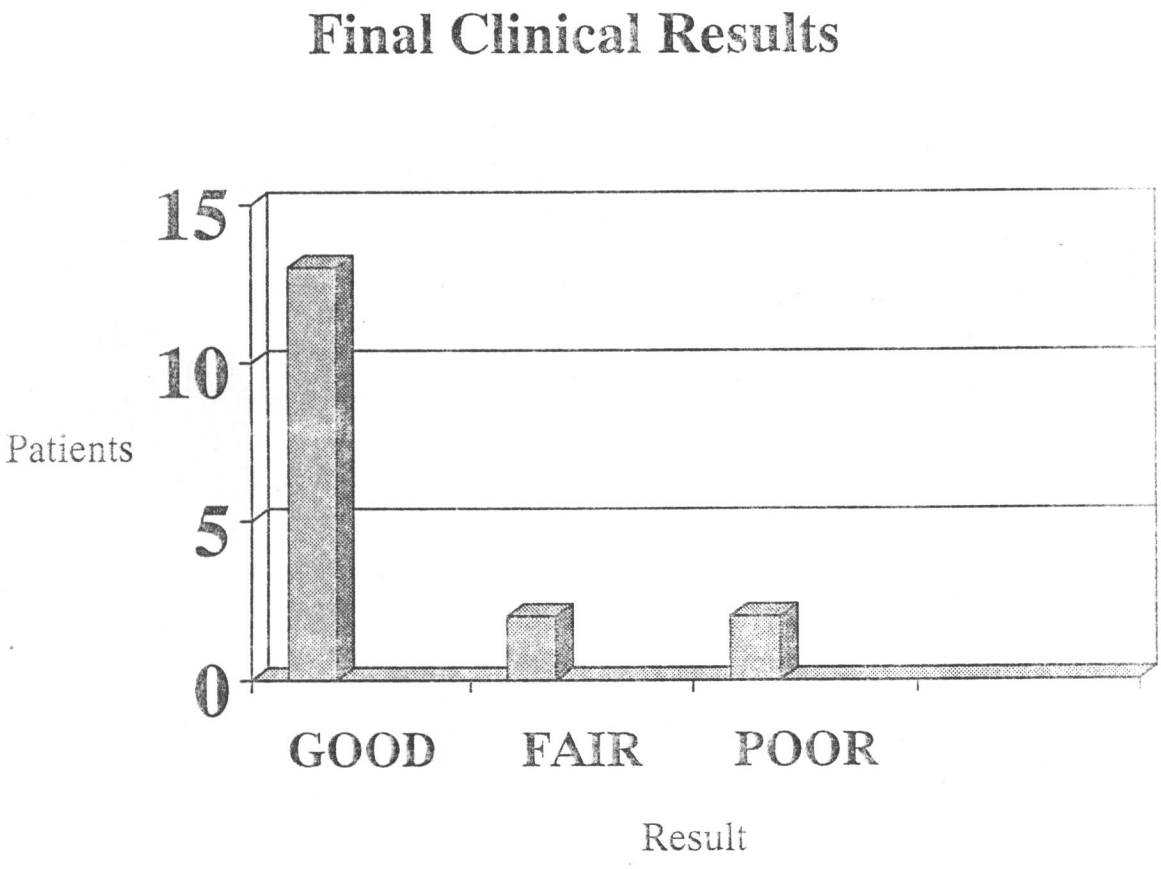
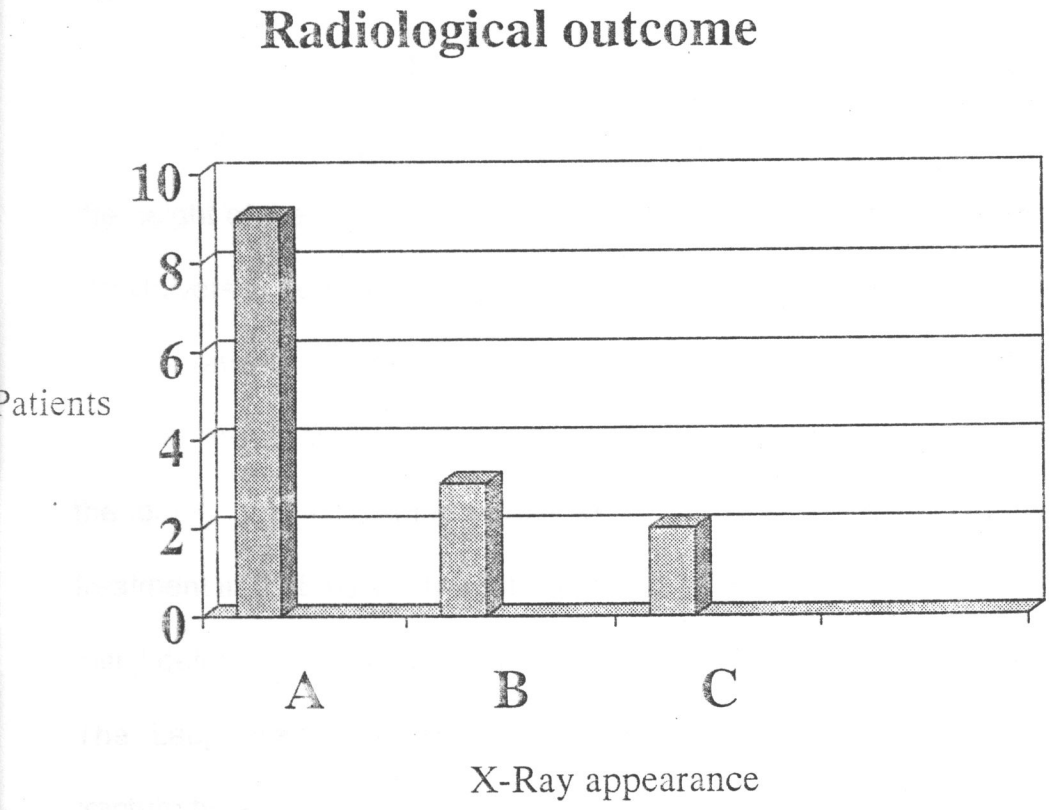

Final Clinical Results
15
10
5
0
Patients
GOOD
FAIR
POOR
Result

Figure 5



A- Reduction maintained
B- Position worsened
C- Failed reduction

DISCUSSION

From the findings of this study the Danis-Weber type B ankle fracture is the commonest (86%) in the University Teaching Hospital and according to the Lauge-Hansen classification it is the supination external rotation type which is the commonest. These findings are similar to those of other workers[6]. Leach and Fordyce at the Royal Cornwall hospital in 1994, had similar findings with type B Danis-Weber constituting 63% of ankle fractures and 58% for the Lauge-Hansen classification though their study involved an older population[6]. The Danis-Weber classification describes the height of the fracture on the fibula as being key to decision making. In the University Teaching Hospital, all ankle fractures were initially managed non-operatively. It seems therefore that the Lauge-Hansen classification which is based on the direction of the deforming force and the position of the foot is more relevant to our situation. In addition it helps nonoperative treatment in that, by applying the principle of reversing the direction of the initial deforming force, one can reduce the fracture through manipulation[2]. The Lauge-Hansen classification also gives a broader distribution of fracture types.

Ankle fractures in the University Teaching Hospital were treated non-operatively by manipulation and applying a back slab in the majority of cases. This was followed by completion of the plaster when the swelling had subsided. The patient was then discharged non-weight bearing using crutches. On a few patients a complete cast was applied at the first

Therefore, although non-operative management of ankle fractures seems less taxing on the meagre available resources it is equally demanding of the surgeon's skills and requires exacting follow up with regular radiographs, especially in the early weeks, if maintenance of reduction is to be ensured. Bad results in non-operative treatment of ankle fractures are usually the consequence of slipping of the fracture in the first week or two after reduction. Recent emphasis in repeating the radiograph as the initial swelling goes down and the hold of the plaster loosens has minimized this albeit at the expense of a new plaster[11].

In the University Teaching Hospital, the earliest time when a patient after ankle fracture went back to normal duties was three months. In fact the majority of them should have been back to normal duties by this time. This is just about the time that healing of the fracture is expected. Infection in an open ankle fracture will obviously delay return to normal duties. It is, however, clear that there would be many other factors that determine a return to normal duties. For example, an office worker will probably return to normal duties earlier than say a soldier. We cannot therefore, based on these results, make a conclusion regarding how soon after treatment patients with ankle fracture return to normal duties.

Only 17 of the 40 patients were adequately followed up. Rather surprisingly considering that the back slab which was initially applied and followed by a below knee cast seems inadequate to hold the reduction after manipulation of an ankle fracture, 13 of these had good clinical

results. However, according to radiological outcome only 9 showed a maintained reduction at follow up. This means that there were more patients with a good clinical outcome compared to those who showed a maintained reduction on the radiographs at follow up. It also means that there were some patients who had a good clinical outcome but had either a failed reduction or indeed a worsening of the position on the radiographs. Therefore a good clinical outcome does not always result from an accurate reduction. In fact most authors when discussing the relationship between reduction and the final result have noted that the adequacy of radiological reduction does not always correlate with the final clinical outcome. Hence other variables such as patients weight and age must play a role in determining the final clinical outcome[10,12].

Follow up was only possible in 17 out of the 40 patients in the study. Most of these patients did not turn up for review especially when they began to feel better while others were missed because they turned up on the wrong date. At other times a patient would come for review but the records including the radiographs could not be traced. Follow up would also have been easier if it was possible to phone these patients and request to see them. The lack of communication with patients and poor record keeping in the University Teaching Hospital makes any follow up study difficult.

In University Teaching Hospital, and similar institutions in the developing world, ankle fractures and other fractures are usually managed by general surgeons. This is because in most cases there are not enough

sitting. A back slab applied after reducing an ankle fracture was unlikely to hold the reduction especially when the swelling had gone down. Ideally, at reduction when a complete cast is ill-advised because of gross swelling. A "horse shoe" plaster splint or 'U slab' which extends down one side of the patient's leg and foot then up the other side and is held with a crepe bandage, is better able to hold the reduction. It was also observed that all the patients were treated with below knee plaster casts. This increases the chances of the foot rotating on the leg thus leading to loss of reduction especially in unstable rotational injuries. To prevent this the cast must extend above the slightly flexed knee[7]. A good compromise (especially in view of the infrequent availability of basic essentials like plaster and cotton wool) to an above knee cast is a functional Sarmiento type cast (see appendix) which is a below knee cast but the anterior part extends to the lower pole of the patella and is firmly molded on the proximal tibia[3]. The cast is usually left on for six to eight weeks non-weight bearing and the patient kept using crutches. A check radiograph immediately after reduction was mandatory but was not always available in the hospital. The first week after non-operative treatment of ankle fractures is the period during which most ankle fractures re-displaced. Redisplacement of ankle fractures have, however, been known to occur even three months after treatment. In fact in our study, there was one patient whose fracture redisplaced at about five months after treatment.

orthopaedic surgeons. General surgeons are usually not trained to operate on fractures. An additional problem in the situation in the University Teaching Hospital is a shortage of plate and screw sets. The best that they can do therefore is refer all potentially unstable fractures to the orthopaedic surgeon as soon as possible because ankle fractures can be difficult to treat. A simple management protocol for the treatment of ankle fractures in the University Teaching Hospital would be helpful in ensuring adequate treatment. A suggested protocol would be as follows:

WeberA	-	MUA + plaster cast
B	-	MUA + plaster cast or for internal fixation if Radiograph unsatisfactory at one week
C	-	Elevate and reduce swelling. Refer for open Reduction and internal fixation

CONCLUSIONS

1. The commonest type of ankle fracture in the University Teaching Hospital is Weber type B or Lauge- Hansen Supination-external rotation fracture
2. Most ankle fractures are treated non-operatively in the University Teaching Hospital. Operative treatment is reserved for irreducible ones.
3. After an ankle fracture most patients have returned to normal duties by 3 months.
4. The final clinical outcome of the management of ankle fractures in the University Teaching Hospital is acceptable. However, better results would be possible if basic principles were adhered to.
5. Final clinical outcome as demonstrated in this study did not seem to correlate with radiological findings.

RECOMMENDATIONS

1. The Lauge-Hansen classification of fractures should be popularised
2. Postoperative radiographs (before discharging the patient) must be taken whenever possible.
3. Repeat radiographs at one week and if possible at 3 months after treatment.
4. "Horse shoe" plaster casts should be used when swelling prevents safe application of a complete cast.
5. Sarmiento type casts should be applied on discharge from hospital.
6. In-service training of junior staff in the correct management of ankle fractures should be encouraged and guidelines circulated.

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APPENDIX I

PROFORMA

SHORT TERM OUTCOME OF ANKLE FRACTURES AT UNIVERSITY TEACHING HOSPITAL

Surname: ..... First name: ..... Hospital No: .....

Age: ..... Sex: ..... Weight: ..... Occupation: .....

Physical Address: ..... X-ray: .....

Date of Injury: .....

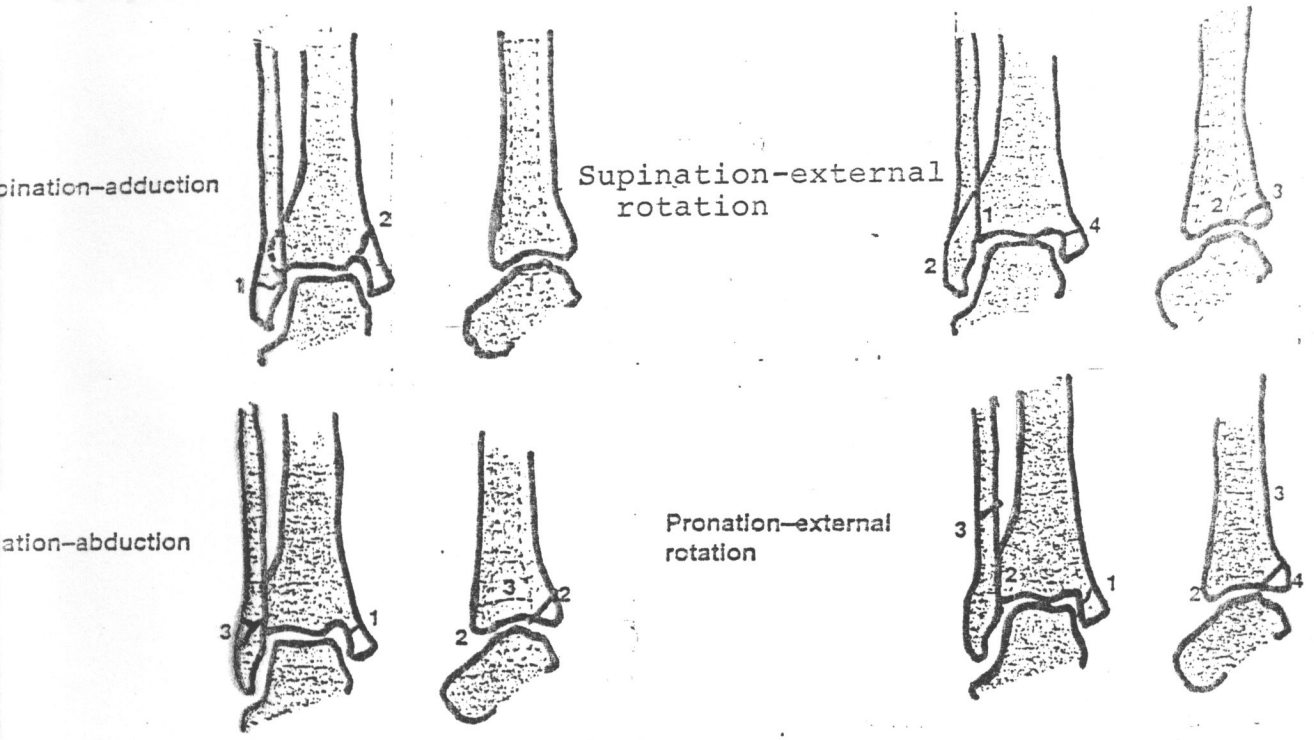
Date of Admission: .....

Mechanism of Injury: .....

Open or closed: .....

(Pre Op. X-Rays): .....

CLASSIFICATION: Lauge-Hansen classification (Tick appropriately)



TREATMENT

Date:.....

Surgeon:.....

Procedure:.....

.....

.....

Post Operation X-rays (tick accordingly)

☐ Satisfactory

☐ Minimum

☐ Major

Post Operation Treatment:.....

2. A O (Weber) Classification
(tick appropriately)

☐ Type A - Fibular pull off' and medial malleolar' push off'

☐ Type B - Fracture Fibula at or above the tibial plafond involving the syndesmosis

☐ Type C - Fracture of fibula above the syndesmosis

3. TALAR SHIFT

Present ☐ degree.
(distance from the weight bearing line)

.....

Absent ☐

APPENDIX II

FOLLOW UP (3 – 6 months)

Subjective Result

Score: Scoring of subjective clinical evaluation

4. No pain, normal ankle

3. Pain is noted only after prolonged stress, participation in sports and ability to walk or work not limited.

2. Pain is moderately incapacitating, but no care or other walking aid is used.

1. Pain is severe and may require use of a daily analgesia in care.

0. Pain is constant and incapacitating, patient is unable to walk sufficiently to care for himself.

Objective Clinical Result

Score: Scoring of objective evaluation

4. Normal

3. Active and passive dorsi flexion plantar flexion pronation and supination are painless.

2. All movements of the ankle are painless and range is than 1/3 to 2/3 normal ankle, slight tenderness.

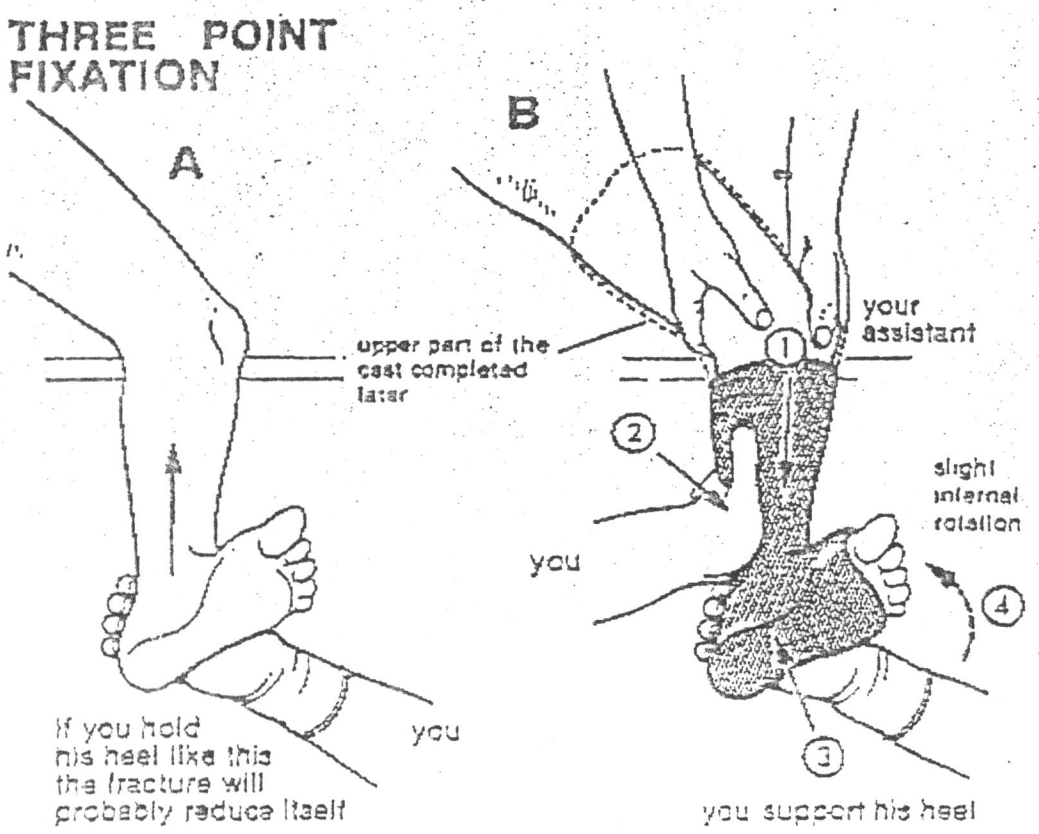
1. All movements of the ankle are painless and range is less than 1/3 of that of normal.

0. Ankle stiff and painful, severe antalgic gait. Varus or valgus deformity of ankle. Any ankle fused was also placed in this category.

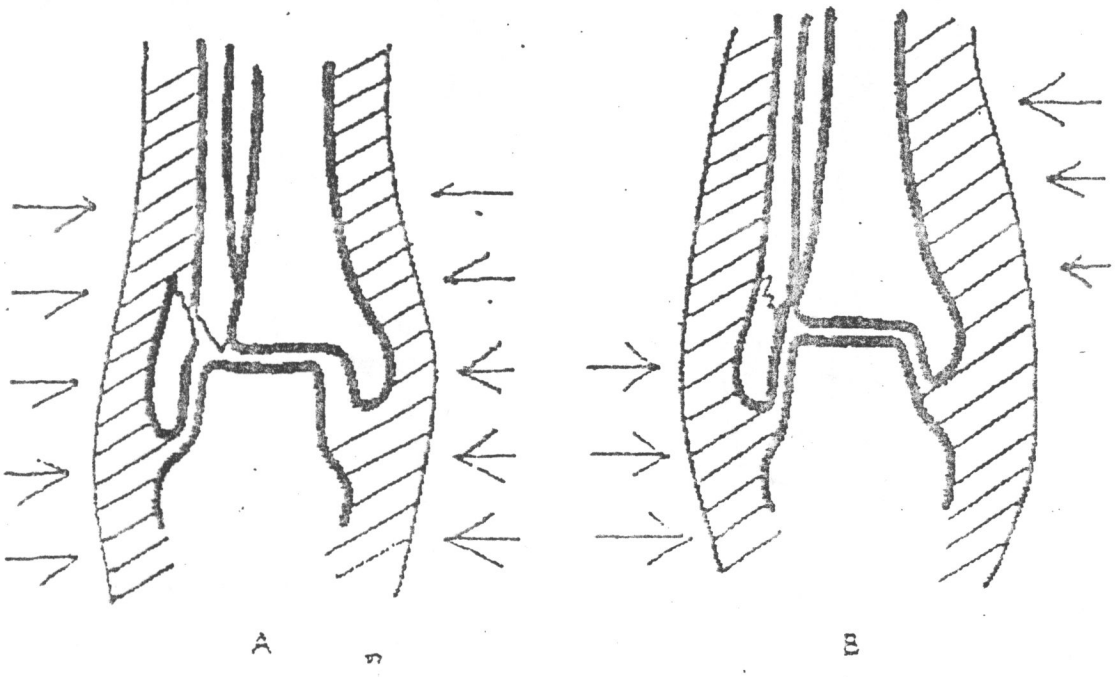
X-ray: appearance

X-ray appearance (tick appropriate)
[ ] Reduction Maintained
[ ] Position Worsened

APPENDIX IV


THREE POINT FIXATION
A
upper part of the cast completed later
you
If you hold his heel like this the fracture will probably reduce itself
B
your assistant
1
2
you
slight internal rotation
4
3
you support his heel

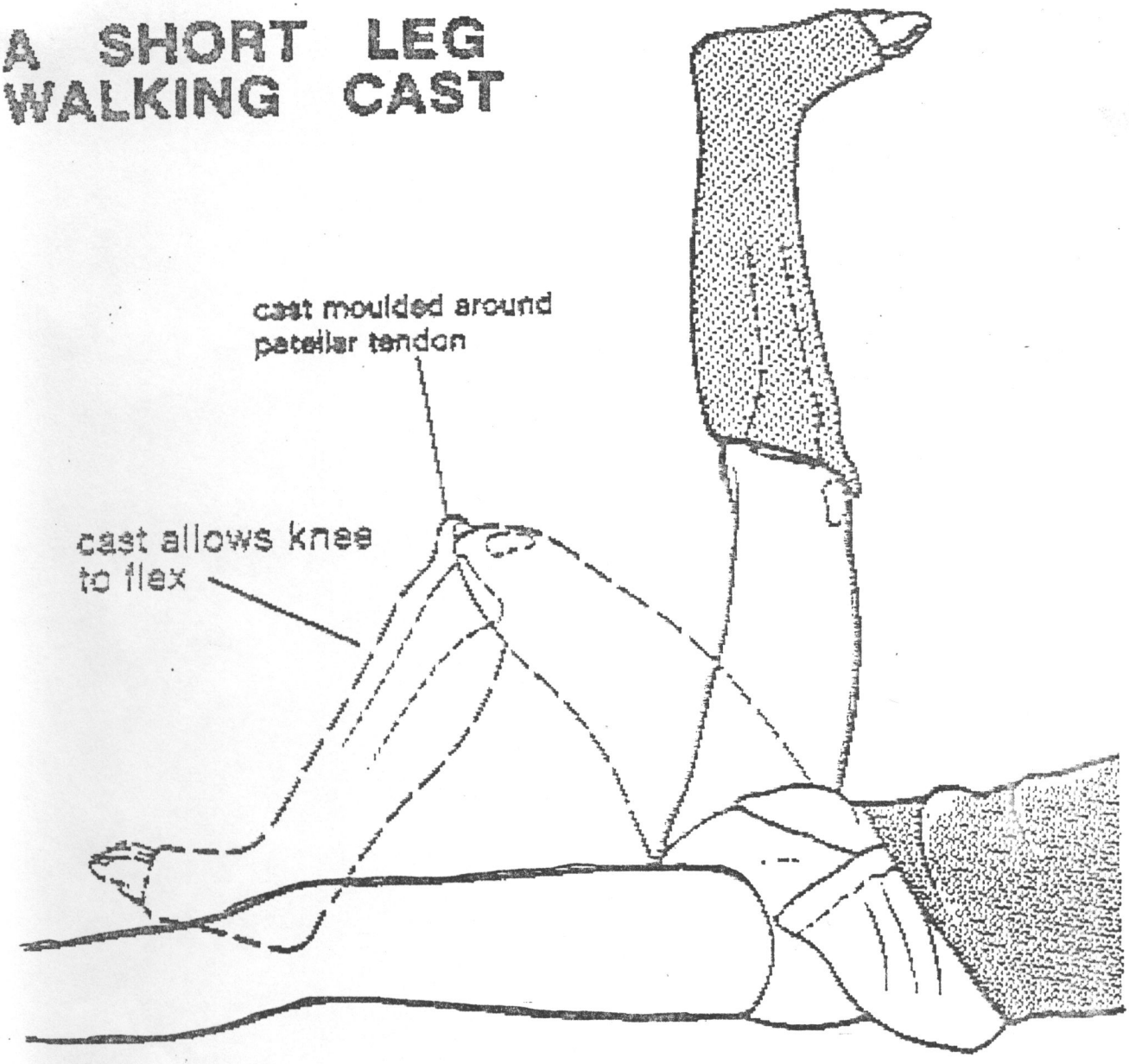
APPENDIX III



WRONG

CORRECT

APPENDIX V



A SARMIENTO TYPE SHORT LEG WALKING CAST is applied with the patient's knee flexed at 90degrees. It is an oblique upper edge, is moulded by triangular compression.