Controlling rotational deformity in ankle fractures : the Bridgend knee grip

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Introduction

The classification of ankle fractures is complicated in many text books but the simplified classification of Colton[1] is adequate in practice. Colton divided the injuries into six groups:

1 Abduction injuries.
2 Adduction injuries.
3 External rotation pronation injuries (with diastasis of the inferior tibio-fibular joint).
4 External rotation-supination injuries (with or without fracture of posterior lip of tibial articular surface).
5 Vertical compression injuries.
6 Unclassifiable injuries.

Diagnosing the mechanism of injury is essential because, as in all displaced fractures, effective splintage must counteract the deforming forces which caused the injury.

Management

Recognition of the forces is usually possible by observing the pattern of the fracture lines, especially in the fibula. Abduction and adduction forces cause transverse or short oblique fracture lines near the level of the ankle joint (Fig 1) whereas rotation forces produce spiral fractures of the fibula above the level of the joint (Fig 2).

Abduction and adduction fractures of the ankle are relatively easy to control in appropriately moulded below-knee plaster casts (Fig 3).

Because of the difficulty in controlling rotation of the foot, however, external rotation fractures (which comprise the majority of displaced ankle fractures) cannot be adequately controlled in below-knee plasters. This is because, while it is easy to obtain a firm hold on the bony ankle region, it is much more difficult to obtain a firm grip on the muscular upper part of the leg and thereby prevent the plaster from rotating on the leg.

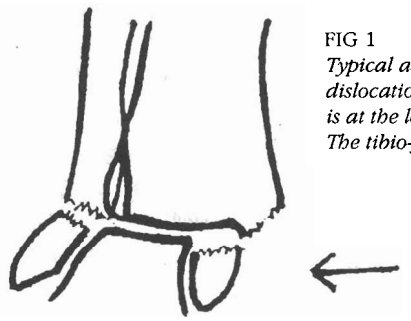

FIG 1
Typical abduction fracture-dislocation. The fibular fracture is at the level of the ankle joint. The tibio-fibular joint is intact.

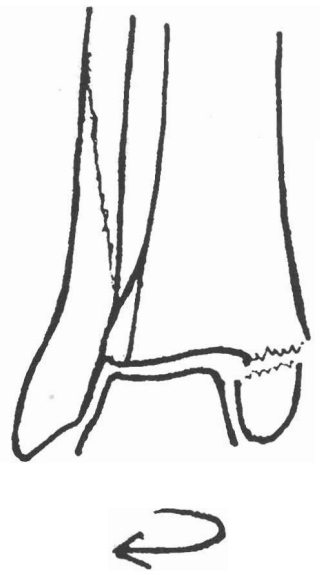

FIG 2
Typical external rotation pronation fracture-dislocation. The fibular fracture is spiral and above the level of the ankle joint.

Although the lower end of the fibula appears to be undisplaced, it is externally rotated allowing the talus to move laterally.

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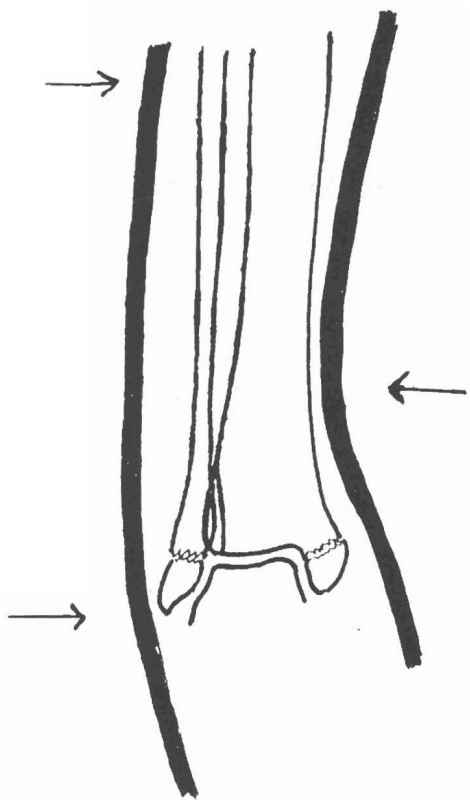

FIG 3 *Reduction of an abduction or adduction fracture-dislocation is secure in a below knee plaster provided the plaster is strongly moulded against the deformity.*

Attempts have been made to solve this problem by extending the plaster above the knee with the knee in 90 degree of flexion. But this is unacceptable because such plasters are very cumbersome and prevent weight-bearing. They are also ineffective because the rapid wasting of the thigh muscles means that this part of the cast becomes loose fitting.

Owing to the difficulty in maintaining reduction of external rotation fractures in conventional plasters, open reduction and fixation with plates and screws is now the standard treatment and, in skilled hands, produces excellent results.

Where the facilities or skills for internal fixation are not available, however, it is highly desirable to have an alternative treatment. An effective method is an above-knee plaster with the knee extended and with the plaster closely moulded around the bony contours of the knee using the two-hand knee grip.

Technique for casting with the Bridgend knee grip

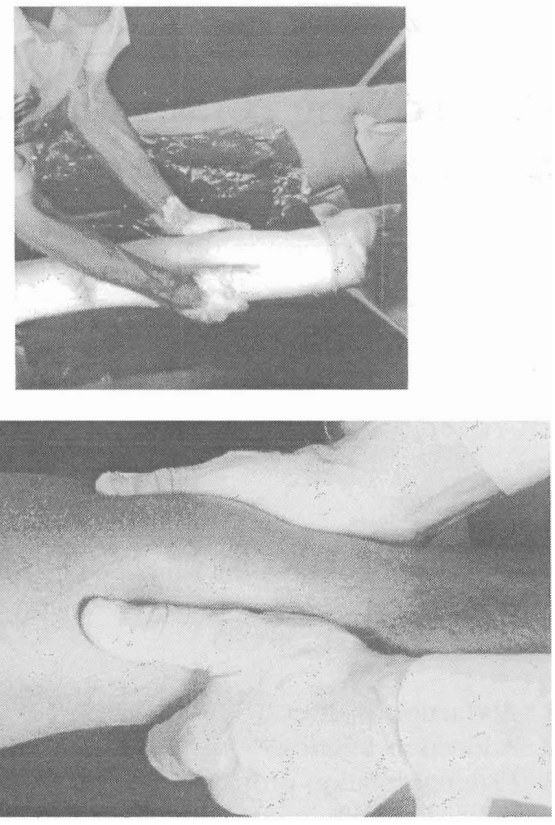

FIG 4
In external rotation fracture-dislocations, external rotation of the foot must be prevented by moulding the plaster around the sides of the patella and around thefemoral condyles using the himanual knee grip.

The technique of application is vital. The deformity of the ankle is corrected by manipulation and a closely moulded below-knee plaster is applied. Once this has set the foot is strongly internally rotated by an assistant and the plaster is extended to the mid thigh with the knee extended (but not hyperextended). This plaster is then closely moulded around the sides of the patella using the radial sides of both thumbs and moulded around the femoral condyles using the fingers (Fig 4). This produces a trefoil cross-section as shown in figure 5. This moulding is also important in controlling rotation in shaft fractures of the tibia and fibula[2].

It also eases pressure on the front of the patella, thereby preventing chondromalacia patellae which is a not uncommon complication of above-knee plasters.

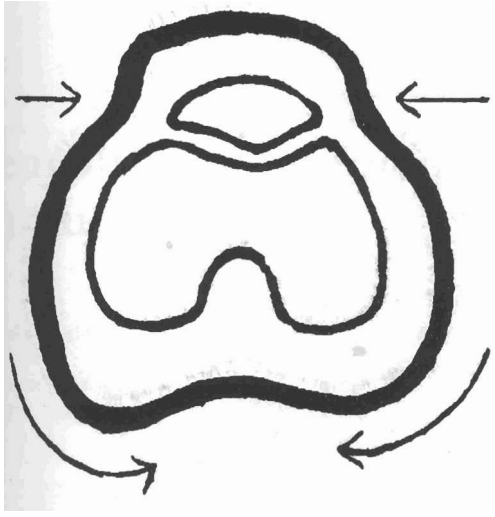

FIG 5 *Cross section showing the trefoil shape of the plaster around the knee.*

Because of the importance of moulding, the plaster bandages should be immersed in cold water. If warm water is used there is insufficient time to contour the plaster before it sets.

Further management

Afterwards a check radiograph is taken, the plaster is split down the front and the leg is elevated. Swelling diminishes after 48 hours so at this time the plaster can be completed and reinforced to enable early full weight-bearing.

The lower limb is designed for weight-bearing and the piston action induced by weight-bearing assists nutrition of bone and cartilage and prevents sympathetic osteodystrophy. It also prevents excessive muscle wasting, thereby preventing loosening of the plaster cast.

Early full weight-bearing in properly moulded plaster casts is an important advantage which is not available to patients treated by internal fixation. Plates and screws are not normally strong enough to allow early full weight-bearing.

Conclusion

In my experience, malunited ankle fractures are the commonest and most disabling type of malunion encountered in clinical practice. In many of these cases the deformity has resulted from inadequate internal fixation. This underlines the importance of conservative management of these potentially disabling fractures.

References

1 *Watson-Jones Fractures and Joint Injuries.* Ed. JN Wilson. Vol 2 1982. Edinburgh and London, Churchill Livingstone.

2 Fowler AW. The importance of joint movements in the treatment of fractures. *East Central Afr J Surg* 1995; 1:49-60.