CHAPTER SIXTEEN

THE POTT'S FRACTURE

THE precision with which it is possible to reduce a Pott's fracture by manipulation becomes a source of pleasure once the surgeon understands the mechanics of this reduction. My own satisfaction is increased when I recall the uncertainty of my own early attempts to reduce this fracture-dislocation and how I was once dependent on the X-ray as on a ' lucky dip.'

The problem in treating a Pott's fracture is not so much how to reduce the fracture but how to make sure that it will stay reduced. I shall endeavour to indicate when I think it is dangerous to persist with closed reduction and when operative aid should be invoked.

Operative treatment of the Pott's fracture is not a procedure to be encouraged as a routine, because there are special complications of operative treatment quite as serious as the defects of closed treatment. In the ordinary Pott's fracture the functional and anatomical results of a skilful closed reduction should be perfect. Even if a small posterior marginal fragment remains displaced, the ankle possesses a latitude for recovery of function which is often astonishing. The open reduction of this fracture-dislocation can be a matter of considerable technical difficulty; to secure adequate exposure in the cramped space available may impair the blood supply of a detached fragment. If for any reason open reduction should be attempted, nothing less than a ' hair-line ' restoration should be regarded as justifying it; incomplete reduction after open operation must be regarded as an error of judgment. If open reduction is considered imperative, then the minimum of metallic ' hardware ' should be used. An injured ankle is prone to chronic œdema, and as it has no muscle covering it is subject to extreme temperature changes, which I believe can cause pain when screw-heads are lying close to the subcutaneous tissues.

THE ANATOMY OF THE POTT'S FRACTURE

There have been various attempts to classify ankle fractures according to the different types of violence producing the fracture but these classifications do not offer help in treatment.

The common fracture-dislocation of the ankle joint, called the Pott's fracture or sometimes the ' third-degree abduction-external-rotation fracture,' is composed of three separate fractures combined with a postero-lateral dislocation of the ankle joint. The three fractures involve the medial and lateral malleoli and the so-called ' third malleolus,' which is a posterior marginal fragment of the articular surface of the tibia. In a severely displaced fracture the X-ray may present an appearance

of utter confusion, and the student may well feel that he will be very lucky indeed to get even one of these 'malleoli' reduced, let alone three at the same time! This erroneous conception springs from concentrating on the radiological appearances of the individual fragments without understanding the anatomy of the injury as a whole (Fig. 38, p. 44).

In reality this complicated fracture consists only of two parts (Fig. 198): a proximal part, represented by the shafts of the tibia and the fibula, and a distal part, represented by the whole *foot*. The crux of this reduction is the knowledge that **the astragalus, the medial malleolus, the third malleolus, and the lateral malleolus all move as one piece,** being inseparably connected by the ligaments of the ankle joint. *Reduction of the displacement is therefore secured by concentrating on the displacement of the astragalus in relation to the tibia rather than making any*

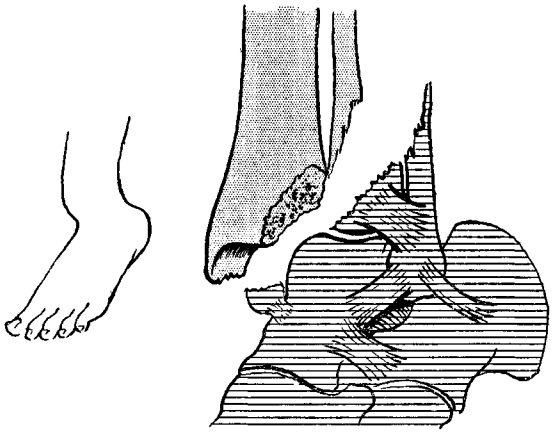


FIG. 198

Anatomy of the Pott's fracture. Showing how the foot together with all the distal fragments move as one unit while the proximal fragments consist only of the shafts of the tibia and fibula.

local attack on one or other of the malleoli. In practice, therefore, the act of reduction merely consists of restoring the alignment of the foot to the axis of the leg. In doing this the sense of touch, by which the sensation of reduction is most often obtained, can be enhanced by a good eye for subtle distortions of outline; indeed a shrewd observer can often guess from the external shape of a plaster whether a reduction has been obtained or not. One of my own visual landmarks in this reduction concerns the projection of the heel behind the line of the subcutaneous border of the tibia; the horizontal distance between these is increased with posterior displacement of the foot.

The Use of Gravity in Reduction

The importance of recognising the role of gravity in producing deformity is nowhere better illustrated than in the special example of the Pott's fracture. It cannot be too often emphasised that **to assess the effect of gravity on a**

displacement while the patient is under anæsthesia is as much part of any reduction as is a knowledge of the effects of muscular tone when the patient is conscious.

If the leg is held in the horizontal position supported only under the calf and

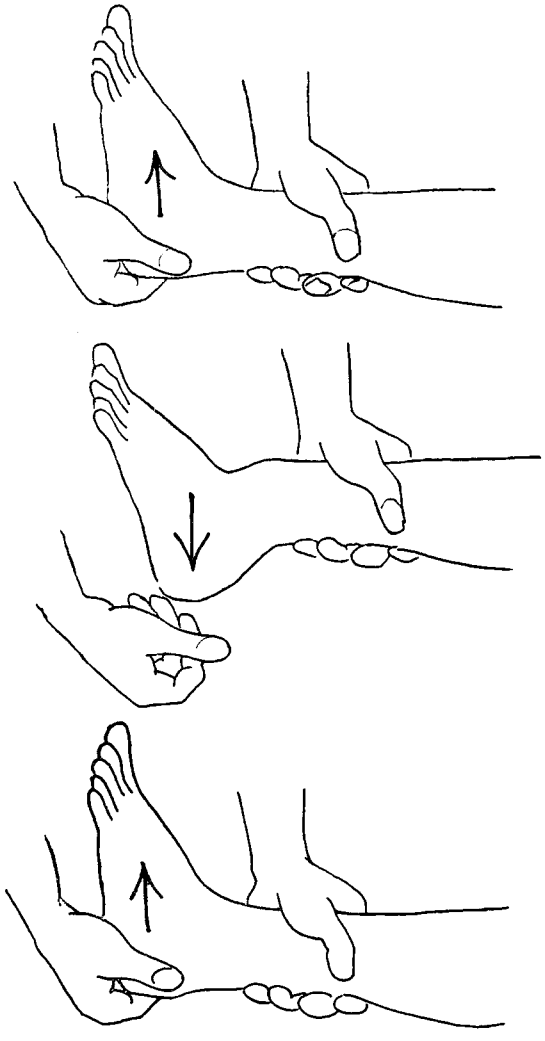


FIG. 199

Exploring the range of anteroposterior displacement before applying the plaster. Assessing the influence of gravity in causing redisplacement.

without any support below the foot, a Pott's fracture will fall into full posterior displacement. In this position an important step in the reduction consists of *assessing the range of the excursion from the position of maximum posterior displacement to the position of reduction* (Fig. 199). By committing this range to memory

the surgeon obtains a mental picture which will help him in a later stage of the reduction. In a similar way *the range of mobility between the position of maximal lateral displacement and full reduction should also be assessed* and remembered (Fig. 200).

By exploring the mobility of the Pott's fracture in this way it will soon become evident that a reduction can be obtained, and can be held, without using force and merely by using gravity and the weight of the foot. **By holding the foot in one hand with the heel resting in the palm, with the foot and leg held horizontally and in external rotation, the ankle will fall spontaneously into**

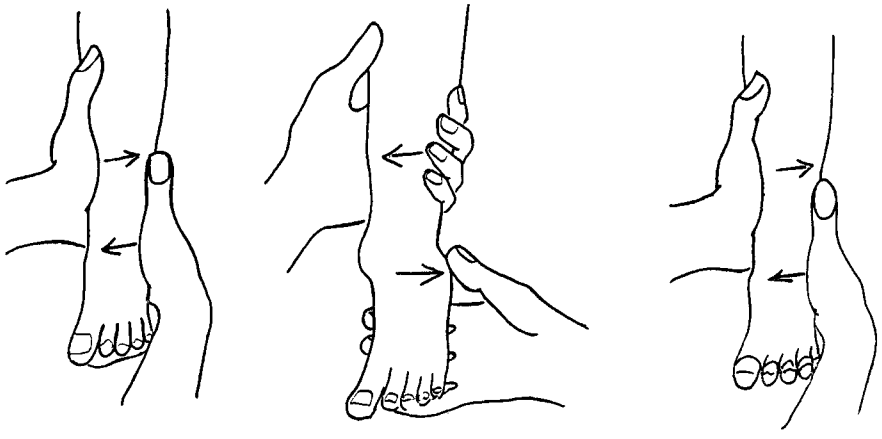


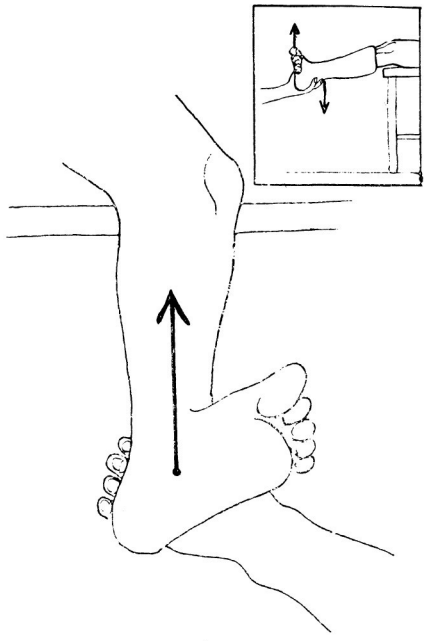
FIG. 200
Exploring the range of lateral displacement between the maximum deformity and the position of apparent reduction.

the position of reduction (Fig. 201, A, B). It is only when the surgeon understands how unnecessary is the use of muscular violence that he really appreciates the mechanics of the Pott's fracture.

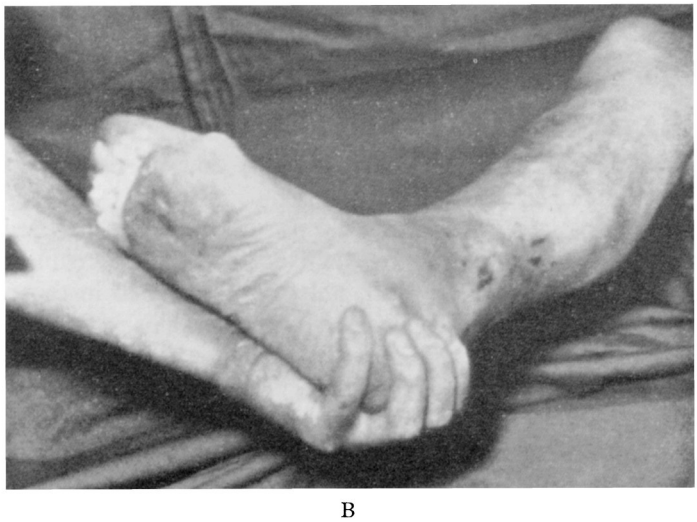
From the emphasis laid on the synergic use of gravity in this reduction it is hardly necessary to draw attention to the fact that the preceding mechanism, *i.e.*, supporting the foot behind the heel, must never be used in those rarer types of ankle fracture with *anterior* displacement of the talus. In these cases the reverse position must be used and the foot must be allowed to fall backwards under its own weight by supporting the leg behind the calf alone. This illustrates how important it is not to reduce any fracture by ritual movements but to assess the influence of various mechanical factors on each injury as an individual case.

The Elimination of Gravity

Some surgeons instead of using gravity to give positive help in the reduction just described prefer to rearrange forces so that gravity is eliminated; in the Pott's fracture this can be done by carrying out the reduction with the tibia in the vertical position by hanging it over the end of a table. This is a good procedure and the surgeon can adopt it as a matter of personal inclination; the correction



A



B

FIG. 201

Showing how gravity can be invoked to maintain reduction if the heel is supported while the *whole leg* and foot are allowed to fall into some degree of external rotation. This corrects the postero-lateral displacement of the foot on the leg. An assistant supports the knee.

of the postero-lateral displacement is carried out as just described, but in this position the surgeon's hands must exert pressure in the appropriate direction. The following technical details are applicable though the vertical method is not the one recommended here.

THE APPLICATION OF PLASTER

The Pott's fracture is best treated by the surgeon applying his own plaster; the surgeon alone appreciates the urgency of the situation and the absolute necessity for completing the plaster while it is still soft and before it has reached the consistency of damp cardboard to obscure his sense of touch.

For the initial purpose of the reduction only sufficient plaster should be applied to be strong enough to hold the reduction temporarily when it has set; this is usually about three 8-inch bandages. During this application no attention should be paid to the ultimate finish of the upper and lower limits of the plaster, which would waste time and invite setting of the cast before the reduction has been obtained. During the rapid application of these three bandages it is unnecessary to keep the fracture either precisely reduced or the foot precisely at a right angle; it is enough for the assistant merely to *hold the foot by the toes.*

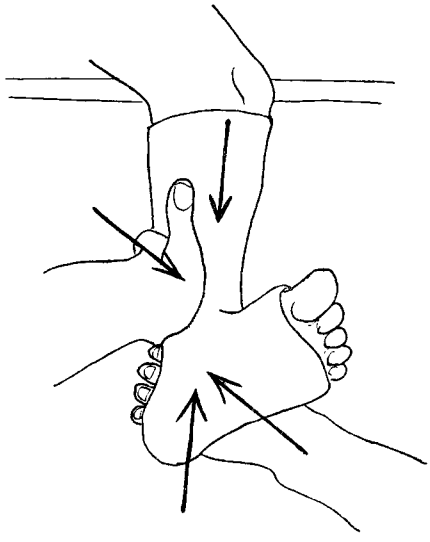


FIG. 202

Position for moulding the plaster while setting. Note hands at different levels and *whole limb* in 45 degrees of external rotation (*i.e.*, knee externally rotated as well as foot).

Having completed the speedy application of these three bandages the surgeon now takes the fracture from the assistant and 'feels' the fracture by moving it about inside the wet plaster; from his previous analysis of the fracture he should be able again to recognise the sensation of reduction, though his tactile impressions will now be a little muffled by the plaster. Having recognised the sensation of reduction he now holds the reduction without further movement until the plaster has set; during this time he invokes the assistance of gravity with an assistant maintaining the foot and leg in external rotation while the surgeon supports the foot with his hand below the heel (Fig. 202). The plaster is now completed by finishing the top and bottom of the cast and applying extra bandages to increase the thickness if deemed necessary.

It will be seen from the foregoing that from the moment of completing the plaster no more than two or three movements are required to recapture the reduction; these **simple rehearsed movements** are **succeeded by a period of complete immobility.** Contrast this with what is seen when the beginner

attempts his first reduction with inadequate instruction. After much struggling and muscular violence it is suspected that a reduction has probably been secured and the application of the plaster is then commenced. An assistant applies the plaster but is impeded in doing this by further last-minute attempts by the surgeon to 'improve' his reduction as new inspirations strike him. Impeded in his attempts to complete the plaster, the assistant applies a rough and irregular cast which is just hardening when the surgeon decides on a final change of tactics. Finally, all further attempts at improving the position being obviously futile, it is decided to see what sort of a position has been obtained by using the X-ray as a 'lucky dip.'

The Padded Plaster

If padding is applied correctly, it can actually *enhance* the fixation of the fragments by its slightly resilient action, which can adapt the plaster to the limb as the latter swells or contracts. This is quite contrary to the popular idea that padding always makes a plaster loose. To apply the padding correctly (Chapter V), the wool must be wound on, with very great care, in a layer about $\frac{1}{2}$ inch thick, and the surface smoothed down before the plaster is applied. The plaster bandage is wound on under very considerable tension so as to compress the wool evenly against the limb. It is quite astonishing how much tension can be applied without the patient feeling any distress, because the pressure is evenly distributed over a large area. At the upper end of the plaster it is essential to pull the bandage specially tight, because otherwise, at the completion of the cast, it will be found that the aperture between the upper end of plaster and the calf is extremely capacious. For this reason it is *advisable to omit the wool in the proximal part.*

As regards the manner of finishing the plaster at the toes it is probably best to leave the toes free by stopping the plaster at the metatarso-phalangeal joints. A platform under the toes, unless very carefully made, often produces a cocked-up position.

THREE COMMON SOURCES OF ERROR IN REDUCING THE POTT'S FRACTURE

There are three points in reducing this fracture which are often not adequately appreciated; they are of great importance in making it possible for the surgeon practically to guarantee a complete manipulative reduction of a fresh fracture.

1. Keeping the Foot at Right Angles to the Leg

In the commendable desire to maintain the fully plantigrade position of the foot during the hardening of the plaster, forceful dorsiflexion is often produced by pressure applied to the sole of the forefoot. This method of causing dorsiflexion can cause a relapse of the posterior displacement of the talus. When difficulty is experienced in getting the foot to the right angle (as when the tendo Achillis is short) by upward pressure against the sole of the forefoot, the pivotal point

will move away from the ankle joint and pass to the insertion of the tendo Achillis (Fig. 203, A) (in other words, from being a lever of the first degree it becomes a lever of the second degree). With the pivot at the insertion of the tendo Achillis into the heel, **dorsiflexion, by force applied to the sole of the forefoot, will push the talus out of the ankle mortice posteriorly.**

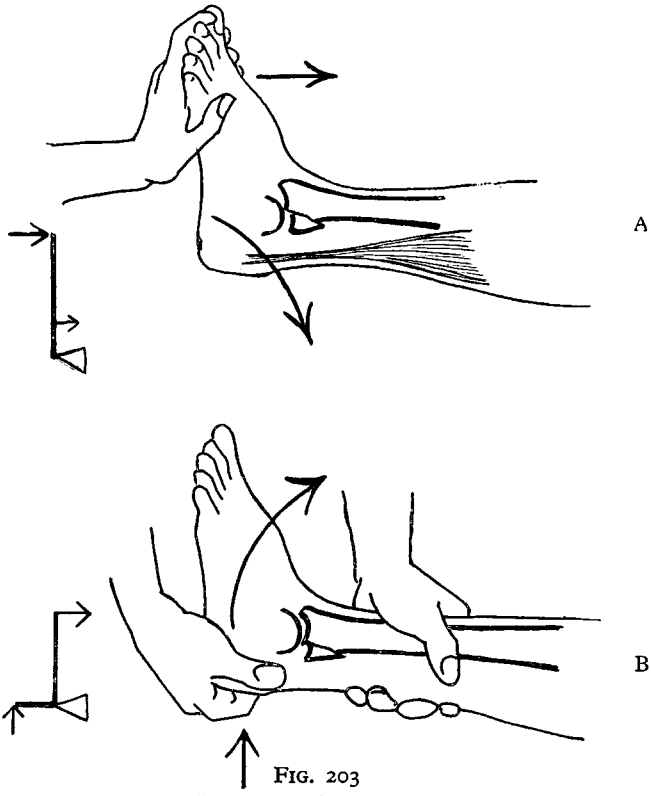
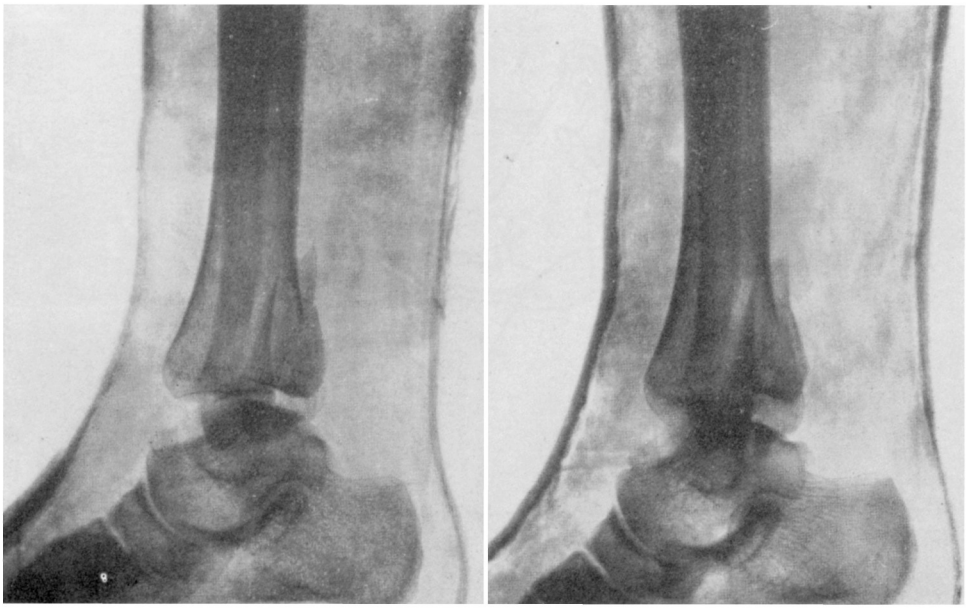


FIG. 203

A, Showing the disastrous effect of struggling to secure a plantigrade foot, especially if the tendo Achillis is tight, by forcing the forefoot upwards. This pushes the talus out of the ankle joint posteriorly by the system of levers illustrated. B, Showing how the plantigrade position should be obtained by lifting the heel forwards—dorsiflexing the forefoot through the medium of the system of levers illustrated. This method enhances the security of the reduction.

It is possible to produce dorsiflexion of the foot without invoking posterior displacement, by exerting the dorsiflexion force indirectly through the heel instead of directly through the forefoot. **To dorsiflex the foot correctly, the hand which supports the heel should draw the os calcis downwards and forwards so as to bring the hindfoot into the plantigrade position** (Fig. 203, B). This movement greatly assists the reduction by pulling the talus forwards. If, now, the forefoot is still in some degree of plantar flexion, owing to dropping at

the mid-tarsal joint, it is permissible to apply some gentle upward pressure to the sole of the forefoot by resting it against the surgeon's chest; this will have no ill effect provided that control of the heel is maintained by the hand which grips it. The example illustrated in Fig. 204 shows how a defective initial



A B

FIG. 204

A, Unreduced Pott's fracture due to ignorance of mechanism explained in Fig. 203, A.
B, Successful reduction (as far as congruity of the talus with axis of tibia is concerned) by using the method of Fig. 203, B. This reduction will give a satisfactory result even with this unreduced posterior marginal fragment.

reduction was corrected by this procedure of drawing the os calcis forwards and downwards.

2. Compressing the Mortice

This phrase is often used to denote an attempt to reduce diastasis of the tibio-fibular joint by compressing the malleoli towards each other and narrowing the width of the ankle joint. This attempt is prone to failure if the obvious attack by direct compression of the two malleoli is adopted. The reason for this is that the force of compression applied to the malleoli is wasted on the soft tissues in a swollen ankle. If the ankle is swollen, **simple side-to-side compression merely applies the same pressure to each side of the talus, which therefore remains in the displaced position having no urge to move more to one side than the other** (Fig. 205, A).

To secure medial movement of the displaced talus, and with it medial movement of the external malleolus, the forces applied to the ankle must be applied

at different levels. **The pressure applied to the outer side of the foot must be below the external malleolus and the pressure applied to the inner side of the ankle must be above the medial malleolus.** Under these conditions the talus will have high pressure on the outer side and low pressure

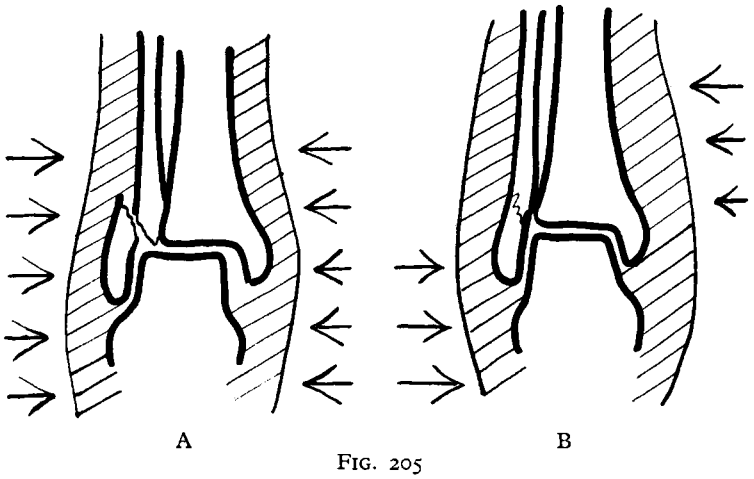


FIG. 205

A, Showing how the attempt to 'narrow the mortice' by applying a 'squeezing' grip with the hands at the same level over each malleolus fails to move the talus because equal pressure is exerted both sides of it.

B, Showing how the talus moves into position, taking the external malleolus with it, when pressures are exerted at different levels.

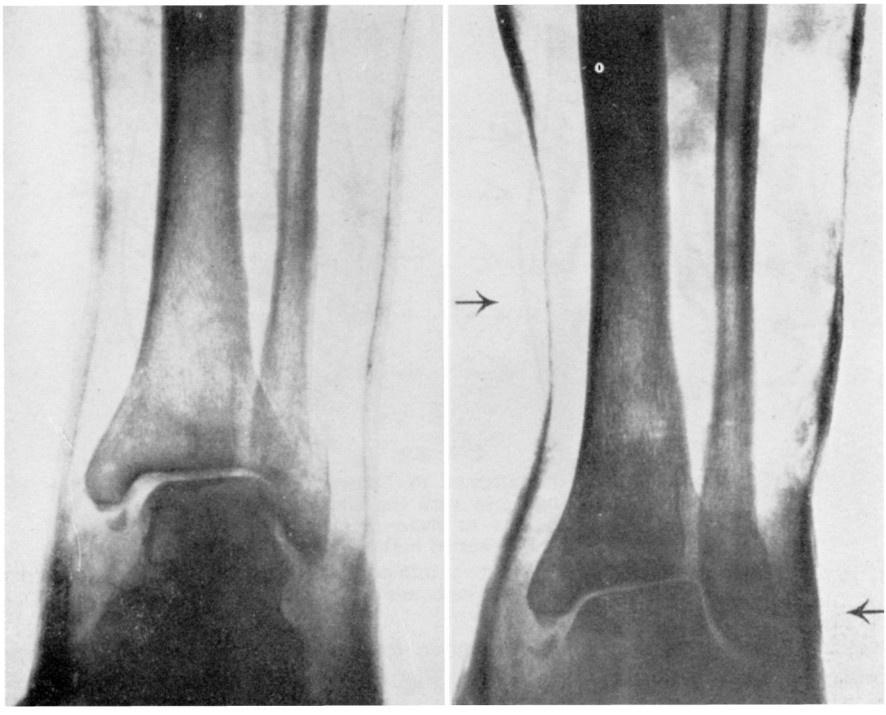
on the inner side and will therefore move towards the medial malleolus *even in the presence of gross swelling* of the ankle (Fig. 205, B).

In Fig. 206, A and B, is seen a failure to reduce the widening of an ankle when a faulty technique was used and also the reduction obtained when the correct method was used. Note here the moulding of the plaster at the levels of maximum pressure situated above and below the plane of movement of the fracture.

3. Rotation

Failure to observe the correct rotatory alignment of the foot to the tibia, as shown by the alignment of the toes and patella, is a common source of incomplete reduction. The Pott's fracture has an external rotation element in the force which originally produced the deformity, and it is therefore essential to *keep the foot internally rotated during the reduction and application of the plaster.* External rotation of the talus carries the external malleolus posteriorly and tends to perpetuate the displacement of the external malleolus which is so commonly seen in the lateral film (Fig. 207, A). Probably some interposition of soft parts occurs in this displacement of the external malleolus because it commonly resists attempts at perfect reduction; however, slight displacement as seen in the lateral view seems to cause no disability if the talus is well reduced in relation to the articular surface of the tibia.

The importance of rotation in widening the mortice becomes obvious when one recollects that the talus is square in its horizontal section; any rotation from its normal position will therefore tend to widen the mortice by forcing the malleoli apart (Fig. 207, B). Therefore in holding the *leg* in external rotation,



A B

FIG. 206

A, Faulty reduction when the mortice was compressed from side to side by pressure at equal levels.

B, Mortice now congruous. Note the shape of the plaster marking the site of the pressure applied above and below the fracture level.

as instructed on page 254 (Fig. 201), it is important to *see that the foot is in very slight internal rotation.*

Fear of Over-reduction

Incomplete reduction of a Pott's fracture can often be traced to a subconscious fear on the part of the operator that he might displace the talus and the associated medial malleolus too far medially. A good example of this is seen in Fig. 208 where the operator at the first reduction deliberately refrained from applying maximal pressure and did in fact try the manœuvre of 'compressing the mortice,' which has been criticised in Fig. 206. At the second reduction, where the operator's force was directed in a three-point system, the reduction is seen to

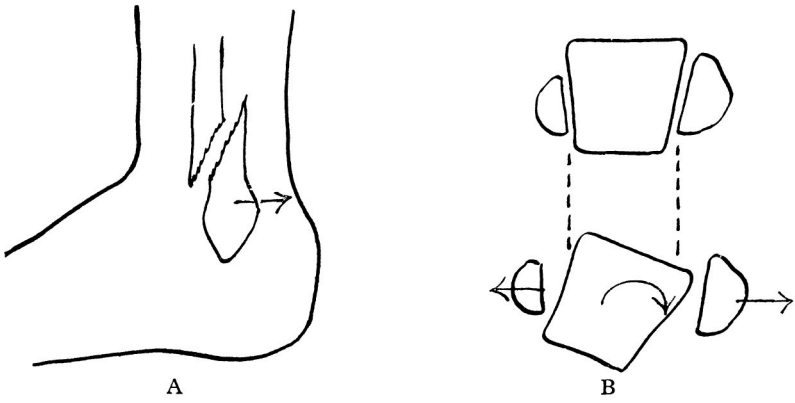


FIG. 207

A, Posterior displacement of the external malleolus probably due to external rotation.

B, Showing the effect of rotation of the talus in separating the malleoli. Knee and foot must therefore always be in correct rotary relation during reduction.

FIG. 208

Example of faulty reduction due to fear of over-correction. The operator 'compressed the mortice' with hands at same levei (Fig. 205). Note good reduction by forcing correction to maximum. Note modelling of plaster above and below level of ankle joint.

be complete. Note the different modelling of the plaster in the last, successful, reduction compared with the preceding plaster.

One of the very few cases of true over-reduction which I have ever seen is

FIG. 209

A rare case of over-correction. Patient instructed to bear weight during first week and perfect reduction obtained spontaneously.

illustrated in Fig. 209, but it is also interesting to observe that a spontaneous correction was obtained simply by allowing the patient to bear weight during the first week.

X-RAY CRITERIA IN THE ANKLE JOINT

1. The Anteroposterior View

Gross degrees of widening of the ankle mortice are readily recognised, but the student will often have difficulty in satisfying himself in minor degrees of displacement. In the normal ankle it is impossible to see a clear gap between the talus and both malleoli in any one film (except a tomogram). In the standard anteroposterior position a clear view is visible through the space between the talus and the medial malleolus, but a varying degree of overlap in the external malleolus is always present. The essential feature is to recognise the normal width of the gap between the talus and the medial malleolus. This gap varies slightly in different normal subjects—in most cases it is equal to the gap between the lower surface of the tibia and the upper surface of the talus, but in others the space between the tibia above and the talus below is a shade narrower than the medial gap, probably due to atrophy of weight-bearing cartilage in older persons.

In the anteroposterior radiograph it is useful to note that the talus has a slight saddle-shaped concavity on its upper surface which mates with a similar convexity on the lower end of the tibia. If these saddle-shaped surfaces are in register one can presume that the main articulation is reduced regardless of the position of the medial malleolus.

A point which frequently gives rise to suspicion and worry is an appearance of tibio-fibular diastasis. If the amount is so slight that it is doubtful, then it is not important **provided that the talus and the medial malleolus are in**

normal contact. The appearance of widening of the tibio-fibular synostosis may be due to swelling and œdema of the damaged tibio-fibular ligament, and all attempts to reduce such small degrees of diastasis will fail if the medial malleolus is already in its normal site. In these cases I feel certain that the malleolus usually settles in place again as the swollen ligament contracts and heals.

2. The Lateral View

It has been stated in a previous paragraph that, with reasonable dexterity and knowledge, the surgeon should almost be able to guarantee a perfect reduction by close methods in most fresh ankle fractures. This is true with two exceptions: (1) gross separation of the medial malleolus, and (2) upward displacement of a posterior marginal fragment. Both these complications may suggest the necessity for open operation.

As regards upward displacement of a 'posterior marginal fragment,' it is the exception rather than the rule to influence its position by closed reduction, and it therefore remains to decide how important, if at all, is some permanent residual displacement of this fragment.

The essential feature about a posterior marginal fracture is not the amount of displacement but the *size* of the displaced fragment; and the essential feature about the size of the displaced fragment is its effect in inviting redisplacement of the talus if it comprises more than one-third of the anteroposterior diameter of the articular surface. **If the talus can be retained in complete congruity with the anterior part of the articular surface of the tibia the ankle joint will in all probability give an excellent functional result** even if the posterior marginal fragment is widely displaced. This is not as surprising as might at first appear when it is remembered that the lateral radiograph of the ankle does not generally represent the true state of the lower surface of the tibia. The posterior marginal fragment is never separated by a transverse fracture line; the fracture line is always oblique and the 'marginal' fragment is merely the separation of a postero-lateral *corner* from the articular surface (Fig. 210). There is usually, therefore, enough articular surface of the tibia at the postero-medial surface to render the talus stable, and the actual state is not as bad as the X-ray might at first suggest. An apparent 'step' on the articular surface of the tibia will not present a ridge to the talus because the step will fill with fibrocartilage and the talus will still operate against a smooth surface. If, however, the talus is allowed to slip backwards by even a fraction of an inch a more serious state of affairs will exist than would result from the mere loss of articular area as represented by the displaced posterior fragment. *If the surface*

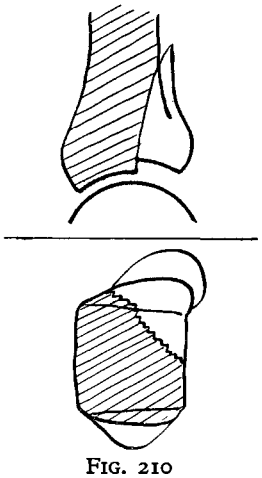


FIG. 210

Showing that the appearance seen in the lateral view (*see also* Fig. 204, B) is not incompatible with a good functional result because the fracture is not transverse and the defect of the articular surface only concerns one corner. Provided that the talus is congruous with the shaft of the tibia (*see* Fig. 211, B) a good result is likely even if the posterior marginal fragment is considerably displaced.

of the talus is not congruous with the anterior surface of the intact part of the tibia it will bear against the posterior edge of this articular surface and so produce a pressure '*high spot*' subject to the whole of the body weight, and osteo-arthritis will commence.

This example illustrates an important mechanical principle; **complete congruity of the unfractured part of a joint is better than improving the**

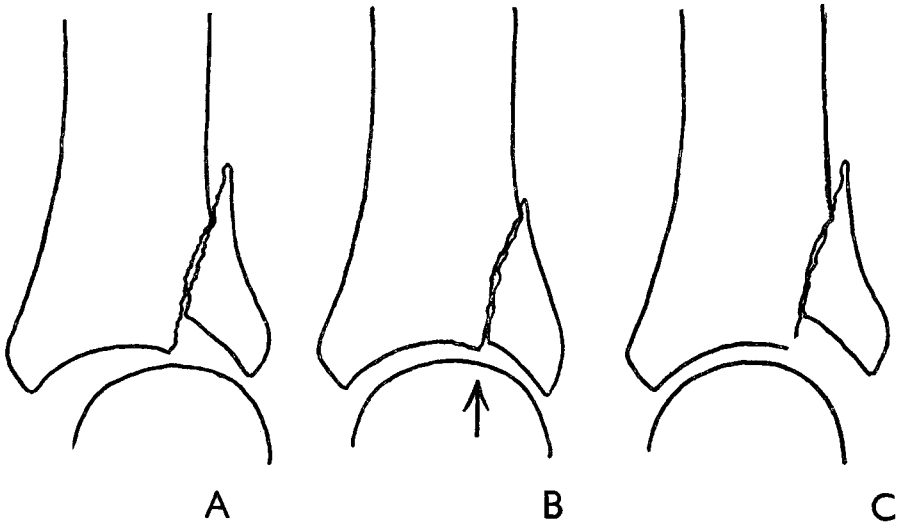


FIG. 211

Illustrating how it is better to leave posterior fragment fully displaced, *provided that* the main tibio-talar articulation is congruous (C), rather than 'improve' the position of the displaced fragment and leave the main articulation slightly subluxed (B). Note 'high spot' between talus and tibia in B.

position of the displaced fragment but leaving the main part of the joint slightly subluxed (Fig. 211).

THE THREE-POINT PLASTER

The reduction and fixation of the Pott's fracture is an excellent example of the three-point action of a plaster cast, the essential points of which are illustrated in Fig. 49, page 52.

Post-reduction Regime

In a fracture where there has been displacement of the talus no useful purpose is ever served by insisting on early weight-bearing. It is true that the articular platform of the tibia is horizontal, and theoretically there should be no force acting in a sideways direction to induce the talus to redisplace. But the ankle takes the whole weight of the body, and if weight-bearing is not allowed in fractures through the hip or the knee for eight weeks there is no reason why the

ankle should be an exception. A severe Pott's fracture requires three months fixation in plaster of Paris. The first two months can be non-weight-bearing and the last month fully weight-bearing. In less severe fractures the period of non-weight-bearing can be reduced to one month. Fractures without displacement can bear weight from the start.

The total duration of plaster fixation can be assessed by that important detail mentioned previously in regard to the rehabilitation of any fracture in an ambulant plaster: it is pointless to remove a plaster at a fixed time if the patient is not walking energetically in that plaster and without a stick. If the patient is not walking briskly before the end of three months he is not receiving adequate rehabilitation and encouragement (and hence there is a psychic hold-up), or there is some complication, such as an extreme bone atrophy, or the plaster is a bad one and is uncomfortable. If the plaster is taken off before the patient is walking well he will walk even worse or possibly not at all.

Skeletal Traction in Pott's Fractures

Some surgeons frequently resort to skeletal traction in complicated Pott's fractures by applying traction through the os calcis with the limb on a Braun's splint.

When skill has been acquired in the manipulative reduction and plaster fixation of the Pott's fracture the number of cases needing skeletal traction will be very small; in my own experience I have rarely found the results of skeletal traction so much superior to manipulative measures to justify the longer hospitalisation needed by this method.

There is considerable danger of distracting the talus from contact with the tibia even with light traction in cases where there has been ligamentary damage.

CRITICISM OF OPERATIVE TREATMENT

There is a growing tendency to recommend open reduction and internal fixation of displaced fractures of the medial malleolus on the grounds that to hold the medial malleolus is the 'key' to holding the whole reduction. Though there is much to be said in favour of this doctrine it is quite unnecessary to apply it as a routine, because so many Pott's fractures can be treated perfectly by closed methods throughout. I myself dislike the idea of the head of a screw lying in the fibres of the medial collateral ligament almost exactly at the centre of motion in this ligament. It is no difficult matter to remove a screw in this site when the fracture is united, but very few surgeons do this.

The common example of a diastasis of the ankle joint associated with a fracture of the external malleolus (Fig. 212) illustrates the importance of mastering the technique of closed reduction in preference to operative treatment. To insert a screw into a fracture of the external malleolus at a level as low as in this case would be difficult without endangering the articular surfaces of the joint. By modelling the plaster above and below the level of the ankle joint the diastasis can be held reduced.

I have not myself found any need to try internal fixation of the external malleolus by wire ' encirclage ' and have mentioned the adverse biological effect of encirclage when applied to fractures in cortical bone (p. 26).

One of the peculiar dangers inherent in the operative treatment of ankle fractures is that a fragment can too easily be fixed in a position *where it ought not to be* and where it is positively harmful. The safety of the conservative method is that, provided the main articular surfaces of the talus and tibia are congruous, displaced fragments imperfectly reduced tend to lie out of the way and will not impinge

FIG. 212

Diastasis of ankle with low fracture of the external malleolus. Skilful plaster technique ought to hold this. To screw this low fracture might damage the ankle joint.

on the main articulations with harmful pressure. Thus in Fig. 213 the medial malleolus has been fixed too far in and will eventually be much more harmful than if it had been allowed to remain, un-united, a slight distance away from the talus. In Fig. 214 the operator was highly delighted with the result of screwing this tibio-fibular diastasis but did not notice that he had closed the mortice too much and that the talus was held away from the tibial surface. The end result, even after removing the screw, was the development of traumatic arthritis within two years. It is very difficult to decide how much to close the mortice of the ankle joint; if it is not closed sufficiently the operation was unnecessary; if it is closed too much it is harmful. *The talus fits the ankle mortice only in full dorsiflexion, so that in a large part of its ordinary range of movement, as when jumping on the toes, it is working in a mortice which is anatomically loose on the talus.*

When the displaced fragment of the medial malleolus is small it is unwise to use a screw. Fractures involving only the tip of the medial malleolus can be left displaced even if they become un-united. Not only may the screw produce comminution of the tip of the malleolus and produce non-union, but it is essential for the screw to be very vertical if it is to avoid entering the joint. This is often

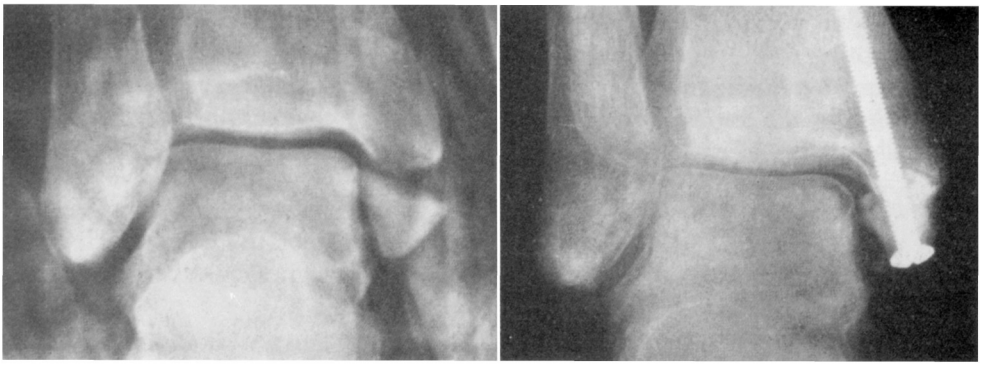


FIG. 213

Fracture of tip of medial malleolus. Position after operation is worse than a fibrous union in original position. Note that the head of the vertical screw lies entirely inside axis of movement of deltoid ligament. Screws placed less vertically, in larger fragments, lie away from the important axis of rotation in the ligament. A catgut stitch would have been better.

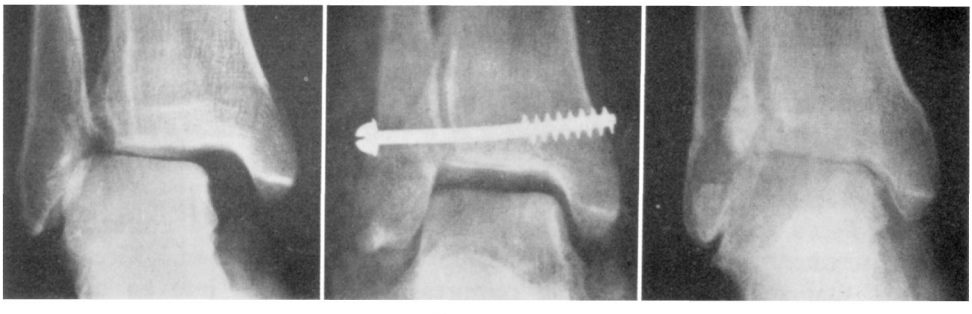


FIG. 214

Too enthusiastic closure of mortice in a diastasis. The talus cannot reach the articular surface of the tibia. Rapid onset of traumatic arthritis even after removal of screw.

technically difficult, and in any case this vertical position puts the screw-head entirely inside the most important part of the deltoid ligament where all the movement is taking place. When the screw can be used less vertically, in large fragments, it does not lie so intimately inside the axis of motion in the ligament.

The only justification for the operative treatment of a Pott's fracture is an absolutely perfect 'hair-line' reposition of the fragments with screws lying quite clear of the articular surfaces; anything less than this constitutes meddlesome surgery and the results are likely to be worse than moderate defects of conservative

treatment for which nature has a compensating mechanism. It is not sufficiently realised by those beginning careers as fracture surgeons how extremely difficult the operative treatment of an ankle fracture can be if it entails anything more than the simple fixation of the medial malleous. Even with X-ray control and the ankle open for an hour or two the operator may still be dissatisfied with the result. The difficulty in operating on an ankle fracture is not unlike the difficulty in making an accurate amendment to a carbon copy in a typewriter: it is the simplest thing in the world to open the sheets of paper and to see just where the new impression ought to fall, but when the sheets are again applied to each other the making of the impression has in it an element of chance and more often than not is slightly out of register.

Slipping of the Reduction

It would be very helpful if criteria could be found for the cases which could safely be left under conservative care and for those which should be operated on without undue delay. The following points may help:

1. The slipping of a Pott's fracture usually starts within a week of the reduction, and probably within three or four days. Spontaneous lateral displacement of the talus after reduction is probably caused by soft tissues incarcerated between the medial malleolus and the tibia. In the 'reduced' position these soft tissues (including even the tendon of tibialis posterior) are compressed at the time when the first post-reduction X-ray is made. After three or four days the soft parts may swell or reassert some natural elasticity and so push the talus laterally—even in a non-weight-bearing plaster. It frequently happens that if the immediate post-reduction X-ray is satisfactory, the second check radiograph may not be taken until two or three weeks later, and if a slip has occurred the ankle will have been in an unsatisfactory position for the greater part of this time. *The most important X-ray after the closed reduction of a Pott's fracture is one taken towards the end of the first week, because then it is still not too late to achieve a perfect result if operation on the medial malleolus is undertaken forthwith.*

2. A Pott's fracture which is likely to stay in the reduced position under closed treatment should never need force to secure reduction. Great force indicates that soft parts are being compressed and forced into an unnatural position and will later force the talus out of the mortice. If the reduced position cannot be held under the force of gravity alone with the limb in the position indicated in Fig. 201 there is no point in forcing a closed reduction, and the medial malleolus should be explored forthwith to remove obstructing soft parts.

3. An imperfect reduction of the medial malleolus (but one which would be acceptable were it not to deteriorate) suggests that soft parts may be compressed in the fracture gap, and this appearance should be regarded with suspicion. This is perhaps another way of saying the same thing as (2) in that this imperfection might be masked if great force had been used during reduction. By contrast, a very perfect reduction of the medial malleolus, easily obtained, indicates that no soft tissues are incarcerated and that conservative treatment can be pursued confidently.

4. In cases where initially there has been gross displacement the chance of soft tissue being incarcerated in the gap of the medial malleolus is always much

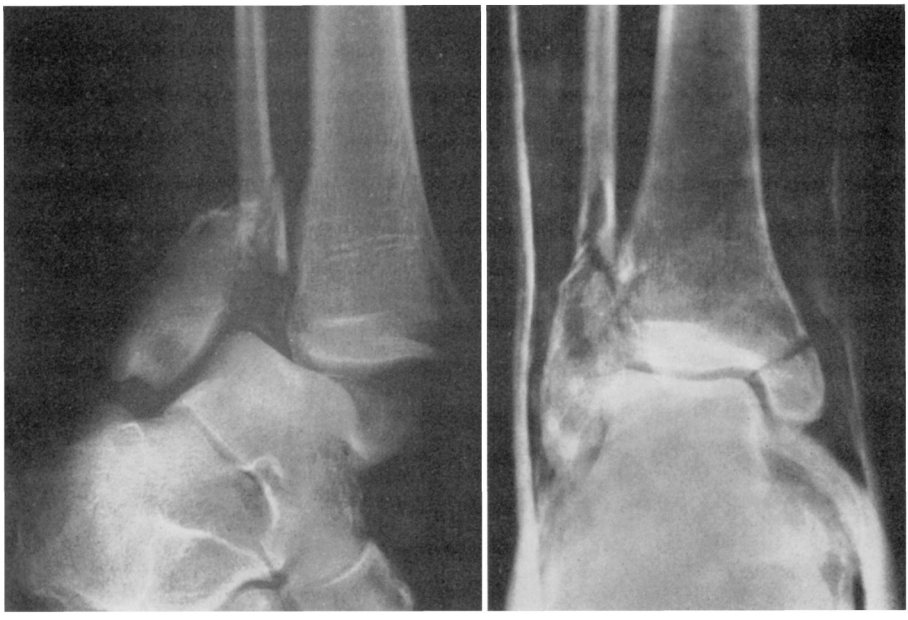


FIG. 215

Gross initial displacement in Pott's fracture increases the possibility of incarceration of soft structures; a perfect reduction such as this, obtained easily by gravity and without undue force, indicates that it can be held conservatively, but with this degree of initial displacement it would be safer to screw the medial malleolus.

greater than with lesser degrees of initial displacement (Fig. 215). Fixation of the medial malleolus is therefore advised if the initial displacement has been gross.

5. Weight-bearing should not be permitted, in fractures which were severely displaced, in less than six to eight weeks, when the plaster should be changed into a new close-fitting plaster before weight-bearing is allowed.