REST AND MOVEMENT*

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In orthopaedic surgery there are in general only two non-operative treatments, rest and movement. And although it would seem an easy matter in any particular case to decide which was the more appropriate treatment, in practice it is often hard to make a choice. The claims of rest have been advocated in the past by such master surgeons as H. O. Thomas and John Hilton, and in our own day the weighty influence of Sir Reginald Watson-Jones has been added. As a matter of fact Hilton was not so much an advocate of rest as of non-interference. But to H. O. Thomas rest was a positive treatment; it was something that had to be imposed. He believed and preached that rest had magical properties. Neither of these two very great men pointed out the harmful effects of rest. That prolonged rest can be harmful has lately been impressed upon us by the damage shown to be done to the knee joint during the treatment of a tuberculous hip.

In making a choice between rest and movement we are largely biased by tradition. For example, I was taught that in infantile paralysis the paralysed muscles must be relaxed continuously. "Never for one moment, night or day, shall the splint be removed." That was the commandment. And this would still be orthodox teaching had it not been for Sister Kenny. Naturally, Sister Kenny was an unqualified person, for the training of a doctor is such that it is not easy for him to break with tradition. I quote this example to show that even our most cherished convictions may be delusions. And just as prolonged uninterrupted splintage has largely been abandoned in the treatment of infantile paralysis, so may we reasonably hope that it will be in the treatment of injuries—and for the same reason, namely on account of the harm it does.

I make no apology for questioning orthodoxy. If orthodox views are correct they will prevail against any opposition; if they are false the sooner they are discarded the better.

The proposition I am putting forward is that movement is often better treatment than rest.

INFLAMMATION AND REPAIR

It is universally held that inflammation should be treated by rest. I would agree, provided that the term inflammation is interpreted correctly. In spite of what many pathologists say, for the clinician the terms repair and inflammation are not synonymous. When the body is attacked by a harmful agent it reacts by pouring out from its blood vessels fluid, cells and antibodies of various sorts. This initial reaction may properly be called inflammation. But there follows a second reaction. The body, having repelled the invader, sets about making good the damage that has been done. It removes dead cells and foreign debris of all kinds, and in the space created by this wholesale removal it lays down repair tissue. The first reaction—inflammation—should rightly be treated by rest, namely the cessation of function and immobilisation; but the second reaction—repair—should, I maintain, be treated by activity, namely the resumption of function and movement.

That rest as a method of treatment should in the course of time be replaced by activity is not a revolutionary idea. We all of us treat a septic finger by rest in the early phase and in the later phase strive hard to regain movement. The difficulty is to know when to make the change. It is easy in theory to formulate a rule about when to use rest and when movement. Rest holds the field so long as the cause of the inflammation is still acting and the patient has not as yet developed a specific defence against it. In the case of a bacterial invasion rest

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should be maintained until the patient has acquired an immunity. In the case of injury rest is never indicated because the cause of the inflammation has disappeared before the patient is even seen by the doctor. The doctor may have to apply a splint to hold torn structures in position, but the injury as such does not call for rest. Indeed, as I hope to show later on, rest is often harmful in that it creates adhesions between parts that ought normally to move freely on one another.

Inflammation and repair are not mutually exclusive. Active inflammation may still be going on in one area when in a neighbouring area repair has taken its place. Nor can one say at any one moment that inflammation has ceased and repair has begun. Consequently it is difficult clinically to determine when to switch from one treatment to the other. One must be guided by common sense, bearing in mind that inflammation ceases when the harmful agent ceases to harm, and that directly inflammation has ceased activity should replace rest as the basis for treatment.

Even if we allow that only active inflammation demands rest, we are still in difficulties, because it is not always easy to know whether the condition present is an inflammation or not. For example, in Paget's disease of bone, where normal bone is replaced by bone of a patternless structure, no one nowadays would claim that the pathological process concerned was an inflammation. We are in similar difficulties over a disease like ankylosing spondylitis where the pathology seems to be a metaplasia of the capsule rather than an inflammation.

CHRONIC ARTHRITIS

At no time is it more difficult to assess the relative merits of rest and movement than when dealing with chronic arthritis. To make our discussion easier let us divide cases of chronic arthritis into three groups: those due to a specific organism, like the tubercle bacillus; those due to degeneration such as the osteoarthritic joints; and the remainder, which for present convenience we may call infective arthritis with the proviso that many may not be caused by either bacteria or a virus.

About the local treatment of a tuberculous arthritis there is little to say except to deplore its shortcomings. In the acute phase we have nothing to offer except recumbency and immobilisation. In the chronic phase, depending on whether there is or is not a likelihood of regaining a useful range of movement, treatment consists either of movement without weight bearing, or of weight bearing without movement. Future generations will regard with astonishment the complacency with which we condemn a child to spend five years of its life on its back on a frame under the delusion that we are treating a disease. They will view us as we view the Spanish Inquisitors, and they will condemn, not our cruelty, but our stupidity. I should like to draw attention again to the harm we frequently do to other joints while we are treating one joint for tuberculous arthritis. I need not call to mind the wobbly, deformed knee associated with shortening of the leg so often seen in a patient who has been treated for tuberculosis of the hip joint.

When we come to osteoarthritis the decision whether to rest or to move the joint becomes easier if one has, as I have, clear-cut ideas on the pathology of the disease. I do not claim that my ideas on the pathology are necessarily correct; but they do give an indication of when and why to rest the joint. Osteoarthritis pathologically has two main features. First, the nourishment of the articular cartilage is faulty; in consequence the cartilage fibrillates, and where it is exposed to greatest pressure it is worn away. This aspect of the disease is immaterial to our present discussion. The second pathological feature is that the capsule shrinks so that the range of movement diminishes. The loss of movement is not of much consequence unless the patient habitually uses the extremes of movement. One often sees a man whose elbow will not extend beyond 160 degrees. The man is often unconscious of his loss because he does not ordinarily use the last twenty degrees of extension. As my colleague, Mr Furlong, picturesquely puts it, you only need full extension of the elbow for putting your

arm up a drain pipe. By contrast, at the knee, full or almost full extension is required whenever one stands. The consequence is that osteoarthritis of the elbow is clinically rare, whereas osteoarthritis of the knee is clinically common. One may see a man with osteoarthritis of the elbow on account of a loose body but not otherwise.

When a person is trying all the time to move a joint beyond the range allowed by the capsule, the capsule is subjected to constant stretching. The symptoms of osteoarthritis are in the main caused by the reaction of the capsule to this repeated stretching. A patient with an osteoarthritic hip complains of pain after use and stiffness after rest. Nothing benefits such a joint more than a period of rest during which the capsule is relieved for a while from being stretched. The rest need not be absolute; often recumbency by itself imposes sufficient restriction of movement.

From the point of view of treatment patients with osteoarthritis may be divided into three classes: those who are at work, those who are reasonably comfortable provided they do not work and those who have disabling pain even if they do no work. Patients in the third group have sufficient disability to warrant operation. Patients in the second group, not being at work, can be treated by recumbency. Patients in the first group cannot be sent to bed, for that would take them off work. Instead they are allowed to go on working, but the range of movement at the painful joint is restricted to its painless range—that is, to a range that does not pull on the shrunken capsule. The rocker shoe for a hallux rigidus is an example of this principle of treatment, and in osteoarthritis of the hip raising the shoe on the affected side acts in the same way, by abolishing the need for abduction.

But one may ask: Is it not possible to restore the capsule of the joint to its former length by, for example, stretching the joint forcibly under an anaesthetic? *A priori*, the ligament is more likely to react to force by tearing than by stretching, and this is what happens in practice. I do not believe that “bone-setting” benefits an osteoarthritic joint. But rest certainly does.

By far the most interesting patients are those suffering from what we have agreed to call infective arthritis; the disease is chronic; it smoulders on for years and occasionally flares like a volcano. I believe that prolonged immobilisation in this disease is harmful. The patient should be encouraged to move his diseased joints in spite of pain and discomfort. This raises the question whether pain is an indication for rest, as John Hilton would have us believe. All physicians with experience of rheumatoid arthritis know that splinting a joint in this disease leads to stiffness. Even in the worst cases of rheumatoid arthritis the patient retains the power of opposing the index to the thumb. Because this movement is essential to everyday existence the patient never for a day ceases to move these two digits. There is no need for him to move the outer three fingers with the result that they stiffen and ankylose. This retention of the most valuable part of finger movements, because being valuable they are the last to be given up, shows I think that movement is more an advantage than a disadvantage in the treatment of chronic arthritis.

But even if one allows that an infective arthritis should only be rested until the patient has acquired some sort of immunity, one must agree that at times the pain is so great that the patient will not move the joint. Under these circumstances the muscles immobilise the joint, but unfortunately they do not immobilise the joint in the best position. And the doctor is forced to apply a splint not in order to immobilise the joint but in order to hold it in the best position for function. What is the best position for function? In a weight-bearing joint there is no doubt that this is the *position of minimal effort*. This term needs defining. The amount of energy spent by the muscles in holding the erect position is small because all the muscles have to do is to balance the joints so that body-weight passes directly down through the centres of the joints. The muscles then act like the stay-wires of a wireless mast. The position in which weight passes directly down through the centre of a joint is conveniently called the position of minimal effort. This position varies with different joints. In the hip it is full extension with slight abduction, the position the hip naturally takes up when a person

stands on one leg. One can easily convince oneself by palpating the gluteus maximus that the antigravity muscles are not in vigorous action when a person is standing. Likewise, if a person is struck unexpectedly on the back of the knee when standing his knee collapses, showing that the quadriceps was not hard in action.

If a joint cannot be put into the position of minimal effort the muscles expend a vast amount of energy holding the erect position. So that, however much the range of movement of a joint dwindles, the position of minimal effort must be maintained or if lost must be regained. Fixed flexion of the knee is common with chronic arthritis, and the position of minimal effort—full extension—can and must be regained by a forcible manipulation under anaesthesia. The manipulation ruptures the ligament at the back of the knee. Lest a violent reaction follow—which oddly enough rarely happens—the knee after the manipulation is held in full extension by a plaster back-splint which includes the foot. Next morning the bandages are removed and the patient is encouraged to bend the knee. It is surprising how much the patient is able to flex the knee considering the brutal exertions of the surgeon of the day before. After being exercised the knee is again bandaged into the plaster back-splint. The exercises are repeated several times a day and in the intervals the patient is encouraged to lift the leg off the bed, the knee being held straight by the plaster. As the quadriceps gains in strength the plaster is left off for longer and longer periods in the day until finally when the patient can hold the knee fully extended against resistance the splint is discarded.

I would have you note two things. First, that by this line of treatment a severe injury is inflicted on the knee joint and that injury is treated immediately by activity; and second, that even in the important task of maintaining the position of minimal effort splintage should only be intermittent. I submit that there is no place for continuous splintage in the treatment of infective arthritis except perhaps for joints where ankylosis causes little disability, such as the wrist joint.

SOFT-PART INJURIES

When a person has, as he thinks, sprained a joint he may have sustained one of three soft-part injuries. He may have torn a muscle, he may have sprained a joint or he may have strained a joint. In as much as treatment and prognosis of these three injuries are different it behoves us to make an accurate diagnosis.

After a tear of muscle, movement remains painful for a time and the patient is grateful if the joint is splinted. Splintage after this injury does no harm provided that the muscle is not allowed to remain idle. If the muscle does remain idle the repair tissue binds together the unharmed muscle fibres so that when they are called upon again to contract pain is felt on account of adhesions. Thus, in the common injury of the calf, so pleasantly but inaccurately called a ruptured plantaris, it is permissible to splint the ankle by a bandage or by strapping so as to make walking easier, but at the same time the calf muscles should be treated with faradism.

The second injury to consider is a sprain. There is considerable misunderstanding about how a ligament works. Its apparent task is to restrict movement at a joint. But the inherent strength of a ligament is small. It does its work by proxy and it makes use of the muscles for the purpose. When a joint is moved by an external force the ligaments are put on the stretch. As soon as a ligament is put on the stretch the overlying muscle is reflexly stimulated to activity. It contracts and resists the force, and the underlying ligament escapes harm. Thus in the ordinary way muscles protect ligaments. They may however fail in their duty. First, the muscles may be caught off their guard, as happens when one is walking on uneven ground in the dark and twists an ankle; and second, the force may be too great either in time or in intensity for the muscles to support, as happens when one stands for long after an illness in bed. Under these circumstances the ligaments lose their protection and then they have themselves to oppose the force; and this they have not the strength to do. If the force is

sudden the ligament tears macroscopically. We call this injury a sprain. If the force is moderate but prolonged the ligament tears microscopically. We call this injury a strain.

There are in existence muscles to prevent a joint from being moved beyond a certain range in all directions in which a joint normally moves, but there are no muscles to prevent movement in a direction in which the joint does not normally move. There are therefore two kinds of sprain. One caused by excessive movement in a normal direction, and the other caused by movement in an abnormal direction. A sprained ankle (which should of course be called a sprain of the subtalar joint since it is caused by excessive inversion of the foot) is an example of the first kind of sprain, and an injury of a finger joint an example of the second kind of sprain.

After a sprain of the subtalar joint active movements may be allowed at once, for there are muscles available that will reflexly come into action if the ligament is threatened. No harmful force can fall on the ligament while it is repairing.

With a sprain of an interphalangeal joint there are no muscles to prevent a lateral hinge—the force probably responsible for the injury—and movement in this direction must

FIG. 1

Garter splintage for sprained interphalangeal joint.

be prevented while the ligament is undergoing repair. This is most easily done by binding the injured finger to its neighbour by means of a miniature garter (Fig. 1). This affords the necessary protection and at the same time allows both fingers to flex and extend fully. This illustrates well the principle of treatment of this kind of sprain, namely the prevention of abnormal movement without restriction of normal movement.

When a ligament has been torn the joint should not be immobilised if it can be avoided. For consider what happens after the injury. The torn ends of the ligaments are bathed in fluid which has exuded from the capillaries. The exudate clots, the clot becomes organised, and finally turns into scar which binds together everything in the neighbourhood. If the joint has been kept still while this is happening movements are afterwards impeded by painful adhesions, which have to be stretched or broken before painless movement is restored. The general practitioner is well aware of the patient who complains bitterly of a painful foot after a sprain. The patient haunts his surgery for weeks until finally in despair he goes to a bone-setter who cures him by restoring movements that would never have been lost had the foot not been immobilised.

The third soft-part injury to consider is a strain. A ligament tears microscopically—that is, it is strained—when a force greater than its muscles can withstand is exerted on the

joint for some time. The indications for treatment are clear: to withdraw the force until the ligament has recovered and in the meanwhile to strengthen the muscles so that in future they will be strong enough to sustain the force. Since the force is usually body-weight, withdrawing the force implies recumbency.

Thus it comes about that a sprain is treated by movement, and a strain by recumbency.

DISLOCATIONS

A dislocation is but one stage further than a sprain, and should, I think, be treated in the same way. But whereas many surgeons are willing to allow early movements after a sprain, most are in favour of splinting a joint after a dislocation. They argue that rest lessens the risk of complications. Complications after a sprain are few, but after a dislocation three that might be influenced by early movements are common: aseptic necrosis, recurrent displacement and myositis ossificans.

Aseptic necrosis is seen most often at the hip joint. It is a deceitful process because it does not reveal itself immediately. There is nothing to tell that the blood supply to the femoral head has been impaired until a radiograph taken several months later shows increased density of the head. This stage is likely to be missed because the patient has apparently recovered and has been discharged and probably lost sight of. Over the next year or two the head of the femur gradually deforms as a result of the softening unavoidably associated with the removal and replacement of the dead bone. The patient then presents himself again complaining of pain.

It is difficult to see how immobilising a joint after a dislocation can avert aseptic necrosis, for the damage to the arterial supply is surely done at the time of the accident. Avoidance of weight bearing prolonged over several years might prevent deformation of the head, but no patient can afford so long a period of invalidism. Aseptic necrosis is uncommon except at the hip and no one knows what influence immediate treatment has, or what are the relative merits of plaster fixation, recumbency and early weight bearing. My own plan is to keep the patient in bed until he has regained muscular control over the joint and can raise the leg off the bed with the knee straight and rotate it in mid air. He is then got up on two sticks and the sticks are discarded as soon as he can stand on the affected leg without exhibiting a Trendelenburg pelvic tilt.

The second complication—recurrent displacement—happens after two injuries: anterior dislocation of the shoulder and inversion-subluxation of the ankle. A dislocation of the shoulder recurs, it is supposed, because the glenoid rim, on account of its poor blood supply, has difficulty in reattaching itself to the bone of the scapula. It is reasonable therefore to hold the torn structures in apposition for a time by keeping the arm adducted and medially rotated. Whether this does in fact reduce the incidence of recurrence is not known. Also, it is debatable whether it is right to impose a longer period of disability on every patient in order to save a few from a recurrence of their dislocation. For there seems no doubt that splinting does prolong convalescence. If movements are unrestricted and encouraged from the start a patient with an uncomplicated dislocation of the shoulder is using his arm naturally again within a week. The figures of De Marlaix are instructive. He found that if the shoulder was not immobilised at all after a dislocation the patient recovered on an average in eighteen days; if the joint was immobilised for one week recovery took fifty-two days; if for two weeks 121 days; and if for three weeks 300 days.

The other dislocation liable to recurrence is inversion-subluxation of the ankle. This is often confused with a sprain of the subtalar joint, and I doubt whether it is possible to distinguish them clinically. One can of course distinguish them by radiographing the foot in forced inversion, but after an injury that is only possible under anaesthesia. In Figures 2 and 3 both feet have been fully inverted. In Figure 2 movement has taken place at the

subtalar joint, and if the movement continued the patient would suffer a sprain of the subtalar joint; in Figure 3 movement has taken place at the ankle. This happens repeatedly, and the patient complains that his ankle is constantly going over in spite of all his efforts by muscular action to prevent it.

Sprain of the subtalar joint is common, but recurrence is rare; so it is hardly worth while submitting every patient to a radiographic examination under anaesthesia in order to find the occasional case of inversion-subluxation. Moreover it is doubtful whether an inversion-subluxation of the ankle can be prevented from recurring by immobilisation, however prolonged. It is better, I think, to treat all *first* sprains of the ankle region with early movements. Patients who complain of repeatedly turning over their ankles are probably suffering from inversion-subluxation, and the diagnosis can be confirmed by radiographing the foot in forced inversion during a quiet period. The subluxation can be cured by an

FIG. 2

FIG. 3

Radiographs of both feet in forced inversion. In Figure 2 the movement has taken place at the subtalar joint, but in Figure 3 it has occurred at the ankle joint.

operation at which a peroneal tendon is threaded through the talus. This effectively prevents the talus from tilting in the mortise, and the patient is off work no longer than he would have been after the original accident if the foot had then been immobilised in plaster.

The third complication—myositis ossificans—occasionally follows a dislocation. The etiology is not known. There is no evidence to show that myositis ossificans is made worse by active exercises. I stress the word active. Characteristically, myositis ossificans is accompanied by spasm of the muscles controlling the joint. Let it be granted that forced movements, and I would include in this category movements masquerading as passive, may do harm, but such movement as the spasm allows probably does no harm. I do not believe that the advice of Sir Robert Jones that in cases of myositis ossificans the joint must be rigidly splinted need be followed. Such movement as the patient permits himself to make is harmless.

FRACTURES OF THE SHAFT

There is a wide divergence of opinion on the principles that should govern the treatment of a fracture of the shaft. We are told on very good authority that the fundamental treatment of a fracture is prolonged uninterrupted immobilisation. This fits in with the patient's idea of things, for he believes that every fracture needs "setting" and after that "splinting."

It is not my purpose in this paper to discuss the necessity or otherwise of setting a fracture. What I am concerned with here is the advisability of splintage.

It is not generally realised that a splint is used for two entirely different purposes. More commonly it is used to preserve alignment, as in a fracture of the shaft of the femur. It may also be needed—and my contention is that the need rarely arises—to obtain union by bone.

FIG. 4
Fracture of humerus before treatment.

FIG. 5
Radiograph sixteen months later. No splintage was used except that provided by a sling. Active shoulder and elbow exercises were encouraged from the beginning.

All structures in the body when divided tend to join. The uniting bond is usually fibrous. This is because the repair tissue is under tension; it is being pulled apart all the time. When the repair tissue is compressed the uniting bond becomes bony. In fractures of the shaft there are muscles attached to both fragments capable of compressing the bone ends against one another, so that union will be by bone even in the absence of splintage.

Figure 4 shows the radiograph of a fracture of the uppermost fourth of the humerus. The displacement is seen better in the lateral view. The fracture was not reduced. The patient was treated with his arm in a sling, and no other splint was used. Active movements of all joints of the arm including those of the shoulder were encouraged from the start. Figure 5 is the radiograph sixteen months later. At that time he had normal function of the shoulder. A possible criticism is that I have chosen as an example a fracture that is known not to give any trouble over union. So I have included another: a transverse fracture of the shaft of the humerus (Fig. 6)—a fracture of ill-repute which often does not join by bone. The patient was treated in the same way. The arm was supported in a sling and no other splint was used. Movements at the shoulder were not encouraged to start with, for they would have caused the fracture to hinge. But when joints distal to the shoulder are moved all the muscles overlying the fracture are simultaneously in action, and they compress rather than hinge the site of the fracture. It was safe therefore to allow movements of the fingers, wrist, forearm

FIG. 6

FIG. 7

FIG. 8

Fractured shaft of humerus treated by a sling without other splintage. Elbow movements were encouraged from the beginning. Figure 6—Initial radiograph. Figure 7—Two and a half weeks later. Figure 8—Three months after injury.

and elbow. Figure 7 shows the state of union two and a half weeks after the injury, and Figure 8 his final radiograph three months after the accident.

A further example is that of a fractured femur. The femur was plated, and the leg was encased in a long plaster spica. Ten months after the accident, soon after he had started weight bearing, he suddenly felt a pain in his thigh and was unable to put his foot on the ground. The radiograph shown in Figure 9 was taken at that time. I gave him an anaesthetic and forcibly straightened the leg, put on a cylinder of plaster to maintain alignment and got him up walking. Figure 10 shows the degree of union after ten weeks when the plaster was discarded, and all treatment ceased. Figure 11 was taken at a routine follow-up one year later. It shows that union has gone on to consolidation. These pictures to me tell a story. The story they tell me is that when the bone was rigidly immobilised by a plate and the muscles put out of action by a long spica plaster the amount of callus was small, but as soon as the plate had broken and the fractured ends could be compressed by muscle action and by weight bearing, the fracture promptly united.

These illustrations show that rigid immobilisation is not, at any rate in every case, essential for bony union. But I go further, for I maintain that splintage is only essential for bony union when there are no muscles attached to the fragments capable of impacting the bone ends. When we come to consider which these fractures are, we find that they are only three: fractures of the carpal scaphoid, transcervical fracture of the neck of the femur, and a fracture of the medial malleolus. Splintage may be needed to hold the fragments in alignment, but that is beside the point.

Teaching that splintage is not always essential is dangerous for a student up for an examination because there are fractures that must be splinted in order to obtain union by bone. Whenever there are no muscles attached to the fragments capable of impacting the bone ends sheering and hinging stresses at the fracture line must be prevented by splintage. Teaching the reverse, that every fracture requires rigid immobilisation, may not be as dangerous for the student but it is equally harmful for the patient, for under a splint muscles lose their

FIG. 9

FIG. 10

FIG. 11

Figure 9—Fracture of femur ten months after plating: the plate has broken and the fracture is ununited. Walking was encouraged in a plaster cylinder.
Figure 10—Condition ten weeks later when the plaster was discarded.
Figure 11—One year later.

extensibility and joints seize up, and under favourable circumstances it is weeks before free movement returns, and in less favourable cases full movement may never be regained. The patient with the fractured femur illustrated in Figures 9 to 11 never got back more than about 15 degrees of movement at his knee. Be it noted that this loss was caused by treatment.

So important is movement that one is tempted nowadays, with the risk of sepsis almost eliminated by antibiotics, to use an internal splint to preserve alignment in order to allow early movement. This principle is well illustrated in fractures of the tibia and fibula where it is sometimes possible by plating the tibia to dispense altogether with an external splint. The radiograph shown in Figure 12 was taken immediately after the plating of a tibia. Figure 13 shows the range of ankle movement three weeks from the accident. The patient returned to his former work as a labourer three months after the accident. In this case, as always, encouraging activity of the muscles overlying the fracture hastened repair. Note that the internal splint was used, not to immobilise the fragments, but to allow the joints to move freely from the beginning of treatment.

FIG. 12

FIG. 13

Figure 12—Fractured tibia, plated to permit early joint movements.
Figure 13—Range of movement three weeks after the injury.

FIG. 14

FIG. 15

Figure 14—Fractures of four metatarsals. Reduction not attempted and no splintage used. Rapid recovery of function. Figure 15—Fractures of several metatarsals. Reduction not attempted and no splintage used. Normal function within six weeks.

FRACTURES THAT CANNOT BE REDUCED

Splints are used for two purposes. Rarely, they are needed to prevent hinging and sheering stresses at the site of the fracture, so that the uniting bond shall be bony and not fibrous. More commonly, they are used to hold the bone ends in good position—that is, to maintain reduction once it has been obtained.

What if reduction cannot be obtained? When a fracture cannot be reduced it is futile (apart from being harmful) to enclose the limb in plaster when the sole object of the plaster is to hold reduction. If any patient with a Bennett's fracture taken at random and wearing a plaster splint with a wire gallows and elastic tractions were radiographed I am willing to wager that in nine cases out of ten the radiograph would show that the fracture was not reduced. It is clearly absurd to impede movement by a splint that is serving no useful purpose. I submit that when there is no displacement, and when reduction cannot be obtained or maintained, the fracture is better not splinted. Figure 14 is the radiograph of a foot showing fractures of four metatarsals. Displacement was slight, so reduction was not attempted. No splint was used. The patient was got up and taught to walk. The bones were able to look after themselves and while they were uniting stiffness of the toe and tarsal joints was avoided by active use of the foot. Had this patient been treated in plaster I believe it would have been months before he was at work again manhandling heavy loads of paper. Figure 15 is another example. Reduction was not attempted and no splint was used. A wound of the skin was sewn up and before that was healed the patient was up walking. He returned to his work as a sailor in six weeks believing that he had a normal foot. Perhaps he had.

FRACTURES INVOLVING JOINTS

Fractures involving joints present problems distinct from those of a fracture of the shaft. The joint may be injured in several ways, each one calling for its own treatment.

First, a fracture of the shaft may extend into the joint without causing any displacement.

FIG. 16

Vertical fracture involving the articular surface of the tibia; immediate weight bearing can be begun. There is a fracture of the calcaneum on the opposite side.

Involvement of the joint in this type of fracture is of no moment. The fracture is treated as a fracture of the shaft and the joint injury is disregarded. This injury is caused by a vertical force ascending the shaft, and the usual history is a fall from a height, the patient landing on his feet. Often there is a fracture of the calcaneum on the same or the opposite side (Fig. 16). The interesting thing about the fracture is that the patient can be got up weight bearing straight away; for, a fracture that is not displaced by an initial force composed of body-weight plus momentum will not be displaced by body-weight alone.

In the second variety of intra-articular fracture there is separation and displacement of part of the articular surface. One of two things may happen to the fragment. It may be depressed

below the level of the articular platform; in this case if the fragment is not replaced the overall bearing surface is reduced. Or it may project above the level of the articular platform; in this case if the fragment is not replaced the opposing articular surfaces become incongruous.

A depressed fragment is difficult to elevate to its proper level except at open operation and almost impossible to retain in position without internal fixation. This is common knowledge. What is not so well recognised is that unless reduction is exact it might just as well not have been attempted. Figure 17 is the lateral view of a lateral-rotation Pott's fracture; it shows a large posterior tibial fragment which has been screwed to the back of the shaft of the tibia. Unfortunately reduction is not complete and no benefit has been derived from that part of the operation; for the fragment is still below the level of the articular surface and can take no part in the transmission of weight.

This case is unusual in that the separated fragment is large. If it were not replaced, a third or more of the bearing surface would be lost. It was therefore reasonable to attempt reduction. But as a rule the fragment is small, and the remaining intact part of the bearing surface is sufficient to transmit weight. So that, considering how difficult it is to do, it is hardly worth while attempting to reduce a depressed fragment unless it is very large. If reduction is not to be attempted splintage is of course superfluous and active movements can be started at once.

A depressed fragment has not any natural inclination to return to its bed. But in the case of an elevated fragment, if the joint is made to move, the opposing articular surfaces will press the fragment back into position and mould the articular surface to conform to its own shape. Here is a clear indication for early movement. But there is another reason why this type of intra-articular fracture should be treated with early movement. If the joint is immobilised the damaged capsule, infiltrated as it must be with repair tissue, will shorten unless it is kept at full length while the repair tissue is being converted into scar. I would submit that an intra-articular fracture of this sort should be treated by early movements and not by rest, in order, first, to flatten any bony excrescences projecting from the articular surface and, secondly, to prevent loss of movement at the joint.

Three common injuries illustrate this principle of treatment: the fracture of the lateral condyle of the tibia—the bumper fracture; the T-shaped fracture at the lower end of the humerus into the elbow joint; and the T-shaped fracture of the lower end of the tibia into the ankle.

In the bumper fracture the lateral part of the articular surface is smashed. The fractured portion may be displaced laterally, it may be depressed, or it may be comminuted. No matter which of these has happened treatment is the same. Traction is applied to the leg and active movements of the knee are started on the day after the accident. Skeletal traction is more comfortable than skin traction, because it can be applied low down in the tibia, far away from the site of injury. It has the additional advantage that it does not impede movement.

Fig. 17

Internal fixation for fracture of posterior articular margin of tibia with large displaced fragment. Reduction is not exact and might as well not have been attempted.

FIG. 18

FIG. 19

FIG. 20

Comminuted T-shaped fracture of the lower end of the humerus. Treatment was by collar-and-cuff sling, with immediate active movements.

FIG. 21

Final range of movement.

Figure 18 illustrates a typical bumper fracture in a woman of sixty-two. The radiograph eighteen months later showed some genu valgum. The genu valgum is permanent but this deformity does not cause any disability and the cosmetic effect can be disregarded in patients of this age. Figure 19 shows the range of movement obtained by this patient. I have never seen results so good as these after the more orthodox method of treatment, namely immobilisation in plaster.

Figure 20 shows a T-shaped fracture of the lower end of the humerus. In this patient the wrist was slung to the neck, and no other splintage was used. Active movements of the elbow were started at once. Gravity and movement were relied upon to reduce the

displacements. Figure 21 shows the range of movement she regained. Extension is far from full, but luckily at the elbow more is not required. This is not a good result, but I do not think any other treatment would have given a better.

In the third variety of intra-articular fracture the whole or almost the whole of the articular surface breaks away from the shaft, and there is nothing, neither ligament nor muscle, attached to the fragment. Such a fracture is by no means uncommon at the elbow — the so-called fractured capitulum (Fig. 22). The fragment is displaced forwards and upwards. It can be replaced by digital pressure under direct vision after the joint has been opened. The problem is what to do after the fragment has been replaced. I believe that active movements of the elbow should be allowed at once. Repeated movement causes the humeral fragment to settle into its correct position *vis-à-vis* the ulna so that when it has become reattached to the shaft the opposing articular surfaces of the humerus and ulna fit one another. Figure 23 shows the range of movement at the end of three weeks. Movement gradually increases.

The fourth and last variety of intra-articular fracture is that in which a fracture is associated with a subluxation or a dislocation of a nearby joint. Figure 24 shows an unusual fracture of this kind. It was treated as though it were a bumper fracture. Traction was applied to the leg and active movements of the knee were begun immediately. Figure 25 is the radiograph five months later. Figure 26 shows treatment in progress. The use of narrow fracture boards enables half the mattress to be let down so that the patient can exercise the knee.

Most Pott's fractures fall into this group. We are here dealing with a dual injury—a fracture of a bone and a subluxation of a joint. Of the two injuries the more important is

FIG. 24

FIG. 25

Figure 24—Fracture-dislocation of the knee. Treatment was by traction and immediate active movements. Figure 25—Condition five months later.

FIG. 26

Treatment in progress. The use of narrow fracture boards enables half the mattress to be let down so that the patient can exercise the knee.

the subluxation. Indeed, it is the only one that need be treated because if the talus is in position the fracture or fractures are automatically in good alignment. In every Pott's

fracture we need to know, not the alignment of the fractures, but whether the talus is out of position. Figure 27 shows a lateral-rotation Pott's fracture with displacement of the talus. The displacement is not great but it must be reduced because in its present position the talus does not fit the articular surface of the tibia. This being a lateral-rotation fracture, the talus slips back into position when the foot is medially rotated (Fig. 28). If the talus has had to be replaced, it must be held in position. This is usually done by an external splint, and the leg

FIG. 27

FIG. 28

Figure 27—Lateral rotation fracture of the ankle with slight but important displacement of the talus. Figure 28—Position after reduction by medial rotation.

FIG. 29

FIG. 30

Figure 29—Lateral rotation fracture of the ankle with displacement of the talus. Figure 30—Stabilisation of the fracture, by internal fixation of the medial malleolus, enabled early active movements to be begun.

is encased in plaster from the toes to just below the knee. In order to hold the talus in position it has been necessary to immobilise the ankle, although immobilisation is not necessary for the repair of the bone. If it were possible to hold the talus back in position and still allow movement at the ankle, that would be preferable. Luckily there is a method of doing this. Anatomically the talus is firmly attached to the medial malleolus by a ligament. If, therefore, the medial malleolus is fixed to the shaft of the tibia with a screw the talus is automatically

anchored. Figure 29 shows an ordinary lateral-rotation Pott's fracture with a lateral shift and a lateral tilt. The medial malleolus was screwed to the shaft and the talus went back in position (Fig. 30). External splintage was dispensed with.

The method has even greater merit in the abduction type of Pott's fracture (Fig. 31), which in the ordinary way has to be splinted for a long time if secondary malunion is to be avoided. In this patient, as in the last, the medial malleolus was screwed to the shaft of the tibia. No external splintage was employed. The radiograph shown in Figure 32 was taken six weeks after the injury, when the patient was about to return to work.

I would draw your attention to the purpose for which internal fixation has been used in these fractures. It was used in order to dispense with external splintage so that movement could be started at once. The disability after a fracture rarely is the fault of the bone. It is nearly always related to loss of movement, and this loss of movement is caused by

FIG. 31

FIG. 32

Figure 31—Abduction fracture of the ankle with displacement of talus. Figure 32—Condition six weeks after injury. Good function had been restored by active movements from the beginning.

immobilisation. The earlier the joints are moved after a fracture, the quicker a man returns to work and the less his ultimate disability. The doctor who treats a fracture should all the time be asking himself: How much stiffness will this patient be left with?

FRACTURES OF THE PELVIS

It is high time that the boggy of the fractured pelvis was laid to rest. A fractured pelvis is a serious injury by reason of its two complications: paralytic ileus and rupture of the urethra. But, *qua* fracture, the injury is trivial. Splintage is rarely required and early weight bearing is well tolerated. Figure 33 shows a disruption of the pelvic ring. There is a fracture through the ischium on one side and through the pubis on the other. In the treatment of this patient the teaching of John Hilton was disregarded; although he had pain he was not treated by rest. Figure 34 shows the patient standing on the worse side three weeks after the injury. He also had a crush fracture of a vertebral body; Figure 35 shows him bending and touching his toes three weeks after the injury. Incidentally he had a dislocation of the elbow with a comminuted fracture of the head of the radius. He has not yet, as may be seen in Figure 35, quite recovered full extension of his elbow.

FIG. 33

Fractured pelvis involving the ischium on one side and the pubis on the other. Early weight bearing was permitted. The patient also sustained crush fracture of the lumbar spine and comminuted fracture of the head of the right radius.

FIG. 34

FIG. 35

Figure 34—Showing ability to stand on the worse side three weeks after the injury. Figure 35—Showing range of spinal flexion three weeks after the injury.

CONCLUSION

I have tried to stimulate interest in movement as a method of treatment. It is too much to expect that I shall have won over to my way of thinking doctors who are addicts of rest. I shall be content if they will occasionally ask: "Is my splint really necessary?"