1.—Dislocation of shoulder-joint with fracture of greater tuberosity of Humerus.

2 and 3.—Fractures of the scaphoid, undiagnosed at time of injury. Bilateral and un-united.

4 and 5.—Trans-scapho-perilunar dislocation. This case was first treated merely as a fracture of the scaphoid. The lateral view shows the Os Magnum displaced behind the semilunar bone.
6.—Fissure fracture of head of radius.

7.—Fracture of mid-shafts of radius and ulna. This type should be plastered from knuckles to axilla.

8.—Fracture of lower third of shaft of humerus.

9.—Fracture of mid-shaft of tibia. This type should be plastered from toes to upper thigh.
10.—Monteggia fracture-dislocation of shaft of ulna plus head of radius (with myositis ossificans).

11.—Inter-trochanteric fracture of the femur with secondary coxa vara.
Case IV (J. T., aged 47).

Admitted to Stoke Mandeville Hospital 24th July 1942. In January 1942, during an epileptic fit, he fell into the kitchen fire and sustained full-thickness burns of the right cheek, lower eyelid, and deep partial-thickness burns of the upper eyelid and right side of the forehead. He was treated by local dressings (details unknown), and allowed to heal by scar tissue grafting at the earliest possible opportunity.

ECTROPION

There was a marked right cornal opacity.

The ectropion was corrected by freeing the lower eyelid into an over-corrected position, followed by the application of a Thiersch graft. Further work on the lips and cheeks was postponed for domestic reasons but could not be carried out because death followed a fall into his bath during another fit.

Comment: Corneal opacity resulting from neglected ectropion—a condition which should be prevented by grafting at the earliest possible opportunity.

Case V (T. B., aged 6).

Admitted to Stoke Mandeville Hospital 19th January, 1943. On 7th August, 1942, whilst playing with matches, his clothing caught fire as a result of which he received extensive burns of both upper limbs, right side of face and neck, and the right chest wall. All areas were treated at his local hospital with gentian violet and he was discharged five months later with the severe scar contractures seen in the illustrations.

Of these the neck scar received primary attention because if left it would interfere with the development of the mandible. These scars were divided, all deep scar tissue removed, and the wound opened out to the fullest extent.

Free grafts were applied, and the patient placed in a previously prepared posterior plaster shell.

Later the flexure contracture of the elbow and adduction contracture of the axilla were corrected in the same manner, the limb being placed vertically above the head by means of platter splints.

All these grafts took well, resulting in a full recovery of function in all joints, except for a few degrees limitation of extension of the neck.

Comment: An example of the correction of scar contracture by free grafts. These burns known to be deep at the time of injury should have been treated by grafting within two or three weeks during the original treatment; the contractures could have been foreseen and prevented.

I am deeply indebted to all the members of my team at the County Hospital, Whiston, and particularly to Professor T. Pomfret Kilner for his constant encouragement and helpful criticism.

FRACTURES—PART I

PRINCIPLES OF DIAGNOSIS AND TREATMENT

by E. H. HAMBLY, F.R.C.S.

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The knowledge and treatment of fractures has progressed within the last decade almost beyond recognition in certain branches of the subject. Side by side with this development on the medical side there is growing in the minds of laymen and patients alike a greater knowledge of the treatment and attainable results. On the other hand, the clinician is greatly helped by the ever-growing variety of radiological and therapeutic methods available.

PRINCIPLES OF CLINICAL DIAGNOSIS

The patient complains of pain, swelling, and tenderness in the neighbourhood of a particular bone or joint.

He frequently gives a clear history of an injury, which he usually describes as a sprain. The history may be misleading, inasmuch that, in an old fracture, the injury may have been forgotten. It is only too easy to accept the patient’s history of a sprain at its face value. Every sprain should be assumed to be a fracture until proved to the contrary by X-rays.

On examination of the patient the following points should be particularly noted. A general examination should always be made to exclude...
any predisposing causes of fracture, e.g.: primary carcinoma of the breast with secondaries in the bone; Fragilitas Ossium, etc. The general examination will furthermore take note of the condition of the heart, lungs and kidneys. Such factors will have to be considered in the choice of anaesthesia, and in the treatment generally.

The local examination should be made with the greatest care, both in regard to the examination of physical signs and in preventing further injury to the affected part. For example, the much-quoted elicitation of crepitus at the site of the fracture site causes both great pain to the patient, and may damage the fracture further as well as the soft tissues. In any case it is unnecessary to elicit this physical sign.

The affected region will be swollen, and warm to the touch. The skin may be blistered and bruised. Blistering is most common in severe injuries of the elbow and ankle joint. Tenderness is most marked over the site of the fracture.

In the limbs deformity may or may not be obvious. Swelling often masks such a deformity. For example, in fractures of the nasal bones, the serious deformity is never apparent until a week after the injury owing to swelling. Inability to use the affected part is a most important clinical sign, e.g. fracture of the neck of the femur causes inability to elevate the limb.

Once the diagnosis of fracture is suspected, examination is made for complications, e.g. in cases of fracture-dislocation of the spine, evidence of paralysis or loss of sensation in the lower limbs is looked for; in fractures of the shaft of the tibia, it should be noted whether the blood supply of the foot is endangered.

**PRINCIPLES OF RADIOLOGICAL DIAGNOSIS**

Every sprain should be assumed to be a fracture until proved to the contrary by X-rays.

Every fracture and dislocation, although the diagnosis be obvious, should be X-rayed before reduction. This is as essential on medical grounds as it is on legal grounds. See X-ray No. 1.

Every fracture and dislocation should be X-rayed immediately after reduction, in the operating theatre if possible.

All fractures should be re-X-rayed at suitable intervals after reduction, e.g. usually after two weeks, and again at suitable intervals until union is obtained:

Certain common fractures present difficulties in diagnosis, even in the presence of good X-rays. Three such fractures are those of the carpal scaphoid; first degree Pott's fracture-dislocation of the ankle; and fractures of the head of the radius.

In fractures of the carpal scaphoid there is a history of a sprained wrist. Actually, a simple sprain of the wrist is very rare without an associated fracture of the lower end of the radius or of the scaphoid. See X-ray No. 2, 3, 4 and 5.

The ordinary straight antero-posterior and lateral X-rays of the scaphoid frequently fail to show any evidence of fracture of the wrist of the scaphoid. An oblique view should always be taken. Incidentally, the treatment of fracture of the scaphoid is immobilisation in plaster, with the thumb in abduction until union is secured. This takes from twelve weeks to two years. The plaster should be taken to the metacarpo-phalangeal joint of the thumb, which should be at right-angles to the plane of the palm.

First degree Pott's fracture-dislocations of the ankle are worse in many ways than third degree ones. This is because the latter are obvious, both clinically and radiologically, and are always treated quite correctly as most serious injuries. A first degree Pott's fracture-dislocation, with a fracture of the external malleolus, is also very serious. It is frequently not diagnosed, and, even when it is, treatment is frequently incorrect. Osteo-arthritis with a painful ankle is only too common as a late result.

In a first degree Pott's fracture-dislocation of the ankle a true antero-posterior and lateral X-ray does not show the full displacement of the fractured fibular fragments. If careful observation is made in the antero-posterior X-ray it will be seen that the articular surfaces of the astragalus and of the tibia are not parallel. An oblique view should always be taken. This demonstrates a wide gap in the fracture of the external malleolus, which represents the degree of the dislocation of the ankle. The treatment of first degree fracture-dislocations of the ankle is immobilisation in plaster, in inversion in the case of abduction fracture-dislocations, and in eversion in the case of adduction injuries. The patient should not bear weight until the fracture is united, which takes about ten weeks. Quite clearly the ankle joint consists of the astragalus acting as a wedge, which widens the socket formed by the two malleoli when weight-bearing occurs.

In fractures of the head of the radius the injury both to the bone and to the articular cartilage of the head of the radius and of the capitellum greatly exceeds the X-ray findings. Antero-posterior and lateral X-rays often fail to show a fissure fracture of the head of the radius. An oblique view should be taken. See X-ray No. 6. The treatment for fracture of the head of the radius is only too frequently the worse possible treatment for such an injury. Physiotherapy of all kinds is the worse treatment. Manipulation of the elbow joint for stiffness resulting from a fractured radial head is even worse. It always produces myositis.
ossificans. The correct treatment for all injuries of the elbow joint is active movements only. Thus, the patient should wear a sling for three to four weeks, and move his arm freely within it. The carrying of heavy weights or forcing of the elbow should be completely avoided. See X-ray No. 10, showing myositis ossificans resulting from massage and manipulation of an elbow which was stiff, secondary to a fracture of the radial head.

**PRINCIPLES OF TREATMENT**

**Simple Fractures.**

The treatment of all fractures may be subdivided into immediate, or first-aid; manipulative with immobilisation; and thirdly, after-treatment, which includes continued immobilisation and physiotherapy.

**First-aid Treatment**

First-aid treatment consists in splinting the affected limb with anything available, e.g. a wooden splint, or a broom-handle in the case of the leg. Morphia should be administered for the relief of pain, which is severe. The patient, who is always shocked, should be kept warm and rested. A hot beverage is of great value, unless it is contemplated to give an anaesthetic very soon. The patient should not be fussled over, but should be allowed to rest until the ambulance arrives to convey him to hospital.

Manipulation and reduction of fractures should always be undertaken in an up-to-date fracture clinic only. It is impossible to get satisfactory results over a considerable series under any other condition.

A twenty-four hour X-ray service must be available both for diagnosis and for confirmation of reduction of the fracture.

Fractures should be treated only by those who are well qualified by experience and training. The treatment of fractures is indeed fraught with difficulties, more so than any other branch of surgery. All fracture clinics should offer a continuous day and night service under the direction of a full-time resident surgical officer with special qualifications.

Fracture clinics should be held daily, including Saturdays, so that complications and unsatisfactory reductions can be rectified. An expert orthopaedic and fracture surgeon should be available at all times for his advice and treatment as required. If, possible, he should take all the fracture clinics himself. However, as this is not always practical, all new cases should be referred to him at his next regular out-patient clinic. A continuous fracture service of this nature is imperative to get satisfactory results.

This does not mean that there is no place for the general practitioner in the treatment of fractures. The contrary is the case. He should, if convenient to himself, assist in or see the treatment of the fracture throughout all its stages. This applies equally to fractures treated in an out-patient department and to those who are in-patients and who will eventually be discharged home under the care of the general practitioner.

Many poor results of fractures treated in special fracture clinics to-day are due to the fact that the general practitioner is not co-opted into the work of treating the patient from the beginning. Fracture work is essentially team work. The general practitioner, to whom the case belongs, should from the beginning fully appreciate what is in the mind of the surgeon in difficult cases.

In the reduction of a fracture or a dislocation deep anaesthesia is essential. Nitrous oxide gas, as usually administered in a casualty department, is not satisfactory. Complete relaxation is essential to enable full reduction of the fracture and to prevent damage to soft tissues. Either pentothal or gas, oxygen and ether should be employed.

**All fractures should be immobilised until they are united.** Failure of union is due more to failure to immobilise the fracture until union has occurred than to any other factor. Some fractures take a very long while to unite. Special cases are the lower shaft of the humerus; see X-ray No. 8 the carpal scaphoid; the shaft of the ulna; the neck of the femur; the lower one-third of the shaft of the tibia; and all infected fractures. All of these must be fully and absolutely immobilised until strong bony union has occurred.

**In a long bone both joints on either side of the fracture must be completely immobilised.** For example, in fractures of the mid-shaft of the tibia, the plaster should extend from the base of the toes to the upper thigh, with the knee flexed to forty degrees. See X-ray No. 9. Fractures of the mid-shafts of the radius and ulna should be plastered from the knuckles to the axilla. See X-ray No. 7. An exception to this rule is a fracture of the mid-shaft of the humerus, which unites with the arm in a collar-and-cuff sling with a plaster back-slab.

**Compound Fractures.**

Compound fractures may be classified from the point of view of treatment into two main groups. The first group are clean compound fractures, with minimal injury to skin and to soft tissues. The treatment for this type is excision of the skin edges, reduction of the fracture, securing of haemostasis, and the application of a padded plaster. The operation must be carried out in a main
operating theatre with full and 100 per cent “no touch” technique. Nothing less will suffice. This technique is discussed later. The patient should be most carefully watched in bed in hospital for undue swelling and for infection. Prophylactic penicillin 50,000 units should be administered, with the addition of sulphanilamide, and anti-gas gangrene serum.

The second group of compound fractures, which include dirty fractures; compound fractures with serious bruising or de-vitilisation of soft tissues; and “Clean” compound fractures which cannot be guaranteed to be clean, or where infection is doubtful. Every hour of delay in the treatment of these fractures greatly increases the chance of losing the limb or even the life of the patient. At best, infection of the bone greatly lengthens the time of union of the fracture.

A compound fracture can be one of the worst injuries it is possible to suffer. The after-results are worse than those of an abdominal emergency. It may be mentioned in this connection that a compound fracture of a finger in a working man will be more serious afterwards than a fracture of the femur.

The patient should primarily be treated for shock, i.e. warmth, morphia, and rest in bed in quiet surroundings.

As soon as the patient can be prepared for an anaesthetic, and as soon as the limb can be cleaned, operation should be undertaken. If pain is severe it may be necessary to leave the cleaning up of the limb until the patient is under an anaesthetic.

The skin edges are excised; all de-vitalised muscle and other tissue is excised; fragments of loose bone are removed; and haemostasis is secured. All fascial planes are opened up and foreign bodies removed. Penicillin with sulphanilamide powder should be introduced by insufflation. The fracture is reduced by gentle manipulation and leverage with blunt hooks.

The wound is lightly packed with vaseline gauze, and the surrounding skin is covered with tulle gras or vaseline gauze to prevent excoriation of the skin by pus. No catgut is buried except to secure haemostasis. No skin stitches are inserted if infection is at all likely.

The limb is then encased in a complete plaster, which is padded in the case of the first plaster to allow for swelling. Some surgeons prefer to leave a window over the wound. If this is done, the window should be large, and the patient should be kept at rest in bed until the skin wound has healed, even if the fracture unites beforehand.

The plaster is changed after six weeks, or before if pus is excessive. Successive plasters do not require cotton wool padding. The plaster can be applied direct to the skin, except for the skin sur-}

rounding the wound, which is covered with vaseline gauze. The plaster is continued until the fracture has united and the skin wound has healed. This may take up to a year or more. If skin loss is severe grafting is indicated as soon as possible.

This “closed plaster” technique for the treatment of compound fractures should only be carried out in a hospital under the continuous supervision of the surgeon. It is no alternative for poor surgery. The plaster is only a protective splint. Abscesses must always be drained, and all infected fascial planes must be opened up. The skin should never be sutured over potentially infected tissues.

Prophylactic Penicillin, 50,000 units, either intravenously or intramuscularly, with sulphanilamide should be administered with the addition of anti-gas-gangrene serum in an initial maximum dose.

The first sign of gas gangrene is ushered in with increased pain, pallor, and signs of toxaemia, undue brightness of the eyes, and an increase of pulse-rate. The presence or absence of actual gas should never be waited for.

AFTER-TREATMENT OF ALL FRACTURES

Although complete immobilisation of the fractured bone is essential, it is equally important to encourage active movements of the limb from the commencement of treatment. For example, in cases of Colles’s fracture, the hand and fingers must be used from the day of the injury. The sling must be completely abandoned after the first twenty-four hours. It is equally important to exercise neighbouring joints, e.g. in fractures of the forearm, it is essential to encourage the patient to use the fingers and the shoulder normally.

The patient must not be permitted to become fracture-minded. He must be re-assured that the plaster has fixed the fracture, and that it is the duty of the patient to prevent stiffness of the soft tissues. In the case of Colles’s fracture, the bone never fails to unite. Failure, however, to move the fingers and hand from the first day only too frequently causes prolonged or even permanent stiffness of the fingers and wrist. In these cases swelling of the fingers is a sign that the hand is not being used enough. The patient is inclined to rest the hand. Provided the plaster is not too tight, swelling of the fingers is caused by failure to use the hand, and is only relieved by active movements.

Similarly, a patient with a fractured spine must not be given the opportunity to meditate upon his “broken back.” After reduction of the fracture and immobilisation in a plaster jacket, exercises to extend the spine must be commenced at once. He may be encouraged to play games and to
resume his work. This not only distracts his attention from the fracture, but it ensures excellent function once the plaster has been removed. The spinal muscles by this time have become so strong that they are stronger than normal, and a spinal jacket is unnecessary.

Re-X-ray at suitable intervals is essential in the after-treatment. Over one-third of all Colles's fractures tend to relapse within the plaster about ten to twelve days following reduction. A re-plaster or re-reduction should be undertaken at this period.

In a similar way inter-trochanteric fractures of the head of the femur, although perfectly corrected initially, always tend to go into coxa vara deformity about the eighth week after reduction. This is due to the strong pull of the adductor magnus occurring when union is commencing. Thus the limb should be kept in full abduction until the eleventh or twelfth week. See X-ray No. 11.

After the plaster is finally removed a reactionary swelling of the limb occurs. In the case of the lower limb, an elastoplast or viscopaste bandage should be worn from the base of the toes to the knee for three to six weeks, with the knee in a crepe bandage if the latter is swollen. In the case of a Colles's fracture, the plaster should be kept on for five weeks, and after its removal a bandage should be worn for three days to one week.

After removal of the plaster physiotherapy and re-habilitation are continued until the function is normal. Re-education can greatly be helped by occupational therapy in a re-habilitation centre, or, alternatively, by early return to work in a factory where the work can be graded upwards.

CAUSES OF FAILURE OF TREATMENT

Failure to diagnose the fracture early enough ranks quite high in the list of causes of failure of treatment.

The most important cause of failure of union, however, is failure to immobilise the reduced fracture long enough, in fact, until strong bony union is secured.

Inadequate immobilisation is included in this category. Both joints on either side of the fracture in a long bone must be immobilised completely.

Failure to reduce the fracture adequately is more the cause of mal-union than non-union. Nevertheless, mal-union in many sites is almost as bad as non-union. A perfect anatomical reduction must be the one aim of the fracture surgeon. If this cannot be obtained by manipulation, open reduction, with or without internal fixation with bone-grafts, vitallium plates, or preferably onlay grafts with vitallium screws must be undertaken. Such procedures should never be undertaken except in a major operating theatre with a full 100 per cent "no touch" technique. Incidentally, stainless steel plates and screws should never be used, as vitallium does not ionise in the bloodstream. Stainless steel rusts, breaks, and later abscesses tend to form around the screws and plates.

The "No Touch" Technique.

Sepsis is the greatest menace in bone and joint surgery. No surgeon should undertake an open operation upon bones or joints unless he is insistent upon a 100 per cent "no touch" technique.

The limb should be cleaned and prepared for three days if possible before the operation. Naturally this does not apply to compound fractures where immediate operation is indicated. The theatre sister should lay out all the instruments with an instrument holder. No suture material, such as catgut, should ever be touched with the fingers. The surgeon should tie all knots with instruments. Catgut and other suture material should be buried as little as possible in the neighbourhood of bones and joints. In the case of tendon suture it was found that silk gives less reaction in the tissues later than catgut, and is therefore preferable.

The operating instruments should be laid out in one row only, not in the usual two rows. This is to prevent the points of the nearer row of instruments from touching the already used handles of the further row. A green towel on the nearer half of the instrument trolley, as advised by Mr. Watson-Jones, is a good reminder to the surgeon to place all the handles of his instruments after use in one line, with the instruments parallel, and with the points not touching each other. This prevents a pile of instruments accumulating throughout a long operation in which the handles of used instruments may contaminate the points of clean instruments about to be used.

Furthermore, a complete "no touch" technique gives a great lead to the nursing staff, who are quick to be dispirited by any bad habits the surgeon may have. Furthermore, the writer has known of three deaths resulting from sepsis, secondary to bone-grafting operations in just over twelve months.

In the reduction of simple fractures with the use of local anaesthesia, it is equally important to employ the full "no touch" technique. Otherwise the procedure results in a compound grossly infected fracture.

Another cause of sepsis is rough handling of the soft tissues.

Once sepsis has occurred, not only is the chance of union seriously delayed, but the life of the limb and even of the patient is in jeopardy. If, however,
the technique of the surgeon and of the theatre staff is perfect, and nothing less must suffice, it will be found that bones are not filled with "black ingratitude" as was formerly thought, but will fulfil the surgeon’s highest expectations.

Failure to treat the soft tissues gives as bad an after-result as failure to treat the fracture adequately. Thus active exercises, physiotherapy, occupational therapy and general rehabilitation must be started from the first day of injury as described previously.

Finally, the financial and economic side of the patient’s happiness should be attended to. The writer is reminded of one of his patients, who was off work for seven months with no compensation. This was due to the fact that he fell and fractured his femur on his way to work and not while at work. Both he and his family, including two children, were on relief throughout treatment. The patient’s treatment should not be marred by such financial worry. Such cases are questions for legislation, but it is the duty of the medical profession to make its voice heard in such matters.

The patient should always be treated as a whole and not, for example, merely as a case of a fractured femur.

SCLEROTIC THERAPY
IN PRACTICE IV.

The Injection Treatment of Hydrocele
and Some Other Conditions

By R. R. Foote, M.R.C.S., L.R.C.P.,
D.R.C.O.G.

Varicose veins and haemorrhoids have been discussed in previous articles, and it now but remains to say a few words about some common conditions occurring in general practice, which may be frequently benefited by injection treatment. The mention of rare conditions and of conditions in which opinion is divided as to the value of sclerotic treatment are especially avoided. Cystic hygroma, branchial cysts, ranula, certain mammary cysts, varicocele, enlarged prostates and herniae have all been the subject of writings regarding the advantages of injection treatment.

If some of the statements in this short article appear too elementary and trivial to warrant mention, it must be remembered that attention to detail is of paramount importance in these simple treatments. Dickson Wright, that great teacher of our times, will spend much time teaching students how to sharpen a needle before injecting a varix (5 c.c. of lithocaine in the wrong place makes a nasty mess!). He frequently states that it is harder to apply a bandage correctly than it is to remove many a gall-bladder.

For some reason difficult to fathom, the injection treatment of idiopathic hydrocele appears to be a much neglected therapy. Patients are constantly being advised surgical treatment when a simple injection will produce a permanent and perfect result. Campbell (1937) wrote regarding 76 cases of infection in 502 cases treated by surgery. Furthermore, he showed that there was a 6 per cent recurrence rate, and that there was some post-operative haemorrhage in 18 per cent. Add to this hospitalisation, expense, and anaesthetic risks, and it is difficult to understand why cases are so treated, since the only contra-indications to this form of treatment are in those cases in which a preliminary aspiration of fluid has demonstrated the presence of an abnormal testicle. It is agreed that the hydroceles of the new-born and those of early infancy should be left alone for some time, since spontaneous resolution is probable. Should this condition persist into later life, surgery is the best treatment having regard to the possibility of the persistence of a congenital opening into the peritoneal cavity. The presence of a haematocoele or of a spermatocele is a further indication to avoid injection. There is some difference of opinion among surgeons regarding the injection of the spermatocele. Some advocate it, but owing to the frequently associated disease of the epididymis it is wiser to attack the matter from the surgical angle so that the organ may be removed at the same time if it be considered necessary. Injection of a spermatocele may anyway be a painful matter owing to the active communication with the testicle or epididymis. Beyond these provisos it is safe to say that there are but few cases of hydrocele which cannot be cured easily by injection. Bilateral hydrocele occurs in about 4 per cent of cases, and the two sacs may be treated at the same time, although a time interval is preferable. The patient must be warned that from one to four injections may be required in order to effect a cure. He should not lose any time from his work however, and with normal care runs very little risks of a complication. This care consists in putting the right amount of solution into the right place and the strict avoidance of sepsis.

The following are the rules for successful injection treatment.

1. The patient should lie on a couch with the legs well separated. The scrotum is supported by means of a sling of elastoplast stretching between the thighs.
2. The site of injection must essentially be high up towards the neck of the scrotum. This is of importance, since neglect of this precaution
Fractures—Part I Principles of Diagnosis and Treatment

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