MANUAL OF EMERGENCY ORTHOPAEDICS

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FOREWORD

'Been there—done that!' could have been the alternative title of this manual. It is the favourite expression of the author, Phillip Segelov, who holds a unique place in the orthopaedic history of Australia. His dynamic personality has led him to the forefront in the practice, teaching, organisation and politics of orthopaedics in this country.

As the first person in Australia to practise advanced methods of internal fixation of fractures, initially his work was criticised. However, his results speak for themselves. He was made a member of AO International in honour of his work and has seen most Australian orthopaedic surgeons adopt these techniques.

At the age of fifty, a myocardial infarct slowed him down for long enough to begin a long term ambition—a manual for hospital housemen.

Written in the old style, it suffers the advantages and disadvantages of single man authorship. No double-blind trials followed by half a dozen possible methods of treatment here! It is simply full of advice from a senior surgeon based on twenty-five years of experience. The book contains many illustrations with brief and occasionally abrupt summaries—you may well be talking to the author direct. Most of the common and major casualty orthopaedic problems can be located by X-ray or diagram. While written for the less experienced, some orthopaedic surgeons in training may find it useful.

We hope, that as time goes on and the owner of this manual calls on it less and less, when confronted with an orthopaedic problem he or she will look up at the book on the shelf and be able to say: 'Been there—done that!'

Eric Caspary

PREFACE

This book is designed to help the Casualty Officer identify orthopaedic or fracture problems that he or she may come across, and to offer the correct primary treatment. There are often many ways a problem can be handled; this book does not pretend to cover them all. It is *not* an orthopaedic textbook and thus rare and unusual conditions are not included.

This manual started as a few pages of notes, and grew as a result of requests from the people it is now intended to help—the young and inexperienced Casualty Officer.

No book is written without help from many sources. My thanks are due to John Cumming for the artwork, to Bill Miles for finding all those X-rays and to my partner, Eric Caspary, for his advice and criticism. My thanks are also due to my publishers for the monumental task of advising a novice.

1986 P.M.S.

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CHAPTER ONE

Fractures: general introduction

General remarks

By definition a fracture is a break in the continuity of a bone and the most tender spot is usually the site of the fracture. The classical signs of a fracture — pain, swelling, loss of function, and crepitus — may not be present in a greenstick (Fig. 1.1) or incomplete fracture, but in a displaced fracture not only do we have the signs mentioned but of course there is also deformity.

It is axiomatic that you X-ray all suspected fractures.

Do I have it X-rayed tonight?

Can I justify calling in a radiographer after hours?

The answer to these questions depends on you asking yourself the following:

Is this likely to be a fracture or not?

If it is a fracture is it likely to need reduction tonight?

Remember that provided you immobilise a fracture and give analgesics most simple fractures can be left overnight.

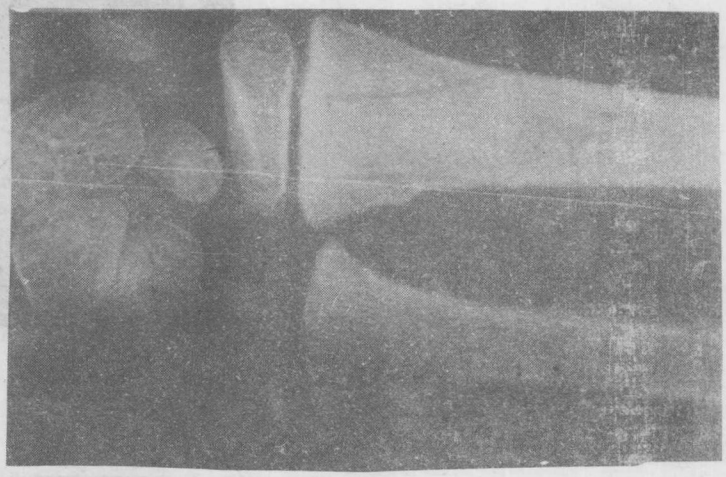


Fig. 1.1 Greenstick fracture of the distal radius.

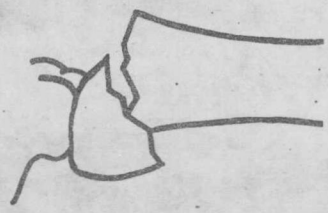
You must immobilise with a padded plaster backslab and warn the patient and/or the parents that if they have severe pain or circulation problems they are to return to casualty.

Please order X-rays that include the joint above and below the tender area.

Looking at X-rays

It is of the utmost importance that the doctor should be able to interpret an X-ray correctly. He needs to decide if a fracture is present and if it is displaced. Does it need reduction?

The first step is to see that the X-rays are on the viewing box the correct way up! Make sure that they are the correct X-rays and that the left side is on the *left* and in the case of a wrist that the thumb metacarpal is pointing to the floor. If you fail to do this, you will mistake a Smith's fracture (Fig. 1.2) for a Colles' fracture (Fig. 1.3).



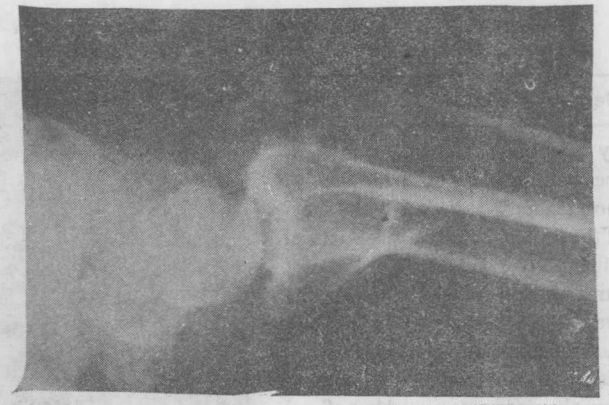


Fig. 1.2 Smith's fracture.

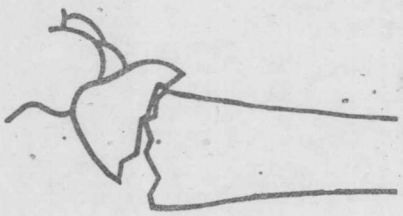
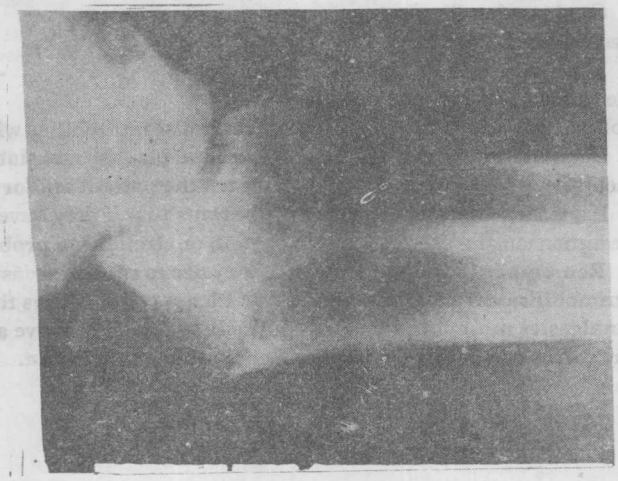


Fig. 1.3 Colles' fracture.



The next thing is to be sure that you can see on the X-rays the joint above and below the suspect area and that there is not a second injury such as a fracture or dislocation that you are missing. The classic mistake is to miss a dislocated hip when the patient has a fractured femur (Fig. 1.4).

Always think and describe displacement of the distal fragment on the proximal — thus a Colles' fracture is displaced dorsally and radially and is often impacted.

Angulation is described according to where the apex of the fracture points.

Displacement is described according to which way the distal fragment is pushed on the proximal one.

It is always necessary to have both an antero-posterior and a lateral view. Sometimes oblique views are also necessary.

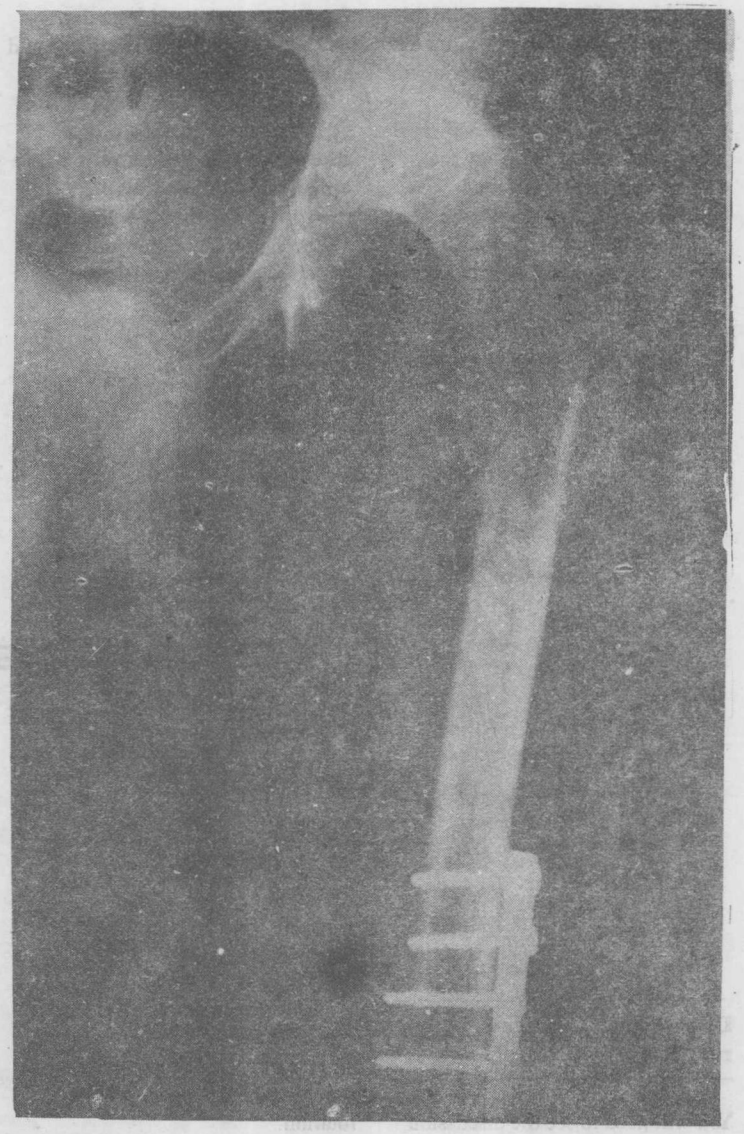


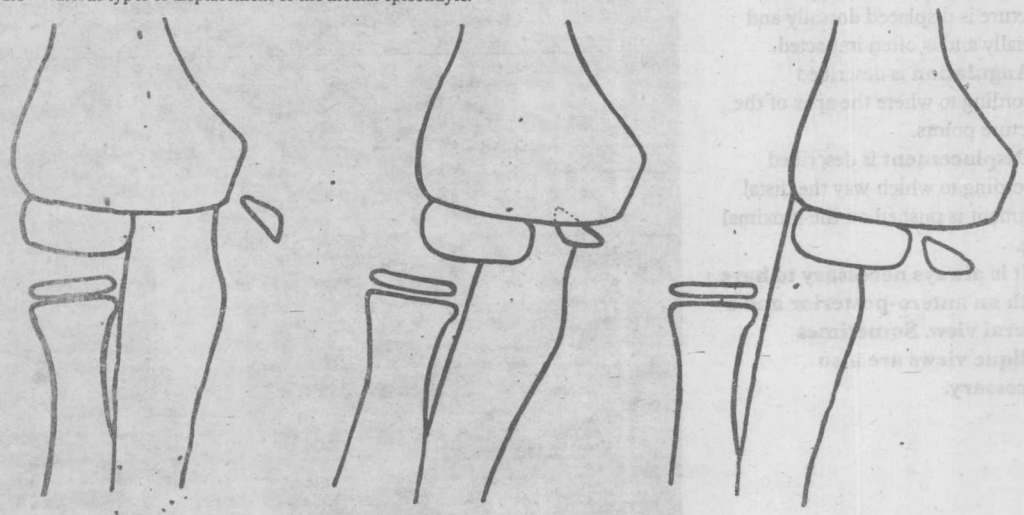
Fig. 1.4 The fractured femur has been plated, but the dislocated hip was missed.

Children's X-rays can be difficult to interpret, particularly around the elbow joint and at the wrist, due to the epiphyses that appear at differing ages. Some help is always there because you can X-ray the opposite elbow or wrist for comparison. Epiphyses are the same on both sides and of course are not tender if not injured. In addition, a fracture is jagged and irregular, whereas an epiphysis is rounded and smooth.

Look at the alignment of the epiphysis to be certain that there is not displacement of the epiphysis as a whole and compare it with the other side.

The elbow is the most difficult region in children as there are multiple epiphyses and they appear at different ages — be careful of the epiphysis of the medial epicondyle in a dislocated elbow in a child, it is commonly avulsed and may be in the joint. Look carefully at what can happen to the epiphysis of the medial epicondyle (Fig. 1.5).

Fig. 1.5 Various types of displacement of the medial epicondyle.



Does the fracture need reduction?

You will need to see the discussion of each fracture to decide this but here are some rules to help:

1. Fractures involving joints (Fig. 1.6) or epiphyses (Fig. 1.7) must be accurately reduced and often require open reduction.

2. Displacement of up to fifty per cent of the width of the bone can be accepted in one or more planes provided there is no angulation or rotation.

3. In an adult (Figs. 1.8 and 1.9) all shortening, angulation and rotation should, if possible, be corrected in the lower limb — even if open reduction becomes necessary.

4. In a child, nature will often come to our aid and will correct the angulation and deformity with growth. Remember the younger the child the more correction will occur and the faster it occurs. The closer the deformity is to the epiphysis, the faster the correction. In an eight year old, thirty degrees of correction will be complete within about nine months if the injury is within one

Fig. 1.6 Postoperative X-ray of a fractured head of radius.

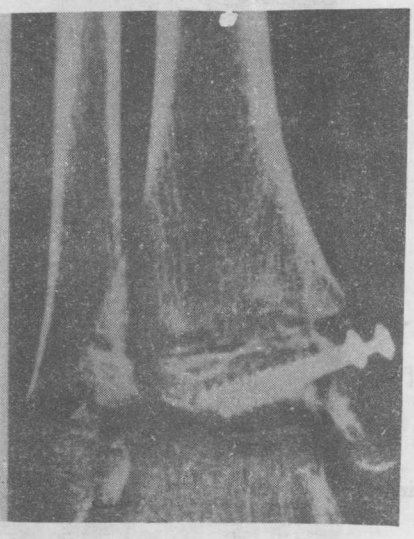


Fig. 1.7 Postoperative X-ray of an epiphyseal fracture of the ankle.

Fig. 1.8 Angulated fracture of the tibia and fibula.

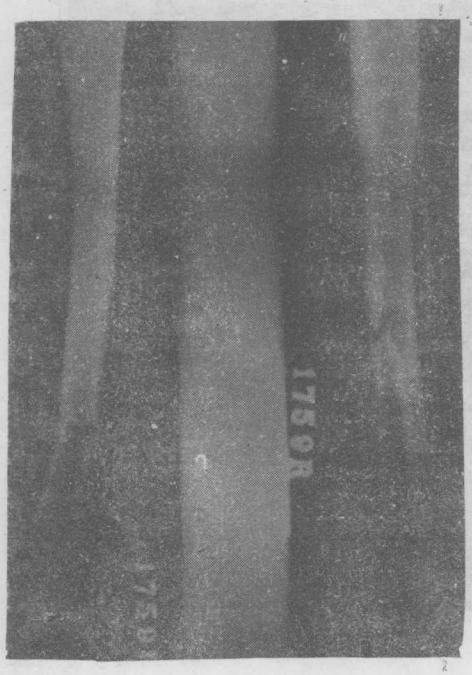


Fig. 1.9 Angulated, shortened and rotated fracture of the tibia and fibula.

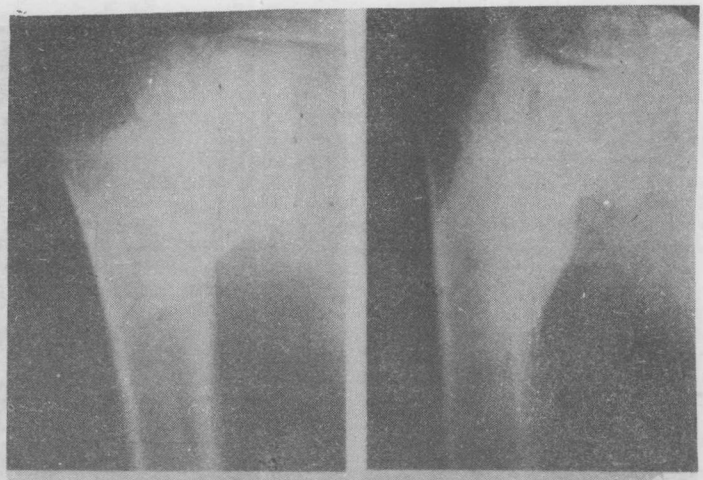


Fig. 1.10 (a) Fracture of the neck of the humerus in a child of eight. (b) The same fracture four weeks later, showing early moulding.

centimetre of the epiphysis (Fig. 1.10).

There is very little correction of deformity in the upper limb after the age of eleven and in the lower limb after the age of fourteen.

5. Remember you are not treating an X-ray or even a fracture but a person with a fracture that has been X-rayed. There may well be good reason for accepting the position of a fracture that is otherwise unsatisfactory. The fracture shown in Figure 1.11 is acceptable in a very frail old lady but not in a healthy young person.

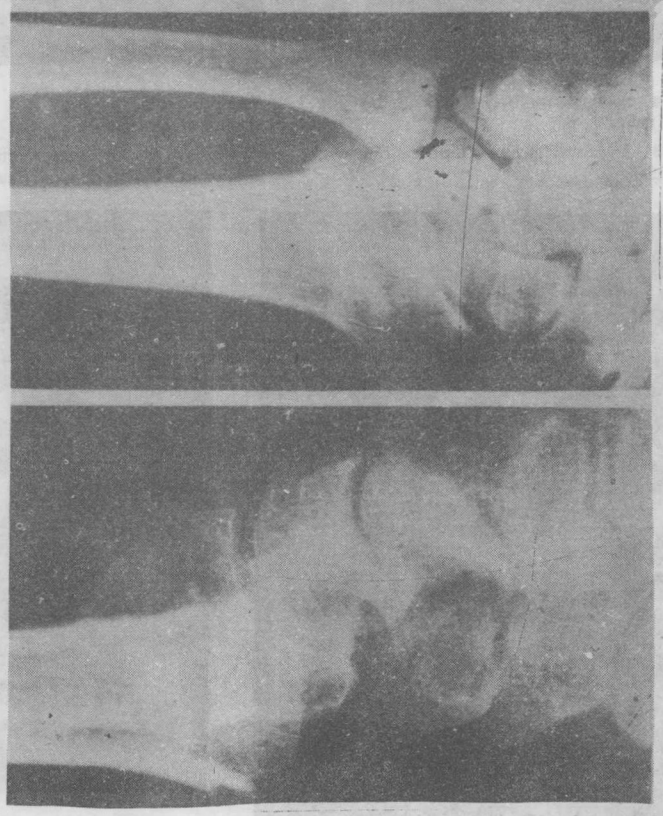


Fig. 1.11 (a) Antero-posterior X-ray of a Colles' fracture. (b) Lateral X-ray of a Colles' fracture..

How to reduce a fracture

Please see each individual fracture for details. Here are some general hints:

1. Examine the X-rays closely and be sure in your own mind which way the fragments are displaced.

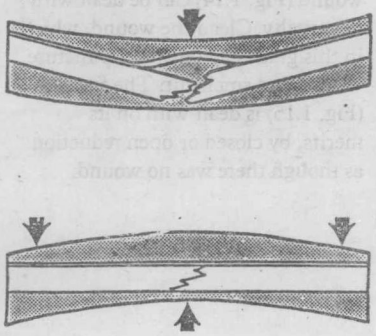
2. **When the patient is anaesthetized** pick up the limb and feel the fracture site gently — most bones can be palpated easily through the soft tissues — make sure that you can feel the deformity that you can see on the X-rays. If you are in doubt then go back to the X-rays until you are sure.

3. Now you are ready to reduce the fracture. Most fractures require traction to overcome the shortening and then direct pressure over the displaced distal fragment — a lot more force is required than most people think. Use the intact periosteum on one side of the fracture to help you as shown in Figure 1.12.

4. Run your finger along the line of the bone and over the fracture site. If it is reduced, then the bump at the fracture site that you had previously palpated should have disappeared. To be sure of this **gently** displace the fracture again and recreate the deformity, then palpate it and reduce — this way, you can be sure in your own mind that it is reduced. **Use your fingers as your guide** and only X-ray the fracture when it is reduced.

5. You are now ready to apply plaster slabs as outlined below. This is where the reduction of many fractures is lost — care needs to be taken by the person holding the limb to maintain the position and in forearm fractures you are better leaving the limb hanging because an assistant picking up the hand will displace the distal fragment.

Fig. 1.12 (a) The periosteal hinge and (b) how it is used in fracture reduction.



Circulatory problems

The last thing you need is to create problems for yourself and for the patient by either ignoring a threat to the circulation or by creating one. It takes but a second to check the circulation in fingers and toes and to show the parents how to do this. If a patient has a displaced ankle fracture or a supracondylar fracture of the humerus then check the circulation **immediately** on arrival in Casualty — if it is deficient give some analgesic and pull on the limb so as to align the fracture a little better even before X-rays are done. In almost all cases, the circulation will return when the gross deformity has been reduced and will thereafter be no problem.

If the circulation does not return, you must advise the consultant immediately.

Do not put a full plaster on a recent fracture

Since adopting this rule, twenty-five years ago, we have not had a single case of Volkmann's ischaemic contracture or circulatory troubles due to tight plaster. There are a few cases where a full plaster may be necessary, then **the plaster and padding must be fully split.**

Do not put a full plaster on a recent fracture

Backslabs or back and side slabs so that the limb is supported on about two-thirds of its circumference are the ideal way to immobilize a recent fracture. Some padding is applied and then the slabs are held on by firm but not tight crepe bandages. This means that there is room for swelling and that when the patient is seen at the one week stage it is easy to tighten the slabs with Elastoplast or to complete the plaster. It is also easy to remove the plaster by cutting through the soft bandage.

Fig. 1.13 Various views of back and side slabs on a forearm.

Use backslabs and sideslabs

Remember that a backslab (Fig. 1.13) will protect the fracture site from being knocked whether the arms is by the side or in a sling. The fracture site is painful, so it is important to protect the area from being hit by a passerby.

Compound fractures

The magic word 'compound' applied to fractures causes many a muttered swear word amongst orthopaedic surgeons since they are usually caused by the folly of a car driver or a motor bike rider.

Think a little. A compound fracture is a fracture in communication with the air. Is there a difference between a minor puncture wound from within and a massive crushing and dirty wound (each with a fracture)?

Of course there is. A much more sensible approach would grade the fracture and describe the following.

1. *The bone* — The site of the fracture, the joint involvement and comminution.
2. *The wound* — The size and situation, the involvement of nerves and vessels and is it a crushing wound or more of a cut?
3. *The contamination* — How dirty is the wound? Wounds from within are basically clean.
4. *The mechanism of injury* — A high velocity injury, a crushing injury, or just a simple fall with a compound wound from within.

In Casualty **for all compound fractures** you must do the following:

1. Assess the patient as a whole. Be aware that the compound injury may be the obvious injury, **but not the only one.** Check the patient for abdominal and pelvic injuries and monitor the pulse and blood pressure.
2. Set up a drip and give the patient some intravenous antibiotics. What you use, depends on the choice at your hospital. We are currently using one of the cephalosporins for non-allergic patients.
3. Give the patient adequate analgesia (intravenously for rapid action) according to age and size but avoid if possible when there are head injuries and before assessment of abdominal injuries.
4. Tetanus toxoid or TIg is given according to whether the patient is immunised. (See section on *Tetanus prophylaxis* below.)
5. Examine the wound and grade the injury in the terms mentioned above. Remember to reapply the compression dressing and splinting.
6. Arrange X-rays, notify consultants and arrange the operating theatre.

The next steps depend on the severity of the injury (grading).

Grade 1: Minor compound fractures. The compound element is small and the contamination minimal. The wound (Fig. 1.14) can be dealt with in casualty. Clean the wound, which in this grade can only be a puncture wound or a small cut. The fracture (Fig. 1.15) is dealt with on its merits, by closed or open reduction as though there was no wound.

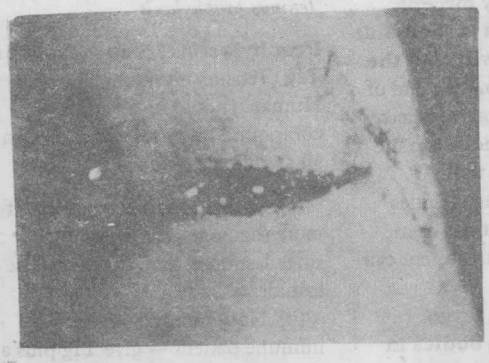


Fig. 1.14 Clean, non-contaminated, wound over a tibial fracture.

Fig. 1.15 X-ray of the fracture of the tibia and fibula occurring with the wound shown in Figure 1.14.

Fig. 1.16 A severe contaminated wound with much tissue damage.

Fig. 1.17 The fracture associated with the wound shown in Figure 1.16.

Grades 2, 3 and 4: Serious compound fractures. For the casualty officer, all the grades above the first will involve him or her in the initial management only because the definitive primary treatment, which will include debridement and repair and reduction of the fracture, will all take place in the operating theatre (Figs. 1.16 and 1.17).

You will need to arrange blood for transfusion in the more serious compound fractures, and of course restoration of blood volume and blood pressure is essential in these patients, before debridement and treatment of the fracture.

Severe bleeding

Sometimes in association with a compound fracture or a large wound, blood gushes forth from the patient at an alarming rate. What do you do?

Don't panic as almost all bleeding can be stopped by a combination of direct pressure and elevation:

1. Apply a large pad or pads and if the bleeding is from a wound on a limb, then a very firm bandage should be applied. If necessary, put another pad and another bandage on it.
2. Elevate the limb.
3. Start up a drip to replace the lost circulatory volume and organize blood cross matching.
4. If there is still a lot of bleeding, then direct pressure by hand over the wound is your next step.
5. If bleeding is still not controlled, an arterial tourniquet is your next step. Use a blood pressure cuff or pneumatic tourniquet, make sure that it is pumped up above the blood pressure and does not make things worse by being a venous tourniquet.

You will need help from a more experienced colleague especially if this is a main artery and it has to be repaired.

6. Your patient will need strong analgesia if an arterial tourniquet is to be left on for more than a few minutes and you must arrange immediate repair as the limb **is devoid of blood supply** whilst the arterial tourniquet is on. The patient may not be bleeding to death but the limb is dying!

Do not use artery forceps unless the situation is such that no other measure will stop the bleeding. By clamping the end of an important artery you may make direct repair impossible due to the crushing of the artery wall.

7. Once the bleeding is under control and the patient has been transfused, definitive treatment can be arranged.
8. **Do not remove large penetrating foreign bodies in Casualty — you may start torrential bleeding from deep within the wound.**

Tetanus prophylaxis

Prophylactic tetanus toxoid or TIg (Tetanus immunoglobulin — Human) should be given in all compound fractures and indeed in all significant wounds as follows:

(a) Fully immunized patient. If more than one year has elapsed since last dose, give a booster dose of toxoid.

(b) Non-immune or partially-immune patient — give TIg plus a dose of toxoid at a different site. TIg, 250 international units, is normally given i.m. but in severe contamination give 500 i.u.

(c) Complete the course of immunization with further doses of toxoid.

TIg circulates in the body at an effective dose for at least four weeks.

Gas gangerene serum is seldom used as it is felt to be of doubtful efficacy. It is much more important for wounds to be adequately debrided and left open, and for adequate or large doses of i.v. penicillin (or other antibiotics if the patient is allergic to penicillin) to be given in such cases.

ATS (antitetanus serum) is a bovine or equine preparation and has no indication now that TIg is available.