An Outline of Fractures and Dislocations

David Sutherland Muckle

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David Sutherland Muckle MB BS(Dunelm) FRCS MS MD

Consultant Orthopaedic and Accident Surgeon,
Middlesbrough General Hospital, North Tees,
Hemlington and the Cleveland Nuffield Hospitals;
Research Associate, University of Durham;
Fellow of the British Orthopaedic Association and
the British Orthopaedic Research Society;
Medical Adviser and Medical Instructor to the FIFA;
Member of the Medical Committee of the
Football Association, England; formerly Medical
Adviser and Club Surgeon to Oxford United FC,
Middlesbrough FC and Oxford University FC

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Preface

Most students would agree that a textbook should be both interesting and informative, although it is often difficult to enliven the basic scientific literature. In a fresh approach this book has been designed to give a concise visual outline to a subject which relies heavily on observations of movement, posture and deformity as well as those useful albeit limited two-dimensional (black-and-white) photographic shadows called X-rays.

One of the most frequent misconceptions made about orthopaedics is that it is the study of immobility (of bed rest, splints and plasters). Nothing is further from the truth! Those rapid, powerful movements that grace the animal kingdom are the true domain of the orthopaedic practitioner and all treatment has one aim—notably to restore form and function as fully and as quickly as possible.

Remember the triad: diagnosis .:. accurate
treatment ... immediate
duration ... minimum

What is the current state of the art? This book intends to sift through the plethora of facts (both old and new) while encouraging the reader to pause, think and research the literature. It has a broad design—for medical, nursing and fellowship students (as a base), as well as general practitioners, radiographers and physiotherapists.

D.S.M.

Contents

1

An introduction to fractures and dislocations

• Fractures

• ***A fracture is a break in bone continuity***. It is visible on X-rays provided the correct views are taken and more than 60% of the bony tissue is destroyed.

The type of fracture depends upon:

1. The direction of the force.
2. Its magnitude.
3. The strength and elasticity of the bone.
4. The restraining action of surrounding soft tissues.

Let us consider the following X-rays (***Fig.*** 1.1)

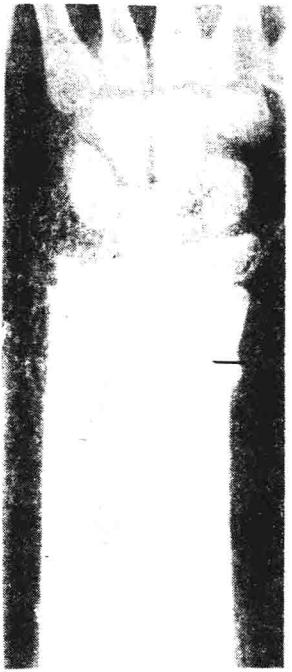
The greenstick fracture of the radius in a child (*Fig.* 1.1*a*) is due to a relatively slight force (a fall on to the outstretched hand) in malleable bones; the comminuted fracture of the tibia (***Fig.*** 1.1*b*) is in a youth with strong bones subjected to a severe force (in this case a motor cycle accident). Little wonder the soft tissues are extensively damaged, although not visible radiologically; while the fractured neck of femur in the aged (*Fig.* 1.1*c*) occurs with trivial force (such as a slip or stumble) in osteoporotic bones. Thus these three X-rays represent a broad spectrum of age, force and fracture requiring a variety of orthopaedic and rehabilitation managements.

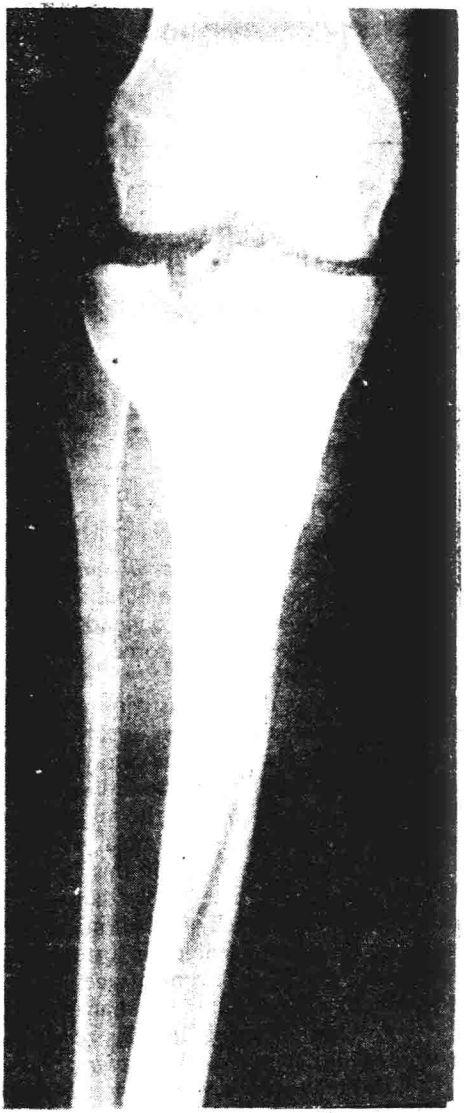
• ***When planning therapy remember the patient (age, occupation and general health) as well as the fracture.***

This may seem a very obvious remark but so often the fractured area and X-rays are subjected to the closest scrutiny to the exclusion of all else.

Forces and Types of Fractures

The force can be *direct or indirect* or a combination of the two. Impact energy is dissipated through the tissues like ripples in a pond. Thus many types of bone and soft-tissue injuries occur.





b

c

Fig. 1.1. ***a***, Greenstick fracture of radius in a child. ***b***, Comminuted fracture of tibia. ***c***, Fractured neck of femur.

Radiological Classification

On radiological grounds alone the following classification is merited (*Fig.* 1.2):

Greenstick	Transverse	Pathological
Compression	Oblique	
Stress	Spiral	
Impacted	Comminuted	
Avulsion	Intra-articular	

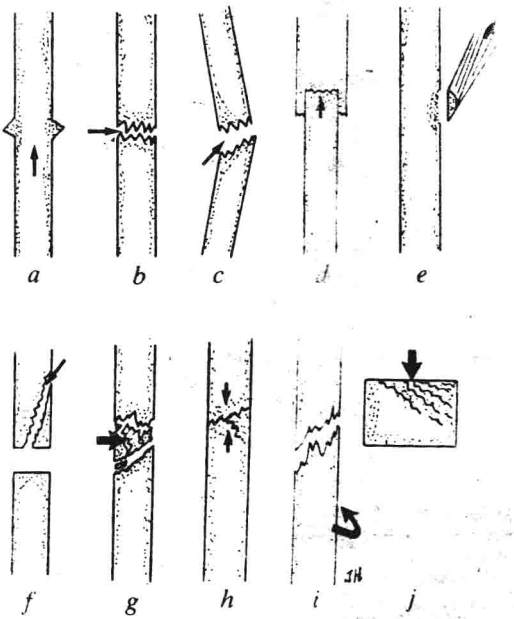
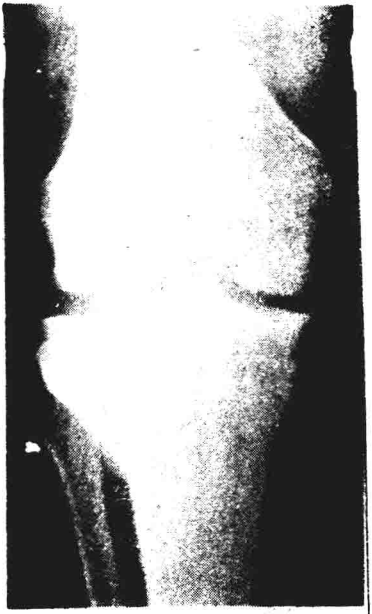


Fig. 1.2. The radiological classification of fractures. *a*, Greenstick. *b*, Transverse. *c*, Oblique. *d*, Impacted. *e*, Avulsion. *f*, Intra-articular. *g*, Comminuted. *h*, Stress. *i*, Spiral. *j*, Compression.



a

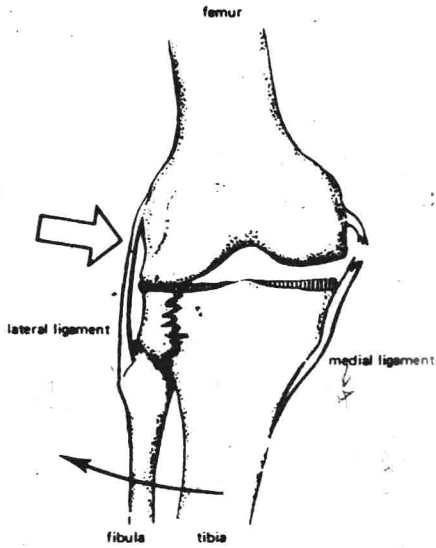


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Fig. 1.3. See text.

Fracture Forces and Soft-tissue Injuries (*Fig.* 1.3)

In *Fig.* 1.3*a* the direction of the tibial plateau fracture indicates a vertical force which on consideration (*Fig.* 1.3*b*) has occurred with either stretching or tearing of the medial ligament complex (*Fig.* 1.3*c*). Other soft-tissue injuries will be described later, especially with regard to dislocations.

Diagnosis

A fracture:

1. Is generally painful.
2. Is associated with loss of function.
3. May have obvious bony deformity.
4. Commonly has associated bleeding and swelling.

• ***Always confirm a fracture with an X-ray and not by eliciting movement or crepitus (a painful procedure that adds to the damage).***

• ***Relate the injury to the magnitude of the forces involved and, if necessary, investigate thoroughly for pathological causes such as tumour*** (*Fig.* 1.4*a*), ***metabolic bone disease (e.g. osteomalacia), Paget's disease*** (*Fig.* 1.4*b*) ***etc.*** (*Fig.* 1.4*c*,*d*).

• ***Look for vessel and nerve injury reflected in the limb below the fracture level; while cord damage must be excluded in even minor fractures of the vertebrae.***

• ***Look for evidence of shock with major long bone or pelvic fractures; as much as 2 litres or more of blood may be lost with femoral and pelvic injuries or when several fractures occur at one time (multiple injuries). Each fracture may lose half a litre into the tissues.***

X-rays

(*The rule of* '2'). X-rays are used to confirm the clinical picture. However, please note that they are only of value if:

1. At least *2* views are taken (usually anteroposterior and lateral) (*Fig.* 1.5*a*,*b*).
2. The whole of the injured area is X-rayed, including *2* joints i.e. above and below the fracture (*Figs.* 1.5*c*,*d*, 5.6, 7.4).
3. A comparison is made with the uninjured limb (i.e. *2* areas), e.g. to find out the normal epiphyseal development in a child's elbow (*Fig.* 1.6).
4. X-rays are taken at *2* different time intervals e.g. in the wrist and femoral head when avascular necrosis due to cessation of the blood supply may not be evident for several months (*Fig.* 1.7).
5. The extent of comminution is greater at surgery than appears on the X-rays (*2* x the damage).
6. And remember that the soft-tissue injuries to muscles, ligaments, tendons and fasciae are not usually visible radiologically unless special films, e.g. arthrograms, are taken (*too* often forgotten).

Ancillary X-rays Investigations

Plain X-rays can be supplemented by special investigations. The most frequently used are shown on pp. 9–11 (*Figs.* 1.8*a–f*, 1.9*a–d*).

Although in its infancy and only available at a few medical centres clinical nuclear magnetic resonance imaging is clearly an important development since the study of protons (and other atomic nuclei, e.g. Na23) in a magnetic field gives pictures of better resolution than CT studies.

Fig. 1.4. Pathological fractures. *a*, Metastatic lesion (breast) in R humerus. *b*, Paget's disease L upper femur. *c*, Unicameral cyst, upper humerus (12 year-old girl). *d*, Fibrous dysplasia lower humerus (20-year-old man).

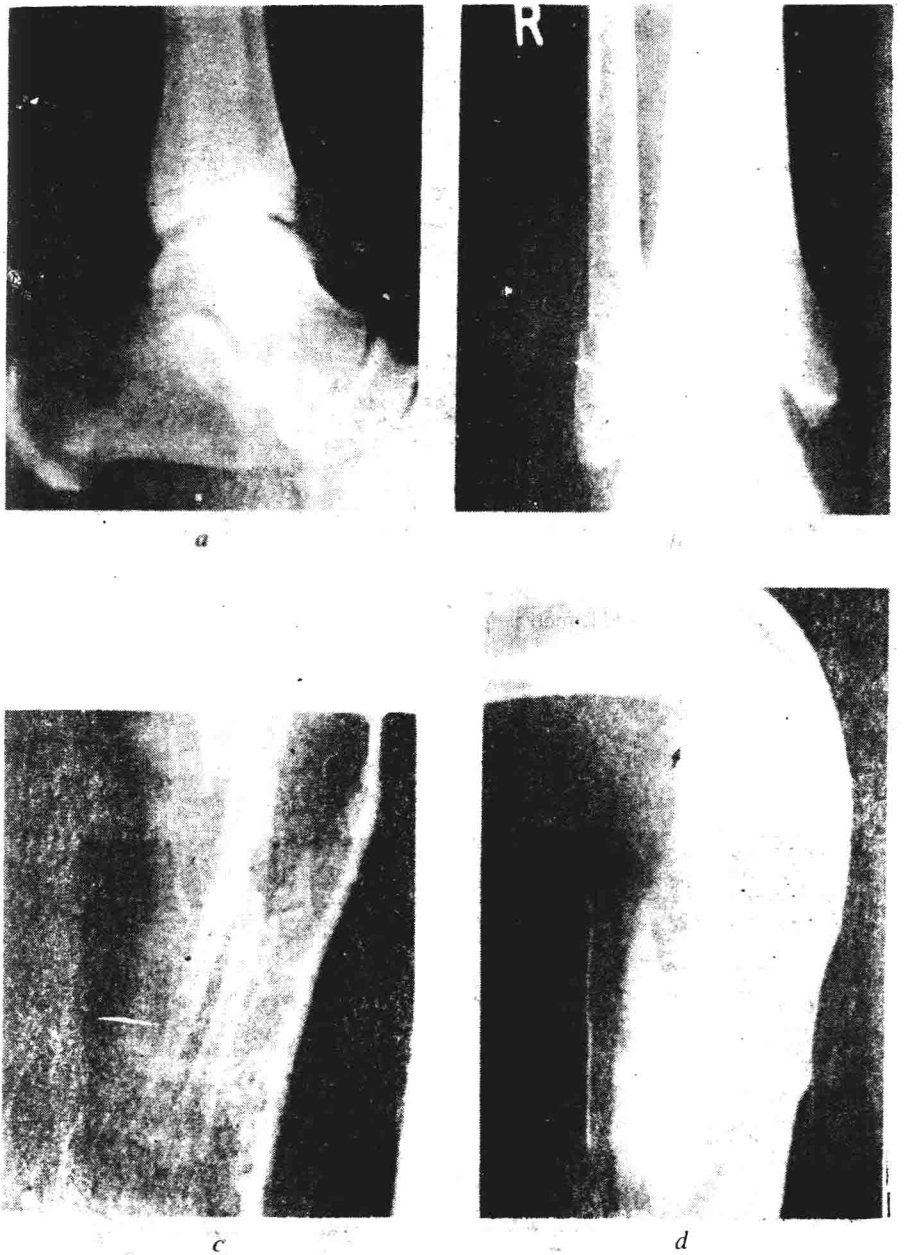
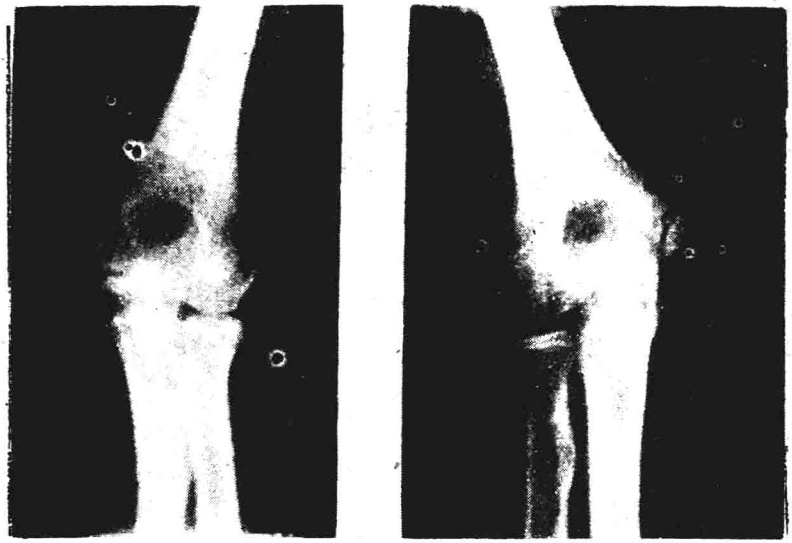


Fig. 1.5. *a*, Lateral view. Ankle appears normal. *b*, AP view shows a fractured lateral malleolus. *c*, A fractured ulna in plaster with elbow not visible (5-year-old). *d*, A fractured radial head missed on the first film.

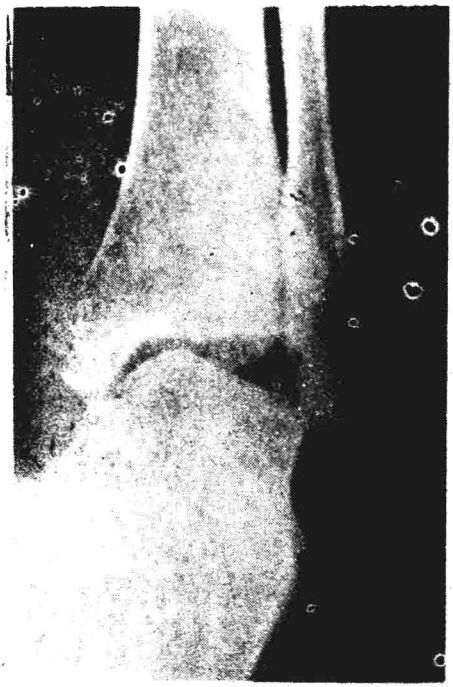


a *b*

Fig. 1.6. ***a,*** A fractured L medial epicondyle (15-year-old) with ***b,*** a comparative film of the other elbow.

a *b*

Fig. 1.7. ***a,*** The first X-ray of a 'sprained wrist' appeared normal. ***b,*** An X-ray 2 weeks later showed a scaphoid fracture.



a

b

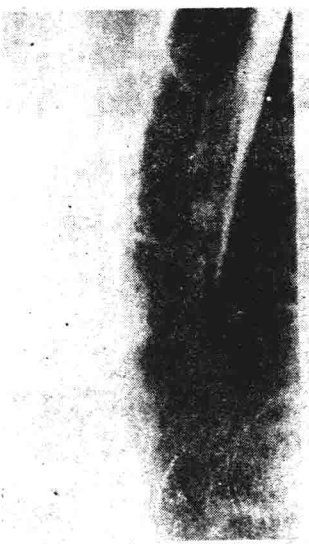
*c*1

*c*2

(*See over for caption*)

*d*1

*d*2

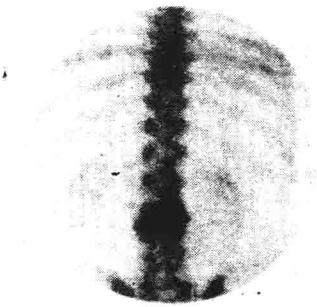


e

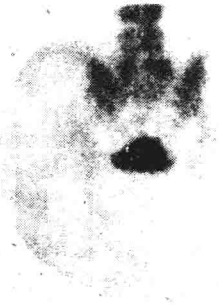
f

Fig. 1.8. ***a,*** A stress film (AP) showing disruption of the lateral ligament complex of the ankle in a young rugby player. *b,* An oblique view of the lower lumbar spine showing a stress fracture of the pes interarticularis of L5 in a soccer player. ***c,*** 1 and 2, Flexion film shows increased anterior movement of the atlas on the axis compared to the extension film (4 mm compared to 2 mm). ***d,*** 1 and 2, Suspected undisplaced fracture of the odontoid process seen on a tomogram. ***e,*** A myelogram showing a complete block due to soft-tissue injury and haematoma in the thoracic spine. *f,* An arthrogram indicates the ruptured lateral ligament of the knee following a tibial shaft fracture in a road traffic accident.

a



L POST. MID. R



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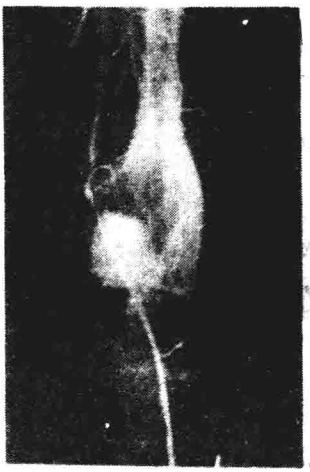

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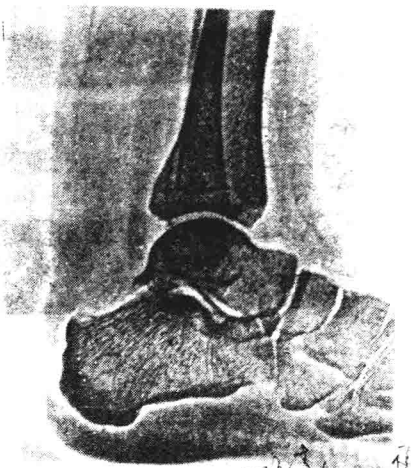
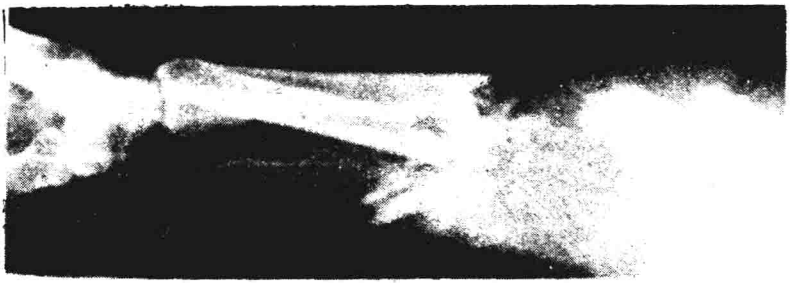


d

Fig. 1.9. ***a***, Computerized tomography (CT) reveals irregular margins of L2 after a crush fracture. No spinal stenosis present. ***b***, Technetium 99 isotope uptake in a pathological fracture of L3 body. ***c***, An arteriogram reveals an aneurysm of the femoral artery following a femoral shaft fracture in an 8-year-old girl, 1 year previously. ***d***, A xerox film showing the soft tissues and bony trabeculae, in this case a chronic thickening of the Achilles tendon in a badminton player.



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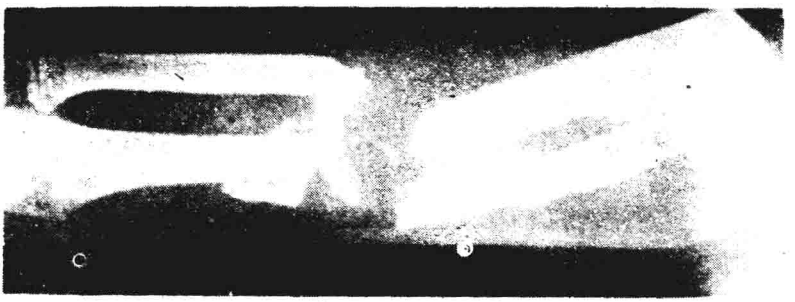

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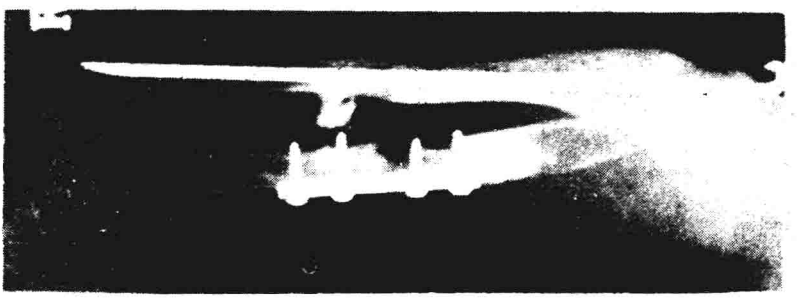

c

Open and Closed Fractures

- A fracture is *closed or simple* when there is no communication between the site of the fracture and the outside of the body.
- A fracture is *open or compound* (and thus much more serious) (*Fig.* 1.10) when there is a wound leading down to the fracture site; thus risking contamination by bacteria.