

Bone structure¹

III. Fractures (general notions)

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Complete fractures: classification

Depending on the direction of the line of fracture, complete fractures are classified as follows:

I - Transversal fractures

Their direction is perpendicular to the longitudinal axis of the bone. They are generally produced by a direct cause or by flexion. The surface of the fracture may be smooth but in most cases it is jagged or irregular. Figure 6 shows these two types of fracture: with a smooth surface (A) and with a jagged surface (B).

II - Oblique fractures

Their direction is oblique to the longitudinal axis of the bone. When the angle of obliqueness exceeds 45°, it is called a "scarfed" fracture. These fractures occur in the large diaphyses and are generally produced by flexion.

III - Spiroidal or helicoidal fractures

The line of fracture is helicoidal. They are produced by torsion and may occur in all long bones.

IV - Longitudinal fractures

Their direction is parallel to the longitudinal axis of the bone and they occur in short, flat bones.

Figure 6 shows: the transversal fracture (A) and (B), the oblique fracture (C), the helicoidal or spiroidal fracture (D), and the longitudinal fracture (E).

Deviation of the fragments

The bone fragments may remain in contact without the slightest deviation occurring,

owing to the intactness of the capsuloligamentous system, the socket, the periosteum, etc. In other cases, deviations may be caused by the action of the traumatising agent and the contractions of the muscles whose tonic balance has been disturbed by lack of osseous support.

Various types of deviation may occur:

A - Angular deviation

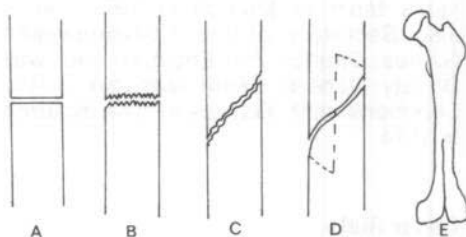
The longitudinal axes of the fragments form an angle.

B - Lateral deviation

The axes involved are parallel and not superimposed. The lateral deviation may be incomplete (B') or complete (B'') as shown in figure 7.

C - Longitudinal deviation

The length of the bone is altered; a shortening may occur as a result of the fragments overlapping (figure 7 C), or a lengthening by diastasis of the fragments (figure 7 D). In certain cases a fragment may penetrate or be forced into another (figure 7 E).



- A - Smooth transversal fracture
- B - Jagged transversal fracture
- C - Oblique fracture
- D - Spiroidal or helicoidal fracture
- E - Longitudinal fracture

Figure 6

¹ See "Olympic Review" since No. 95-96. Published with the kind permission of the Spanish Judo Federation's review.

F - Rotation

This is a peripheral deviation caused by rotation or displacement. The lower fragment is in a position of internal or external rotation in relation to the upper fragment (fig. 7 F).

In figure 7, we can see the various types of deviation of the fragments in the case of complete fractures.

Diagnosis of fractures

In order to diagnose a fracture, we have to base our opinion on a number of symptoms than can be divided up as follows:

1. *Subjective symptoms*; those reported by the patient.
2. *Objective symptoms*; those observed by the doctor.

Subjective symptoms

Antecedents of the traumatism

The circumstances of the traumatism are reported by the patient himself or, in some cases, by witnesses.

Cracking

Noticed by the patient at the time of the accident, when the fracture occurred.

Acute pain

A constant symptom that grows worse with any attempts at movement in the neighbourhood of the fracture. Examinations must be carried out with the greatest care, by exerting only light pressure with the fingertips at the suspected point of fracture, or in the case of long bones, by striking one end of the bone in a longitudinal direction. For example, if we suspect a fracture of the tibia, we tap on the heel.

Objective symptoms

Functional impotence

This is also a subjective symptom, the subject being unable to move the injured part.

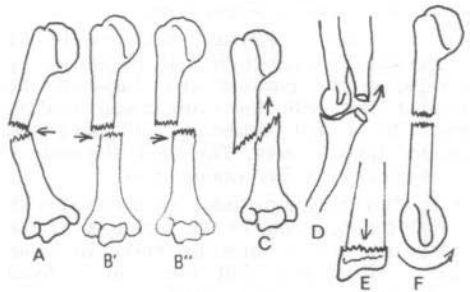
However, a type of fracture exists in which, the bone fragments having been forced into each other, movement may occur and lead to an error of diagnosis. Functional impotence is therefore to be considered in conjunction with the pain and the breaking of the bone.

Deformity

Caused by the swelling of the flesh and the deviation of the fragments, this shows up clearly on examination, especially when compared with the corresponding symmetrical part of the body. In certain fractures the deformity is typical and contributes to a specific diagnosis. The deformity is verified by palpation.

Abnormal mobility

A pathognomonic symptom (i.e. leaving no doubt of fracture) when it exists. In frac-



- A - Angular deviation
- B - Lateral deviation
- B' incomplete
- B'' complete
- C - Deviation with shortening through overlapping
- D - Deviation with diastasis
- E - Penetration
- F - Rotation

Figure 7

tures in which the fragments are forced into each other, abnormal mobility may not exist.

Crepitation

This is produced by the ends of the bone fragments rubbing together, one fractured surface against the other. The crepitation should never be explored except by a doctor, in the rare cases where warranted, as there is great danger of causing injuries to soft parts, vessels, nerves, etc., by the movement of exploration.

Bruising and haematomas

Bruising, seldom an early symptom, is of little value in the diagnosis of a recent fracture. For the same reasons, a haematoma, which is not constant, is also of little help.

General signs

In cases of fractures, one generally notices a slight hyperthermia, and analytical examination shows a leucocytosis.

To sum up, a fracture can usually be diagnosed by inspection and palpation, by comparing the position and shape of the injured part with the symmetrical healthy part. It is not necessary to move the injured limb or area. *The final diagnosis is confirmed by X-Ray examination.*

A fracture may sometimes be confused with a dislocation, owing to the similarity of the symptoms, but it must be borne in mind that a dislocation will result in a fixed position of the joint which can only be remedied by suitable manoeuvring, while an abnormal position of a fracture is easy to correct.

It is important to remember that *in dislocations there is an abnormal state of immobility and in fractures an abnormal state of mobility!*

Complications caused by fractures

When a fracture occurs, the teguments and the skin, the vessels, nerves, muscles, joints,

etc., may be damaged and there may be marked repercussions on the patient's general condition, with various complications, in addition to any after-effects that might remain.

While many traumatisms do not go so far as to cause a bone to break, they often cause damage in the surrounding membrane called the *periosteum*, resulting in a very painful condition of "traumatic periostitis". This occurs mainly in bones with little muscular protection, like the tibia for example.

In children, the periosteum is very thick and lesions to it are rare. This explains why, in spite of a bone fracture, there is very often no deviation of the fragments. These are known as subperiosteal fractures, halfway between complete and incomplete fractures.

In the case of *subperiosteal fractures*, the bone is fractured over the whole of its width, but the periosteum resists and remains intact, keeping the fragments in contact like a collar, thus avoiding any deviation. Such fractures, occurring only in children, heal quickly and easily.

Treatment of fractures

How to treat a fracture will be discussed when we come to the subject of first aid. It should however be said here and now that the most important thing is to *immobilise the fracture* by means of splints or if these are not available, by using straps, bands or handkerchiefs. It should not be forgotten that the *two joints on either side of the fracture must be immobilised*, taking care all the time to move the injured person as little as possible. As soon as possible afterwards, the patient must be handed over to the care of a doctor.

A.C.T.

(to be continued)

