

Short Communication

Classifications of Broken Bones

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Over time, attempts have been made to unify the way of communicating between orthopedists, without the need to directly see the patient's image studies or clinical presentation, as well as to create a way to define etiology, treatment or talk about the prognosis according to the type of fracture. Classification systems emerged from this need and although there are inter-observer differences, these are useful tools which will be unified in the following review.

ABBREVIATIONS

AO: Arbeitsgemeinschaft für Osteosynthesefragen (German for "Association for the Study of Internal Fixation", or AO

INTRODUCTION

A fracture is defined as a disruption in the continuity of the bone and cover a large spectrum of possible situations, from an undisplaced stress fracture of metatarsal to an open multisegmentary humerus fracture with nervous involvement [1].

Even in the earliest written surviving medical text, the Edwin Smith Papyrus, there was a rudimentary classification of fractures. That served to characterize the fracture and to guide the treatment; these are two goals of modern classification systems as well [2].

All systems of fracture classification have served numerous purposes: To characterize fractures according to certain general and specific features, to guide fracture treatment, and to predict outcomes of fracture care [3].

The classification of fractures can be described in terms of characteristics [4]

- **Etiology:** Cause
- **Morphology:** Fracture pattern
- **Severity:** Involvement of soft tissue or a joint
- **Location:** Part of the bone affected
- **Displacement:** Relation between fragments of bone

Etiology:

- **Traumatic:** Result of forces applied to the bone by a direct/indirect mechanism
- **Pathological:** Result of a low energy mechanism in an abnormal/diseased bone
- **Insufficiency:** Result of a low energy in a bone with a decreased mineral density

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- **Fatigue:** Result of cyclical forces with excessive frequency [5].

Morphology:

- **Transverse:** $<30^\circ$ by a direct force applied to the bone
- **Oblique:** $>30^\circ$ by a direct force applied to the bone
- **Spiral:** By an indirect rotational force
- **Multisegmentary:** Defined as a presence of 3 or more segments of bone
- **Avulsion:** Caused by traction of ligament, tendon or capsular insertion
- **Impaction:** When bone fails in axial compression

Severity:

- **Open fractures:** See Table 1
- **Intraarticular:** the fracture disrupts the articular surface.
- **Comminution:** A high-energy injury and associated with musculoskeletal damage

Table 1: Gustilo & Anderson Clasification for Open Fractures.

Fracture Type	Wound	Contamination	Soft-tissue Damage	Others
I	<1cm	Minimal	Mild	
II	>1cm	Moderate	Moderate	
IIIA		Substantial	Severe	Coverage adequate
IIIB		Substantial	Severe	Coverage inadequate
IIIC				Arterial injury requiring repair

Thoracolumbar fractures

The classification system described here exists in order to provide surgeons from different institutions with a common language to discuss various injuries. It provides consistency in injury diagnosis and treatment. The AO Spine thoracolumbar fracture classification system aims to achieve international acceptance.

Type C injuries are segmental injuries. They involve an interruption or separation of both the anterior and posterior components of the vertebral segments. The disruption of the anterior component may be through the disk or vertebral body. The disruption of the posterior elements may be through the spinous process, lamina, pars interarticularis, or posterior ligamentous complex. Type B determines if there is a tension band injury to the spinal column. The presence of a vertebral body fracture can be seen in B and C type injuries. Type A fractures are injuries without posterior wall injury.

Ankle fractures

Niel Lauge-Hansen develop an ankle fracture classification based on foot position at the time of the traumatic event (supination or pronation) and the direction of the deforming forces (abduction, adduction, or external rotation).

Lauge-Hansen created four categories and 13 subgroups of ankle fractures based on his study.

Hip fractures

According to the Tronzo classification system, fractures of types I and II are considered stable while the unstable are the types III, variant, IV and V. Instability criteria of trochanteric fractures included reverse obliquity, posteromedial comminution and sub-trochanteric extending.

CONCLUSION

Fracture classification systems are highly useful for describing patterns; this has been one of the best uses for systems. Using a well-known fracture classification to describe a fracture to an orthopedist or colleague who cannot immediately view the fracture radiographs should bring about in the orthopedist a visual image of the fracture. That enhances communication between orthopedic physicians.

Fracture classification systems are also useful as educational tools.

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