

HGLS classification for proximal humeral fracture

– based on Codman and LEGO™

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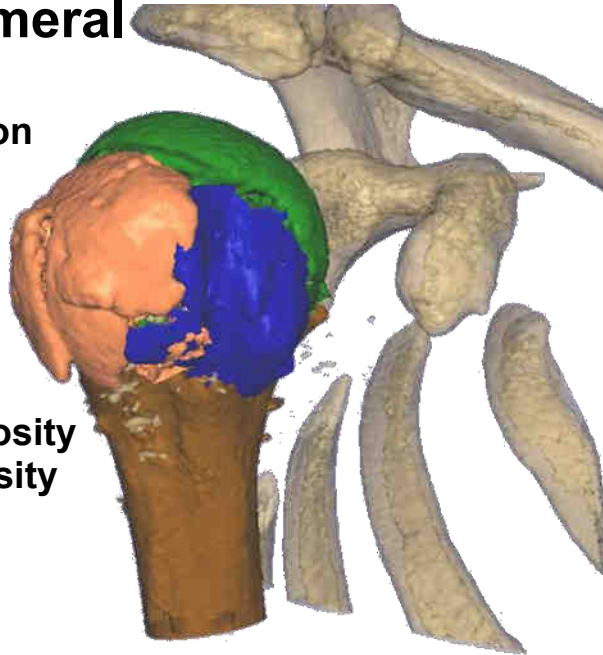
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Proximal Humeral Fractures

Fracture description relating to parts and fracture plane

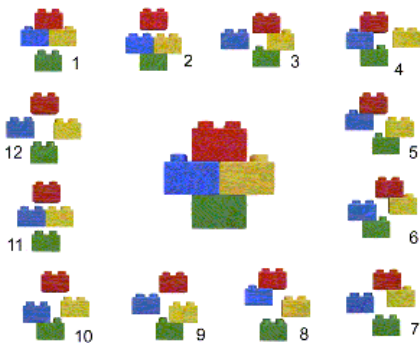
H – Head
G – Greater Tuberosity
L – Lesser Tuberosity
S – Shaft

“-” fracture plane



(modified from Hertel)

To plan a humeral fracture management strategy, an understanding of the fracture morphology is required. Contemporary classifications are compromised by a failure to precisely define the boundaries between the various fracture patterns and by the fact that a considerable number of fractures do not fit into any of the described patterns. Descriptions are often confusing, generally require the recall of a numerical list, have poor inter-observer reliability and do not usually provide useful guidance for management or prognosis.



Hertel introduced a classification system based on a binary decision process regarding five basic fracture planes, and from this, a combination of fracture patterns can be represented using LEGO™ blocks. Additional descriptors such as the length of the medial metaphyseal extension and the integrity of the medial hinge were the most relevant predictors of humeral head ischemia, which provided to the classification system with strong prognostic decisional elements.

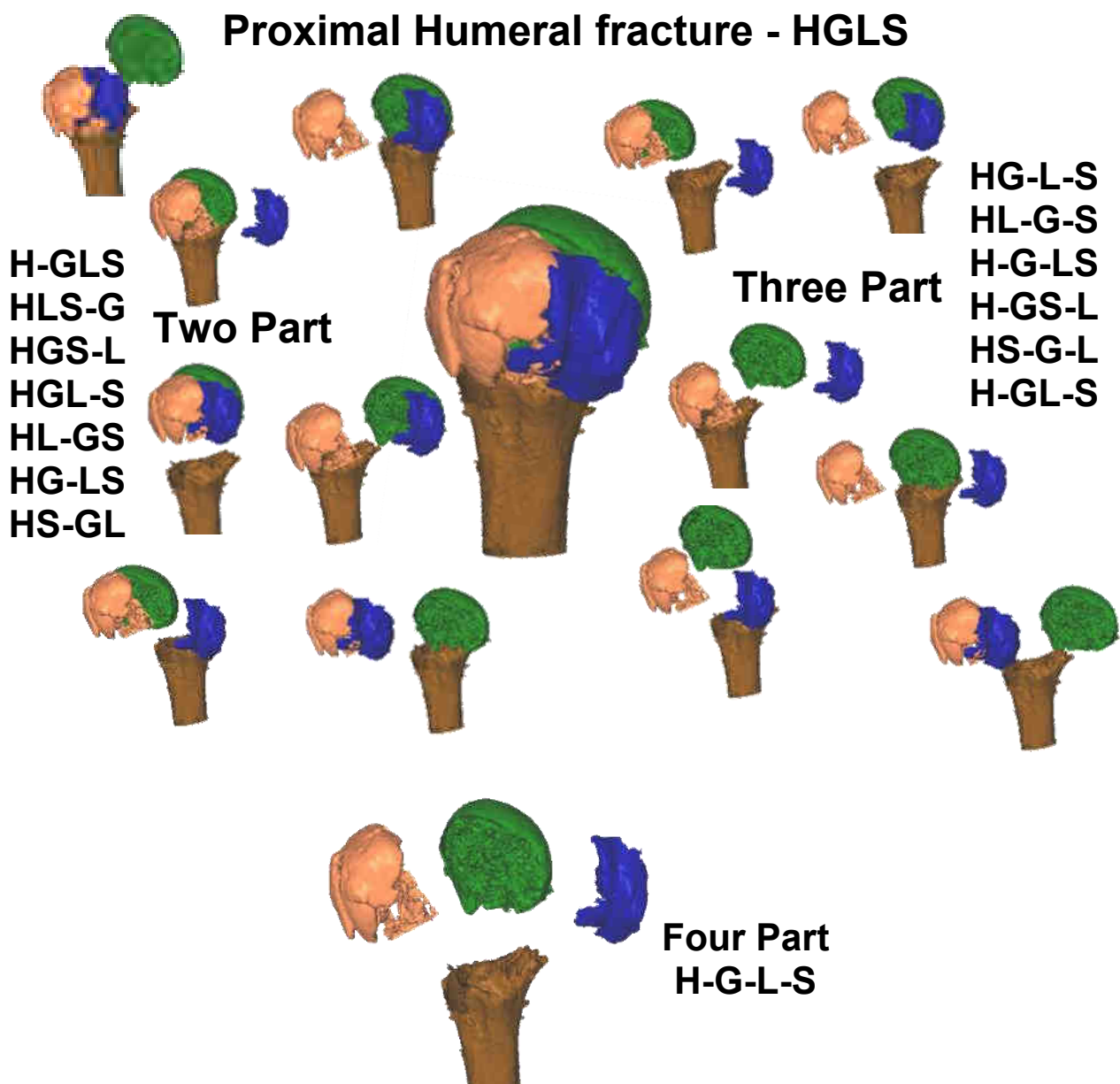
Hertel binary fracture classification

To expand the LEGO™ pattern of fracture representation, a clinically more appealing version was developed, which does not require memorization of 12 basic LEGO™ fracture patterns. It was based on the possible (mathematical) combination of fragments, and in addition to “Hertel’s LEGO™ system” it allows for two additional, although extremely rare, patterns, thus being truly comprehensive.

We called it the HGLS Classification where H stands for head, G for greater tuberosity, L for lesser tuberosity and S for shaft. The fracture plane is denoted by a “-“. For example: an anatomical neck fracture is H-GLS, a lesser tuberosity fracture HGS-L, and a four-part fracture is H-G-L-S. By adding descriptors of head dislocation (dH) and head splitting (latH / medH) as well as the length of the medial metaphyseal extension, the integrity of the medial hinge, and the amount of displacement of the fragments, the fracture pattern can be precisely identified. The system is open-ended and does not require the recall of a numerical list. Additional information can be added when further research and knowledge on the theme will make it necessary.

By using 3D image creation, the proximal humeral fracture can be better defined and the basic fracture planes and the fragments identified - particularly those critical to maintain humeral head vascularity.

An improved appreciation of the fracture morphology using 3D imaging information can be used to precisely classify the fracture using the HGLS system and assist in the planning of the reduction and fixation strategies.



Head Fracture pattern modifiers:

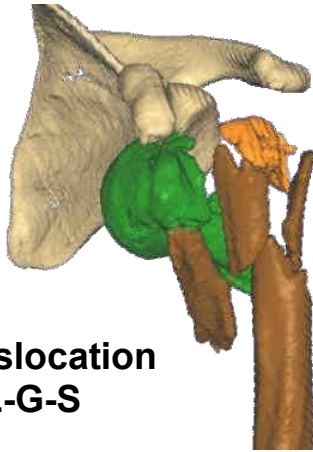
dH – dislocation of head

med / lat / ant / post – head splitting fragments

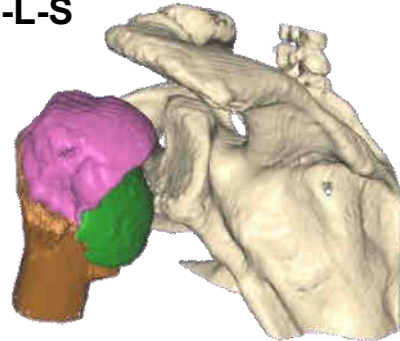
H(c10) – length of calcar in mm

H(a45) – angle of head from normal head–shaft angle

e.g. H(c10,a40)-L-GS, dH-GLS, dmedH-latHG-L-S



Head Dislocation
dHL-G-S



Head splitting
medHL-latHG-S

“The HGLS system provided a more reliable description of fractures of the proximal humerus compared with the Neer and AO systems.”

Reference:

Sukthankar AV, Leonello DT, Hertel RW, Ding GS, Sandow MJ.

A comprehensive classification of proximal humeral fractures: HGLS system.

J Shoulder Elbow Surg. 2013 Jul;22(7):e1-6. doi: 10.1016/j.jse.2012.09.018.

Predictor of Humeral Head Ischaemia

“Strongly predictive” basic fracture patterns for humeral head ischaemia:

Hertel LEGO™ system

0.7 for combined types 2,9,10,11,12

0.67 for Four-part fractures

HGLS system (directly matches Hertel LEGO system)

H-GLS 2 part

H-GS-L 3 part

H-G-LS 3 part

H-L-GS 3 part

H-G-L-S 4 part

Reference:

Hertel R, Hempfing A, Stiehler M, Leunig M. Predictors of humeral head ischemia after intracapsular fracture of the proximal humerus.

J Shoulder Elbow Surg. 2004 Jul-Aug;13(4):427-33.)