

# Biomechanical assessment of paediatric supracondylar humeral fracture fixation constructs: a retrospective cohort study

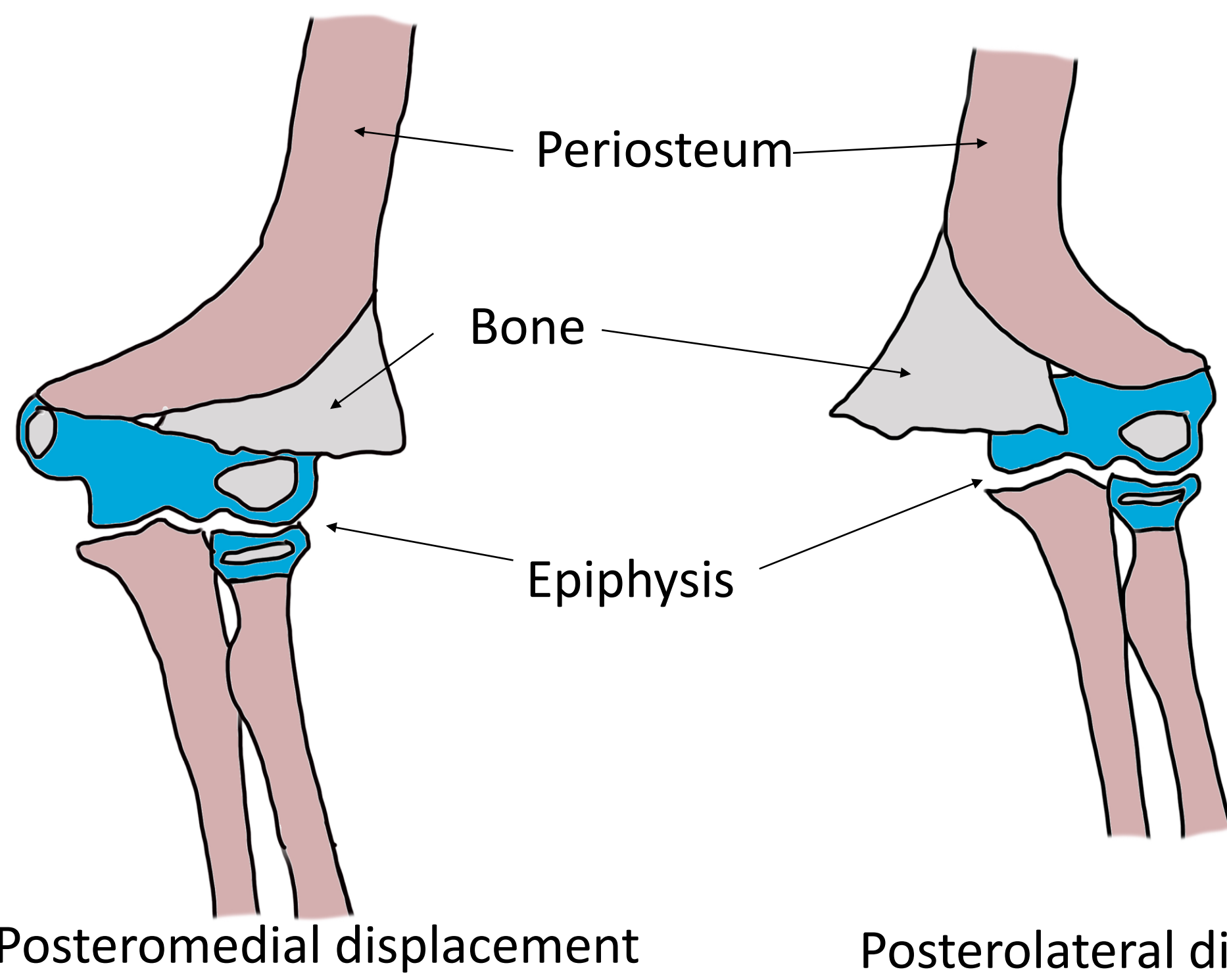
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## Introduction

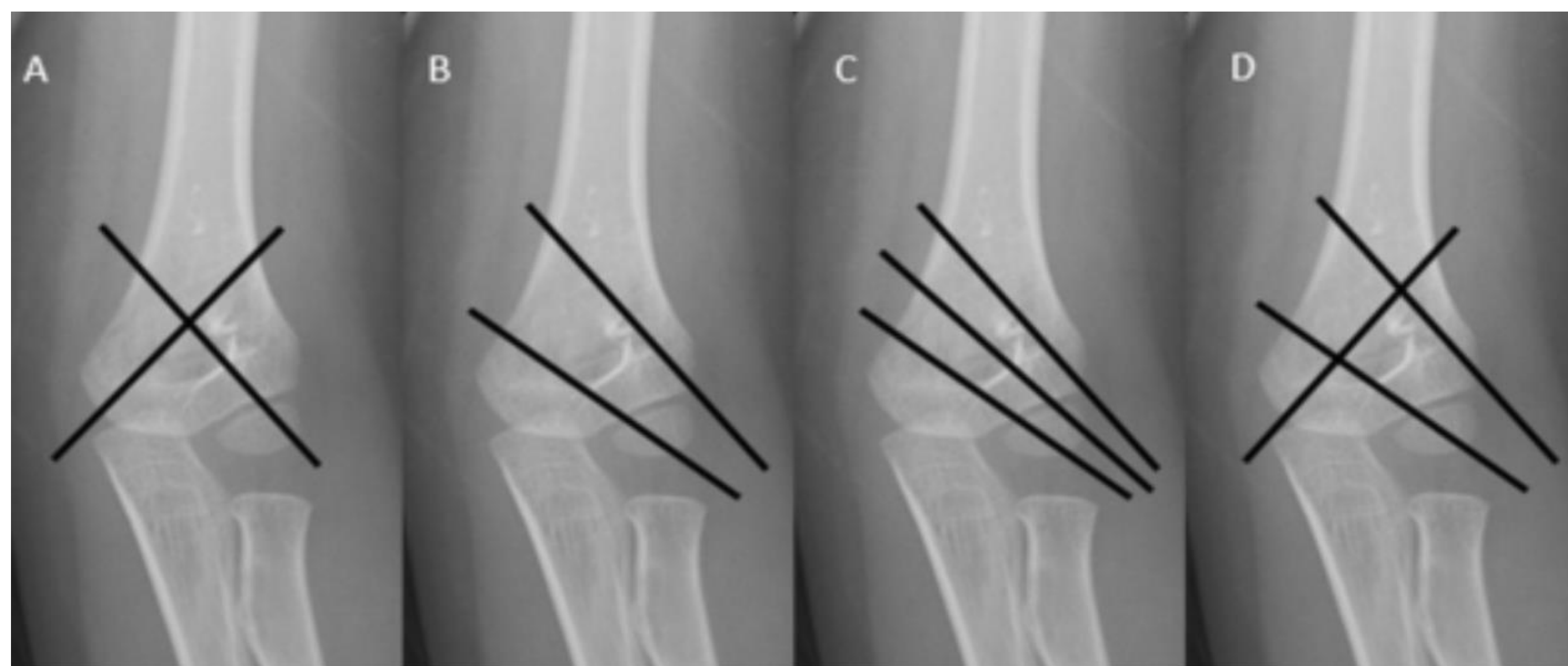
- BOAST recommends lateral wiring where possible to avoid iatrogenic ulnar nerve injury.
- Aims of study:
  - To review fixation constructs in Gartland 3 fractures, assessing for radiographic instability at follow up.
  - To explore the theories presented by Prusick *et al.* regarding fixation of posterolaterally displaced supracondylar humerus fractures.[ 1 ]

## Background

This schematic shows the difference between the direction of displacement, with regard to the medial and lateral periosteum, which is partially torn as the fracture displaces. Posteromedial fractures should have intact medial periosteum and vice versa for lateral.



As the fracture is reduced, the intact periosteum is also reduced and contributes to stability on the side that is intact. 2mm K wires should be used in any one of the following configurations to provide stability. A knowledge of the intact periosteum theory allows the surgeon to understand why some fractures are a challenge to fix with lateral wire constructs (B and C).



## Methods

- An OPERA search identified all paediatric supracondylar humeral fractures treated operatively in NHS Tayside between 2012-20.
- Radiographs were classified by 3 surgeons including the posterolateral or posteromedial modifier to the Gartland classification (Rockwood and Wilkins).
- Primary outcome was defined as rotational instability seen on post op Xray.

## Results

98 Gartland 3 Supracondylar humerus fractures

### Posteromedial Gartland 3 fractures

Lateral only wires – 3/12 cases showed rotation in clinic  
 Crossed wires – 0/34 cases showed rotation in clinic  
 All 3 that failed had technical errors e.g. wires through fracture site or comminution

### Posterolateral Gartland 3 fractures

Lateral only wires – 16/18 cases showed rotation in clinic  
 Crossed wires – 6/34 cases showed rotation in clinic

## The shelf analogy

1) These are widely spaced brackets making it a strong shelf



2) This shelf will fail because there is no bracket on the medial side. Similar to lateral only wiring if you place both of your wires into the lateral humeral column.



3) **Posteromedial** - In most posteromedial fractures, the medial periosteum will be intact, which makes up for the lack of a bracket, meaning this shelf will now work fine.



4) **Posterolateral** - In posterolateral fractures, the periosteum is intact on the lateral side, but not on the medial side, leaving the medial side exposed and likely to be unstable.



5) **Posterolateral** - You can still counter this, by placing your bracket/wire as far medial as you can. If the very lateral part of the medial distal humerus is comminuted, this wire may have insufficient hold and a medial wire may be required.



## Conclusions

- **Posteromedial** Gartland 3 fractures will remain stable as long as lateral wires are performed without technical errors. Lateral only wires should be the gold standard treatment in these fractures.
- **Posterolateral** fractures have a high chance of instability with lateral only wiring, which can be used with care. We would recommend intraoperative screening and the use of a medial wire if lateral wires alone do not confer a stable construct.