

## Metacarpal Fractures

### Leave, Wires or Plate

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12th Southampton Hand Course  
for Therapists and Surgeons  
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UNIVERSITY OF  
**Southampton**  
School of Medicine

University Hospital Southampton   
NHS Foundation Trust

## Summary

- ☞ Principles of treatment
- ☞ Options available
- ☞ Metacarpal Neck Fractures
- ☞ Metacarpal shaft fractures
- ☞ Informed Consent

### ☞ Covering

- Neck
- Shaft

### ☞ Not Covering

- Base
- Head



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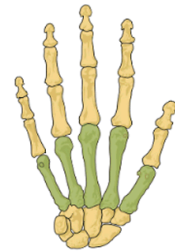
## Principles of Treatment

- ☞ Reduce Pain
- ☞ Early mobilisation
  - Tendon glide
  - Maintain intrinsic function
- ☞ Promote Union
- ☞ Excellent long term function
- ☞ Avoid complications



## Restore anatomy

- ☞ Metacarpal function
  - Stable platform connecting mobile wrist and fingers
  - MCPJ and CMCJ
  - Muscle attachment
    - Interossei
    - Adductor pollicis



## Consequences of altered anatomy

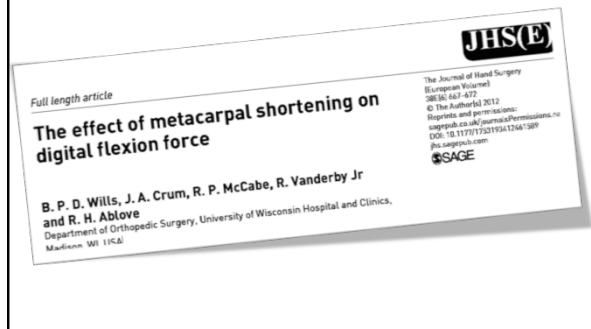
- |  |  |
|--|--|
| <ul style="list-style-type: none"> <li>☞ Reduced shaft length                             <ul style="list-style-type: none"> <li>▪ Weakness</li> <li>▪ Extensor lag</li> <li>▪ Cosmesis</li> </ul> </li> <li>☞ Head Angulation                             <ul style="list-style-type: none"> <li>▪ Weakness</li> <li>▪ Cosmesis                                     <ul style="list-style-type: none"> <li>• Dropped knuckle</li> </ul> </li> <li>▪ Stone in Palm                                     <ul style="list-style-type: none"> <li>• Index MC head</li> </ul> </li> <li>▪ Reduced grip</li> </ul> </li> </ul> | <ul style="list-style-type: none"> <li>☞ Shaft angulation                             <ul style="list-style-type: none"> <li>▪ Weakness</li> <li>▪ Hyperextension of MCP</li> <li>▪ Cosmesis</li> <li>▪ Angular deformity</li> <li>▪ Rotational deformity</li> </ul> </li> </ul> |
|--|--|



## Short metacarpal *Extensor lag*



## Short metacarpal *loss of flexion force*



## Angular shaft deformity *MCP hyperextension*



## Rotational Deformity



## Dropped Knuckle

## Does malunion really matter?

Westbrook, Davis, Armstrong, Burke (2008) *The Clinical Significance of Malunion of Fractures of the Neck and Shaft of the Little Finger* J Hand Surg Eur Vol 33 732-739

- 252 fractures
  - 218 non-op
  - 44 surgery
- MC Neck
  - No difference
  - operated (n=18)
  - conservative MC neck (n=105)
- MC shaft
  - Operated (n=26)
  - had worse DASH and worse cosmesis
  - non-operative (n=113)



## Orthobullets

### General Treatment

- Nonoperative
  - immobilization
    - must be stable pattern
    - no rotational deformity
    - acceptable angulation & shortening (see table)

	Acceptable Shaft Angulation (degrees)	Acceptable Shaft Shortening (mm)	Acceptable neck Angulation
Index & Long Finger	10-20	2-5	10-15
Ring Finger	30	2-5	30-40
Little Finger	40	2-5	50-60

- Operative
  - operative treatment
    - general indications
      - intra-articular fxs
      - rotational malalignment of digit
      - significantly displaced fractures (see above criteria)Ⓢ
      - multiple metacarpal shaft fractures Ⓢ
      - loss inherent stability from border digit during healing process
    - postoperative
      - early motion is critical
      - remove pins/ cast at ~ 4 weeks

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## Options

### ☞ Non-operative

- early mobilisation
- neighbour splint
- solid splint



### ☞ Surgery

- percutaneous wires
- intramedullary wires
- IM screws
- plates and screws
- Intraosseous loops
- Ex fix





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## Indications Metacarpal neck

- ☞ index and middle
  - 10-15
  - Fixed CMCJ
- ☞ ring
  - 30-40
- ☞ little
  - 50-60
  - Mobile CMCJ
  - Hyperextensible MCPJ



## Boxer's Fracture Neighbour strap or brace?

### THE USE OF A MOULDED METACARPAL BRACE VERSUS NEIGHBOUR STRAPPING FOR FRACTURES OF THE LITTLE FINGER METACARPAL NECK

I. J. HARDING, D. PARRY and R. L. BARRINGTON

*From the Department of Trauma and Orthopaedics, Kettering General Hospital, Kettering, UK*

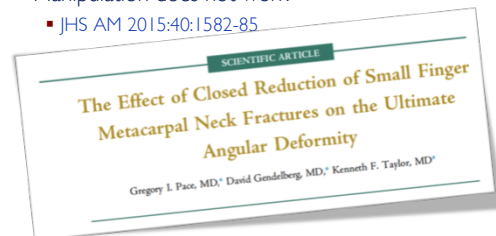
Seventy-three patients with fractures of the neck of the little finger metacarpal were randomized to treatment with a moulded metacarpal brace or neighbour strapping. Sixty-five of these attended for follow-up at 3 weeks. Both treatment modalities permitted a functional range of movement, but patients treated with the metacarpal brace had significantly less pain than those treated with neighbour strapping, and this facilitated an early return to work.

*Journal of Hand Surgery (British and European Volume, 2001) 26B: 3: 261-263*



## Non-operative

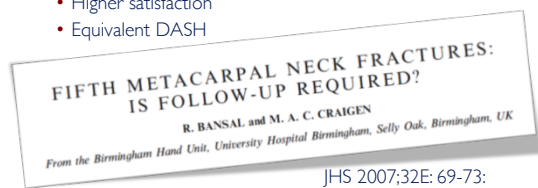
- ☞ Immediate mobilisation
  - No splint
- ☞ Manipulation does not work
  - JHS AM 2015;40:1582-85



## Non-operative for 5<sup>th</sup> MC neck

### 78 patients

- Plaster and follow up
  - RTW 5 weeks
- Neighbour strap, info sheet and discharge
  - RTW 2.7 week
  - Higher satisfaction
  - Equivalent DASH



I would not recommend

distal plates

transosseous wires .



## Distal plate



- ☞ Impinges on head
- ☞ Prevents hyperextension

Facca et al 2010 *Fifth metacarpal neck fracture fixation: Locking plate versus K-wire*  
Orthop Traumatol Surg Res. 96:506-12

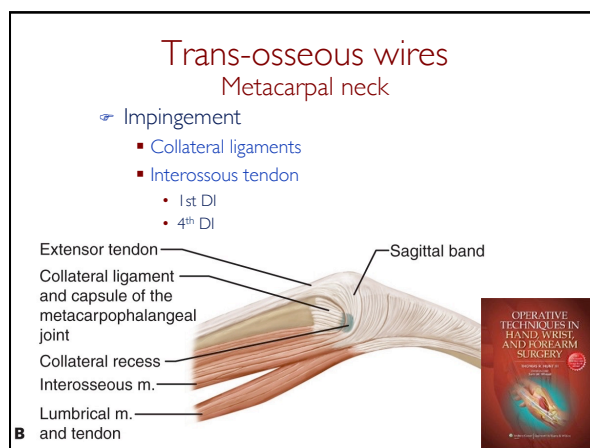
### Patients

- Non randomised
- 18 locking plates vs 20 IM wires

### Outcomes

- Flexion 59% plate vs 98 % wires
- Extension 89% plate vs 99% wires





### Intramedullary wires

- ☞ Recommended for neck fractures
- ☞ Percutaneous
- ☞ Stable
- ☞ Avoid impingement
  - Collateral ligaments
  - 1<sup>st</sup> and 4<sup>th</sup> Dorsal interosseous

Foucher G, et al (1976) A new technique of osteosynthesis in fractures of the distal 3d of the 5th metacarpus Nouv Presse Med. 5: 1139-40

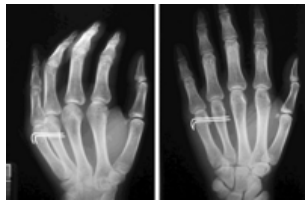
### Which is best

Leave *or* Bouquet IM wires *or* transverse pins?

- ☞ Non-operative
  - probably better or maybe equal to IM wires
- ☞ IM wires
  - probably better or maybe equal to transverse wires
- ☞ Plates
  - worse than wires

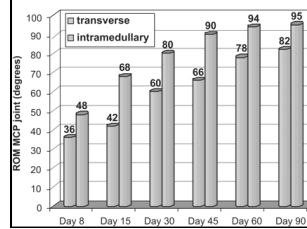
- Wong et al (2006) Comparison between Percutaneous Transverse Fixation and Intramedullary K-Wires in Treating Closed Fractures of the Metacarpal Neck of the Little Finger J Hand Surg Eur 31 61-65

- 59 cases, non randomised, 24 months review
- no difference in outcome



Winter M, et al (2007) . Surgical treatment of the boxer's fracture: transverse pinning versus intramedullary pinning. J Hand Surg Eur 32: 709-13

- N=36
- Clinical and radiological outcomes
- Better ROM for IM wires



Full length article

### Isolated, extra-articular neck and shaft fractures of the 4th and 5th metacarpals: a comparison of transverse and bouquet (intra-medullary) pinning in 67 patients

I. N. Sletten

Department of Orthopaedics, Oslo University Hospital, Oslo, Norway

- Equivalent
  - ROM, qDASH, grip
- High complication rate
  - 12% superficial infection (all PQ wires)
  - 39% impaired skin sensation

JHS(E)  
The Journal of Hand Surgery  
(European Volume)  
37E(3) 387-395  
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sagepub.co.uk/journalsPermissions.nav  
DOI: 10.1177/1753193411431048  
jhs.sagepub.com  
SAGE

### Splint or IM wires?

Strub et al (2010) Intramedullary splinting or conservative treatment for displaced fractures of the little finger metacarpal neck J Hand Surg Eur 39. 725-729

- N=44
- 30 to 70 degree angulation
- Non randomised
  - Splint or IM wires
- Mobilised at 2 weeks
- No difference in ROM at 2, 6, 12 weeks
- Better aesthetics and satisfaction in surgical group



# Conservative treatment has comparable outcome with bouquet pinning of little finger metacarpal neck fractures: a multicentre randomized controlled study of 85 patients

I. N. Sletten<sup>1</sup>, J. C. Hellund<sup>2</sup>, B. Olsen<sup>1</sup>, S. Clementsen<sup>3</sup>,  
H. D. Kvernmo<sup>4,5</sup> and L. Nordsletten<sup>1,4</sup>

## Abstract

Current literature gives few guidelines regarding indication for operative treatment of little finger metacarpal neck fractures, and some surgeons choose operative treatment when the palmar angulation exceeds 30°. The objective of this study was to determine whether conservative treatment produces comparable outcomes with bouquet pinning in a randomized, controlled trial. Eighty-five patients with little finger metacarpal neck fractures with  $\geq 30^\circ$  palmar angulation in the lateral view were included. Patients were randomized to two groups: conservative treatment without reduction of the fracture (43 patients); and closed reduction and bouquet pinning (42 patients). After 1 year, there were no statistical differences between the groups in QuickDASH score, pain, satisfaction, finger range of motion, grip strength, or quality of life. There was a trend versus better satisfaction with hand appearance ( $p=0.06$ ), but longer sick leave ( $p<0.001$ ) and more complications ( $p=0.02$ ) in the operative group.

Level of evidence: Level 2

The Journal of Hand Surgery  
(European Volume)  
2015, Vol. 40E(1) 74-83  
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sagepub.co.uk/journalsPermissions.nav  
DOI: 10.1177/1753193414560119  
jhs.sagepub.com  
**SAGE**

## My recommendation metacarpal neck fractures

- ☞ Index and middle finger
  - less than 15 degrees
  - non-operative
- ☞ Little finger
  - Almost always leave alone
  - If surgery: Intramedullary wires
  - never transverse wires or plate

Little



Index



## Summary

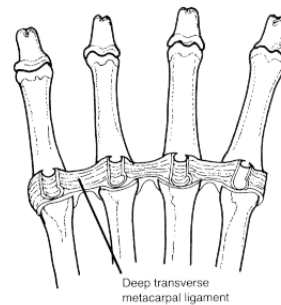
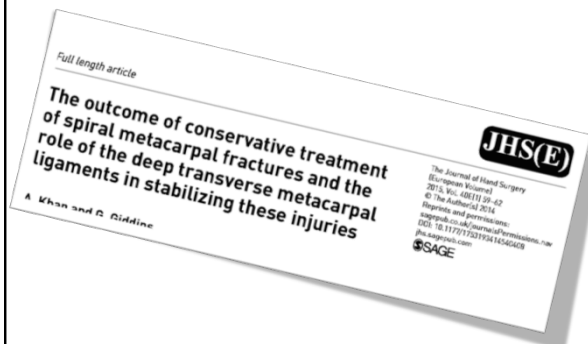
- Principles of treatment
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- Metacarpal neck Fractures
- Metacarpal shaft fractures
- Informed Consent

## Non-operative treatment

Do not use these Splints  
Fulcrum!



## Non-operative care



## Earliest return to function

### Athletes

- Goalie vs Stryker

### Non operative or operative



## Metacarpal fracture

### Case

- 28 year old
- Premiership and international Goalkeeper
- Fall in training
- Oblique 3<sup>rd</sup> metacarpal fracture

### Options

- non-operative
- operative

### Risk Avoidance

- Informed MDU
- Polled 5 colleagues (Bolam, Bolitho)
- Discussed with patient all options and all risks (Montgomery)



## Non-operative

### Advantage

- can see callus
- no risk of surgical complication
  - infection
  - metalwork impingement
  - non-union

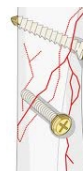
### Early movement

### No splint

### Clickini gone by 3 ½ weeks

### Playing by 5 weeks


## Lag screw



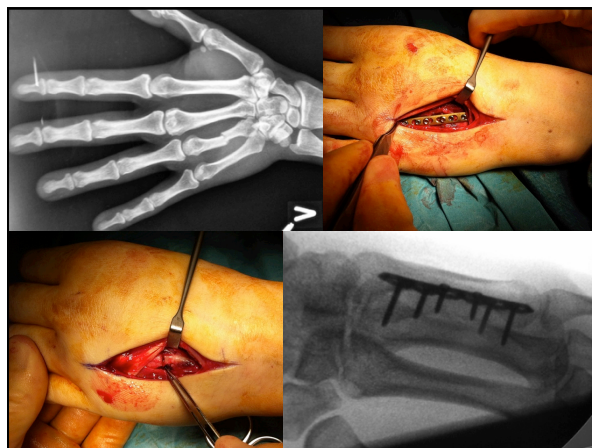
**AOTRAUMA**

## Plates and Screws

- ☞ Recommended for
  - Shaft
  - Base
- ☞ Advantages
  - Stable fixation
  - Early mobilisation
- ☞ AO Techniques
  - Pre-bend
  - Axial compression
  - Lag screw




T-plate LC-DCP

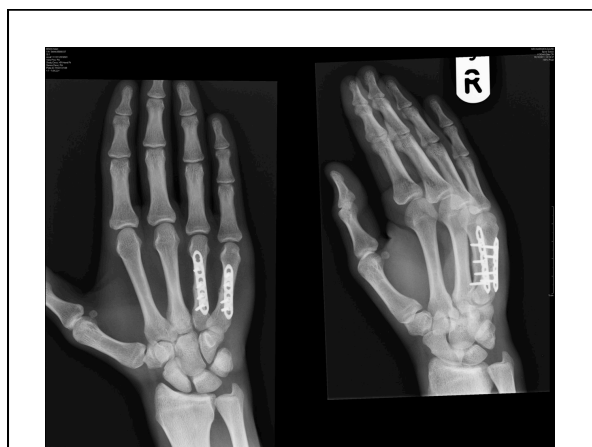


## Multiple fractures

- ☞ Souerc and Mudgel Plate (2008) *Fixation in Closed Ipsilateral Multiple Metacarpals* J Hand Surg Eur 33 740-74
  - 19 patients, 43 fractures
  - Early ORIF plates
  - All had excellent outcome
  - Plates removed in 2



a b c





## Plates and Screws Soft tissue care

### Surgical Approach

- Index and little
  - Hairy/glabrous border
- Middle and Ring
  - Dorsum
  - 2 MCs via one incision



## Plates and Screws Soft tissue care

### Take Care

- SRN
- DBUN
- Extra-synovial

### Preserve blood supply

- Minimal periosteal stripping
- Preserve muscle attachment



## Complications of metacarpal plating Non-union

### Distraction

### Soft tissue stripping

- Periosteum
- Interossei



## Complications of metacarpal plating plate impingement



## Complications of metacarpal plating

- ☞ When has the fracture healed?
  - primary bone healing
  - no callus
- ☞ Peri-prosthetic fracture
  - Athletes

## Trans-osseous wires Shaft

- **Protruding ends**
  - Infection
  - obstruction
- **Wire necrosis**
  - 4 cortices minimum
- **Not as stable as plates**



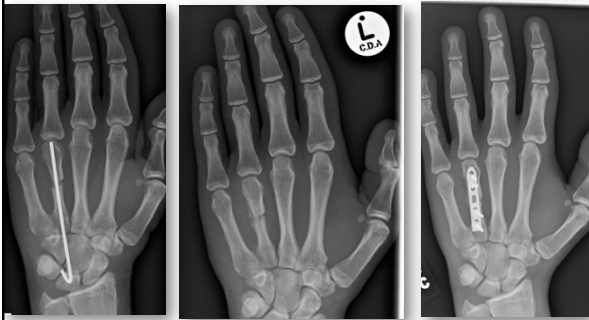
IM wires for shaft fractures  
can work but.....



Fix it properly.....



## Bad IM Wire

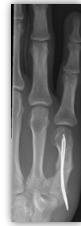


## IM wires vs plate

Ozer et al (2008) Comparison of IM nailing versus plate screw fixation of extra-articular metacarpal fractures J Hand Surg (am) 33:1724-31

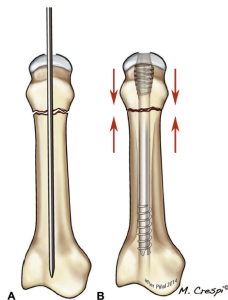
### Plate fixation

- Similar DASH and ROM
- Longer to perform
- More expensive
- better maintenance of position
- less hardware removal



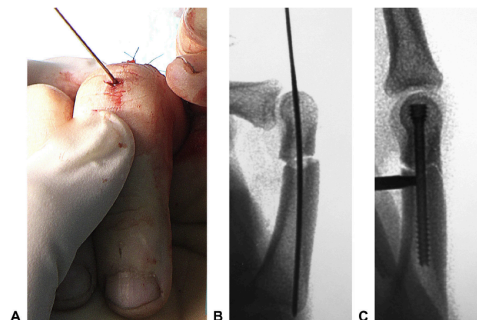
## Intramedullary screws

Pinal et al JHS (Am) 2015 40:692-700



## Intramedullary screws

Pinal et al JHS (Am) 2015 40:692-700



## Summary- Metacarpal shaft

- ☞ Oblique-Spiral
  - early mobilisation
- ☞ Multiple
  - plate
  - im wires
- ☞ Displaced transverse border
  - plate
  - im wires

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## Recent review article



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