

# Humeral Nailing

False accusations

Feras Yaish

ST5

Why the bad reputation?!

# Poor evidence:

- Meta-analysis:
- Bhandari et al, *Acta orthopaedica*, 2006
- 3 RCT
  - Re-operation: RRD 74%, NNT 10
  - Shoulder impingement: RRD 90%, NNT 6

# Reoperation

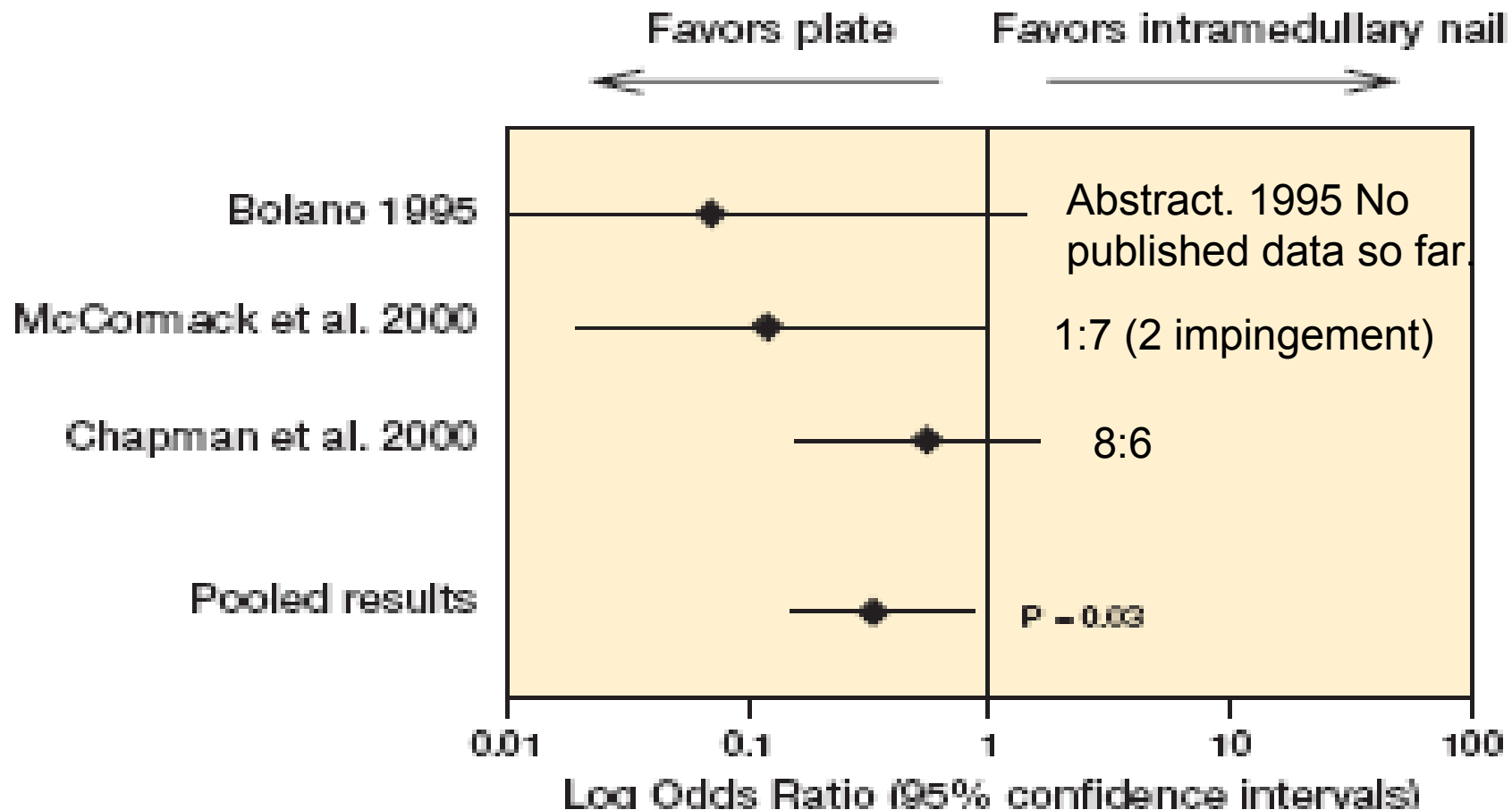


Figure 1. Statistical pooling of 3 studies (155 patients) revealed that plate fixation results in a significant reduction in reoperation rates ( $p = 0.03$ ) as compared to intramedullary nail fixation.

# Shoulder pain + impingement

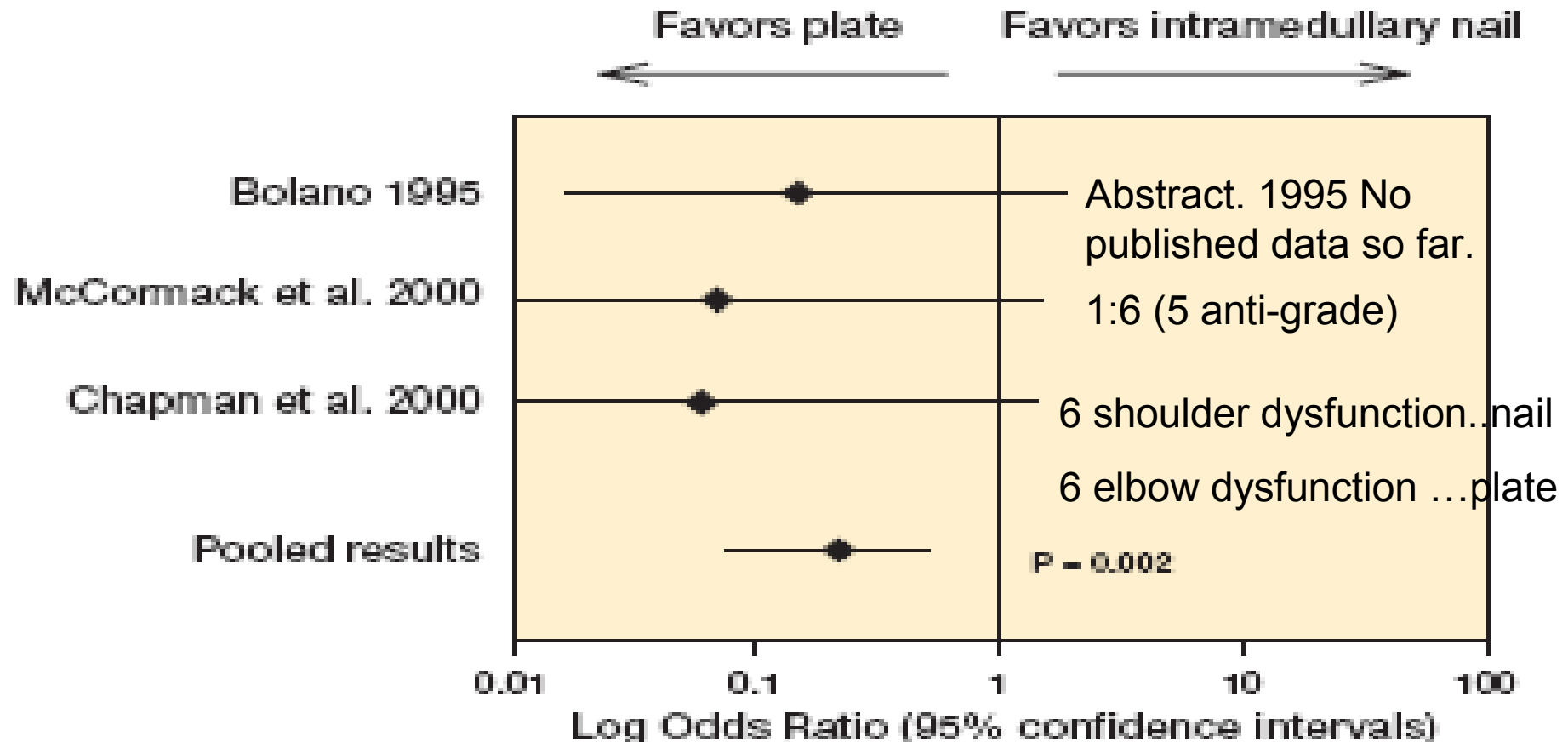


Figure 2. Statistical pooling of 3 studies (155 patients) revealed that plate fixation results in a significant reduction in shoulder impingement and pain ( $p = 0.002$ ) as compared to intramedullary nail fixation.

# Old evidence

- Rodriguez, 1995, JOT:
- RCT 20 patients each,
  - Antigrade nailing Vs DCP
  - ALL UNITED, but:
  - IMN:
    - 19 removal b/c symptomatic
    - All protected in brace for 6 months



**Hackethal nails**

# Old implants & technique

- Hems, 1996, Injury
- The oxford experience:
  - Russell Taylor nails, interlocking, retrospect.
  - 21 non-pathological:
    - 7 non-union
    - 5 un-satisfactory shoulder function
  - **Technical problems** nail insertion
  - Fracture and soft tissue **distraction**.



# Criticism to nails

- Non union
- Radial nerve injury
- Shoulder pain, rotator cuff & impingement  
... metal work removal.

Recent evidence

# Changulani, 2007, Int. Orth

- RCT
- 23 antigrade reamed Interlocking IMN Vs 24 plates.
  - No difference: union rate, ASES.
  - Nerve: 1 radial... DCP, 1 axillary...IMN
  - 4 shoulder impingement... IMN removed...improved. 19%
  - 3 Deep infection...DCP
  - Union time IMN 6.3 , DCP 8.9 wks. ( $p < 0.001$ )
  - 1 nail broken at distal screw

# Chapman, 2000, JOT

- RCT
- 38 IMN antigrade locked Vs 46 DCP
  - No diff
    - non union (3 DCP, 2 IMN)
    - Nerve injury (1 DCP, 2 IMN (PIN))...All recovered
    - Iatrogenic comminution (1:1)
    - Joint dysfunction & stiffness (6 shoulder: 6 elbow)
  - 4:1 removal of metal
  - 3 deep infections...DCP
  - 2 heterotopic ossification...DCP

# Putti, 2009, J Orth Surg

- RCT
- 16 IMN antigrade, locked, unreamed Vs 18 DCP
  - No difference
    - Union rate (1 non-union...DCP)
    - ASES (45.2, 45.1)
    - Re-operation (1 DCP, 1 IMN (ROM))
  - IMN:
    - 2 transient radial nerve palsy
    - Shoulder: 1 impingement, 1 frozen shoulder, 13 pain (subsided 1 year)
    - 1 iatrogenic greater tuberosity fracture
  - DCP:
    - 1 Non union surgery
    - 1 frozen shoulder

# Accusations

- Non union
- Radial nerve injury
- Shoulder pain, rotator cuff & impingement  
... metal work removal.

# Non union

- Linn, 1997, JOT
- Martinez, 2004, arch. Orth. Tr. Surg
- Crates, 1998, Clin Orthop
- Tome, 1998, Clin Orthop
- Redmond, JBJS, 1996
- Shazar, 1998, Orthop
- Rommens, 1995, JBJS
- Rodriguez, 1995, JOT
  
- Recent Literature:
  - DCP 2-10%
  - IMN 0-8%

# Radial nerve injury

- Same incidence in all previous studies
- IMN: don't see the nerve
  - Risk being entrapped in fracture site
- DCP: can see the nerve (approach)
  - Risk of fibrosis, direct injury, entrapment under plate.
  - Radial nerve sensitive
    - Average to ONSET of recovery 16 wks (5-30)
  - Risk 2-5%

(Wang, 2009, JOT)



- Martinez, 2004, Acta
- Kesmenli, 2003, Acta
- Linn, 1997, JOT
  - 48 prospective IMN, locked Vs 25 DCP retro
  - IMN: all united, no nerve injury, faster
  - DCP: 1 nerve, 1 Deep infection, 1 non-union
    - *'indications of nerve exploration were progressive nerve palsy in one patient and spiral fractures with lateral spike with nerve palsy in two patients and without palsy in one patient'*

# Wang, 2009, JOT

- 707 humerus fixations
- 46 Secondary radial nerve injuries
  - 3 IMN, (+ 4 Ender nails)
  - 39 DCP (DID NOT mention proportion of each fixation)
    - 12: nerve was explored intra-op
    - 5 regained 4/5 power (20- 30 wks)

# Cognet, Rev Chir Orthop Reparatrice Appar Mot,

- French
- 30 pt. radial nerve palsy + humerus fracture. All explored.
- 30% DCP, 33% IMN
- 6 secondary.... ALL DCP
  - 6 direct conflict w/ plate
  - 10 compression at intermuscular septum
  - 5 nerve graft
  - 2 tendon transfer

- Their conclusion
  - Increase risk of radial nerve injury and persistent palsy in
    - Distal 3<sup>rd</sup>
    - Spiral
    - PLATE FIXATION
- Be careful if you prefer to “SEE the nerve is intact”

# Shoulder problems

- Obvious higher incidence of
  - Removal of metalware
  - Shoulder symptoms
- BUT
  - RCT..... Same functional results
  - Symptoms improve if prominent nail removed
  - Similar problems in Elbow with DCP
  - Some plating patients had frozen and/or painful shoulders

# Romens, 2009, JOT

- 99 Synthes Unreamed interlocking nails.
- Acute fractures
  - 9% open
  - 8% polytrauma
  - 5% primary radial palsy

- Not a simple procedure
- Meticulous technique
  - Entry point
    - Cuff incision and repair
    - Screening
  - Compress fracture **BEFORE** locking (manual or compression device)
  - Proximal nail tip below cartilage



- Non union: 3%
- Radial nerve palsy: 3 %
  - All explored, one incarcerated in # site
- Shoulder function (Constant score):
  - 91% excellent, 5.4% good, 2% fair, 1% poor
- Re-operation
  - 3 radial nerve
  - 3 non union
  - 1 relocation of misplaced locking screw
  - 1 superficial wound infection
- Non metal impingement





(a)



(b)

# Accusations

- Non union
  - similar to DCP
- Radial nerve injury
  - Similar, maybe less
- Shoulder pain, rotator cuff & impingement  
... metal work removal.
  - Can be minimised to 3% with careful technique
  - DCP ...Elbow stiffness and dysfunction.

# Advantages

- Preservation of fracture biology and haematoma
- Decreased risk of injury to radial nerve
- Load sharing... Osteoporosis
- Can be faster and easier procedure
- Metal removal ....DCP ...radial nerve



Kylie Minogue

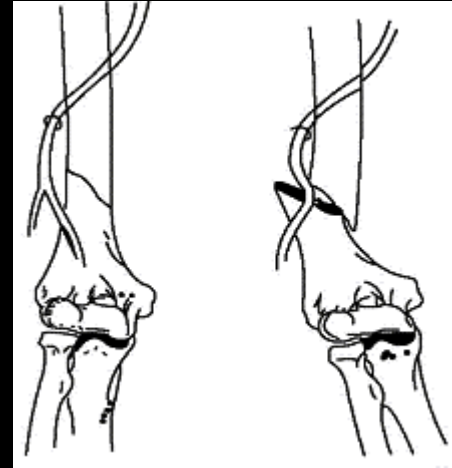
# Better to nail these





# Avoid nailing these

- Spiral + distal third fracture (Holstein-Lewis fractures)
- Primary Radial nerve palsy



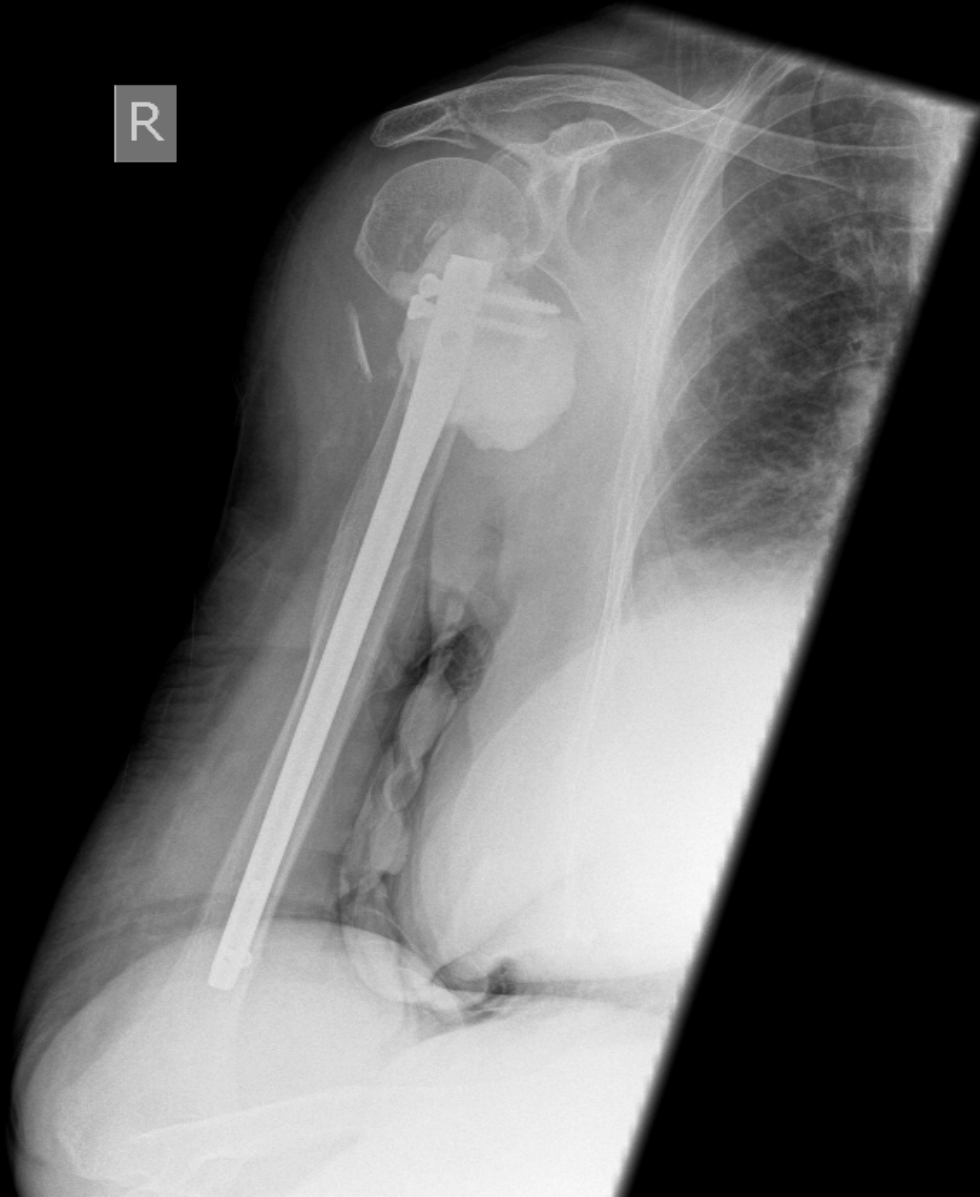
# Summary

- In the past: nail and technique problems  
BAD REPUTATION
- New nails + good technique = Good results better
- Similar union rate and radial nerve palsy
- Nails have their advantages (fracture biology, load sharing, easy)
- Shoulder problems can be minimized with good technique... DO NOT 'just shove it in'.



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W 1.774 : L 2.068