

Distal Humerus

Intraarticular fractures and complications

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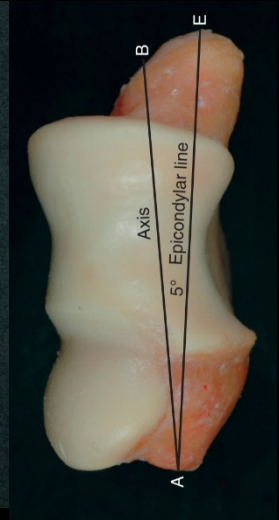
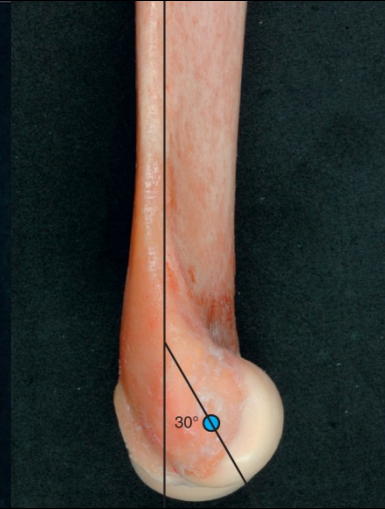
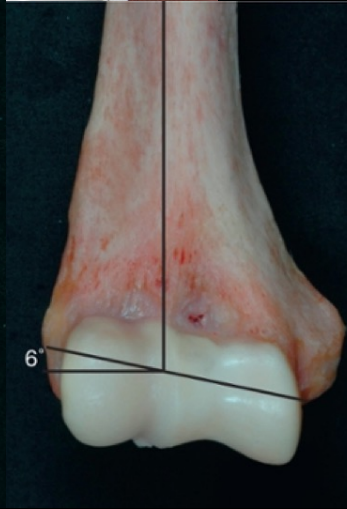
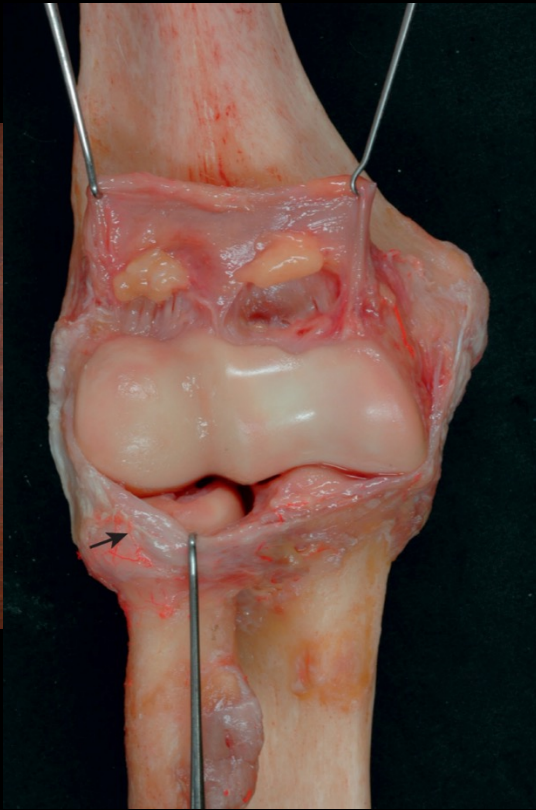
Acknowledgement: Senior Consultant Carl Erik Alm, Orthopedic Trauma Department, OUS



Anatomy

Joint surface:

- Valgus
- External rotation
- Flexion



Non-operative vs. Operative treatment



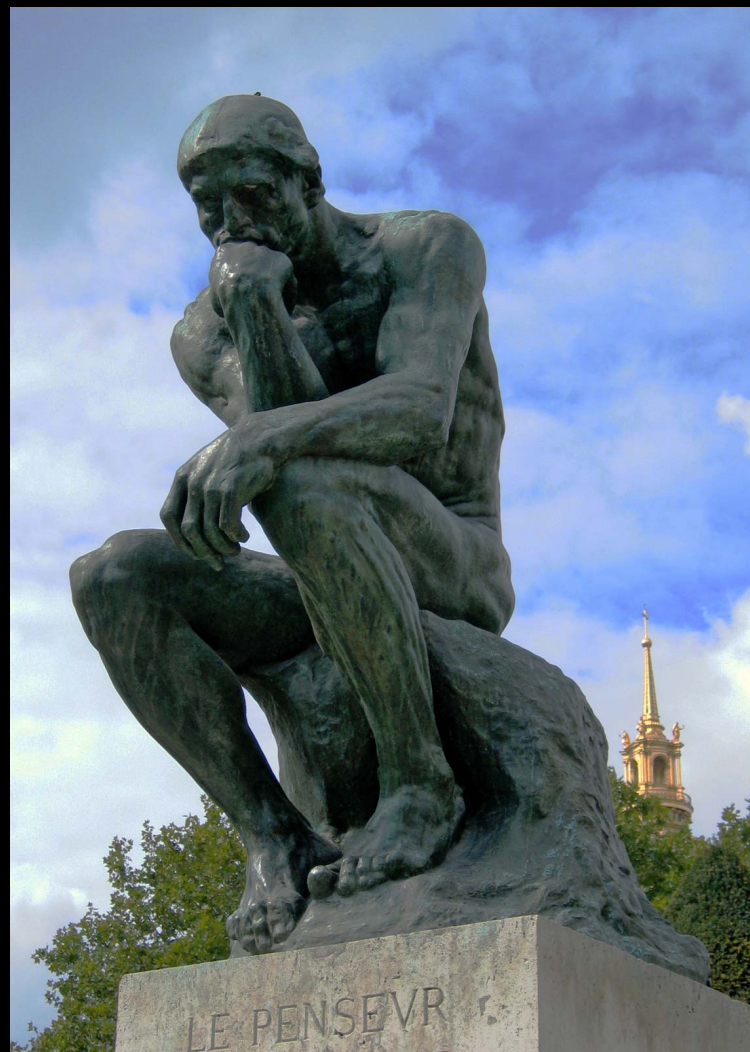
No randomized trials or prospective studies comparing non-operative treatment with operative treatment

Non-operative treatment

- Aitken S A et al (2015) 40 low-demand patients

Reserved for low demand elderly patients, not fit for surgery

- Nauth et al (2011) – RR poor result: 2,8 (95% conf. interv. 1,8-4,4)



ORIF or Arthroplasty?

ORIF

Gold standard

If possible to achieve anatomical reduction and stable fixation that allows early active ROM

Plan for plan B - In some cases perioperative conversion to arthroplasty is necessary

Arthroplasty

Pre existing arthritis

Rheumatoid arthritis

Non-reconstructable fracture

Coronal shear fractures?

FAVOURS HEMI ARTHROPLASTY

«YOUNGER», ACTIVE

DIFFICULTIES WITH RESTRICTIONS
ASSOCIATED WITH TE

FAVOURS TOTAL ELBOW ARTHROPLASTY

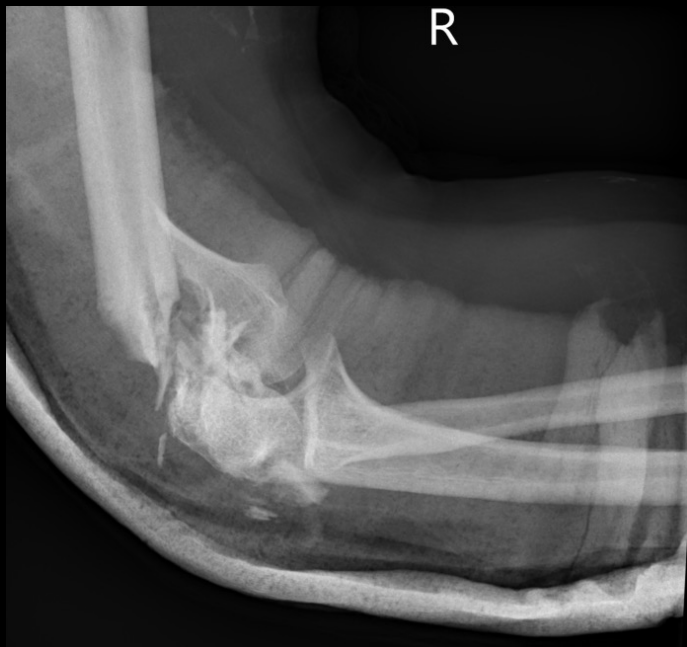
INSUFFICIENT OR UNCERTAIN LIGAMENT STATUS

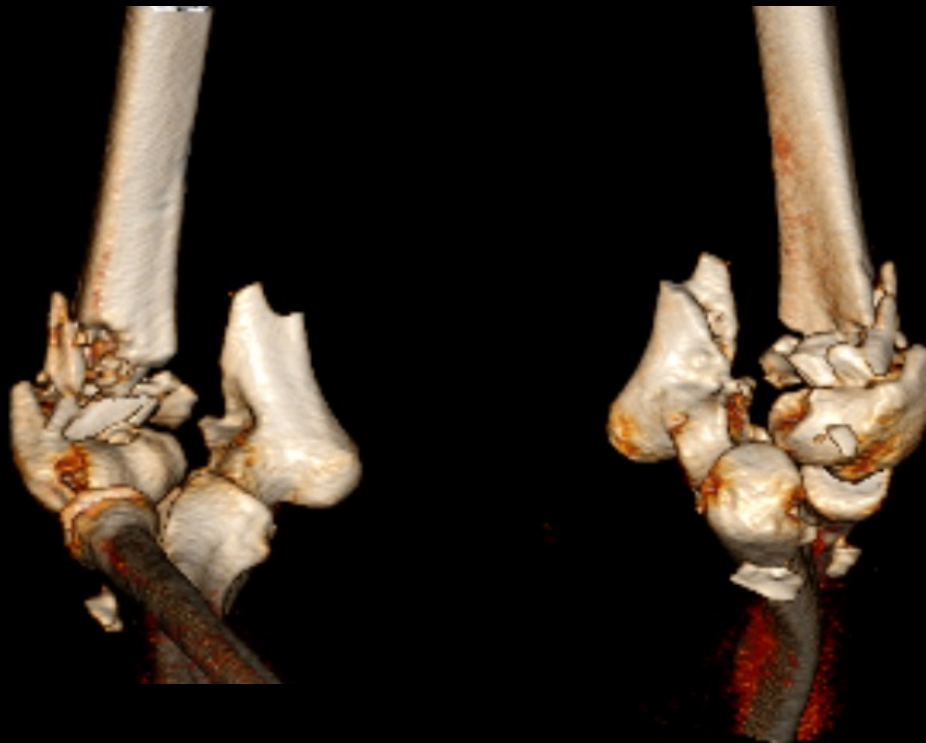
BICONDYLAR FRACTURE PATTERNS?

Day 1

- 35 y/o male crashed on electric scooter
- OI Type 1, otherwise healthy
- No findings on Trauma CT
- Complains of right elbow pain
- Neurovascular intact
- Slight deformity of elbow observed

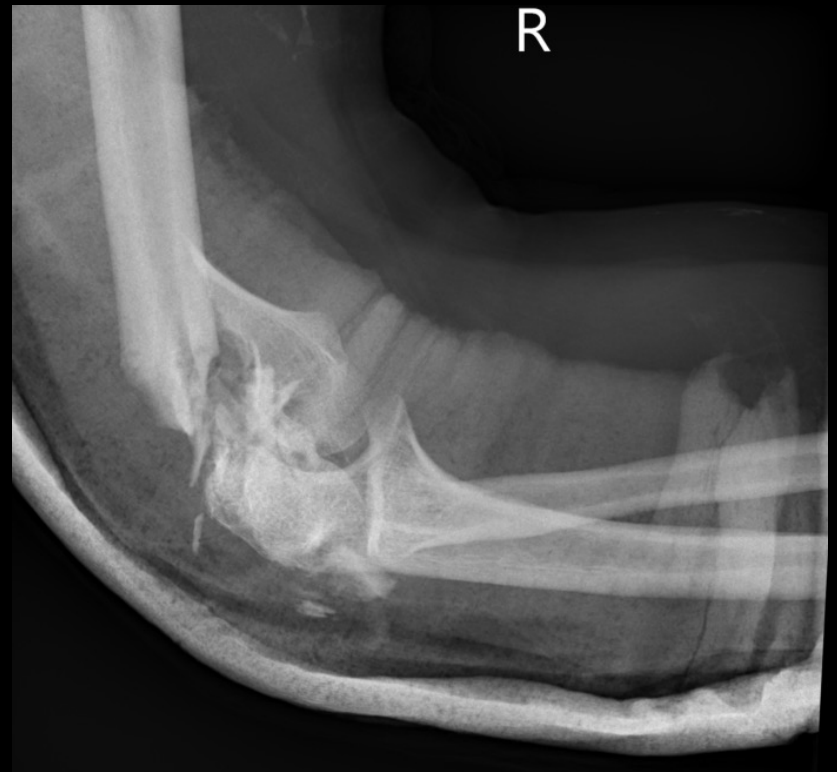






1 week

- Still neurovascular intact
- No signs of infection
- Ready for surgery
- Plan?

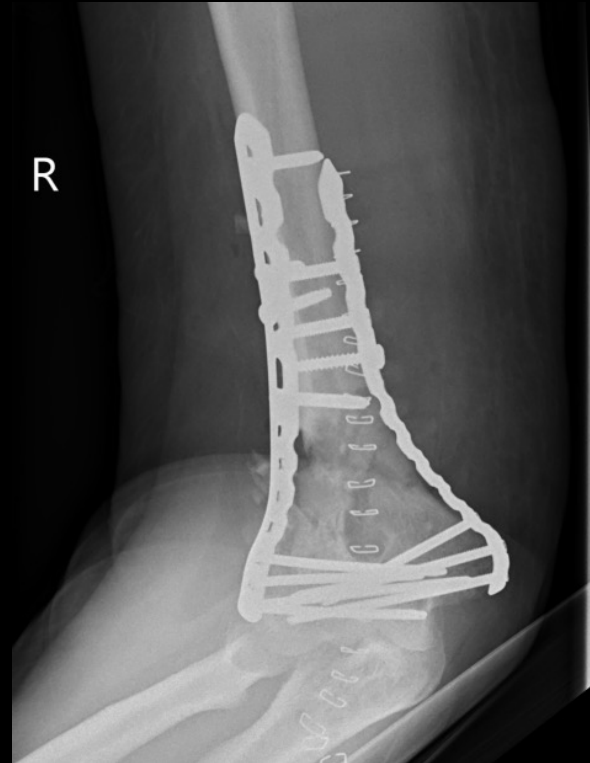


Approaches

- What do you need to see?
- How will you fix your fracture?
 - Paratricipital
 - Olecranon osteotomy
 - Triceps splitting/TRAP
 - Medial/lateral



Satisfied?



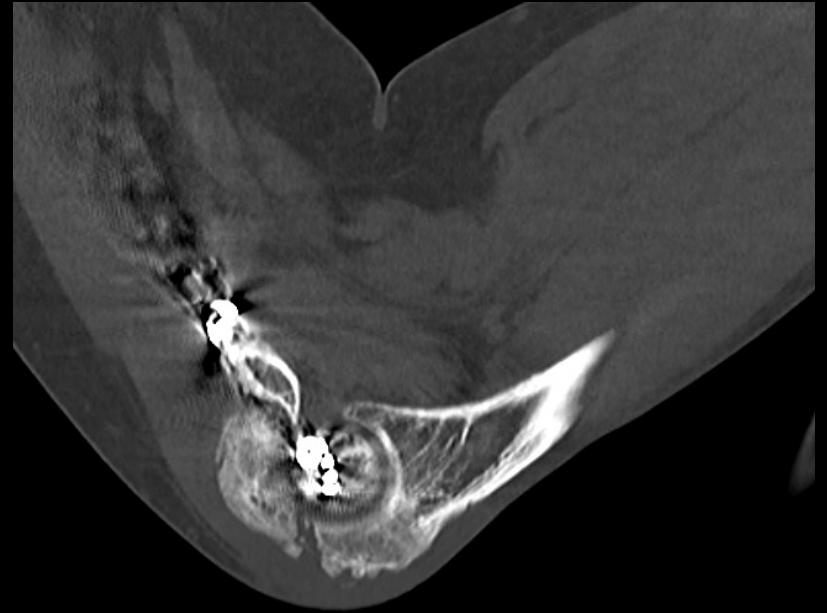
8 weeks

- No pain
- Still no signs of infection
- Slightly diminished ROM
- Increased effort in PT



5 months

- No pain
- Elbow flexion 100 degrees, extension deficiency 45 degrees
- CT performed
- Plan?



8 months

- Ready for surgery - again
- Elbow ROM 85-95 degrees





Plate configuration – Does it matter?

- Parallel plates better biomechanically
- No clinical evidence
- Choose configuration according to fracture pattern



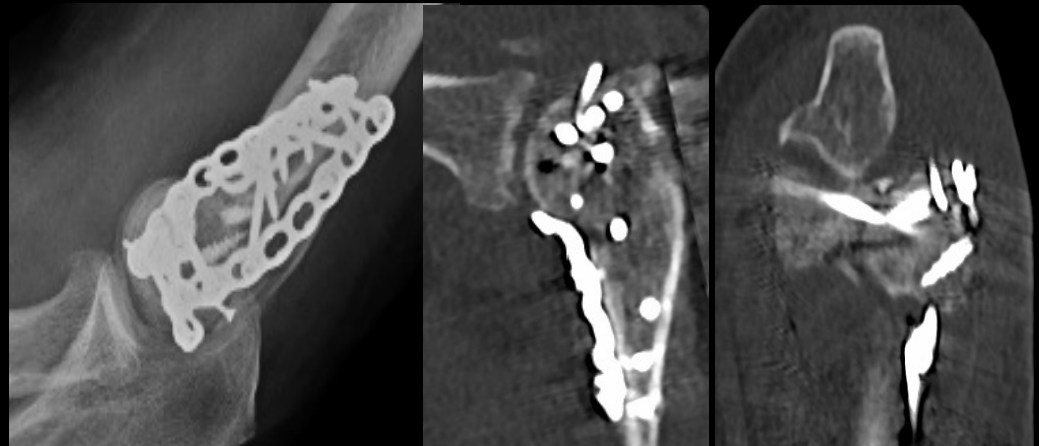
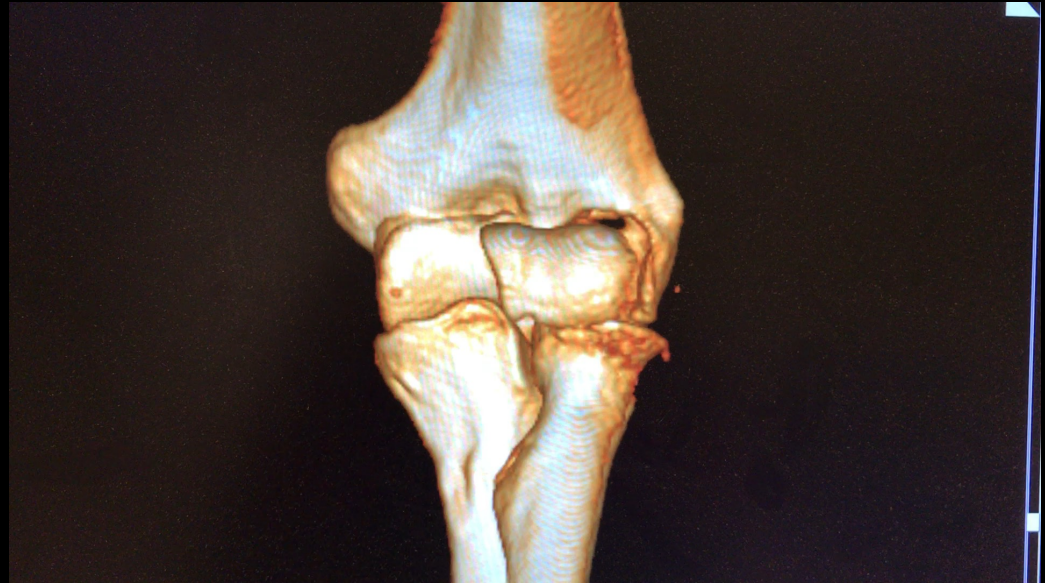
PARALLEL



PERPENDICULAR

ORIF - Challenges

- POOR BONE STOCK
- COMMUNITION/IMPACTION
 - WORSE FRACTURE PATTERNS?
 - RECONSTRUCTABLE?
- AVN
- HARDWARE FAILURE
- NON-UNION



Distal humeral fractures - Complications

- **Ulnar neuropathy 10-20%**
 - Consider anterior transposition when preop. symptoms
- **Heterotopic ossification 10%**
 - NSAID's?
- Hardware failure
- Nonunion

NAUTH ET AL. JBJS 2011



Distal humeral fractures - Complications

- **Ducrot, G., et al. (2013).**
- Complication rate - 14/43 (33%)
- Frechette, G., et al. (2021).
- Complication rate 5/22 (23%)

Complications of articular distal humeral fracture fixation: a systematic review and meta-analysis.

Yetter TR, et al. J Shoulder Elbow Surg. 2021. PMID: 33711499 Review.



Take home messages

1. Know your anatomy – distal humerus is tricky
2. Treatment is almost always surgical
3. Know when to fix and when to replace
4. Pre-op planning (CT, position of patient, hardware, approaches)
5. Know the principles of fixation (ORIF, not OIF)
6. Beware of complications
7. Be humble – it's difficult, but good fun

References

1. **Elmadag M, Erdil M, Bilsel K, et al.** The olecranon osteotomy provides better outcome than the triceps-lifting approach for the treatment of distal humerus fractures. *Eur J Orthop Surg Traumatol*. 2012 Dec 21.
2. **Koh KH, Lim TK, Lee HI, et al.** Surgical release of elbow stiffness after internal fixation of intercondylar fracture of the distal humerus. *J Shoulder Elbow Surg*. 2013 Feb;22(2):268–274.
3. **Ducrot G, Ehlinger M, Adam P, et al.** Complex fractures of the distal humerus in the elderly: is primary total elbow arthroplasty a valid treatment alternative? A series of 20 cases. *Orthop Traumatol Surg Res*. 2013 Feb;99(1):10–20.
4. **Got C, Shuck J, Biercevicz A, et al.** Biomechanical comparison of parallel versus 90-90 plating of bicolumn distal humerus fractures with intraarticular comminution. *J Hand Surg Am*. 2012 Dec;37(12):2512–2518.
5. **Lumsdaine W, Enninghorst N, Hardy BM, et al.** Patterns of CT use and surgical intervention in upper limb periarticular fractures at a level-1 trauma centre. *Injury*. 2013 Apr;44(4):471–474.

References

6. **Worden A, Ilyas AM.** Ulnar neuropathy following distal humerus fracture fixation. *Orthop Clin North Am.* 2012 Oct;43(4):509–514.
7. **Abrams GD, Bellino MJ, Cheung EV.** Risk factors for development of heterotopic ossification of the elbow after fracture fixation. *J Shoulder Elbow Surg.* 2012 Nov;21(11):1550–1554.
8. **Cornell CN, Ayalon O.** Evidence for success with locking plates for fragility fractures. *HSS J.* 2011 Jul;7(2):164–169.
9. **Kloen P, Helfet DL, Lorch DG, et al.** Temporary joint-spanning external fixation before internal fixation of open intra-articular distal humeral fractures: a staged protocol. *J Shoulder Elbow Surg.* 2012 Oct;21(10):1348–1356.
10. **Koonce RC, Baldini TH, Morgan SJ.** Are conventional reconstruction plates equivalent to precontoured locking plates for distal humerus fracture fixation? A biomechanics cadaver study. *Clin Biomech (Bristol, Avon).* 2012 Aug;27(7):697–701.

References

11. **Brouwer KM, Lindenhovius AL, Dyer GS, et al.** Diagnostic accuracy of 2- and 3-dimensional imaging and modeling of distal humerus fractures. *J Shoulder Elbow Surg.* 2012 Jun;21(6):772–776.
12. **Sanchez-Sotelo J.** Distal humeral fractures: role of internal fixation and elbow arthroplasty. *J Bone Joint Surg Am.* 2012 Mar 21;94(6):555–568.
13. **Brouwer KM, Bolmers A, Ring D.** Quantitative 3-dimensional computed tomography measurement of distal humerus fractures. *J Shoulder Elbow Surg.* 2012 Jul;21(7):977–982.
14. **Egol KA, Tsai P, Vazques O, et al.** Comparison of functional outcomes of total elbow arthroplasty vs plate fixation for distal humerus fractures in osteoporotic elbows. *Am J Orthop* (Belle Mead NJ). 2011 Feb;40(2):67–71.
15. **Coles CP, Barei DP, Nork SE, et al.** The olecranon osteotomy: a six-year experience in the treatment of intraarticular fractures of the distal. *J Orthop Trauma.* 2006 Mar;20(3):164–171.