

Traumatic Elbow Instability

David Ring MD PhD

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Simple Elbow Dislocation

- No associated fractures
- Complete or near complete capuloligamentous injury
- Extensive muscle injury
- Nearly always stable after reduction
- No advantage to surgery if stable
- No more than 2 weeks immobilization



Elbow Dislocation

- Usually posterolateral
 - Can dislocate with anterior band of MCL intact
- Posteromedial pattern
 - Less common
 - Possibly more unstable

Slight Subluxation

“Drop Sign”

- This is like pseudo-subluxation in the shoulder.
- The combination of extensive muscle and ligament injury and guarding due to pain create a slight sag.
- **IMPORTANT:** distinguish from subluxation that will cause articular damage

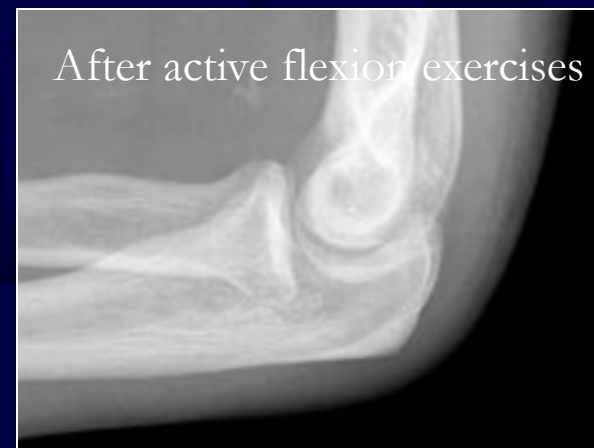


Slight Subluxation

“Drop Sign”

Management:

- Avoid varus stress (shoulder abduction)
- Active flexion
- Overhead exercises



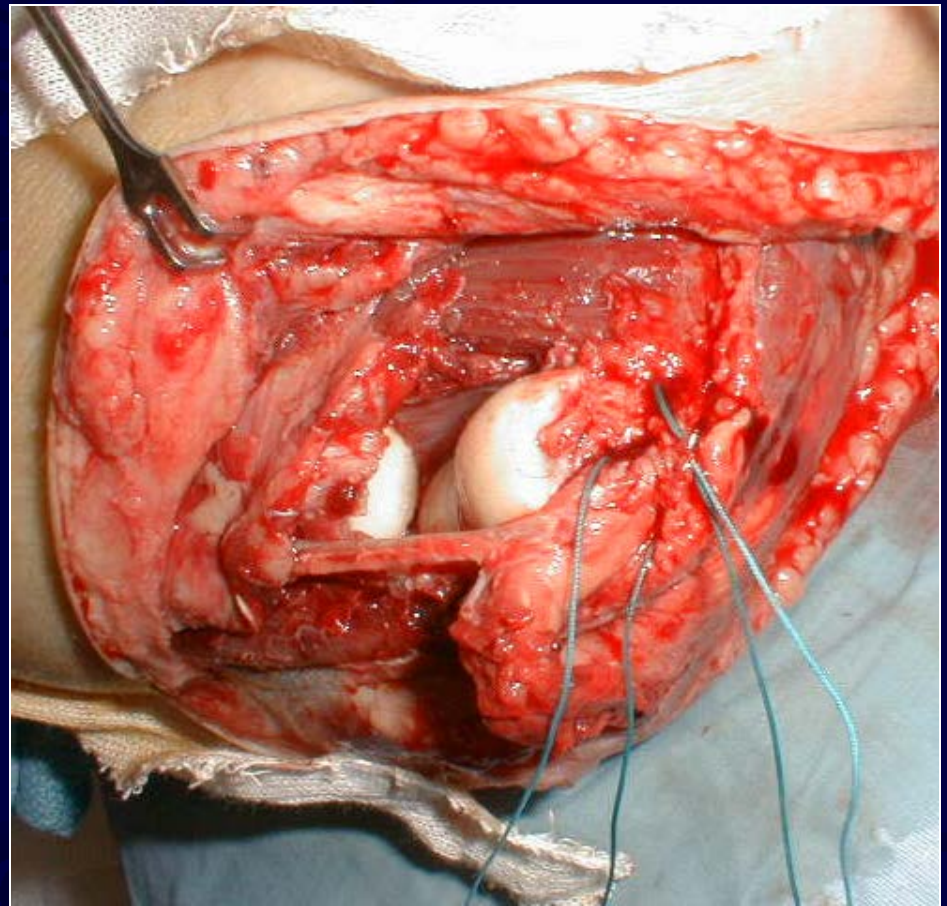
Unstable Simple Elbow Dislocation

- **Uncommon**
- **Older women (simple fall)**
- **Young men (high-energy)**



Unstable Simple Elbow Dislocation

- **Ligament / muscle reattachment to epicondyles**
- **External fixation**
- **Cross pinning**



Cross Pinning

- **Useful bail out**
- **Stiff and located is preferred to subluxation**
- **Stiffness usually worked out easily**
- **2.0mm pins exit proximally for retrieval in case of breakage**
- **Can be placed with local**
- **Only needed for 3 weeks. Bury if needed longer**



Chronic Simple Elbow Dislocation

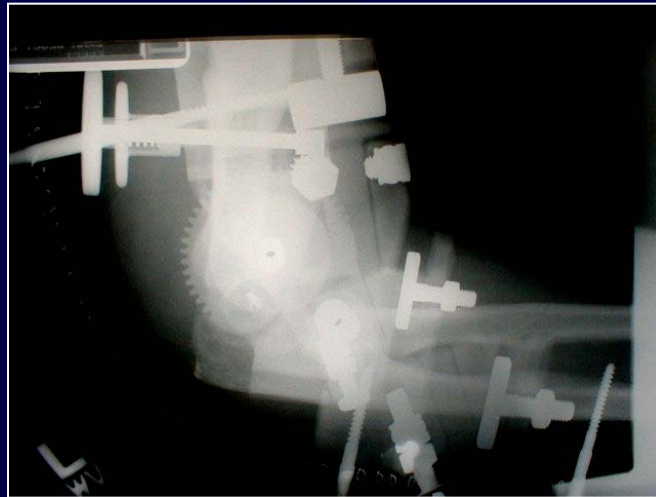
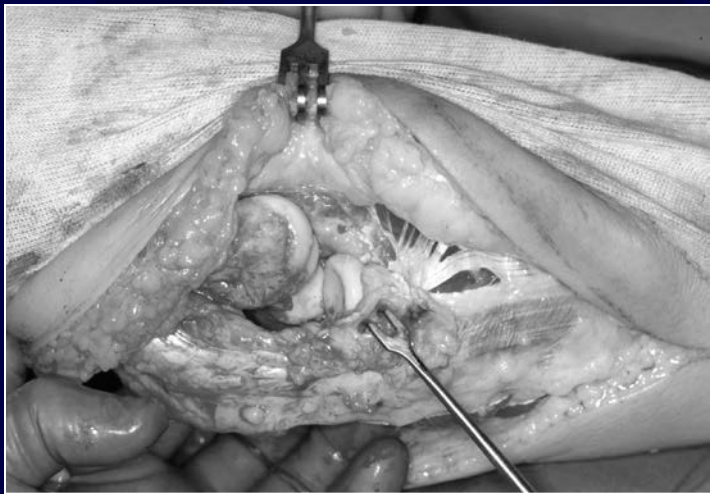
Jupiter and Ring JBJS 2002

Treatment: Open reduction and hinged external fixation

No ligament reconstruction

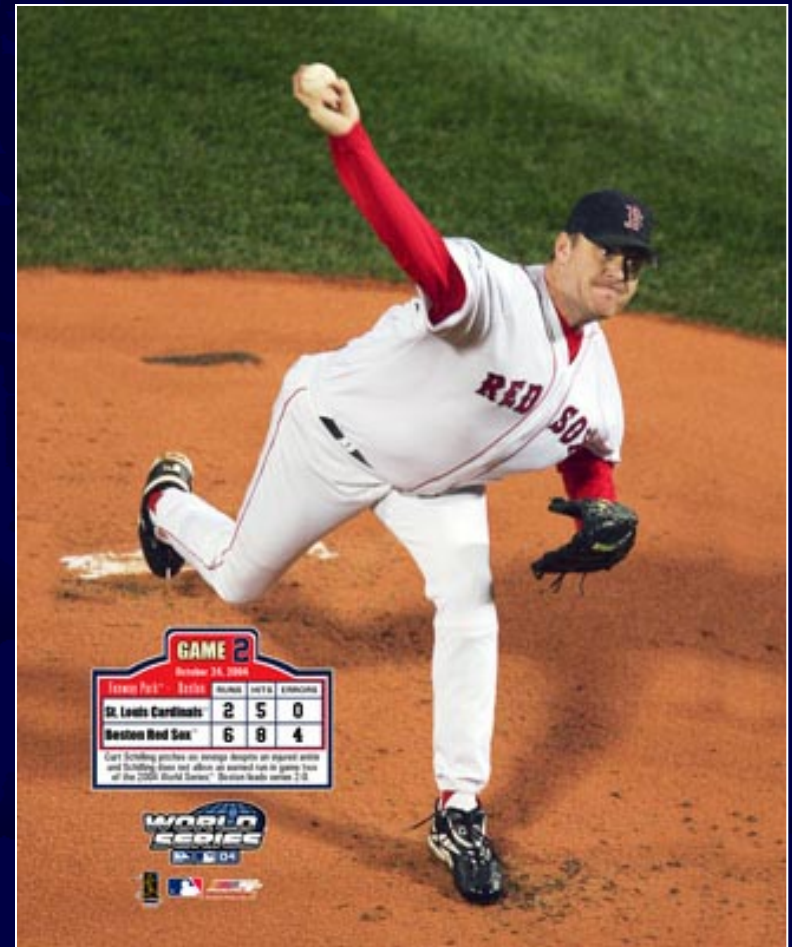
5 patients: dislocated for 2 to 9 months

Stable elbow, > 100 degrees motion in all patients



Medial Collateral Ligament Insufficiency

- Throwing athletes
- Chronic attenuation
- Inability to throw 95 mph fastballs



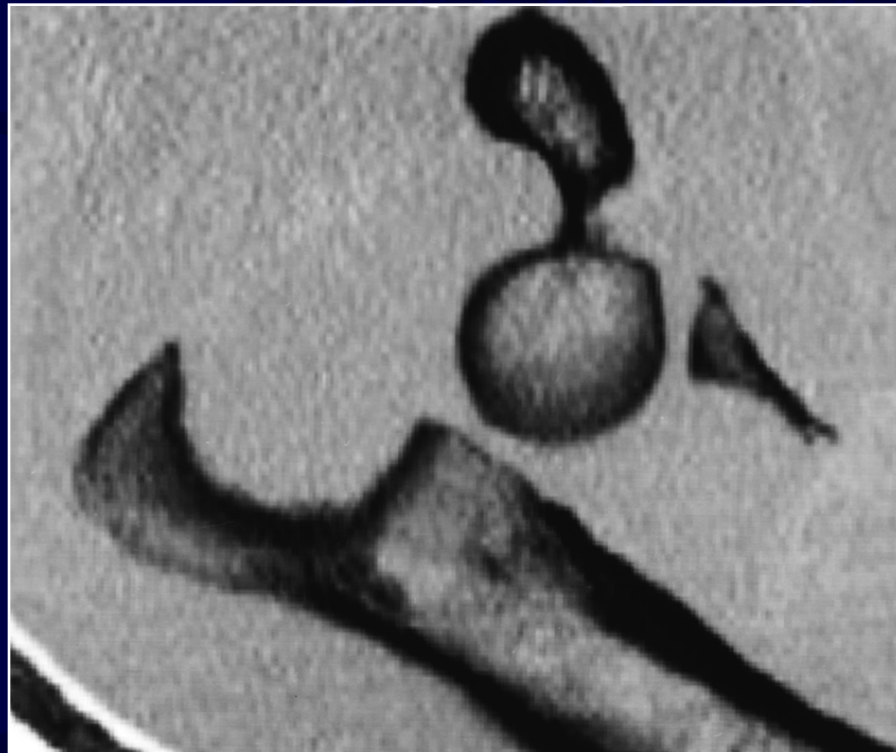
LCL Insufficiency

Recurrent Simple Elbow Dislocation

- Insufficiency of the lateral collateral ligament
- Adolescent elbow dislocation
- Iatrogenic



Traumatic Elbow Instability Associated with Fractures



Definition

Fracture-dislocation of the elbow

- Dislocation of the elbow
- Intra-articular fracture



Definition

Traumatic Elbow Instability

- Injury that destabilizes the elbow
- With or without dislocation



Patterns of Traumatic Elbow Instability With Fracture

Dislocation with Articular Fracture

Dislocation + radial head fracture



Olecranon Fracture-Dislocations

Anterior



Varus posteromedial rotational instability



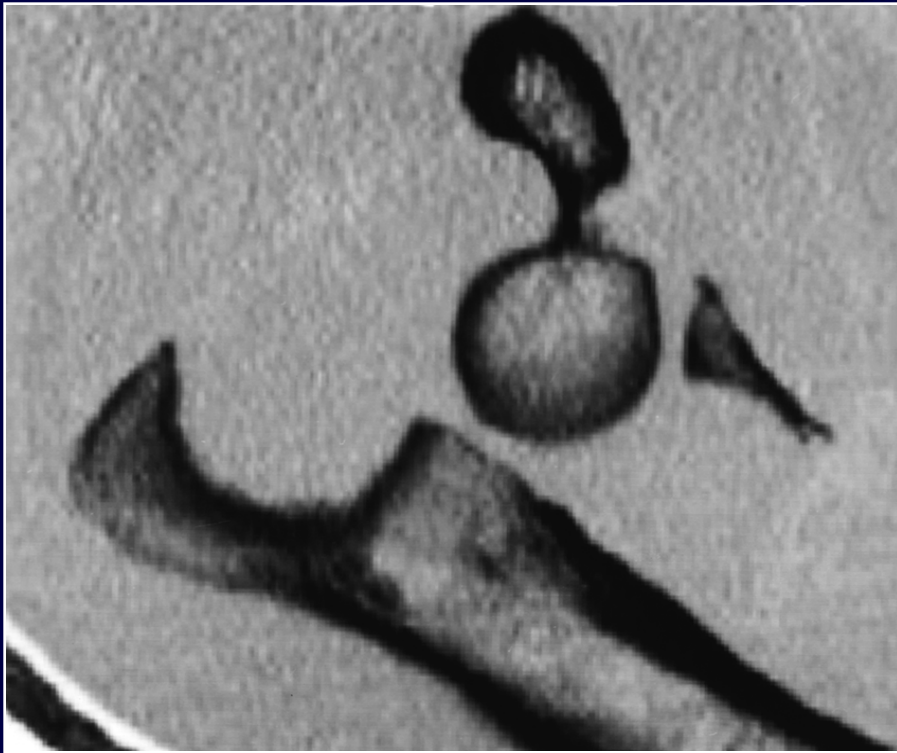
Terrible Triad



Posterior



Dislocation vs. Disruption

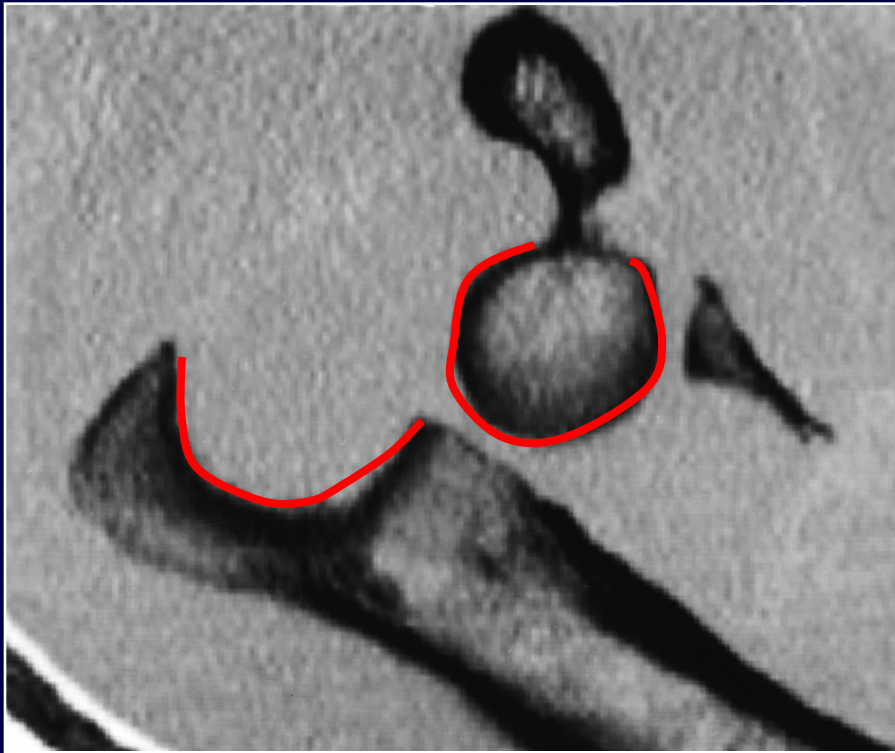


Dislocation

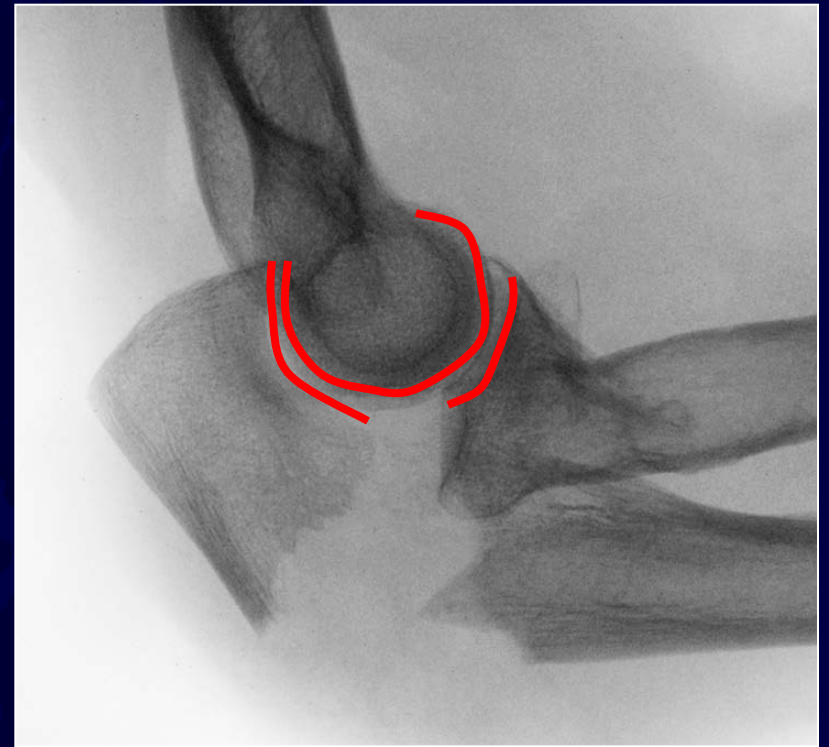


Disruption

Dislocation vs. Disruption

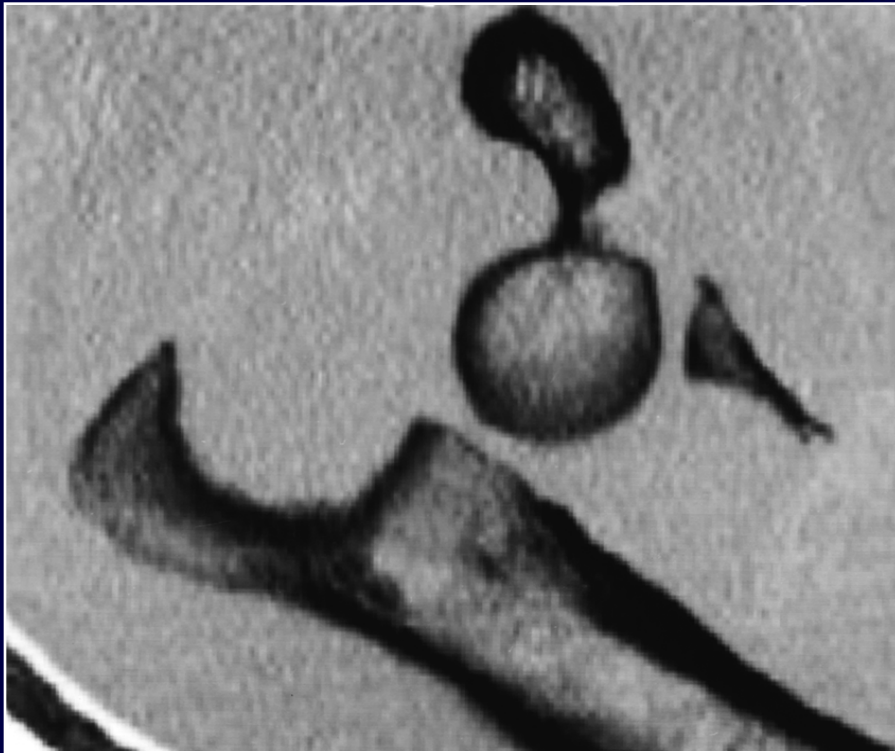


Dislocation

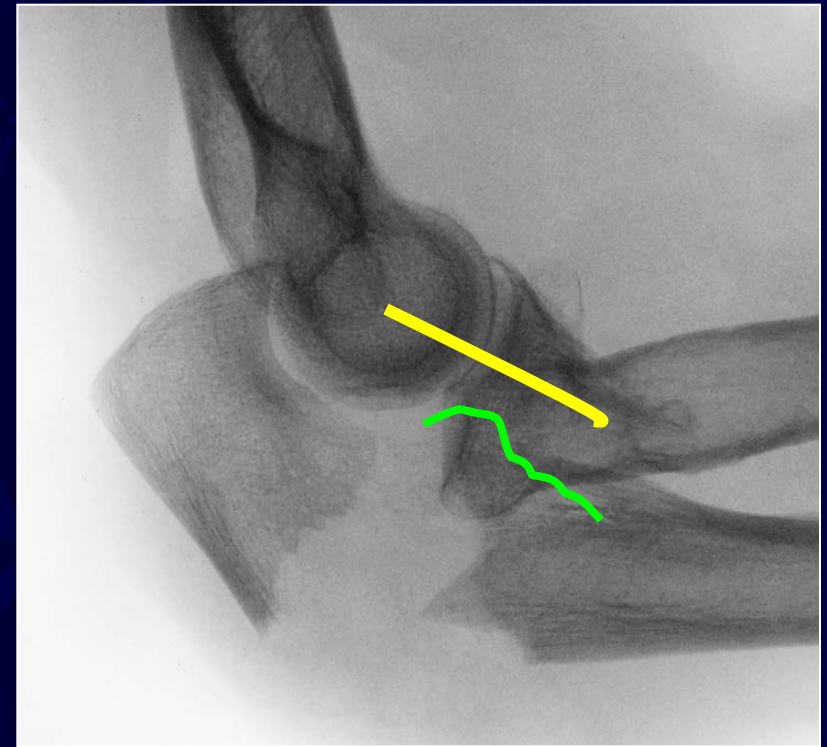


Disruption

Dislocation vs. Disruption



Dislocation



Disruption

Ligaments Partially Spared

Disruption



Ligaments Partially Spared

Patterns of Traumatic Elbow Instability With Fracture

Dislocation Injuries

Dislocation with Articular Fracture

Dislocation + radial head fracture



Terrible Triad



Disruption Injuries

Olecranon Fracture-Dislocations

Anterior



Posterior



Varus posteromedial rotational instability



Posterior Dislocation + Radial Head Fracture



Posterior Dislocation + Radial Head Fracture

Results of Treatment of Fracture-Dislocations
of the Elbow

MARK A. BROBERG, M.D.,* AND BERNARD F. MORREY, M.D.**

24 patients

Ulnohumeral dislocation with radial head
fracture

Cast 1 month +/- radial head resection

“Results better than generally thought”

Secondary procedures for radial head

No problems with instability

Posterior Dislocation + Radial Head Fracture

Dislocations of the Elbow and Intraarticular Fractures

PER OLOF JOSEFSSON, M.D., CARL FREDRIK GENTZ, M.D.,
OLOF JOHNELL, M.D., AND BO WENDEBERG, M.D.

23 patients

Excision of radial head and cast

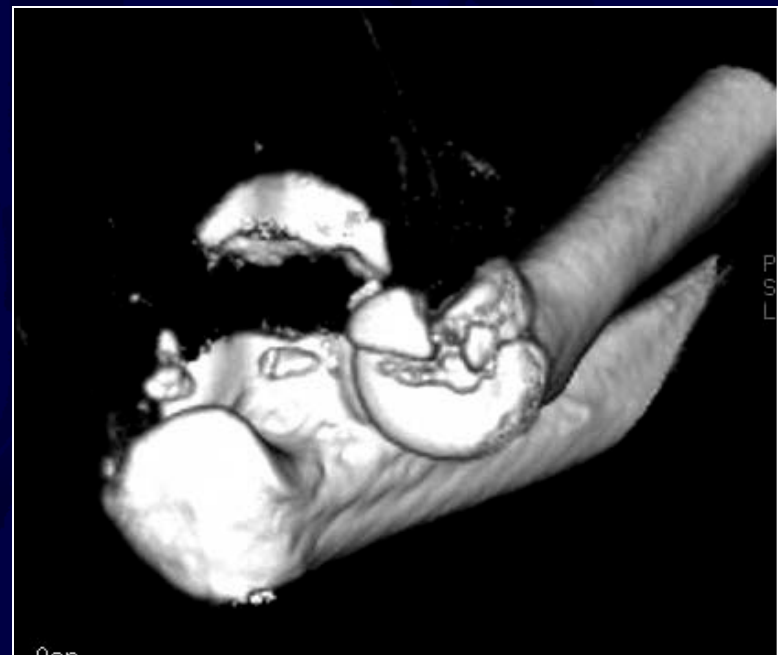
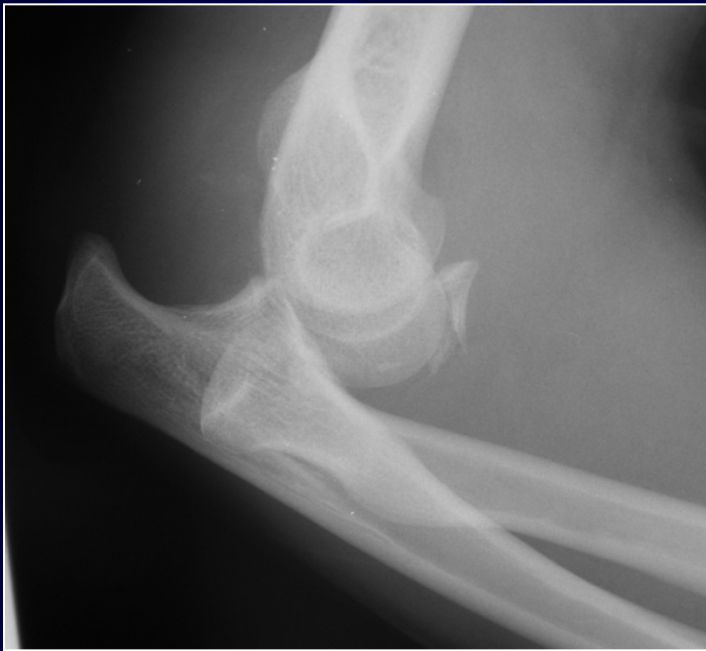
INSTABILITY in patients with **CORONOID**
fractures (4 patients)

Terrible Triad

Posterior dislocation

Radial head fracture

Coronoid fracture



Terrible Triad

Dislocations of the Elbow and Intraarticular Fractures

PER OLOF JOSEFSSON, M.D., CARL FREDRIK GENTZ, M.D.,
OLOF JOHNELL, M.D., AND BO WENDEBERG, M.D.

Only patients with INSTABILITY had
CORONOID fractures (4 patients)

Terrible Triad

Ring, Jupiter, Zilberfarb JBJS 2002

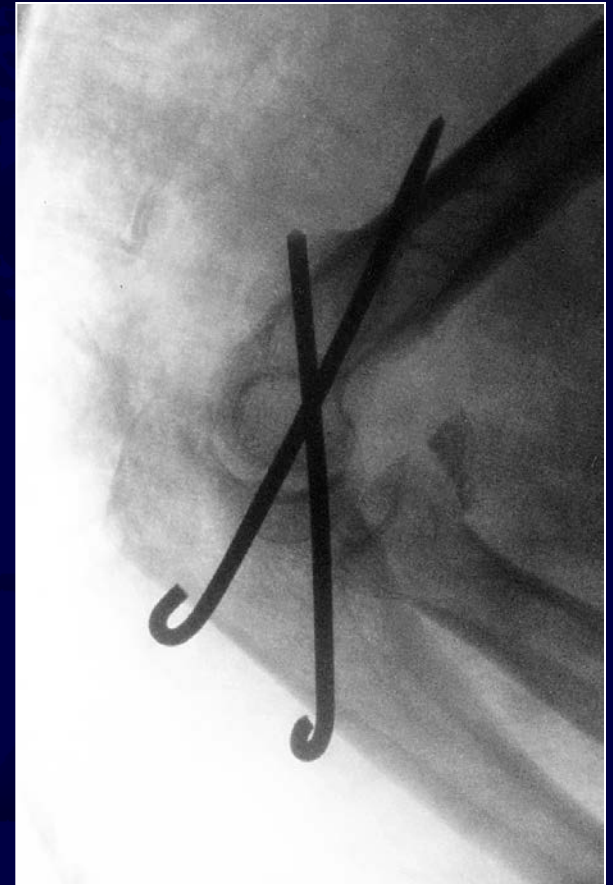
11 patients

Regan and Morrey Type 2 coronoid fractures

7 redislocated in splint or cast

5 redislocated after operation

Only 4 patients with satisfactory results

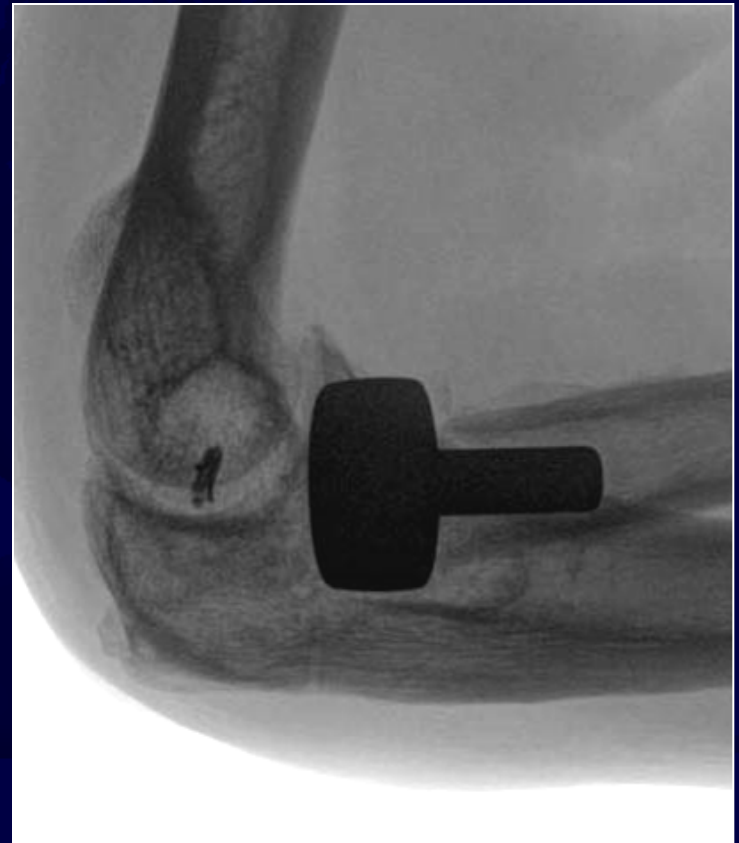


Terrible Triad

Pugh DM, Wild LM,
Schemitsch EH, King GJ,
McKee MD

Standard surgical protocol
to treat elbow dislocations
with radial head and
coronoid fractures.

J Bone Joint Surg Am. 2004
Jun;86-A(6):1122-30.





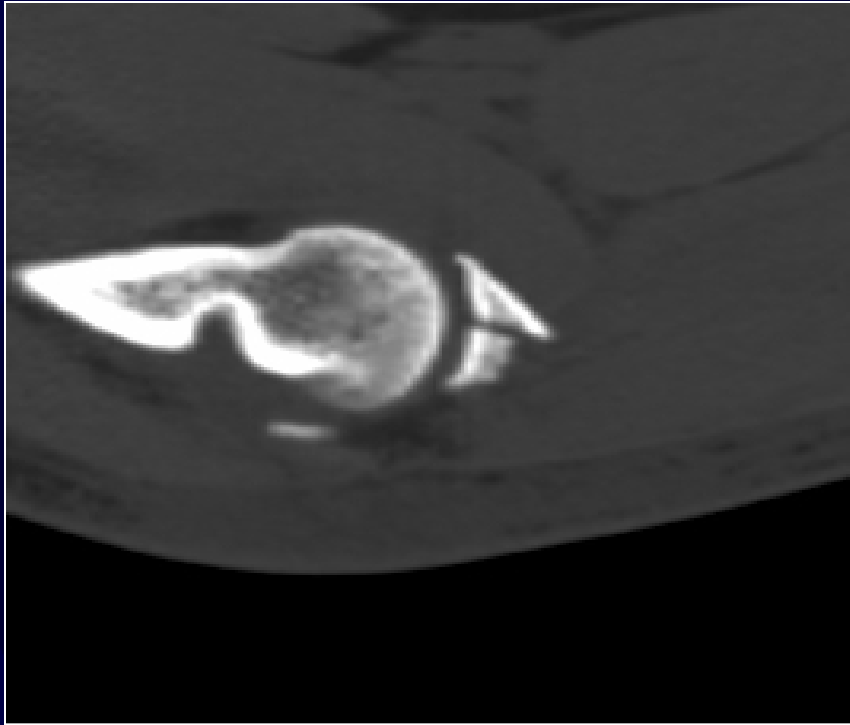


Regan and Morrey

Based on single lateral radiograph

- Type 1: Tip avulsion
- Type 2: $< 50\%$ coronoid height
- Type 3: $> 50\%$ coronoid height







68 kV
0.061 mA
0:34 ΔT
8 NS

Massachusetts General Hospital

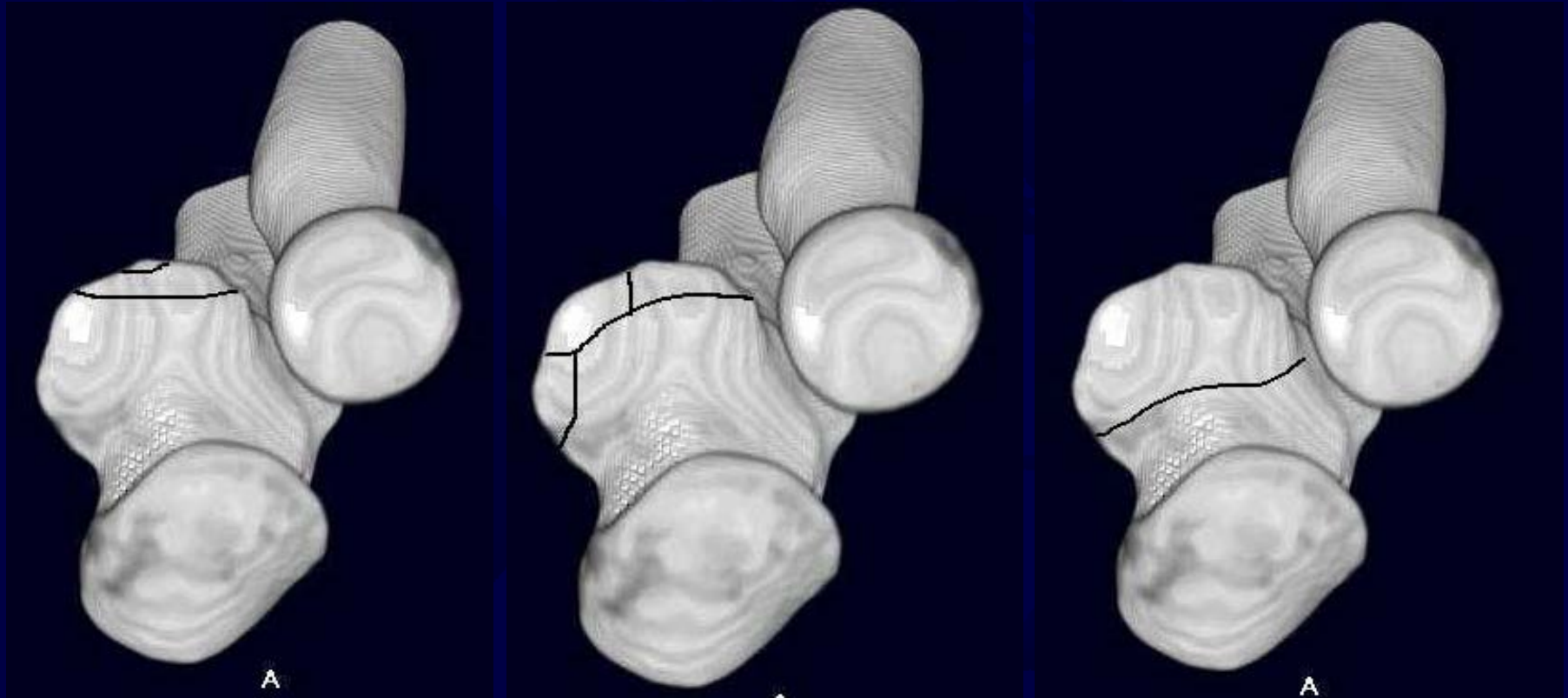
5/21/2001
12:32:46

|R|2|F|S|



FLUOROSCOPE

O' Driscoll Classification



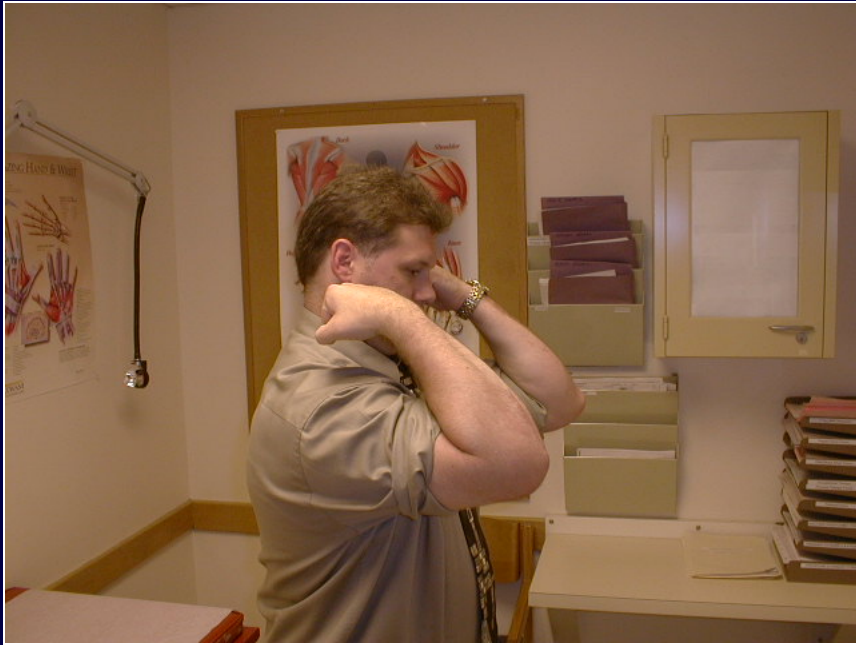
1

2

3







Varus Posteromedial Rotational Injuries

Inadequate Treatment

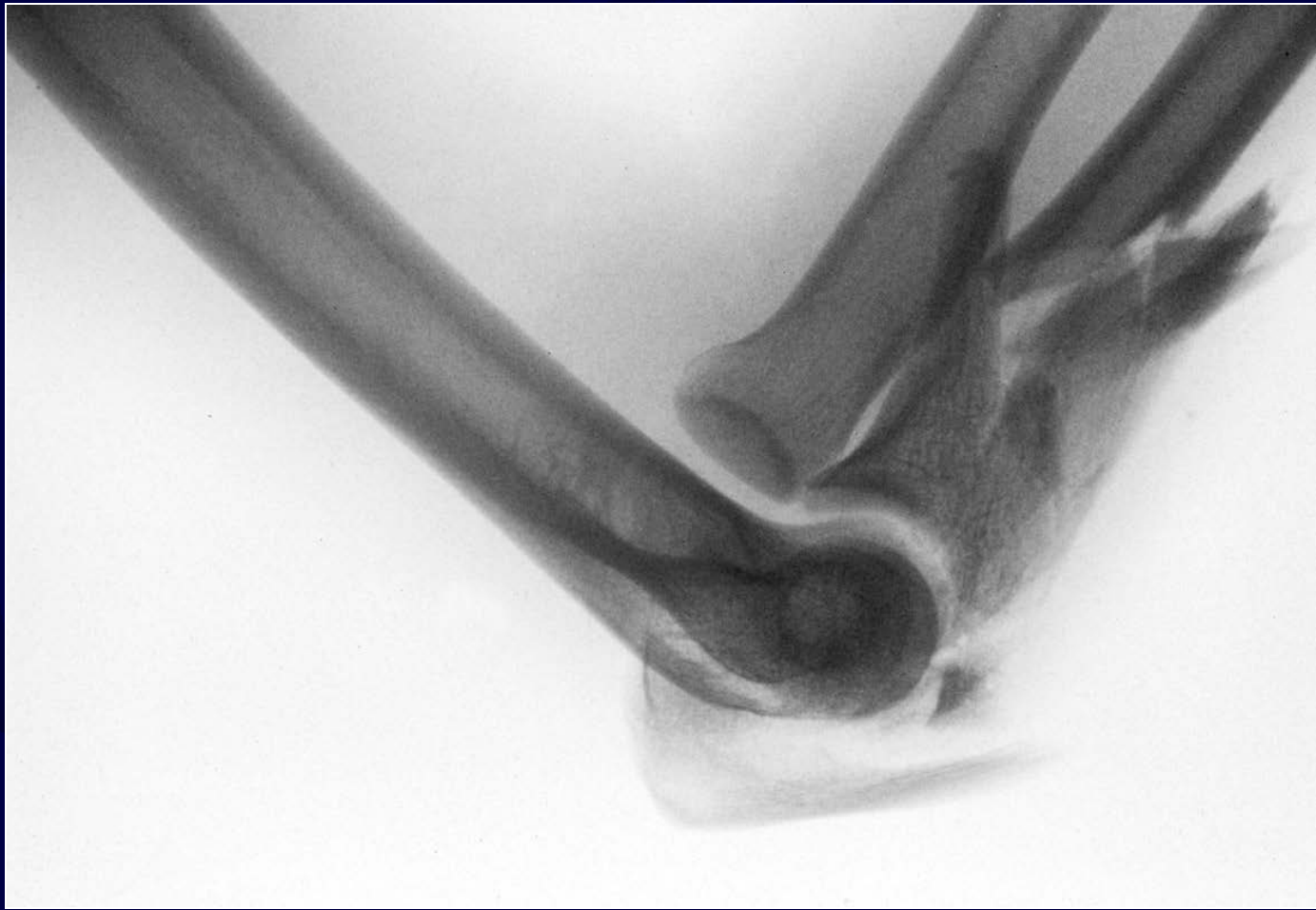


Olecranon Fracture-Dislocations

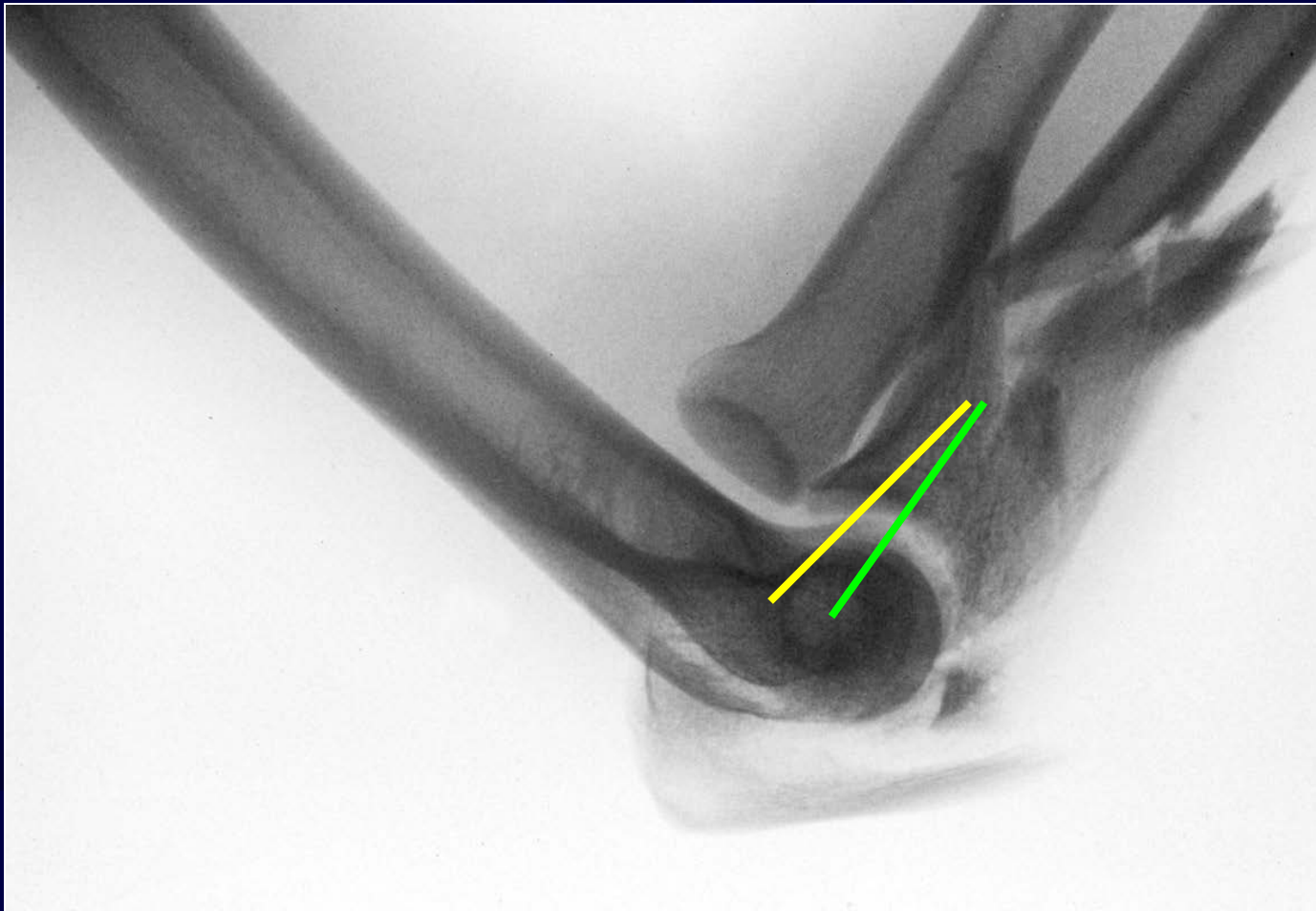
Anterior (trans-olecranon) fracture-
dislocations

Posterior (posterior Monteggia)
fracture-dislocations

Anterior (Trans-Olecranon Fracture- Dislocation of the Olecranon



Anterior (Trans-Olecranon) Fracture-Dislocation of the Olecranon



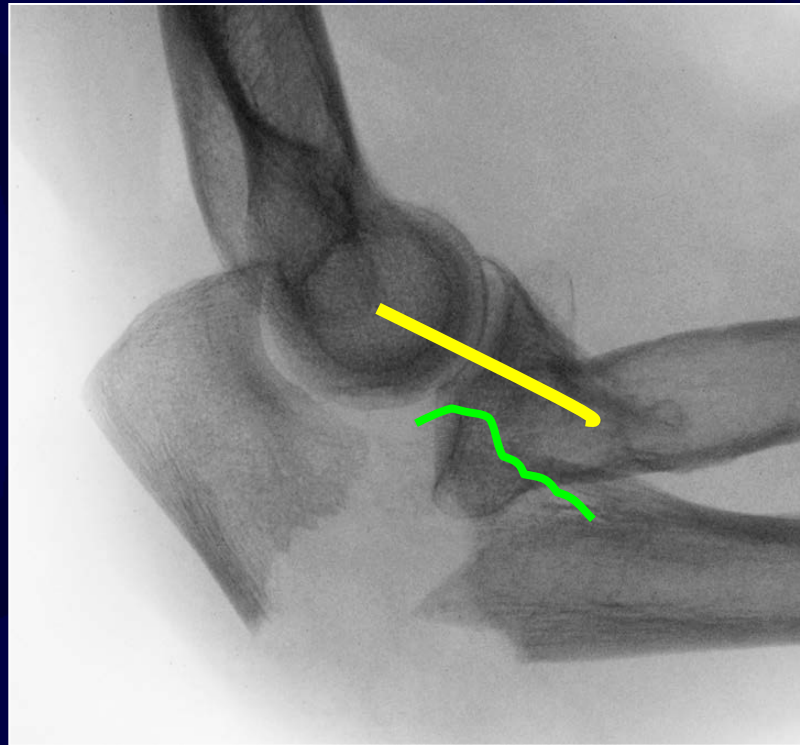
Posterior Fracture-Dislocation of the Olecranon

POSTERIOR MONTEGGIA TYPE FRACTURE-DISLOCATION



Posterior Fracture-Dislocation of the Olecranon

POSTERIOR MONTEGGIA TYPE FRACTURE-DISLOCATION



Principles of Treatment

Restore contour and dimensions of trochlear notch

Contoured dorsal plate

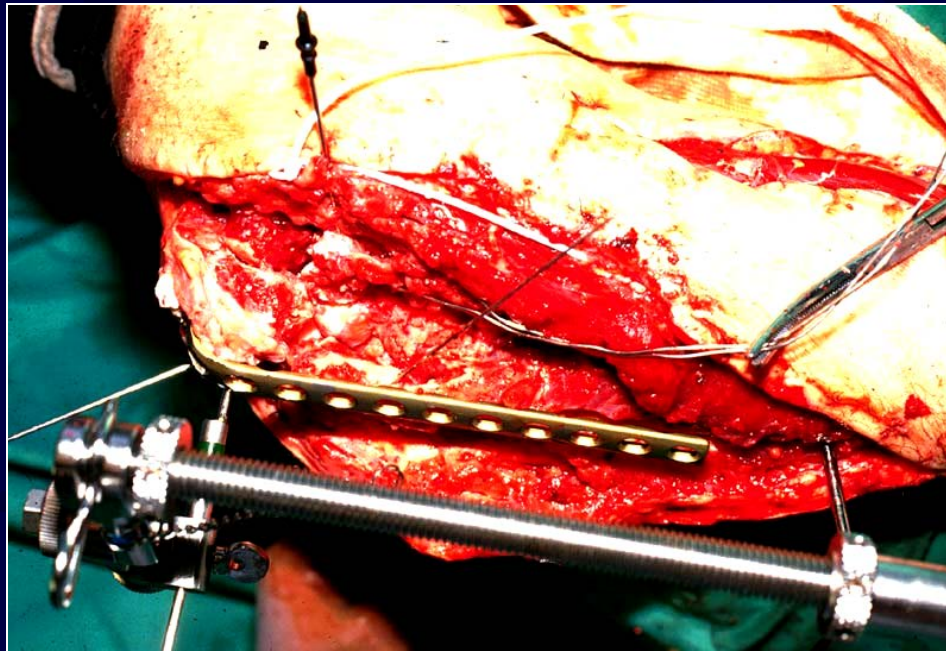
Fixation of coronoid

Bridge fragmentation



Treatment Tips

- Pin the olecranon to the trochlea
- Consider a temporary external fixator for a complex fracture

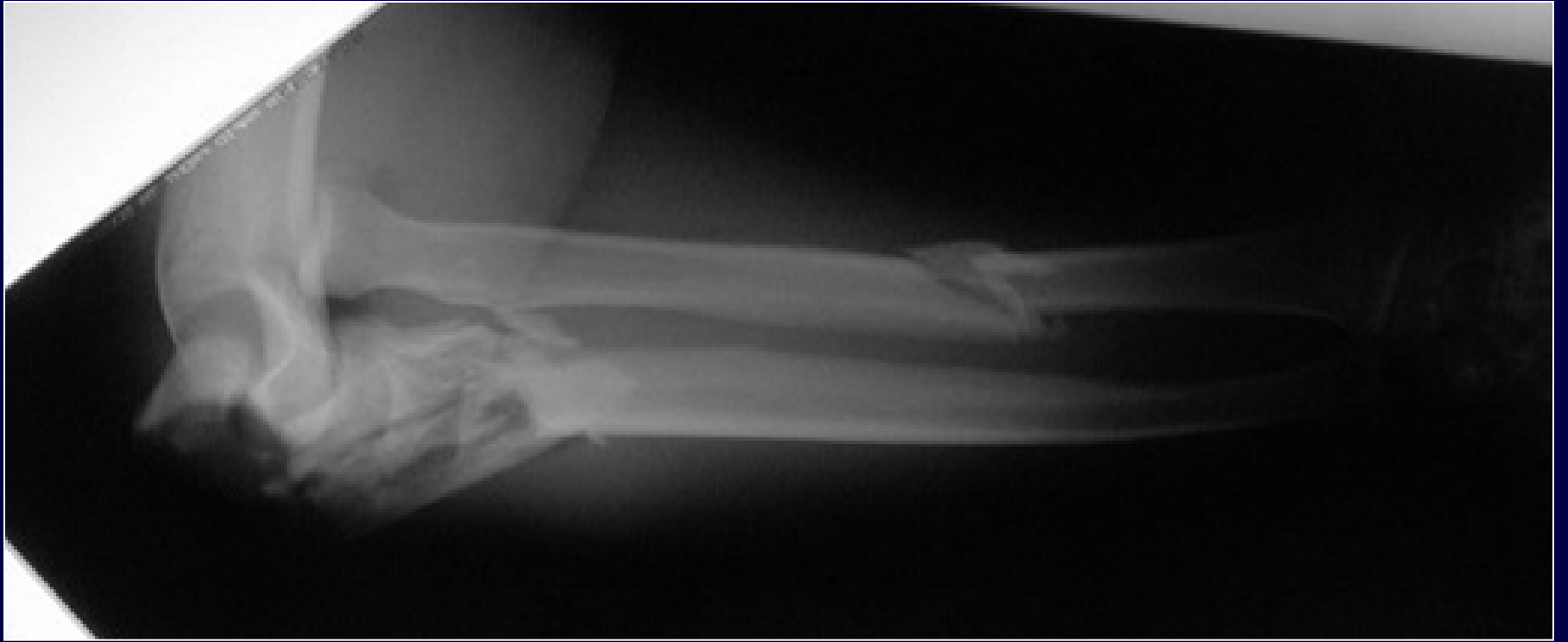


Coronoid Exposure

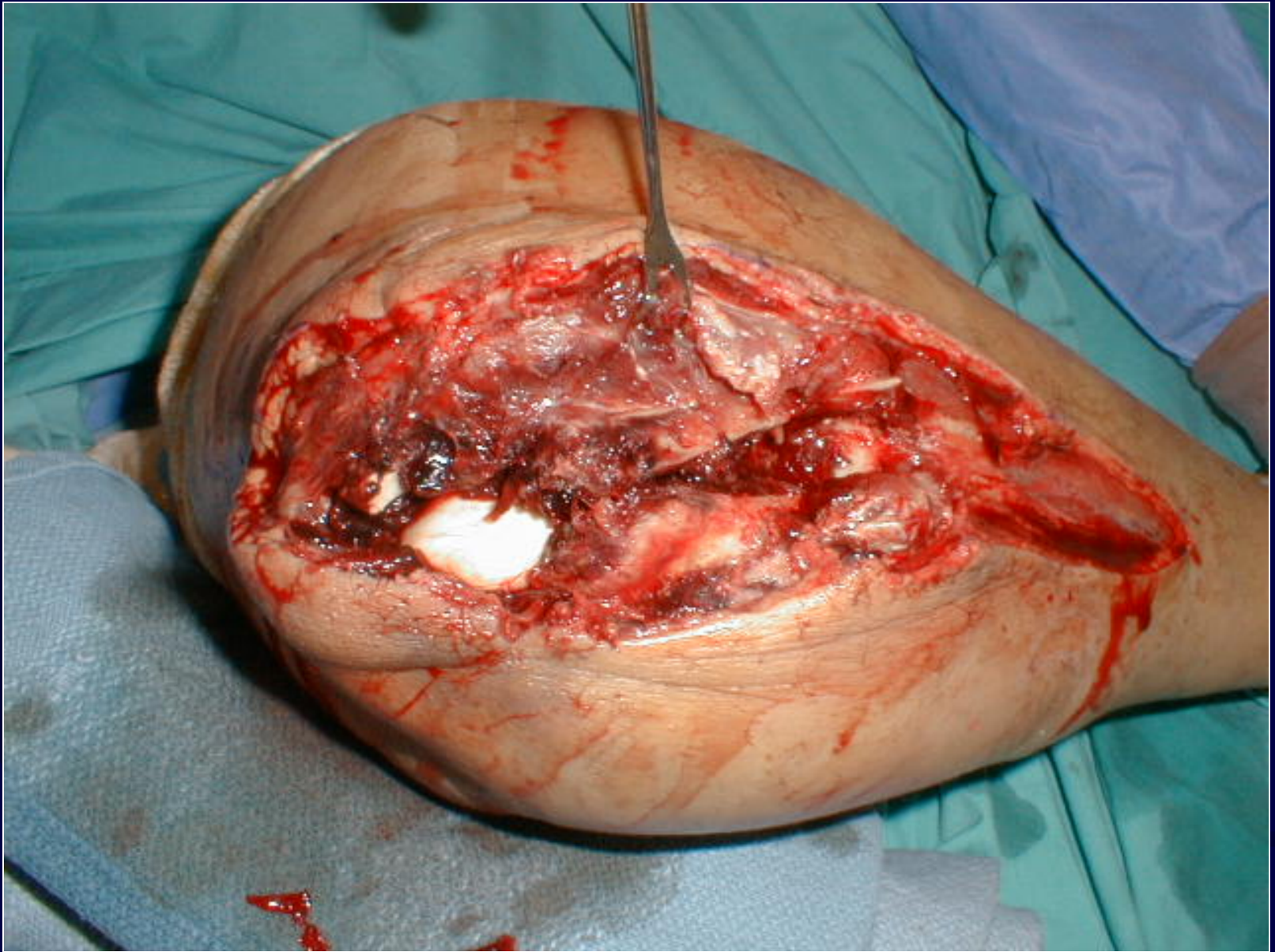
- Through an olecranon fracture
- Lateral
 - Kaplan interval with elevation of ECRL origin
 - Removal of radial head fragments
- Medial
 - Over the top (tip)
 - Split in FCU by ulnar nerve (medial facet)
 - Elevate entire flexor-pronator mass from dorsal (base fracture)

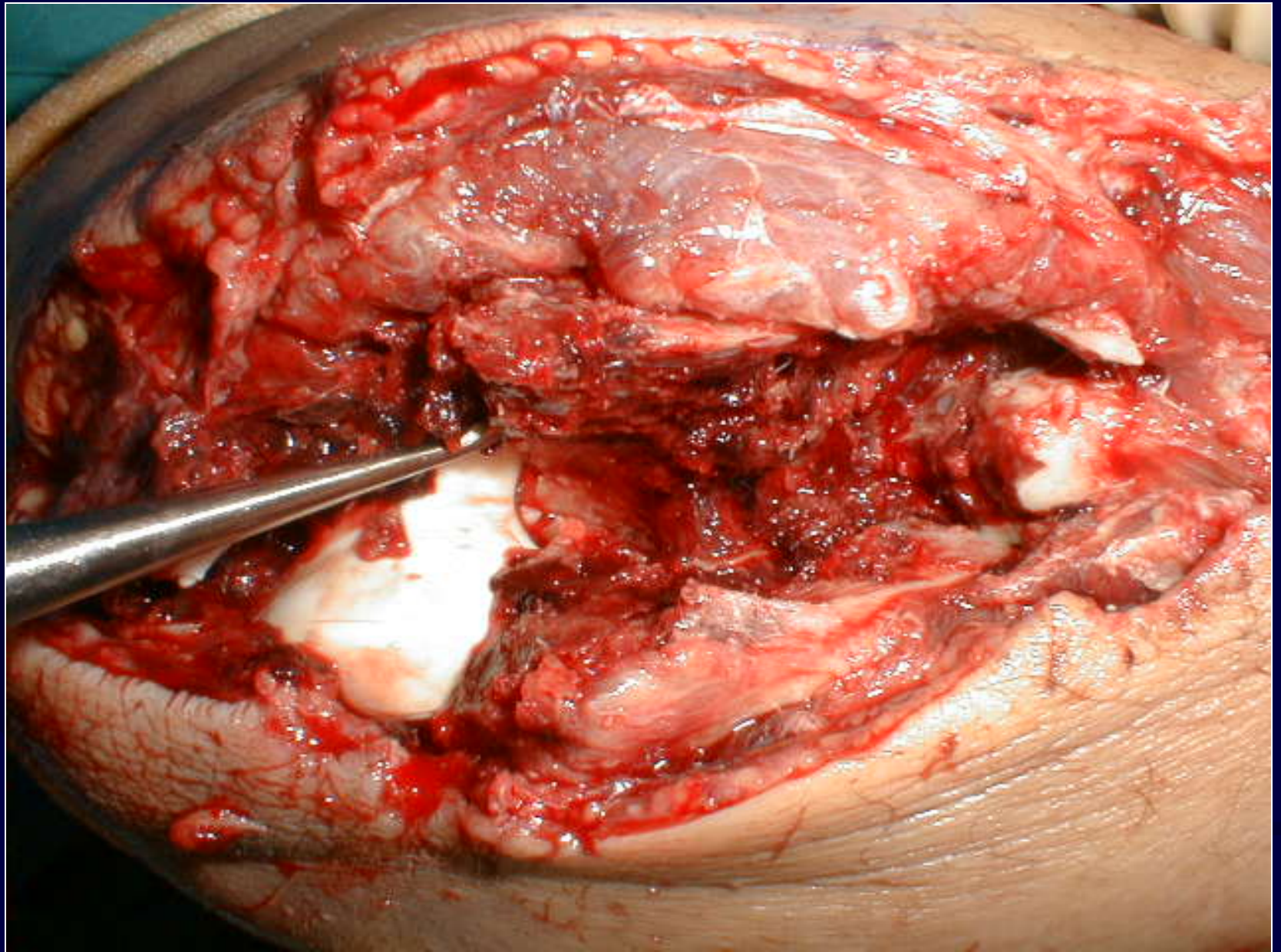
Coronoid Provisional Fixation

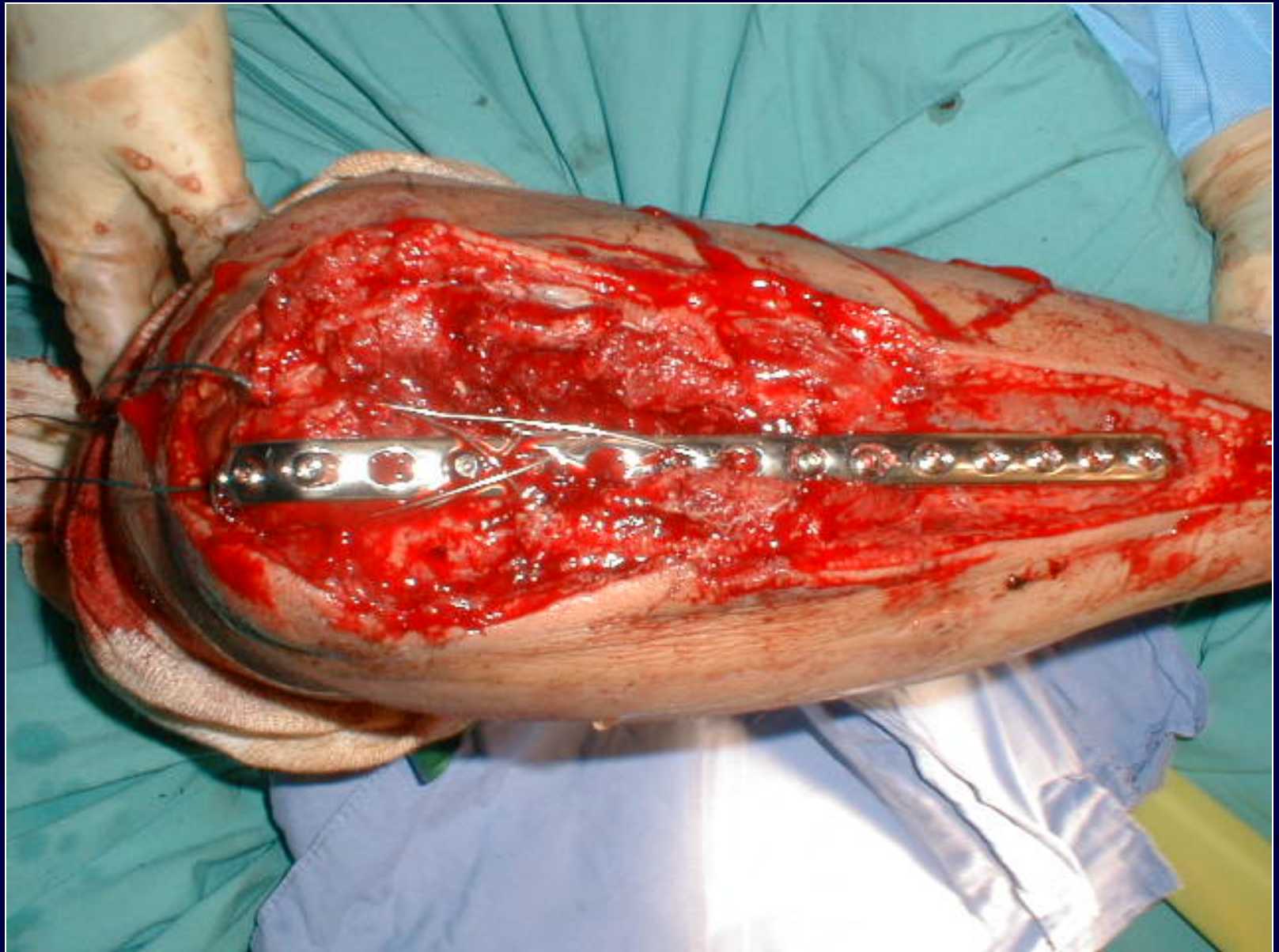
- Coronoid fixation with plate then reduce and fix olecranon
- Pin fragments to trochlea
 - Need to immobilize the elbow

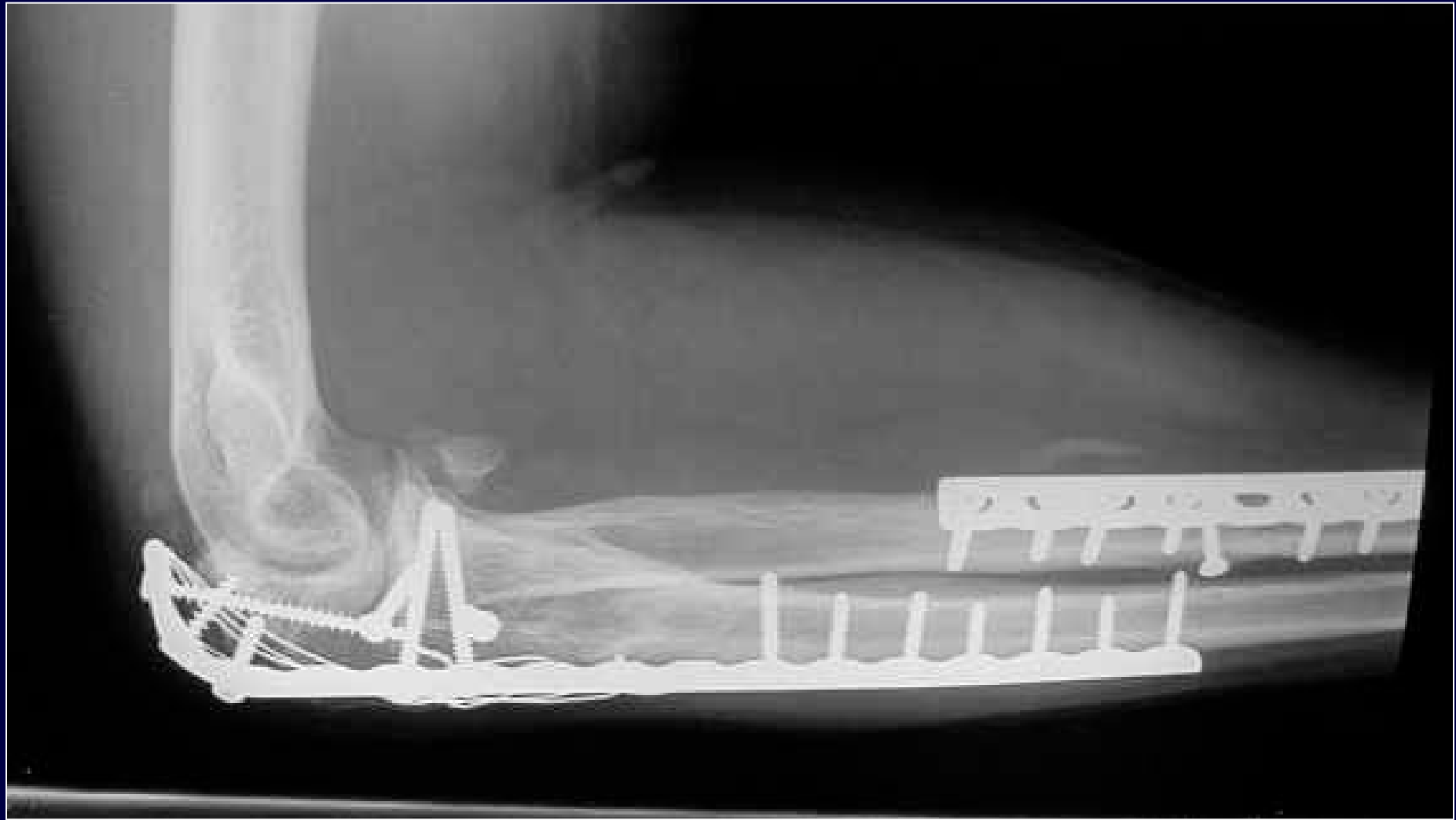








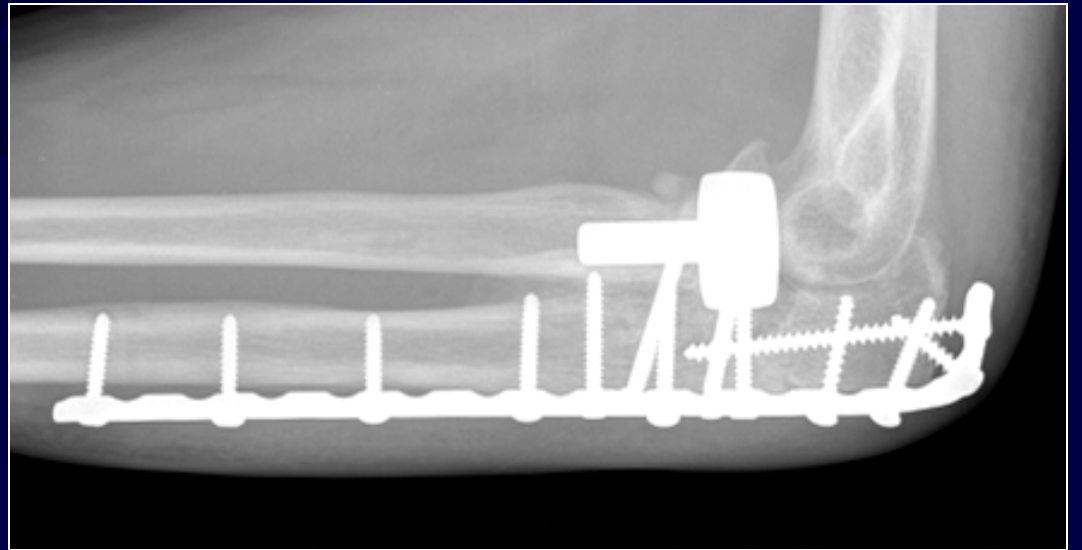














Exercises During Recovery

- If the LCL is injured, avoid varus stress (shoulder abduction) for 3-4 weeks. Overhead exercises can be helpful.
- If fixation is tenuous a 3-4 week period of immobilization is acceptable
- Active, self-assisted elbow flexion and extension and forearm rotation are the key
- Encourage patients to get into a “healthy stretch” mindset. It hurts, but it helps.

Summary

The LCL is more important than the MCL

The ligaments will heal if you keep the elbow concentric, even when treated late

Active motion adds to stability (avoid varus stress)

Even small coronoid fractures can be a problem

Patterns of Traumatic Elbow Instability With Fracture

Dislocation Injuries

Dislocation with Articular Fracture

Dislocation + radial head fracture



Terrible Triad



Disruption Injuries

Olecranon Fracture-Dislocations

Anterior



Posterior



Varus posteromedial rotational instability



Review Articles for Reference

1: Rodríguez-Martin J, Pretell-Mazzini J, Andres-Esteban EM, Larrainzar-Garijo R. Outcomes after terrible triads of the elbow treated with the current surgical protocols. A review. *Int Orthop*. 2011 Jun;35(6):851-60. Epub 2010 May 8. Review. PubMed PMID: 20449590; PubMed Central PMCID: PMC3103950.

2: Mathew PK, Athwal GS, King GJ. Terrible triad injury of the elbow: current concepts. *J Am Acad Orthop Surg*. 2009 Mar;17(3):137-51. Review. PubMed PMID: 19264707.

3: Ring D. Displaced, unstable fractures of the radial head: fixation vs. replacement--what is the evidence? *Injury*. 2008 Dec;39(12):1329-37. Epub 2008 Aug 13. Review. PubMed PMID: 18703190.

4: Cheung EV. Chronic lateral elbow instability. *Orthop Clin North Am*. 2008 Apr;39(2):221-8, vi-vii. Review. PubMed PMID: 18374812.

5: Grace SP, Field LD. Chronic medial elbow instability. *Orthop Clin North Am*. 2008 Apr;39(2):213-9, vi. Review. PubMed PMID: 18374811.

6: Ring D. Instability after total elbow arthroplasty. *Hand Clin*. 2008 Feb;24(1):105-12. Review. PubMed PMID: 18299024.

7: Dipaola M, Geissler WB, Osterman AL. Complex elbow instability. *Hand Clin*. 2008 Feb;24(1):39-52. Review. PubMed PMID: 18299019.

8: Martin BD, Johansen JA, Edwards SG. Complications related to simple dislocations of the elbow. *Hand Clin*. 2008 Feb;24(1):9-25. Review. PubMed PMID: 18299017.

Review Articles for Reference

9: Tejwani NC, Mehta H. Fractures of the radial head and neck: current concepts in management. *J Am Acad Orthop Surg.* 2007 Jul;15(7):380-7. Review. PubMed PMID: 17602027.

10: Sotereanos DG, Darlis NA, Wright TW, Goitz RJ, King GJ. Unstable fracture-dislocations of the elbow. *Instr Course Lect.* 2007;56:369-76. Review. PubMed PMID: 17472320.

11: Tashjian RZ, Katarincic JA. Complex elbow instability. *J Am Acad Orthop Surg.* 2006 May;14(5):278-86. Review. PubMed PMID: 16675621.

12: Bain GI, Ashwood N, Baird R, Unni R. Management of Mason type-III radial head fractures with a titanium prosthesis, ligament repair, and early mobilization. Surgical technique. *J Bone Joint Surg Am.* 2005 Mar;87 Suppl 1(Pt 1):136-47. Review. PubMed PMID: 15743855.

13: McKee MD, Pugh DM, Wild LM, Schemitsch EH, King GJ. Standard surgical protocol to treat elbow dislocations with radial head and coronoid fractures. Surgical technique. *J Bone Joint Surg Am.* 2005 Mar;87 Suppl 1(Pt 1):22-32. Review. PubMed PMID: 15743844.

14: Mehta JA, Bain GI. Posterolateral rotatory instability of the elbow. *J Am Acad Orthop Surg.* 2004 Nov-Dec;12(6):405-15. Review. PubMed PMID: 15615506.

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