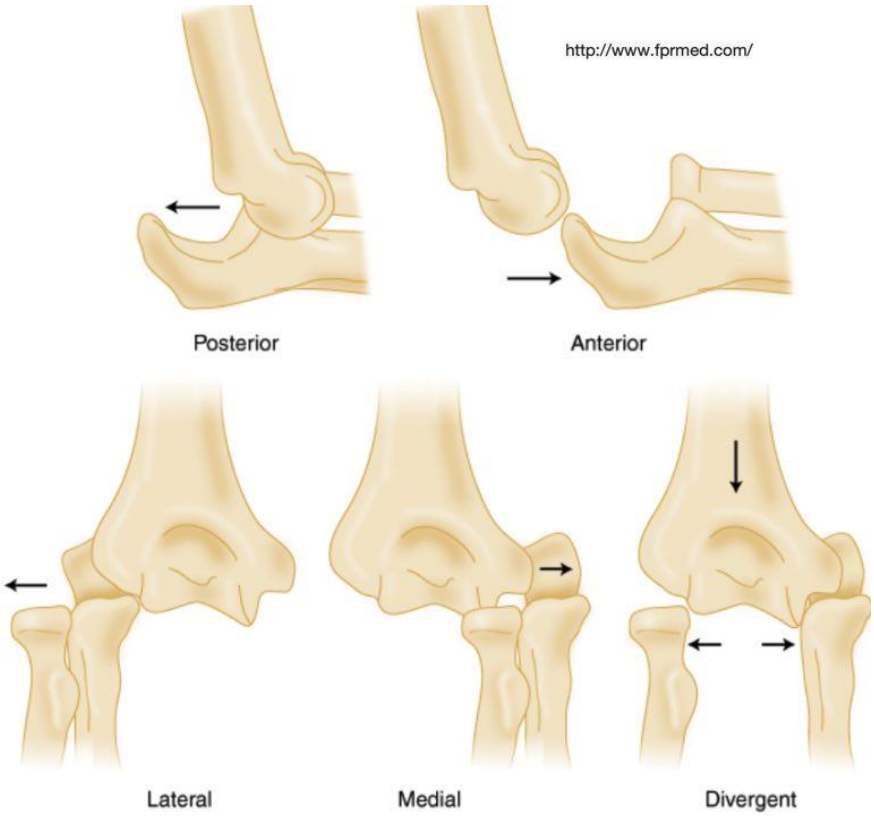
This week: elbow reduction.

This is one of the most common large joint dislocations, second only to the shoulder. It is well within the EM wheelhouse to reduce without necessarily needing orthopedic involvement, with the caveat that there are complex subsets that will always need ortho involvement, more on that below. It occurs most commonly between the ages of 10 and 19; sports (football, wrestling, basketball, and skating) being the usual cause. The mechanism is most commonly due to a fall on an outstretched hand.



The VAST majority of elbow dislocations will be posterior/posterolateral, where the olecranon will be displaced posterior to the humerus. Less than 2% will be anterior, where the olecranon is anterior to the humerus. Fractures are present in about 50% of all elbow dislocation injuries – the most affected being the medial/lateral epicondyle (12-34%), followed by the radial head (10%) and the coronoid process (10%). About 15% of patients will also have a shoulder or wrist injury in addition to the dislocation.

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Radiographs, including AP and lateral views, are usually sufficient for diagnosis. An oblique view can also be obtained to look for periarticular fractures. If there is concern for a complex injury pattern (dislocation with displaced fracture) or neurovascular injury, a CT scan should be obtained.

On exam, there will likely be swelling, deformity, and joint laxity/instability. Posterior dislocation will have the arm held in flexed position with a prominent olecranon that is not aligned with the epicondyles.



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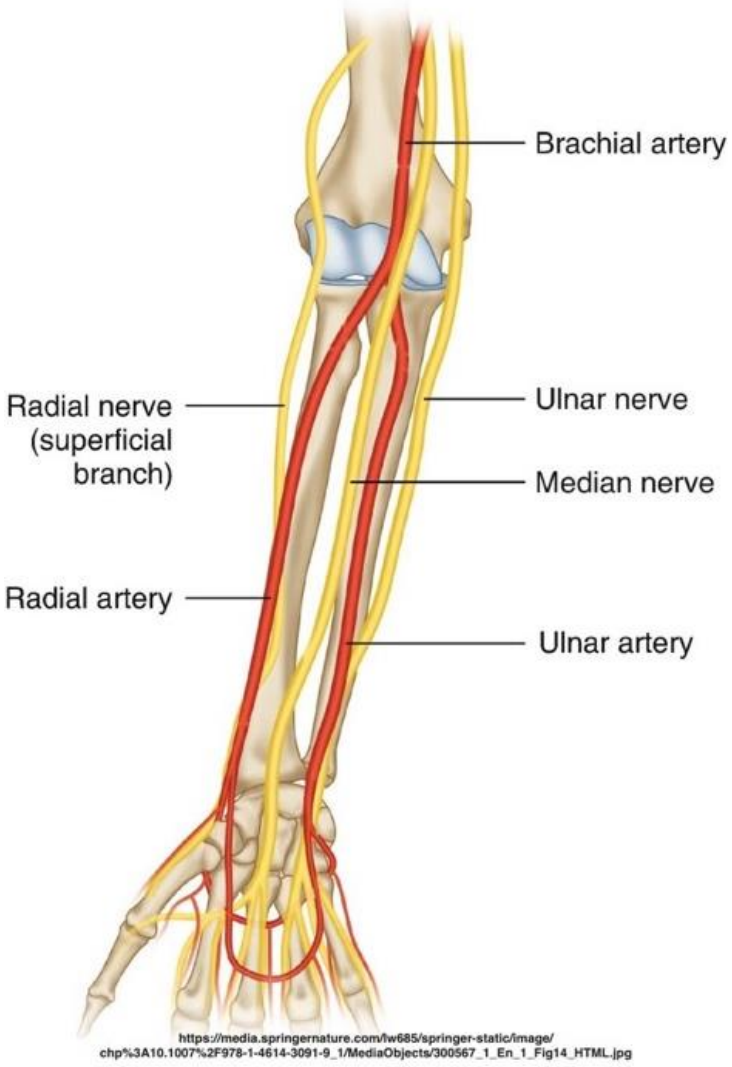
Anterior dislocations will have the arm held in full extension. The upper arm may appear shortened; the forearm will be held supinated.



<u>Considerations</u>:

- As with any orthopedic injury, assess for neurologic or vascular compromise. Anterior dislocations are more likely to cause neurovascular injury, but it can occur with any injury.
    - Widening between the distal humerus and olecranon signals a higher risk for vascular injury

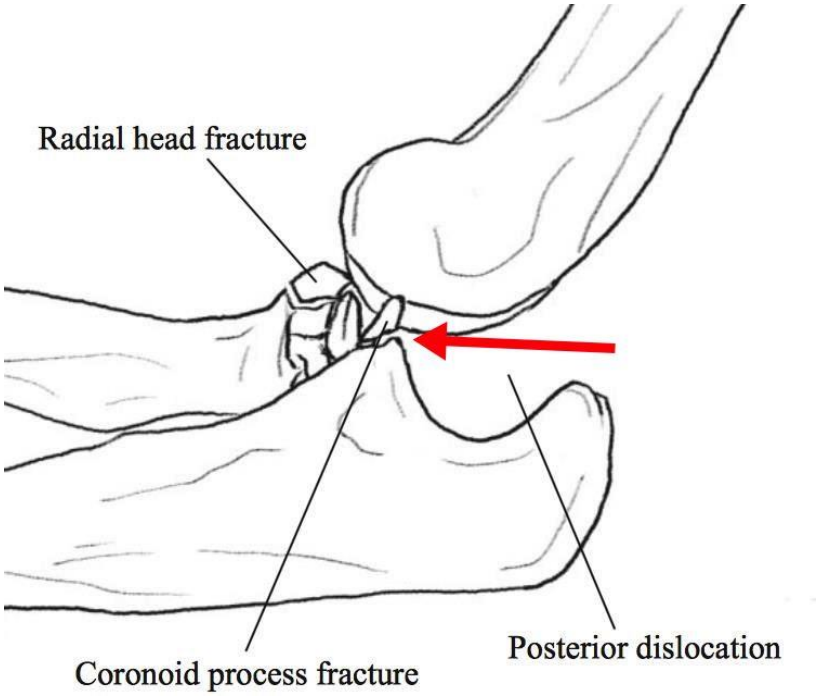
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- About 20% of cases will have a nerve injury (usually to the median or ulnar) which will improve with reduction
- If there are any wounds near the joint, treat as an open fracture.
- Given the frequency of concomitant shoulder and wrist injuries with elbow dislocations, make sure to get imaging of the entire arm
- The arm musculature tends to spasm - procedural sedation will likely be necessary
- A rare, complicated elbow dislocation is known as the “terrible triad” – posterior dislocation with fracture of both the radial head and coronoid process of the ulna. These injuries are very unstable/difficult to reduce, requires a difficult surgery, and may lead to diminished function in the affected arm. If the triad is present, the patient will need emergent evaluation by an elbow specialist due to the complexity of the repair.

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Consent:

- Risks: pain, bleeding/infection (if open fracture or using hematoma block), damage to the brachial artery, median and ulnar nerve damage, iatrogenic fracture, conversion of non-displaced fracture to a displaced fracture, damage to the tendons/ligaments, failure of procedure or need for repeat attempts at reduction
- Alternatives: surgical/open reduction
- Contraindications: complex injury pattern (displaced fracture and dislocation), multiple unsuccessful reduction attempts
    - Relative contraindications: neurovascular compromise (controversial – may worsen underlying injury) presence of hardware

Supplies:

- Your healing hands
- A helpful assistant
- Stretcher/cot where the patient can lay prone
- Bed sheet for counter traction
- If using a hematoma block:
    - Skin cleanser – chlorhexidine, iodine/povidone, alcohol
    - 10 ml syringe

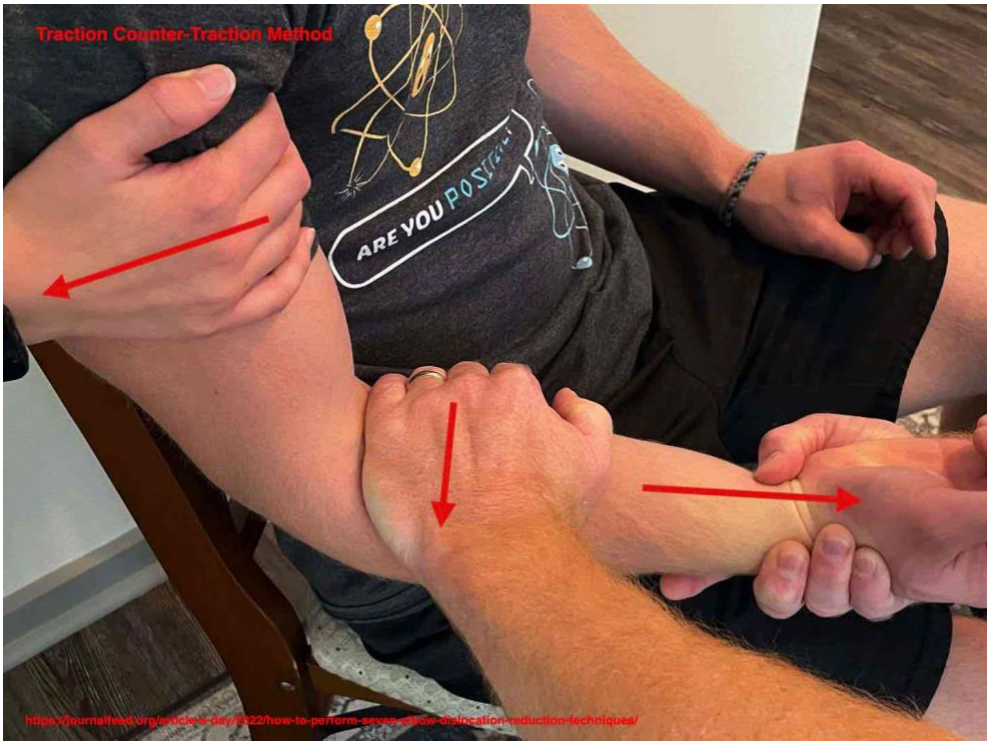
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    - 18 ga needle
    - Lidocaine 1%
- Procedural sedation
- Splinting supplies
- Sling

How to do it:

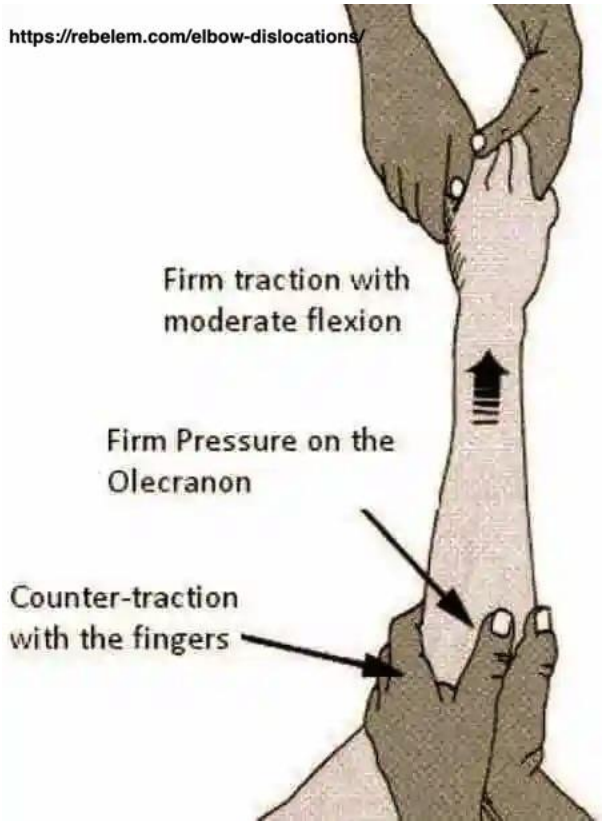
Posterior Dislocation

- Traction-counter traction
    - Position patient seated on stretcher
    - Elbow should be flexed to 90 degrees and the forearm supinated
    - Have the assistant grab the *mid-distal humerus* – not the antecubital fossa
        - Gently pull the humerus posteriorly to provide counter traction
        - Can use a sheet – may be less painful for the patient
    - Provider places one hand just distal to the antecubital fossa and the other hand encircles the wrist
    - The hand near the antecubital fossa should apply continuous downward pressure while the other hand starts to apply traction to the forearm longitudinally
        - The pressure/traction may need to be held for 5-10 min to overcome muscle spasms
    - If needed, the assistant can use their other hand to help guide the olecranon into position

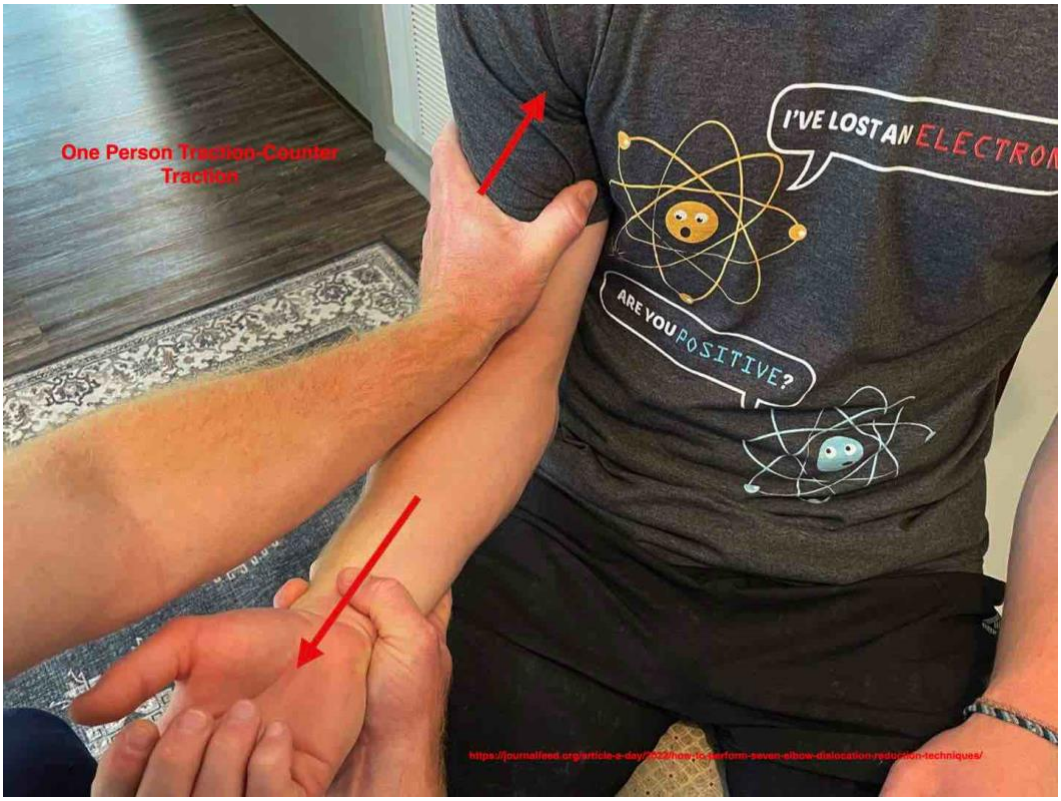


- Slight modification on this technique involves assistant or clinician wrapping both hands around the distal humerus and using the thumbs to apply pressure on the olecranon until it reduces

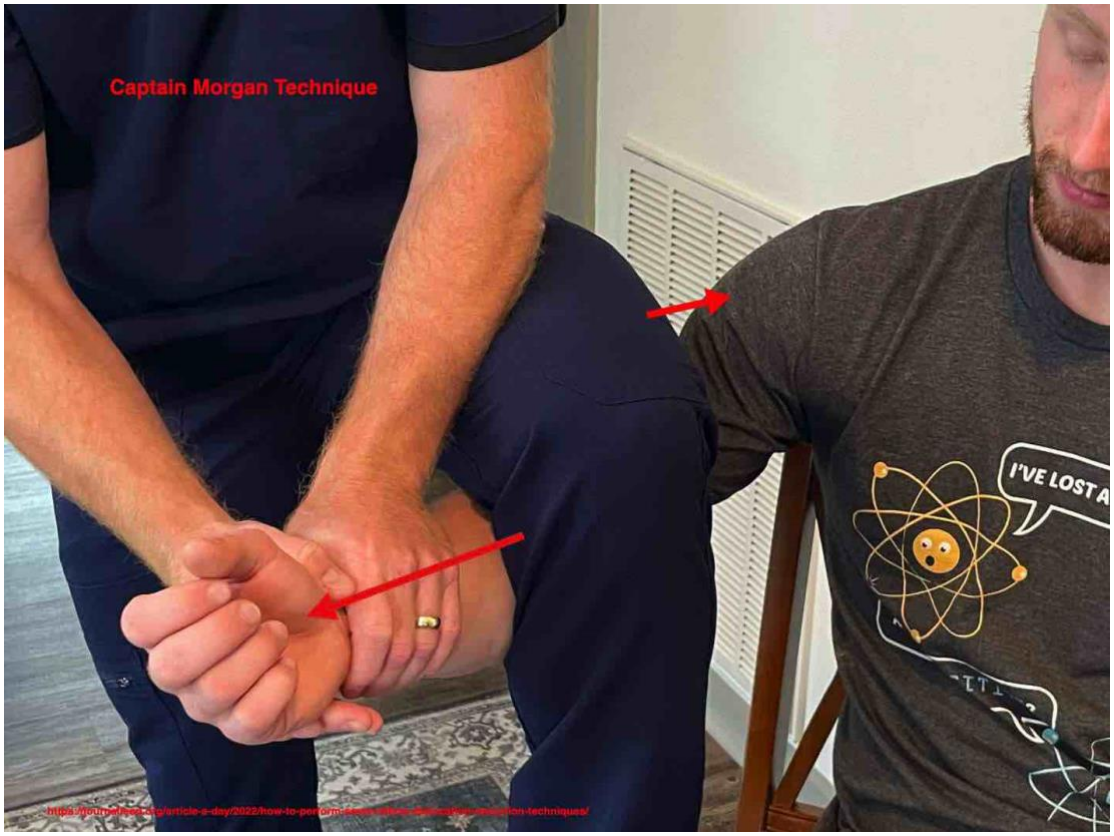
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- One-Person traction-counter traction
    - Position patient seated with elbow flexed and the forearm supinated.
    - Stand in front of the patient
    - Place one hand on the distal humerus and your other hand on the wrist/distal forearm (or grasp hand like you are handshaking it)
    - Apply posterior pressure on the distal humerus while applying steady longitudinal traction
    - May be more difficult to maneuver the olecranon into place versus two-person method

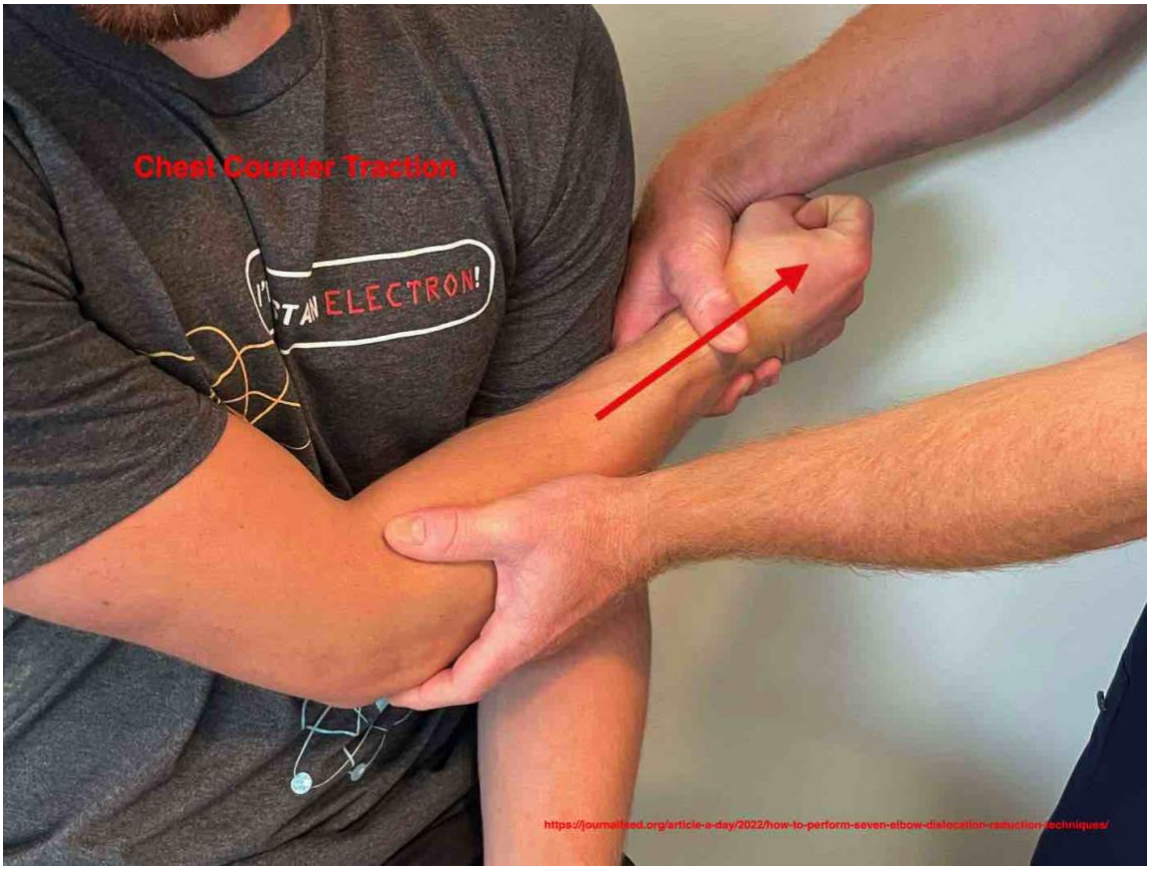


- The Captain Morgan
    - A one-person technique that allows one hand free to be used to maneuver the olecranon if needed
        - Major downside: patient's arm must be between the practitioner's legs
    - Have patient sitting on a low stretcher.
    - Clinician stands on the side of the affected arm and places foot on the stretcher with a flexed knee (Captain Morgan style).
    - Patient's proximal arm is pulled underneath the clinician's leg with the patient's antecubital fossa placed near with the clinician's popliteal fossa
    - Clinician uses their knee/thigh to provide counter traction as continuous longitudinal traction is placed on the forearm by pulling on the wrist.
    - If needed, one hand can be used to maneuver the olecranon into place while traction on the forearm is applied with the other hand.



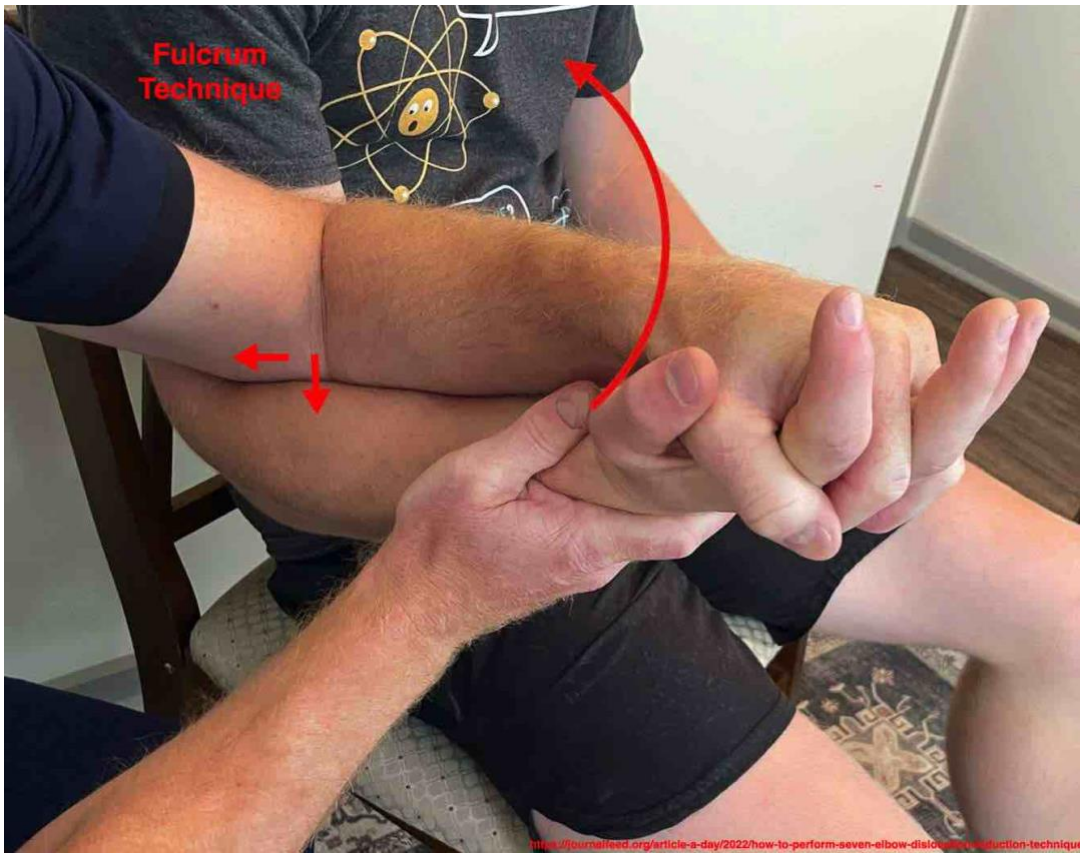
- Chest Counter Traction
  - Patient is seated with arm in a neutral position
  - Clinician stands on the non-affected side of the patient
  - Arm is pulled across the patient by the clinician by gripping the wrist/forearm with one/both hands – the chest wall acts as counter traction to the motion
  - Continuous longitudinal traction is applied to the wrist
    - One hand can be used to manipulate the olecranon and guide into place

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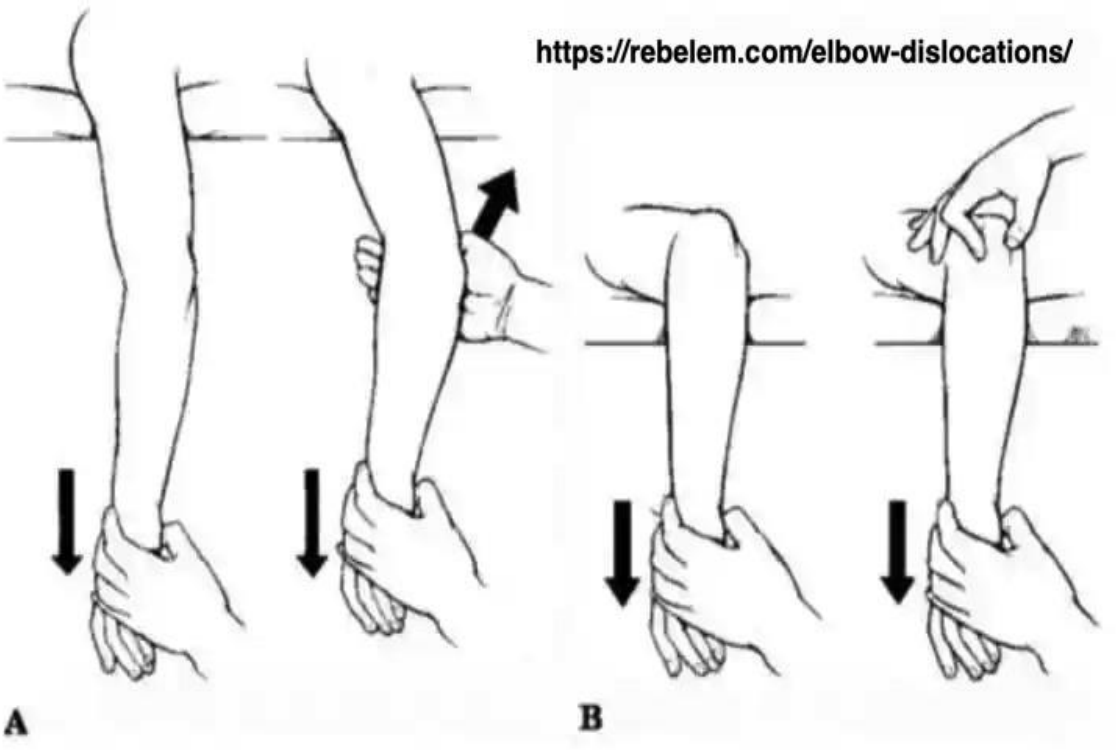
- <u>Leverage/Interlocking Hands Technique</u>
    - Patient is seated with elbow flexed and forearm supinated
    - Clinician stands next to the stretcher and interlocks fingers with the patient using the opposite hand (e.g. if the patient's right elbow is injured, the clinician uses their left hand)
    - Place your elbow against the distal portion of the patient's humerus/biceps
    - While keeping downward pressure with the elbow, start to slowly flex the patient's elbow.
        - Clinician's elbow will act as a fulcrum to hyperextend and move the olecranon into place
        - Stretcher may need to be raised/lowered to allow clinician to get adequate leverage

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- Arm Hang Method
    - A good one-person technique similar to the Stimson method for shoulder dislocations
    - Have patient lie prone with arm hanging off the side of the bed
        - Approach A
            - Arm is entirely hanging off the bed with the humerus off the side of the mattress
            - Clinician places one hand in the antecubital fossa and provides upward counter traction while continuous longitudinal traction is applied to the forearm with the clinician's other hand on the patient's wrist
        - Approach B
            - Forearm is hanging off the side of the stretcher with the humerus still on the mattress
            - Downward traction is applied on the forearm by grasping the wrist. Clinician's other hand is used to maneuver the olecranon until reduced.

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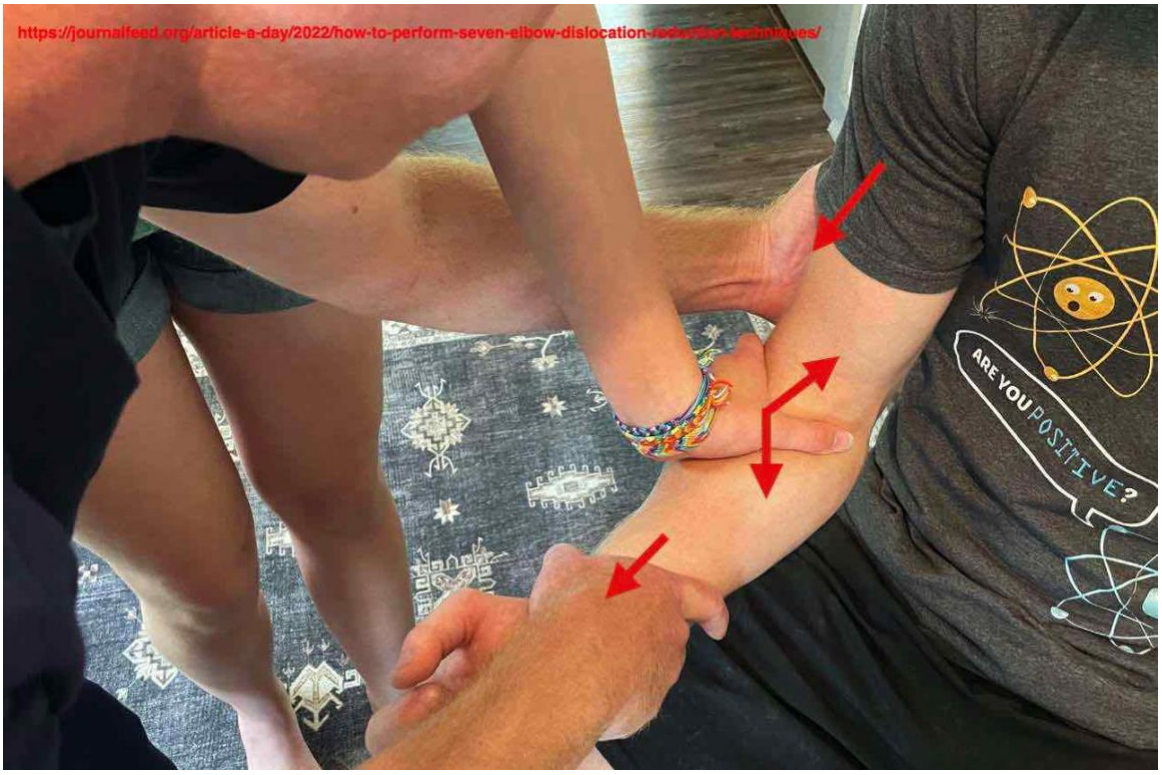
- <u>Double thumb hanging technique</u>
  - Modification of the hanging technique that does not require traction
  - Have patient laying prone with forearm hanging off stretcher
  - With a posterior dislocation, the olecranon protrudes and will be palpable
  - Use both thumbs to engage the displaced olecranon and push up and over the coronoid process – this will take a lot of force/leverage and cannot be done if there are fractures present



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Anterior Dislocation

- Anterior dislocations are a little trickier to reduce and will require multiple sets of hands
- Modified Traction – Counter traction technique
    - Patient is seated with the arm flexed to 90 degrees and forearm supinated
    - One clinician places hand just distal to the antecubital fossa and applies downward force to disengage the olecranon from the distal humerus. This hand will also provide counter traction to the other clinician.
    - Second clinician applies longitudinal force to the distal forearm by grabbing the wrist and pulling. The clinician's other hand is placed behind the mid humerus and provides slight anterior/stabilizing force on the humerus
    - Once the olecranon has disengaged from the distal anterior humerus, slight posterior force is applied by the first clinician on the proximal forearm to guide the olecranon into place.

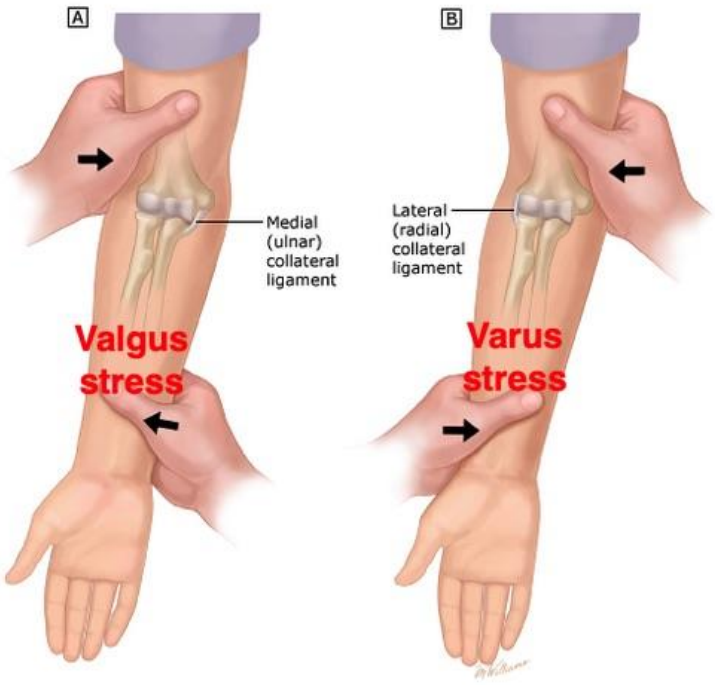


Post Procedure Care:

- Test for laxity to determine how to splint

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- Have patient externally rotate the humerus and slightly flex elbow to about 20 degrees and then apply varus and valgus stress to assess for instability
- Splinting based on injury pattern provides additional support and stabilization of the joint
- Laxity with valgus stress indicates a medial collateral ligament injury – splint with forearm in supination
- Laxity with varus stress indicates a lateral collateral ligament injury – splint with forearm pronated
- No laxity (very unlikely) splint in neutral position



- Post reduction, splint the elbow with a posterior long arm splint in 90 degrees of flexion with the forearm positioned based on laxity testing

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- Reassess neurovascular status post splinting and repeat X rays
- For stable simple dislocation reductions (i.e. dislocation that stays in place post reduction), patient should follow up with orthopedics within the next week
    - Keep patient in splint for 1-2 weeks, followed by early immobilization. Prolonged (>3 week) immobilization is associated with poor functional outcomes and elbow contractures
    - Dislocation with non-displaced fracture that is stable when reduced can be treated the same way
- For unstable simple dislocations, discuss with ortho. Can usually reduce, splint, and have patient follow up in 48-72 hours in clinic.
    - Patients generally require a more prolonged immobilization (2-3 weeks) and then transition to a hinged splint for another month
- Complicated (displaced fracture + dislocation) will almost always need operative management so discuss with ortho
    - A trial of splinting may be adequate for minimally or non-displaced radial head fractures
    - Splinting without operation in these patients may lead to a worse functional outcome

References:

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- https://www.orthobullets.com/trauma/1018/elbow-dislocation
- https://coreem.net/core/elbow-dislocation/
- https://www.merckmanuals.com/professional/injuries-poisoning/how-to-reduce-dislocations-and-subluxations/how-to-reduce-a-posterior-elbow-dislocation
- https://www.emdocs.net/em3am-elbow-dislocation/
- https://journalfeed.org/article-a-day/2022/how-to-perform-seven-elbow-dislocation-reduction-techniques/
- https://www.ncbi.nlm.nih.gov/books/NBK549817/
- https://jetem.org/posterior-elbow-dislocation/
- https://www.ncbi.nlm.nih.gov/books/NBK559277/

Videos:

- https://www.youtube.com/watch?v=Z0u1cS4z_PU – longer video – procedure starts around 3:20. Includes hematoma block of the elbow
- https://www.youtube.com/watch?v=2zgoA0ZAKT8 – posterior elbow dislocation
- https://www.youtube.com/watch?v=MAKqZZrzdOE – posterior dislocation techniques – discussed one person and two person methods
- https://www.youtube.com/watch?v=A91TWNbSEOQ – two-person posterior reduction
- https://www.youtube.com/watch?v=FBqDTWVyz4Y – multiple techniques
- https://www.youtube.com/watch?v=_lYQE6cIDUo – difficult posterior dislocation reduction
- https://www.youtube.com/watch?v=4i7gbeUsxZk – lateral dislocation reduction (rare)
- https://www.youtube.com/watch?v=bCqPTSgW3-c – varus and valgus stress tests
- https://www.youtube.com/watch?v=kXyGIqvYWts – posterior long arm splint application

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