

# Joint mobilization to the Elbow, Wrist and Hand



## **REFERENCES:**

- 1. Kisner C, Colby LA: Therapeutic Exercise: Foundations and Techniques. Philadelphia: FA Davis Co., 5th ed., chap 5, 2007.**
- 2. Kaltenborn FM: Manual Mobilization of the Extremity Joints. 4th ed., Oslo: Olaf Norlis Borkhandel, 1989**

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# Humeroulnar and Humeroradial Joint

- **Structures and Movements**
  - Humeroulnar Joint
    - Convex: humeral (trochlea)
    - Concave: ulna (trochlea notch)
  - Humeroradial Joint
    - Convex: humeral (capitulum)
    - Concave: radius
- Active movements
  - Flexion, extension.

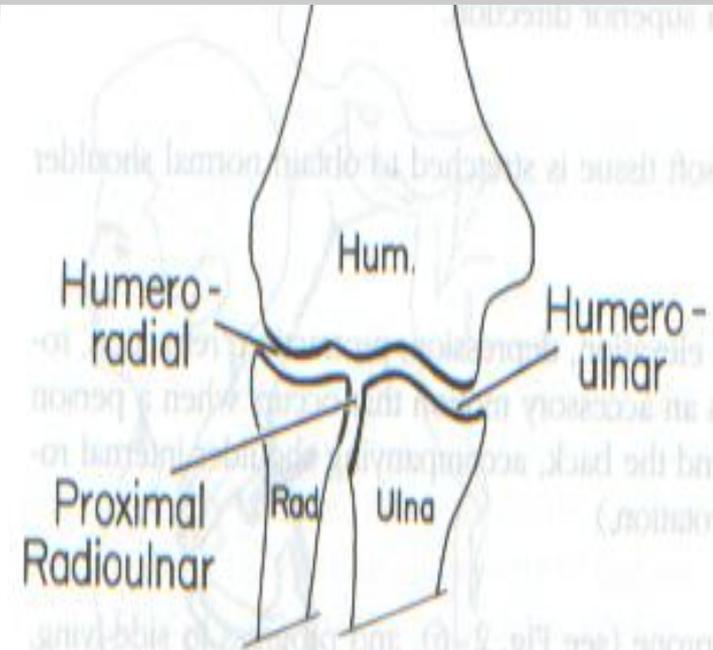
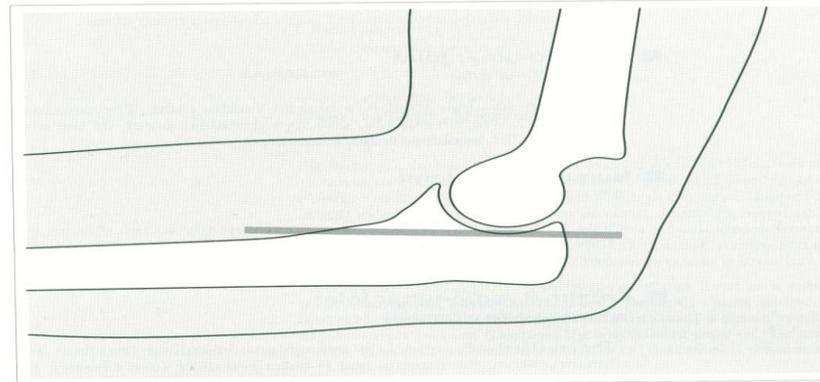


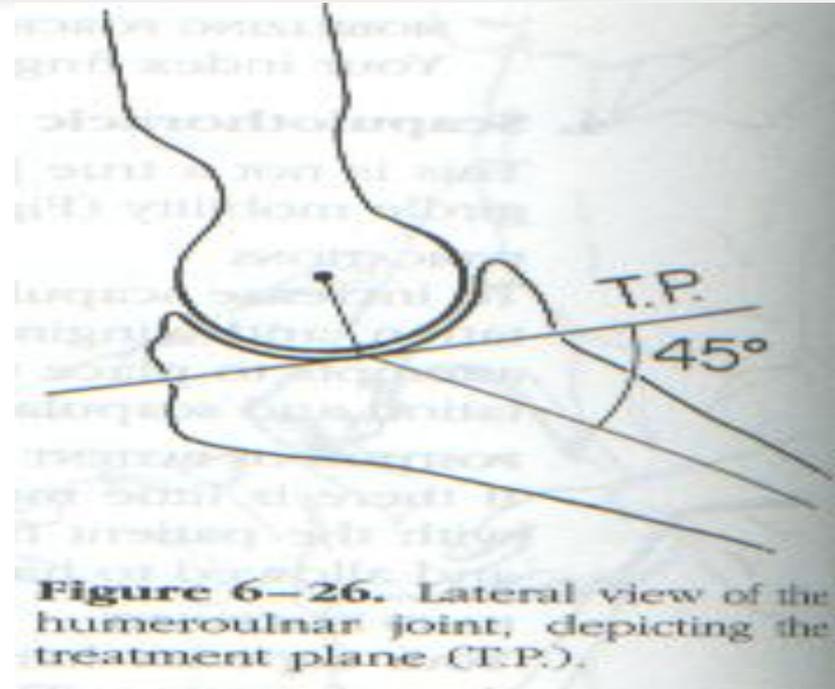
Figure 6-25. Bones and joints of the elbow complex.





# Humeroulnar and Humeroradial Joint

- Close packed position
  - Humeroulnar Joint
    - Maximal extension
  - Humeroradial Joint
    - Elbow flexed  $90^{\circ}$   
forearm supination  $50^{\circ}$
- **Loose packed position**
  - Humeroulnar Joint
    - $70^{\circ}$ - $90^{\circ}$  elbow flexion, forearm  $10^{\circ}$  supination
  - Humeroradial Joint
    - Full extension, full supination
- Capsular pattern
  - Flexion—extension





# Ulna Distraction (humeroulnar joint)

- **Use: testing; to increase general mobility( extension or flexion)**
- P— supine with arm resting on table and elbow flexed
- O— The PT's stabilizing hand grasps the patient's anterior/distal surface of the humerus
- The mobilizing hand contacts the anterior/proximal surface of the ulna
- M--- The mobilizing hand exerts a caudal force through the finger contacts on the ulna. (consider the treatment plane)



# Ulna Distraction

A----Ulnar distraction

B----Ulnar distal gliding  
To increase elbow flexion



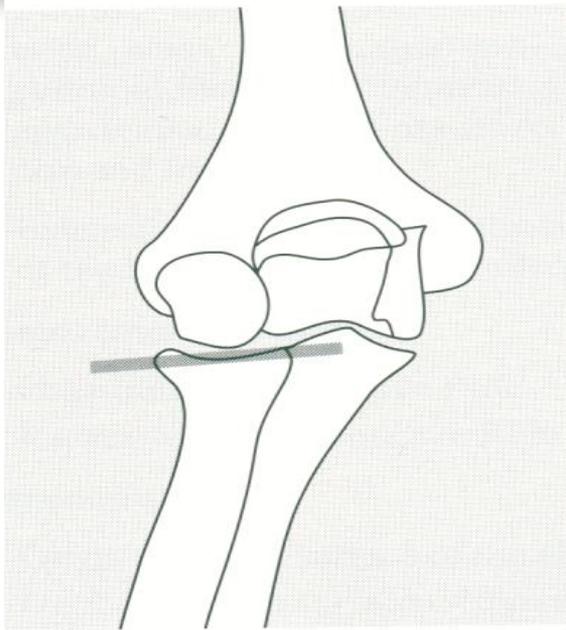


# Radial traction

- Use: **testing; to increase general mobility**
- P— supine with arm support on table with the elbow placed in the loose packed position
- O—The patient's arm is fixated against the table with a belt. The PT's hand grasps with both hands around the ventral surface and proximal part of the patient's forearm.
- M---The PT shifts the body backward moving the ulna at a right angle to the forearm, thus producing traction in the elbow joint.
- Same technique can be done at the end of the elbow available range (traction progression)



# Radial traction



**Figure 6–28.** Joint traction; humeroradial articulation.



# Dorsal Glide and Volar Glide of the Radial (Humeroradial joint)

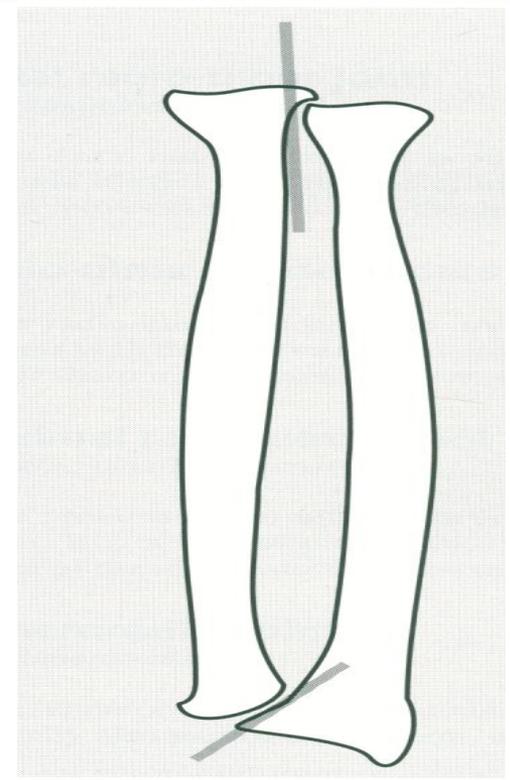
- **Use: to increase elbow extension -- posterior glide to increase elbow flexion -- anterior glide**
- P— supine with arm support on table
- O—The PT's stabilizing hand grasps around the distal humerus. The mobilizing hand grasps the radial head.
- M--- The mobilizing hand exerts a anterior force through the thumb pad. The mobilizing hand exerts a posterior force through the index and middle fingers (or thenar eminence)

# Dorsal Glide and Volar Glide of the Radial (Humeroradial joint)



# Proximal Radioulnar Joint

- **Structures and Movements**
  - Convex: radial head
  - Concave: ulna (the radial notch)
- Active movements
  - Pronation, supination
- Close packed position
  - 5° supination
- **Loose packed position**
  - 70° elbow flexion, 35° forearm supination





# Proximal Radioulnar Joint

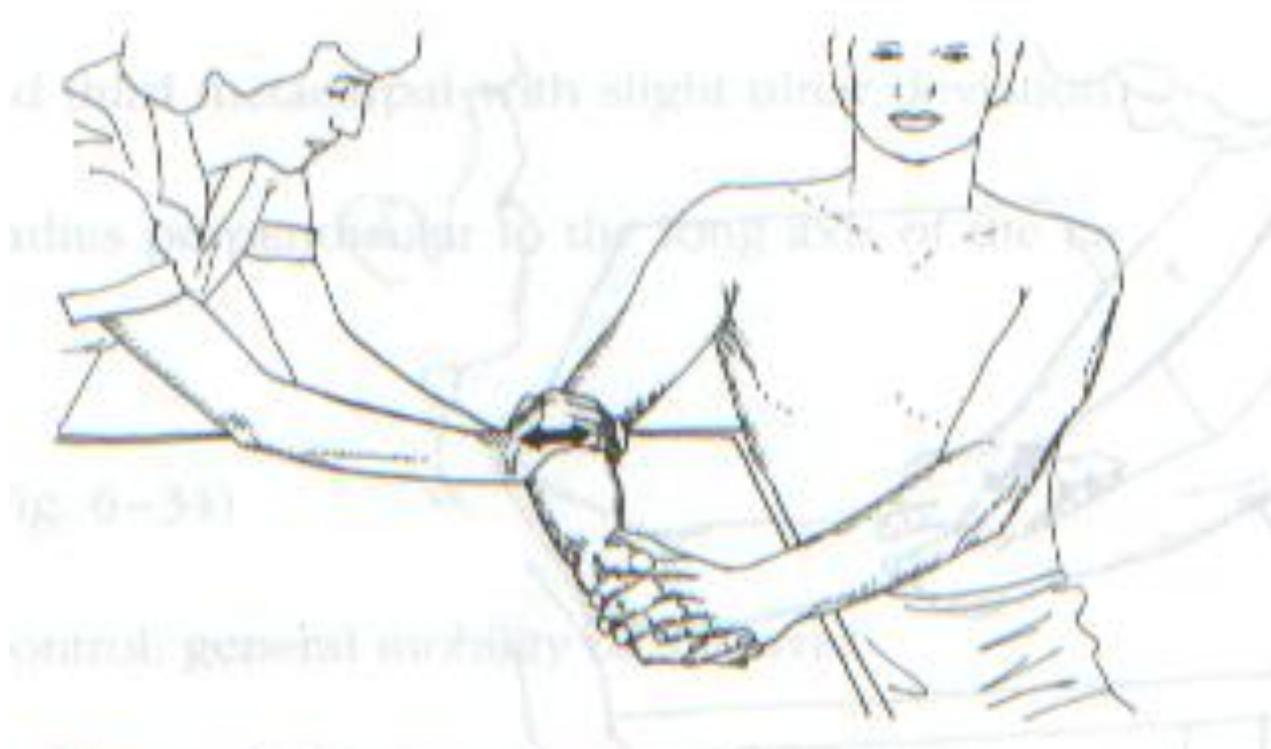
- Component and joint play motions
  - Distraction
  - Dorsal/volar glide
  - Superior/inferior glide
- **Capsular pattern**
  - Pronation and supination are restricted equally



# Proximal radioulnar joint

- **Posterior glide to increase forearm pronation**
- **Anterior glide to increase forearm supination**
- **P—supine with arm supported on table**
- **O—The PT's stabilizing hand grasps around the distal humerus. The mobilizing hand grasps the radial head.**
- **M--- The mobilizing hand exerts a anterior force through the thumb pad. The mobilizing hand exerts a posterior force through the index and middle fingers (or thenar eminence)**

# Anterior Glide and Posterior Glide of the Radial Head



**Figure 6-31.** Dorsal-volar glide; proximal radioulnar joint.

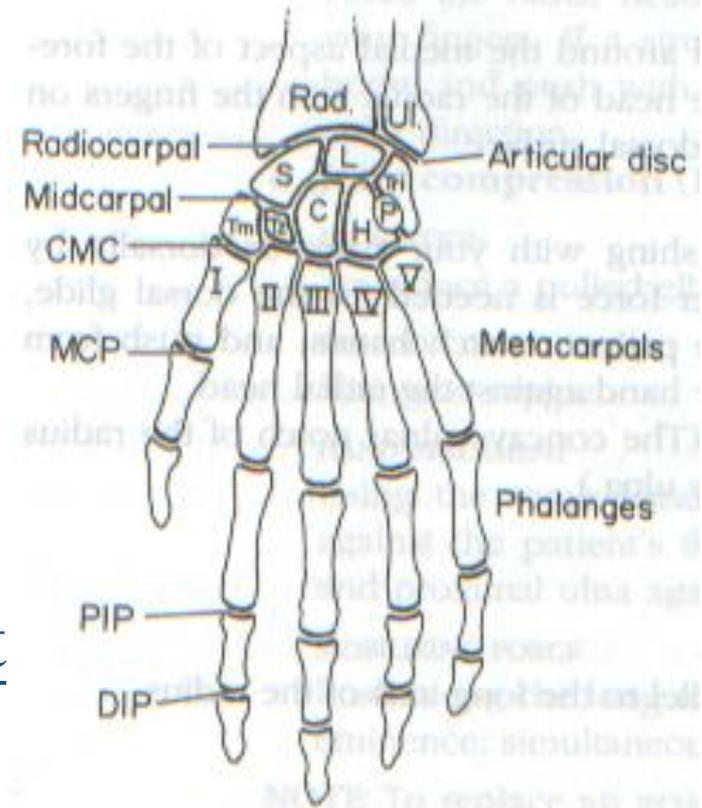


# Distal Glide of Radius on Ulna

- **Use: to increase a joint play motion necessary for full elbow extension**
- P — supine with arm supported on table, elbow bent, and forearm in neutral position
- O —The PT's stabilizing hand grasps around the distal humerus against the plinth. The mobilizing hand grasps the distal radius.
- M--- The mobilizing hand pulls the radius distally. The elbow may be gradually extended as movement increases.

# Distal Radioulnar Joint and Ulna-Meniscal –Triquatraal Joint

- Distal Radioulnar Joint
  - Convex: head of ulna
  - Concave: distal radius
  
- Ulna-Meniscal –Triquatraal Joint
  - Convex: carpal bones (ulnar part of lunate, triquetrum)
  - Concave: articular disc (meniscus)





# Volar Glide and Dorsal Glide of Radius

- **Volar glide of radius- increase forearm pronation**
- **Dorsal glide of radius- increase forearm supination**
- P – sitting or supine with arm supported on table
- O – The PT's stabilizing hand grasps the distal ulna from the ulnar side. The mobilizing hand grasps the distal radius from the radius side.
- M -- The mobilizing hand moves the radius in volar or dorsal direction.

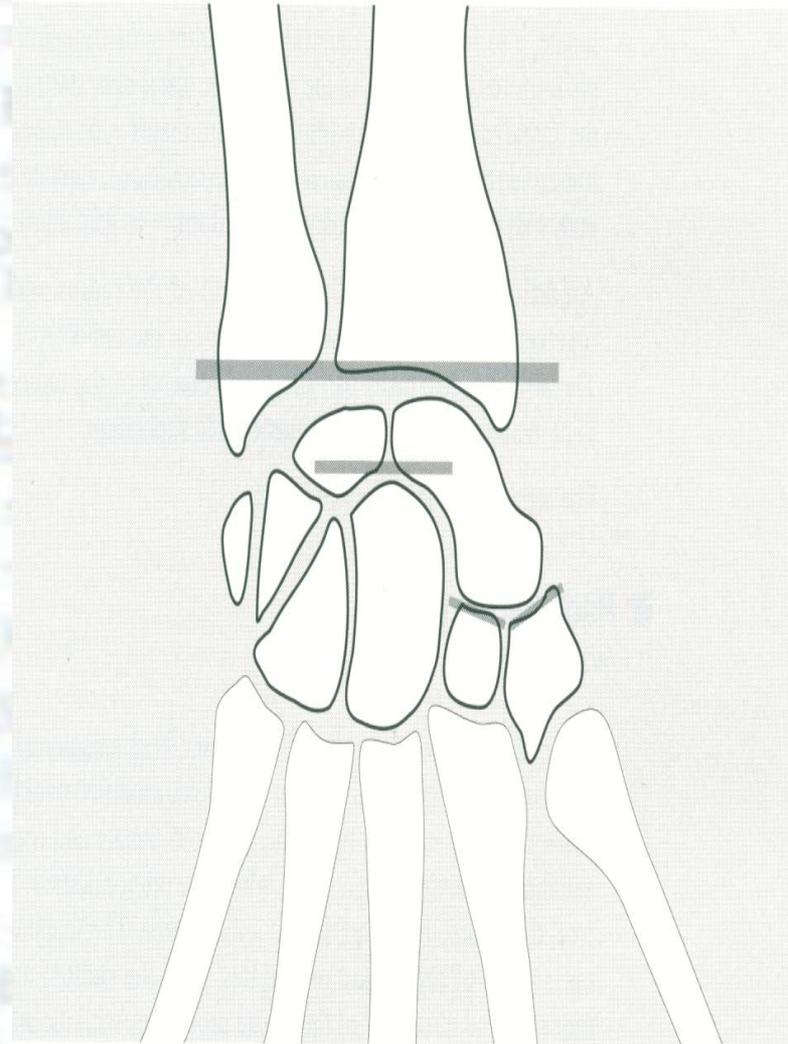
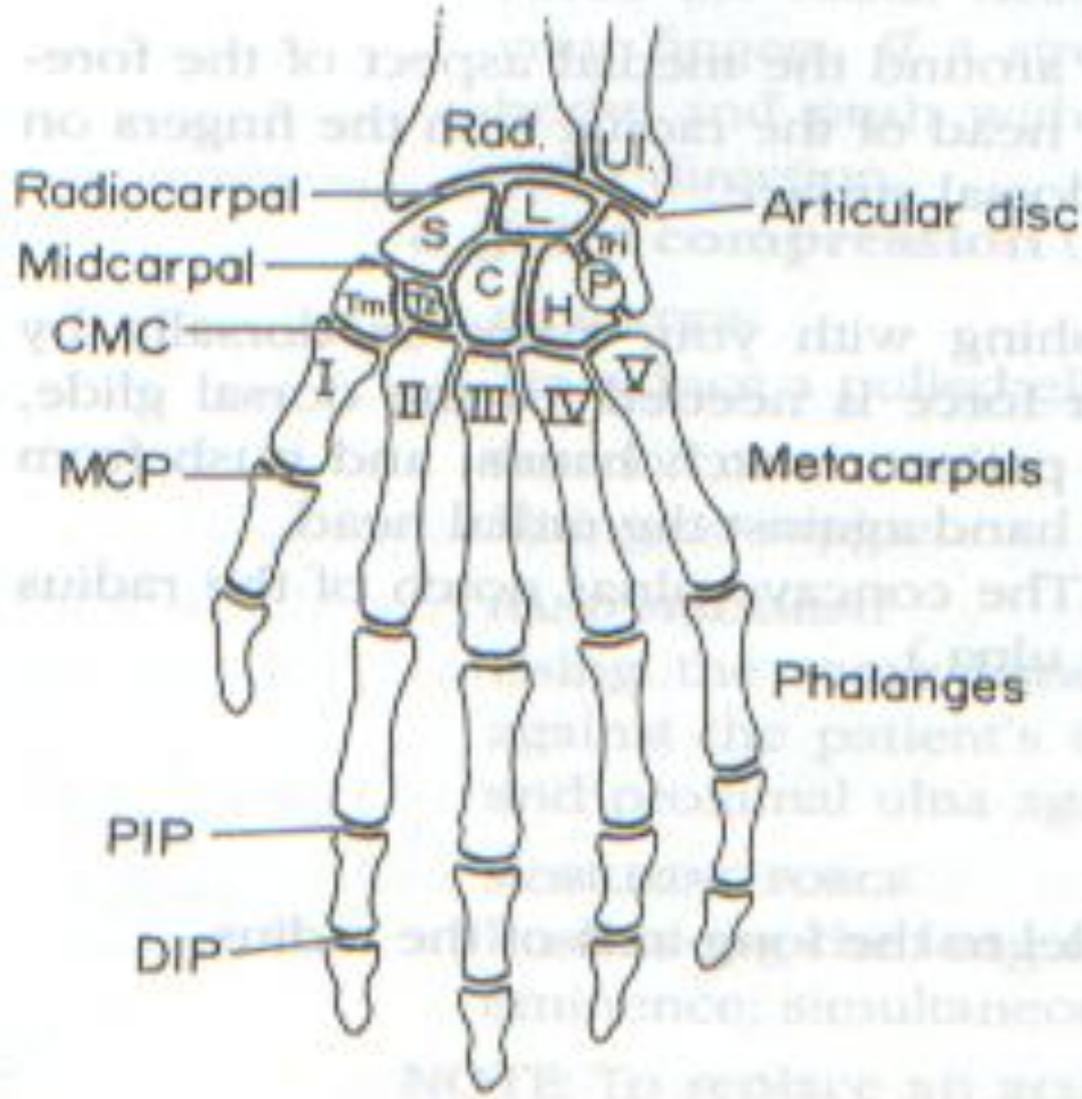


# Volar Glide and Dorsal Glide of Radius





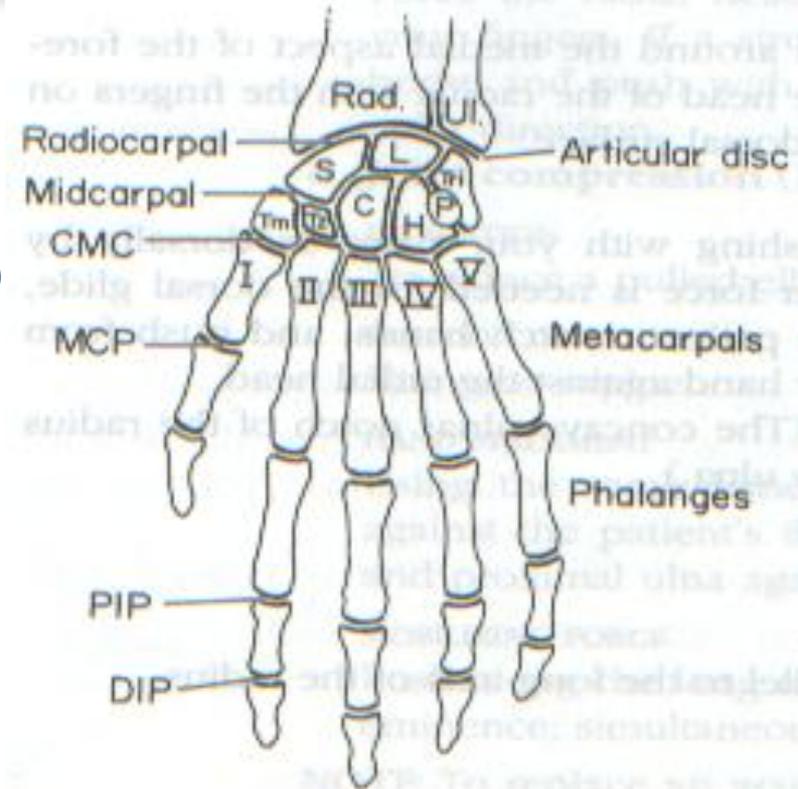
# Wrist and Hand





# Radiocarpal Joint

- Radiocarpal Joint
  - Convex: carpal bones (scaphoid, radial part of lunate)
  - Concave: radius
- Active movements
  - Flexion, extension
  - Abduction, adduction
- Close packed position
  - Maximal extension + radial deviation





# Radiocarpal Joint

- Loose packed position
  - $0^{\circ}$  neutral position+ slight ulnar deviation
- Component and joint play motions
  - Dorsal/volar glide
  - Medial/lateral glide
- Capsular pattern
  - Restricted equally in all directions



# Radiocarpal traction

- Use: **testing; to increase general mobility**
- P – sitting with forearm in pronation and supported on table
- O – The PT's stabilizing hand grasps the patient's distal radius and ulna. The table acts as an additional stabilization for radius/ulna. The mobilizing hand webspace contacts the dorsal surface of the proximal carpal bones. PT's forearm is parallel to long axis of the forearm.
- M -- The mobilizing hand exerts a caudal force to separate the joint surface.



# Radiocarpal traction

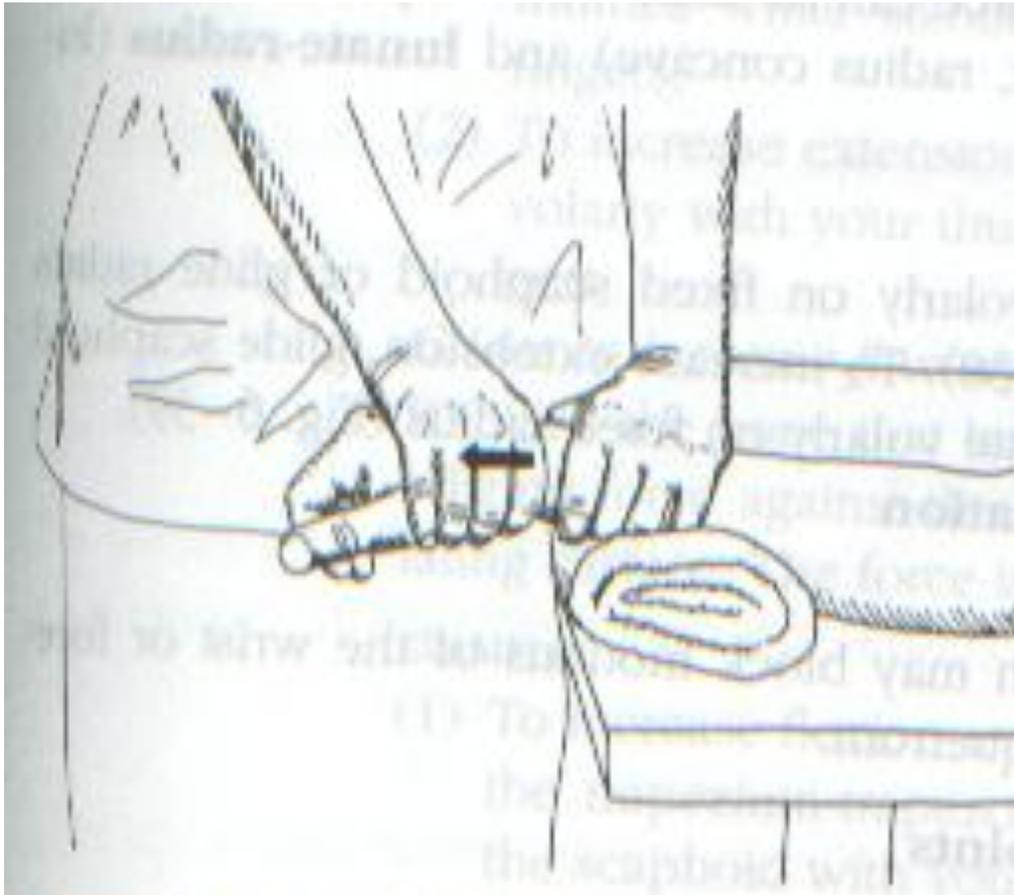


Figure 6-34. Joint traction; wrist joint.



# Dorsal Glide and Volar Glide of carpal bone

- Use:
  - to increase wrist flexion -- **dorsal glide**
  - to increase wrist extension -- **volar glide**
- P -- sitting with forearm supinated/pronated and supported on table with wrist at edge of table
- O -- The PT's stabilizing hand grasps the patient's distal radius and ulna. The table acts as an additional stabilization for radius/ulna. The mobilizing hand webspace contacts the proximal carpal bones.
- M -- The mobilizing hand exerts a **Gr.II distraction** and then moves the proximal carpal row in dorsal/volar direction.



# Dorsal Glide of carpal bone



**Figure 6-35.** Dorsal glide; general mobilization of the wrist joint.

# Volar Glide of carpal bone



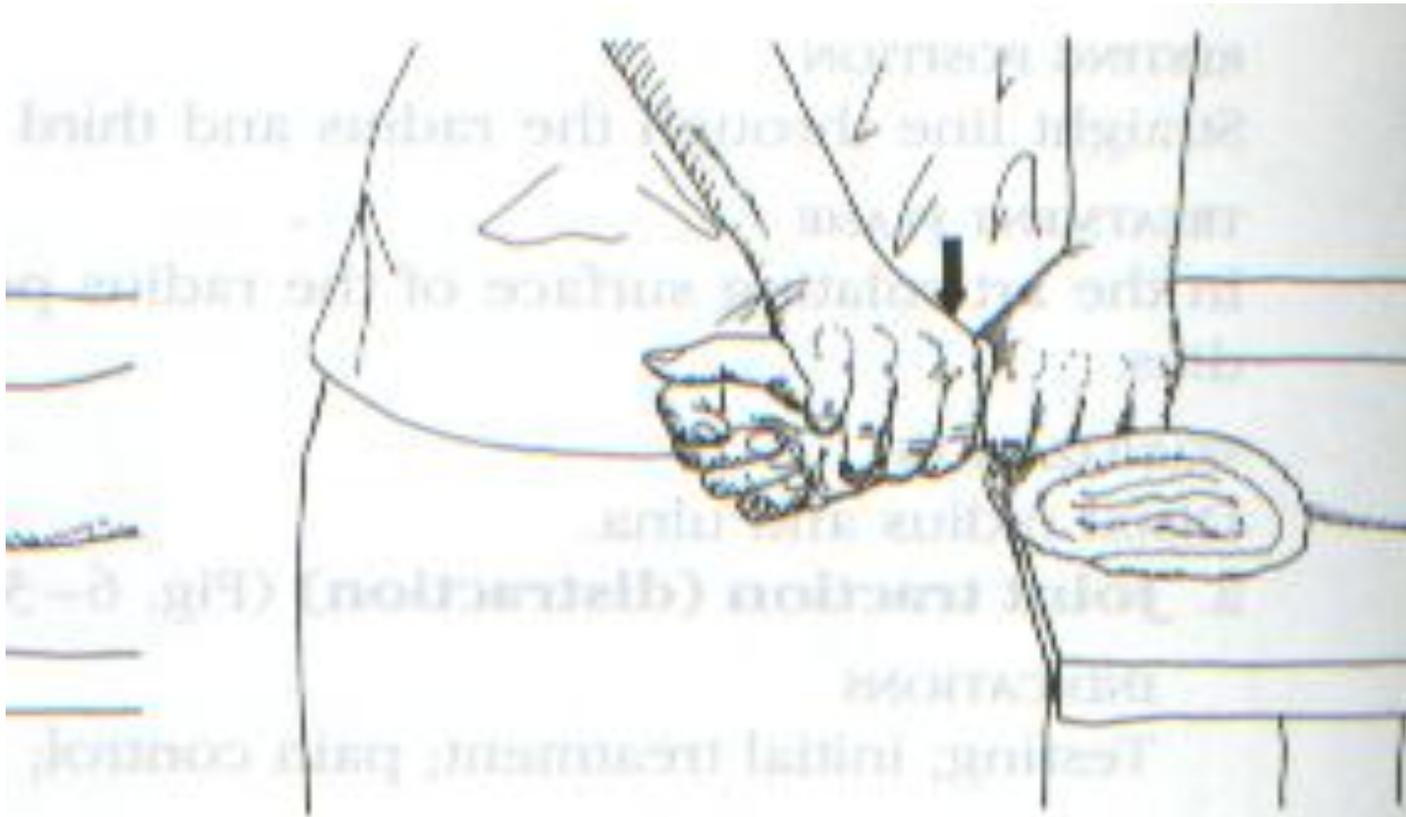
**Figure 6-36.** Volar glide; general mobility of the wrist joint.

# Lateral Glide and Medial Glide of carpal bone

- Ulnar glide - increase **abduction (radial deviation)**
- Radial glide - increase wrist adduction (**ulnar deviation**)
- P -- sitting with forearm supported on table. Forearm is midline between supination/pronation (or pronation)
- O -- The PT's stabilizing hand grasps the patient's distal radius and ulna. The table acts as an additional stabilization for radius/ulna. The mobilizing hand webspace contacts the proximal carpal bones.
- M -- The mobilizing hand exerts a Gr.II distraction and then moves the proximal carpal row in medial/lateral direction. The direction of the glide is a concave arc.



# Medial Glide of carpal bone



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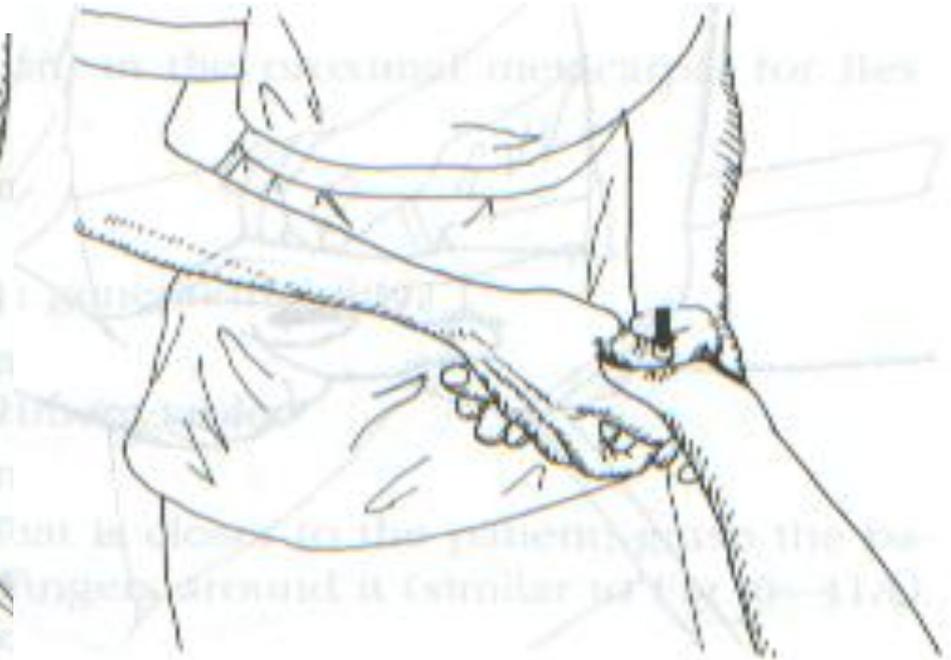
**Figure 6-37.** Ulnar glide; general mobilization of the wrist joint.



# Thrust



**Figure 6-38.** Stabilization of the distal bone; volar glide of the proximal bone; shown is stabilization of the scaphoid and lunate with volar glide to the radius.

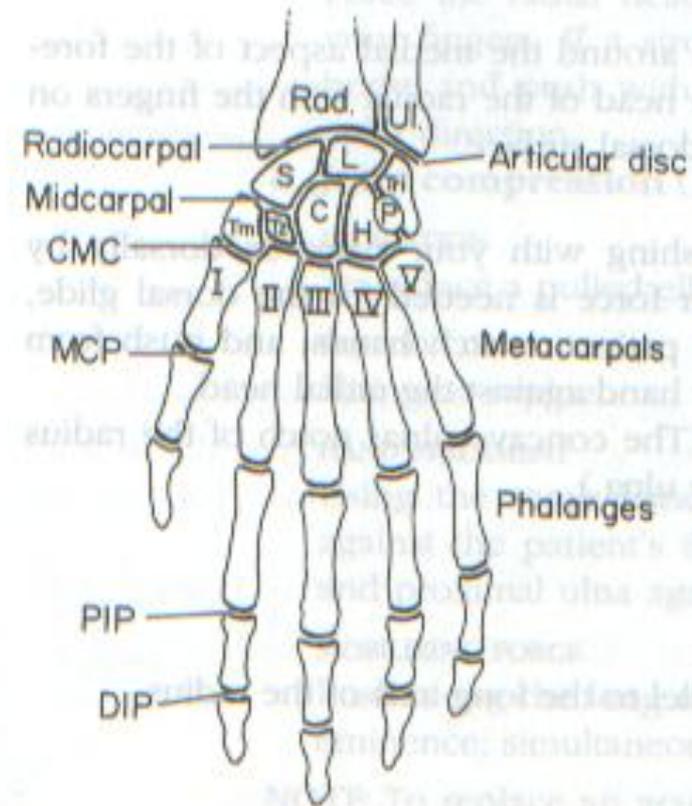


**Figure 6-39.** Stabilization of the proximal bone; volar glide of the distal bone; shown is stabilization of the radius with volar glide to the lunate.

# Carpometacarpal (CMC)

## Joint of the Thumb

- Structures and Movements
  - Saddle Joint
  - Abduction/adduction
    - Convex: proximal metacarpal
    - Concave: trapezium
  - Flexion/extension
    - Convex: trapezium
    - Concave: proximal metacarpal
- Active movements
  - Flexion, extension, abduction, adduction, opposition, circumduction





# Carpometacarpal (CMC)

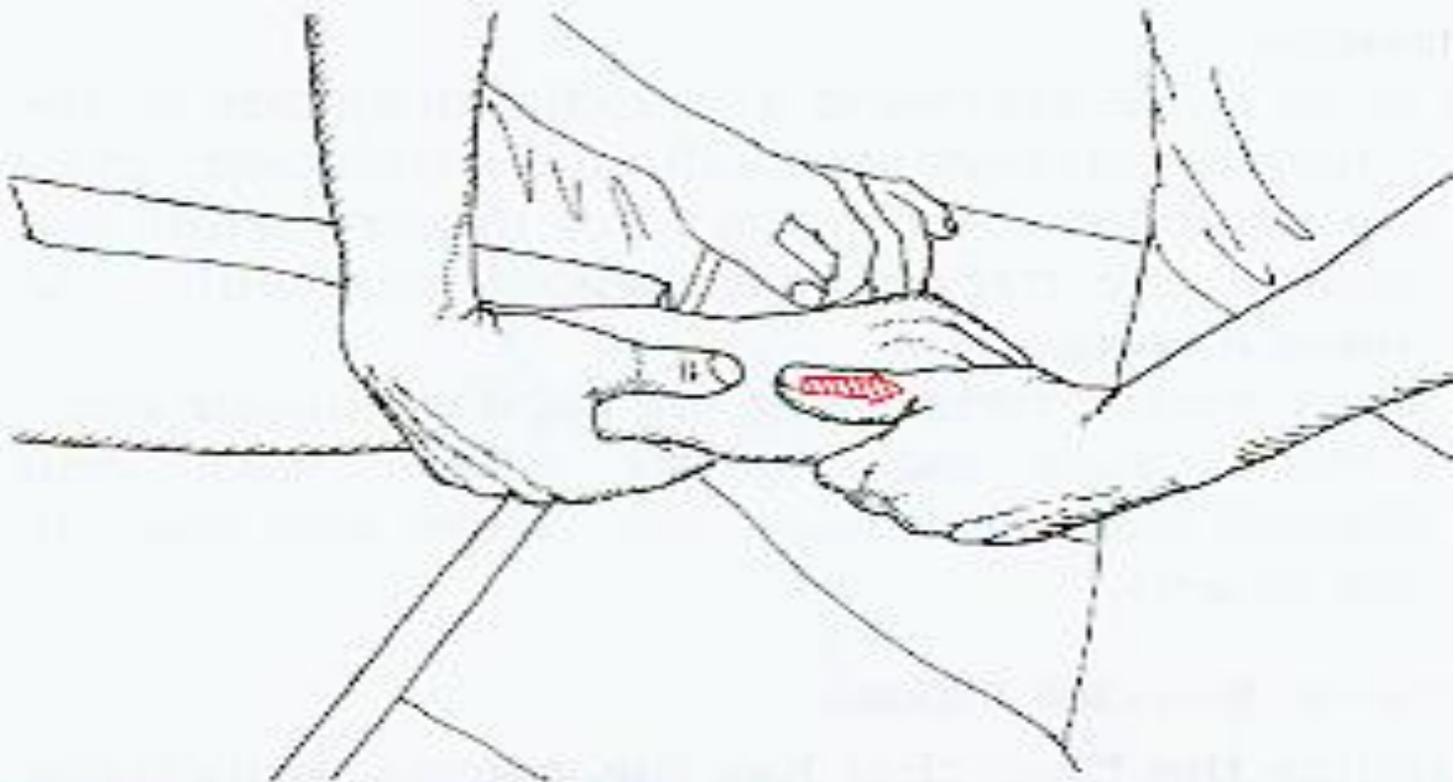
- Close packed position
  - Maximal opposition (abduction+ flexion)
- Loose packed position
  - Metacarpal bone midway between abduction-adduction and flexion-extension
- Component and joint play motions
  - Distraction
  - Dorsal/volar glide
  - Radial/ulnar glide
- Capsular pattern
  - Abduction -- extension



# Carpometacarpal traction

- **Use: testing; to increase general mobility, pain control**
- **P** -- sitting with forearm and hand resting on table
- **O** -- The PT's stabilizing hand fixates the trapezium. The mobilizing hand grasps the patient's metacarpal.
- **M** -- The mobilizing hand exerts a long axis traction to separate the joint surface.

# Carpometacarpal traction



**Figure 6-40** Joint traction; carpometacarpal joint.



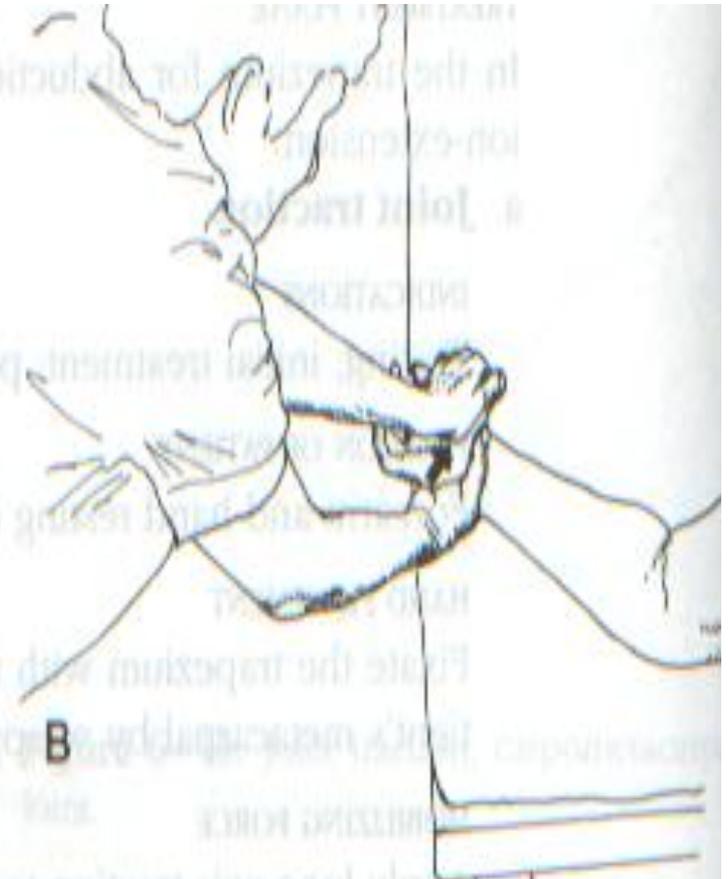
# Radial Glide and Ulnar Glide of metacarpal bone

- Use: to increase flexion -- ulnar glide  
to increase extension -- radial glide
- P -- sitting with forearm in neutral position and supported on table.
- O -- The PT's stabilizing hand fixates the trapezium. The mobilizing hand grasps the patient's metacarpal bone just distal to the joint space.
- M -- The metacarpal base is glided across the palm for flexion, and away from the palm for extension.  
(concave on convex)

# Radial Glide and Ulnar Glide of metacarpal bone



**Ulnar Gliding**



**Radial Gliding**



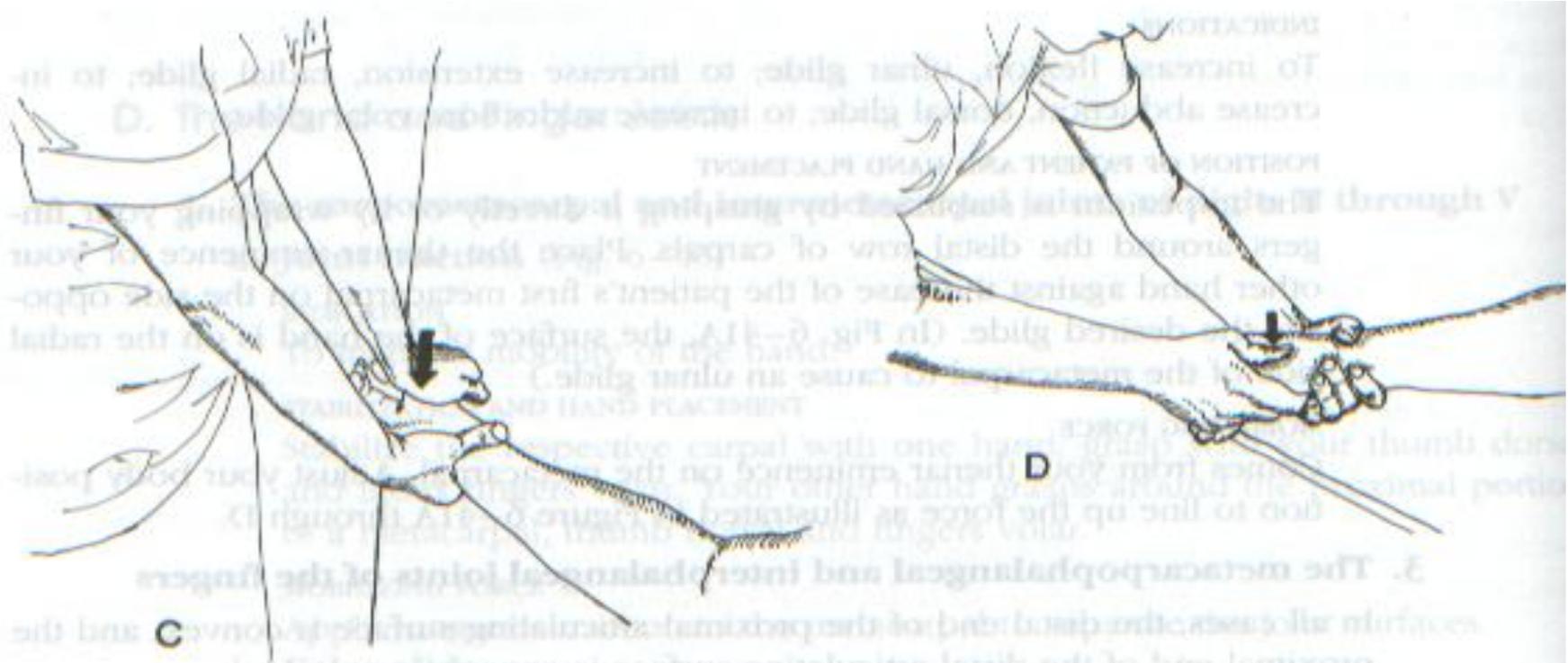
# Dorsal Glide and Volar Glide of metacarpal bone

- Use: to increase thumb abduction -- dorsal glide
- to increase thumb adduction -- volar glide
- P -- sitting with forearm semisupinated and wrist supported on table.
- O -- The PT's stabilizing hand fixates the trapezium. The mobilizing hand grasps the patient's metacarpal bone just distal to the joint space.
- M -- The metacarpal base is glided across the palm for abduction, and at right angles away from the palm for adduction. (convex on concave)

# Dorsal Glide and Volar Glide of metacarpal bone

## Dorsal Gliding

## Volar Gliding



**Figure 6-41.** Carpometacarpal joint of the thumb. (A) Ulnar glide to increase flexion. (B) Radial glide to increase extension. (C) Dorsal glide to increase abduction. (D) Volar glide to increase adduction. Note that the thumb of the therapist is placed in the web space between the index and thumb of the patient's hand in order to apply a volar glide.



# Joint Mobilization to the Hand

- Structures and Movements
  - Metacarpophalangeal Joints
    - Convex: metacarpal head
    - Concave: the base of the proximal phalanx
  - Proximal Interphalangeal Joints (Distal)
    - Convex: proximal phalanx (middle phalanx)
    - Concave: Middle phalanx (distal phalanx)
  - Active movements
  - Flexion, extension, abduction, adduction, circumduction

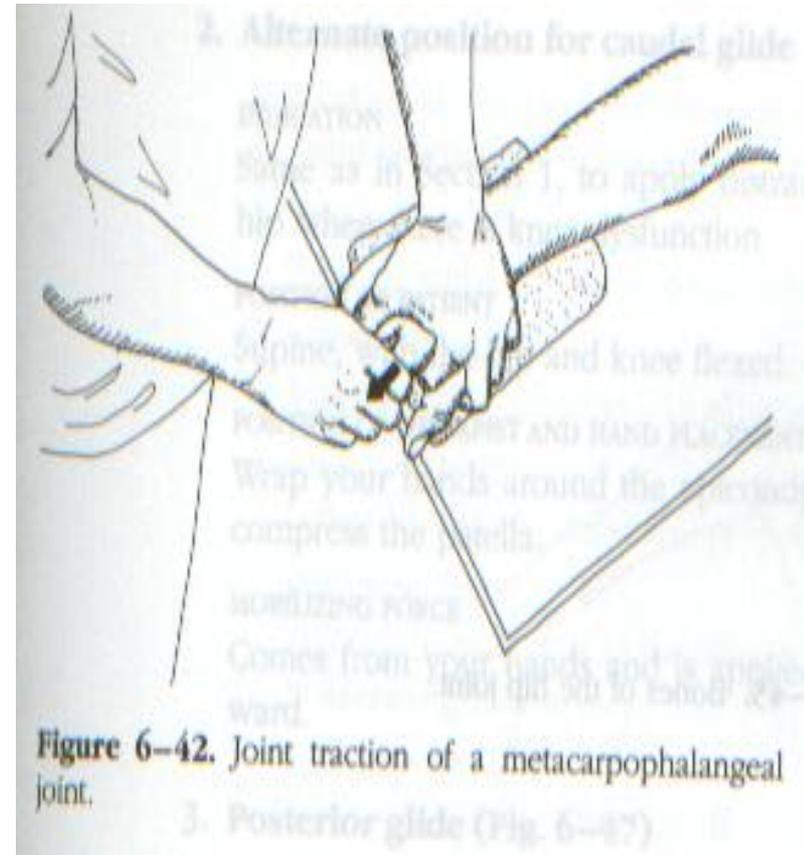


# Joint Mobilization to the Hand

- Close packed position
  - 1st MCP – full extension, full opposition
  - 2nd – 5th MCP – full flexion
  - IP -- full extension
- Loose packed position
  - 10-20° flexion
- Component and joint play motions
  - Distraction
  - Long axis rotation
  - Dorsal/volar glide
  - Radial/ulnar glide
- Capsular pattern
  - restricted in all directions with slightly more limitation in flexion

# Distraction (MCP, PIP, DIP)

- **Use: testing; to increase general mobility**
- **P** -- sitting with forearm supported on table
- **O** -- The PT's stabilizing hand grasps the proximal joint surface. The mobilizing hand grasps the distal joint surface .
- **M** -- The mobilizing hand exerts a long axis traction force to separate the joint surface.





# Radial Glide and Ulnar Glide ( MCP )

- To increase 1st, 2nd MCP abduction -- radial glide
- To increase 4th, 5th MCP adduction -- radial glide
- To increase 1st, 2nd MCP adduction – ulnar glide
- To increase 4th, 5th MCP abduction – ulnar glide
- **P** -- sitting with forearm in neutral position and supported on table.
- **O** -- The PT's stabilizing hand grasps the proximal joint surface. The mobilizing hand grasps the distal joint surface .
- **M** -- The mobilizing hand exerts a force in medial/lateral direction.

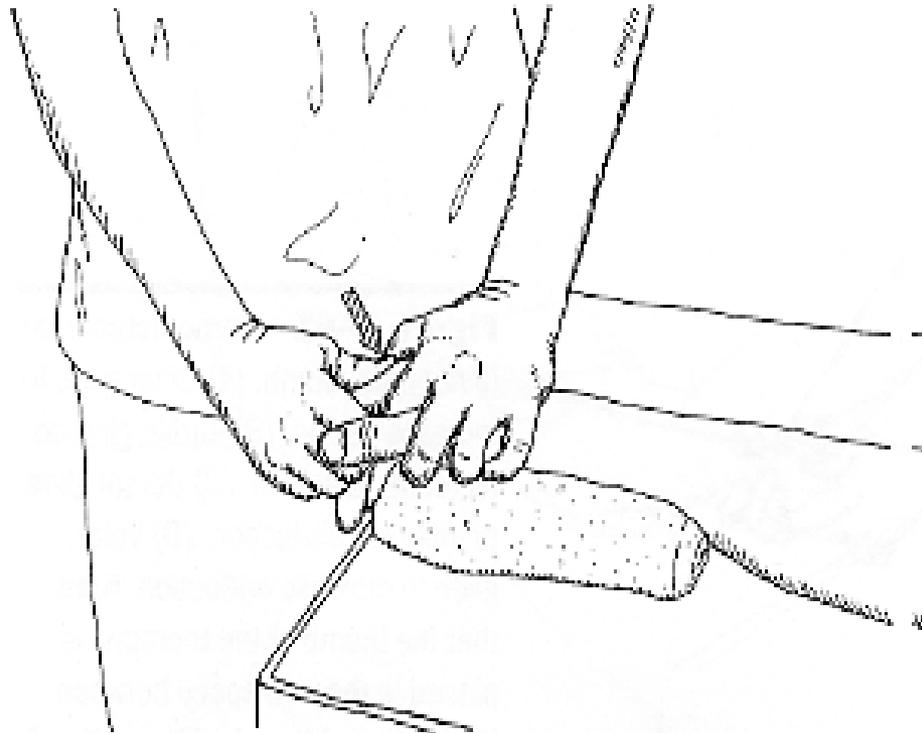


# Dorsal Glide and Volar Glide ( 1st-5th MCP, PIP, DIP )

- To increase flexion -- volar glide
- To increase extension -- dorsal glide
- **P** -- sitting with forearm supported on table.
- **O** -- The PT's stabilizing hand grasps the proximal joint surface. The mobilizing hand grasps the distal joint surface .
- **M** -- The mobilizing hand exerts a force in volar or dorsal direction.



# Volar Glide of MCP



**Figure 6-43** Volar glide of a metacarpophalangeal joint.



# Long-Axis Rotation

- **Use: testing; to increase general mobility**
- **P** -- sitting with forearm supported on table
- **O** -- The PT's stabilizing hand grasps the proximal joint surface. The mobilizing hand grasps the distal joint surface .
- **M** -- The mobilizing hand exerts grade II distraction on the distal joint surface while the hand exerts a force of rotation in the medial or lateral direction.