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Examination and Assessment For The Upper Extremity: Part 2

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Description

- This is the second part in a two course series that will provide clinical assessment tools and guidelines to aid in the treatment planning for the upper extremity involved patient.

2

Learning Outcomes

As a result of this course, participants will be able to:

- Define 2 guidelines when screening for UE motion
- List 2 tests of dexterity to use for the upper extremity population
- List 2 tests of sensibility for use on the hand patient.
- List one outcome tool specific to the upper extremity population.

3

Review of course 1: Purpose

- Establish baselines
- Determine components to be addressed in treatment/establish treatment plan
- Determine limitations
- Establish treatment goals
- Determine treatment results and outcomes
- Efficacy of treatment

4

Examination methods need to be:

- Accurate
- Standardized
- Reliable
- Reproducible
- Valid
- Meaningful to your outcome

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Objective Measurements: ROM

- ASHT recommendations for ROM:
  - "0" is neutral.
  - "+" is hyperextension
  - "-" is an extension deficit
  - Measurements should be written as extension/flexion (e.g. -10/85).
  - Volar/dorsal for fingers and wrist
  - Hamilton and Lachenbruch 'equal reliability between lateral and dorsal goniometer placement'

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Active Range of Motion (AROM)

- Muscle's ability to move a joint
- Variations from person to person in what is considered "normal"
  - Younger not accurate: don't hold the maximal
- Pay attention to the "arc of motion"

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AROM:

- Limitations can be due to:
  - Adhesions
  - Denervation
  - Weakness
  - Edema
  - Subluxation, dislocation, or bowstringing of tendons
  - Lack of tendon continuity or tendon attenuation
  - Joint restrictions (articular or capsule)

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Thumb ROM

- The thumb has a highly mobile CMC joint with the saddle-shaped trapezium as its base
- Composite flexion: to base of small finger
- Occurs in the frontal plane, parallel to the plane of the palm.

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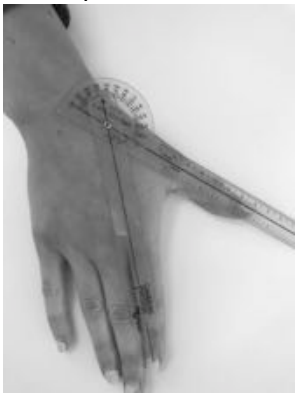
Radial Abduction

Frontal plane: Parallel to the palm of the hand.



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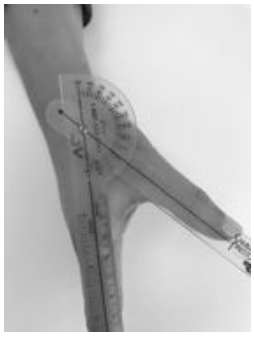
Palmar Abduction

- Sagittal plane: perpendicular to the palm
- Adduction returns the thumb to the palm.



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Opposition: composite abduction, rotation and flexion

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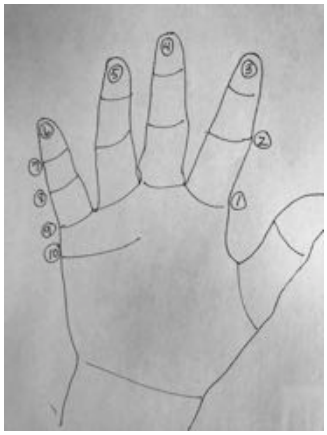
Opposition measurement

- To base of small finger
- Ability to oppose each finger tip
- Kapandji opposition test



Landmarks with Assessment

- Fingertip to palm
- Measure in cm.

- Fingertip to distal palmar crease (DPC)

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Total Active Motion (TAM)

- TAM = AROM of the MP, PIP, and DIP minus any extension deficits.

  Example:

  MP 0/90

  PIP -10/85

  DIP -5/55

  TAM = (90 + 85 + 55) – (10 + 5) = 215
- *not accurate if the patient has hyper extensible joints.
- Total passive motion (TPM) – same formula

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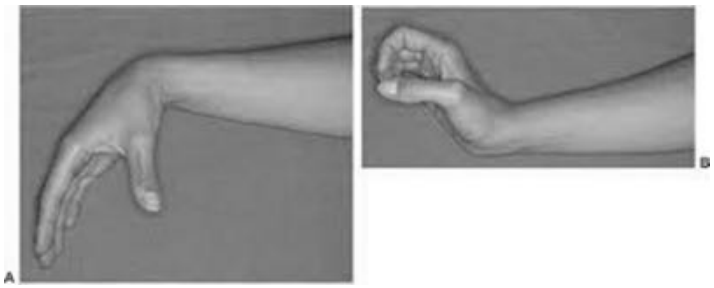
Tendon Integrity through ROM:

Following examination of ROM: should perform wrist flexion/extension to assess tenodesis.



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Passive Range of Motion (PROM)

- Ability of a joint to be moved through its normal arc of motion by means outside the body.
- Assesses the capacity of a joint, may be affected by:
  - soft tissues
  - joint incongruence
  - capsular structures surrounding the joint.

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Limited Motion due to Structures outside of the joint

- If PROM>AROM then the joint is being limited by adhesions, weaknesses or tendon integrity. Document measurement of A/PROM.

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Stress Testing of Joints

- Test for ligament integrity
- Volar Plate

- Perform radial and ulnar stress test with:
- MP joint in flexion and PIP and DIP joints in extension (closed packed position)
- –Use caution with an acute injury prior to x-ray

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Muscle/tendon length tests

- Intrinsic Tightness Test:
- Hold MP in extension and passively flex the PIP, note ROM.
- Then place MP into flexion, and passively flex the PIP, note ROM.

Test is positive if PIP ROM is greater with the MP flexed.

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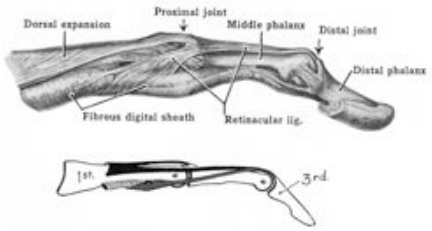
Oblique Retinacular Ligament (ORL) Length Test



Grant, John Charles Boileau [Public domain]

- *PROXIMAL ATTACHMENT: volar proximal phalanx*
- *DISTAL ATTACHMENT: terminal extensor tendon*
- *SLACK IN PIP FLEXION AND DIP EXTENSION*
- *TAUT IN PIP EXTENSION AND DIP FLEXION*
- *Helps coordinate extension of IP joints*

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ORL Length Test:

- Test Position: max PIP extension then flex DIP. If motion is less than with PIP flexed, ORL is tight.

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Extrinsic Extensor Tightness/Length Test

- Hold MP in extension and passively flex IPs (elbow extended and forearm pronated)
- Repeat IP flexion with the MP in flexion.
- Test is "+" if the IP ROM is greater with the MP in extension (vs. flexion).
- Varying wrist position will affect results.
- Must rule-out IP limitations prior to completing this test

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Extrinsic Extensor Test:

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Extrinsic Flexor Tightness/Length Test

- Place wrist in neutral and passively extend the digits; then slowly increase wrist extension (elbow extended and forearm supinated)
- Positive test if patient is unable to passively maintain IPs in extension as the wrist extension is increased
- Rule out PIP or DIP joint tightness by evaluating the individual joint status with wrist in neutral or slight flexion

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Strength: Manual Muscle Test (MMT)

- MMT: can measure groups of muscles or can be specific to each muscle.
  - Scale is 0-5
  - Use consistent scale
    - (0=no movement, 5=full AROM and strength)
  - Note any pain with excursion of muscle-tendon unit
    - (i.e. 1st dorsal compartment with De Quervain's tendonitis)

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Grip and Pinch Strength:

- Dynamometer
  - Standard Method
    - Seated
    - Elbow 90 degrees
    - At side of body
    - Forearm neutral
    - Not resting on surface
    - Tester holding dynamometer
    - Wrist 0-30 ext; 0-15 UD

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Pinch Strength:

- Pinch gauge:
- Seated
- Forearm neutral
- Elbow 90 degrees at side
- Wrist neutral to slight extension
- Examiner holds gauge
- Can pronate for tripod and tip

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Types of Pinch:

Tripod (3 Jaw Chuck)
Thumb against IF and MF.
Median n. injuries or
CMC; DJD

Lateral (key)
Thumb against radial
side of IF
Ulnar N. (add pollicus or
First dorsal interossei)

Tip to tip
Thumb against IF
Anterior interosseus
Nerve

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Functional Strength:

- BTE
- Cybex

- Performance of activities

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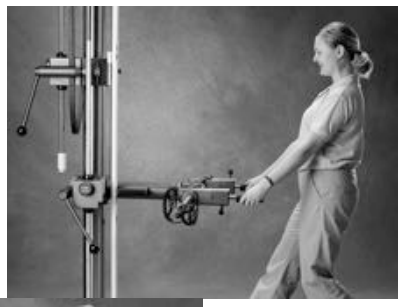

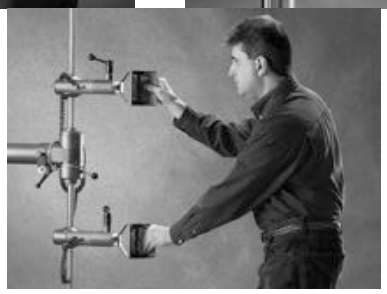

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Sensibility/Sensation:

- Hierarchy of Testing
  - Autonomic/sympathetic
  - Detection
  - Discrimination
  - Quantification
  - Identification

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Progression of Sensory Recovery:

- Pain/temperature
- 30 cps vibration
- Moving touch
- Static touch
- 256 vibration
- 2-point discrimination
- Localization to touch
- Stereognosis

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Sensibility: Detection

- Touch Threshold
  - Light touch
  - Deep pressure
  - Vibration

Monofilaments
Vibrometers

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Spatial Discrimination:

- Localizing and discriminating orientation
  - 2 point discrimination
  - Touch Localization

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Identification:

- Shape, texture and object identification
  - Moberg Pick up
  - Shape, texture identification

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Two Point Discrimination

- This test is performed using a discriminator
- Innervation density test
- Ability to perceive number of stimuli
- The patients hand should be supported with vision occluded

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Two Point Discrimination: Static and Moving

- Points are applied to digital pulps
- Static testing: Performed in a randomized sequence on the digital pulps in a longitudinal fashion with points perpendicular to skin
- Static testing begins at 5 mm of distance between the 2 points
- Testing is proximal to distal
- Patient responds with “one” or “two”
- Dynamic testing: Begins at 8 mm between the 2 points and the points are across width of the pulps, and traced from proximal to distal

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Two Point Discrimination

- Use enough pressure to just blanch the skin
- Make sure points are perpendicular to the skin surface
- Use random order to test
- 7/10 correct responses are needed to assess accurate sensation level
- If no response or inaccurate response is given, the distance between the ends is increased by 1 mm until 7 of 10 responses are accurate
- Compare to contralateral side
- Compression neuropathies can still have a “normal” result.
- Sensitivity 32%, Specificity 81%

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Two Point Discrimination

- Indications for testing:
  - Nerve lacerations with repairs or grafts
  - Nerve compressions after surgical releases
  - Long-standing nerve compression with motor changes

Problems with testing:

- No force control
- No inter-rater reliability
- Skin topography can alter results
- Vibration of examiner’s hand can alter results
- Difficult to control velocity of points
- Limited repeatability

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Semmes-Weinstein Monofilaments

Standardized test

- Correlates the ability to functionally discriminate light touch to deep-pressure
- The test evaluates the cutaneous innervation of the median, ulnar and radial nerves
- Patient is seated with the upper extremity in a comfortable position and vision occluded
- Sensitivity 82%, Specificity 86%

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Semmes-Weinstein Monofilaments

Application by standardized methods:

- Applied perpendicular to skin for 1.5 seconds and the monofilament bends in a C, and then removed for 1.5 seconds
- Repeat for 3 trials per monofilament for a positive response with monofilaments 1.65-4.08
- Repeat once for monofilaments 4.17-6.65

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Sensibility:Threshold

- Temperature
- Stereognosis
- Vibration

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Sensation: Functional Tests

- Assess the usefulness of the sensibility
  - Moberg Pick up
  - Touch localization
  - Tactile gnosis

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Sensibility: Objective Tests

- Level I: Autonomic/sympathetic
- Passive cooperation
  - Ninhydrin sweat test
  - Sudomotor function
  - NCS
  - Wrinkle test

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Sensation: Provocative Tests

- Provocative postures
- Activity simulation

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CONTINUED

Dexterity: Manual

- Nine hole peg test
- Minnesota Rate of Manipulation

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CONTINUED

Dexterity and Coordination

- Jason Taylor Hand Function Test
- MRMT
- Purdue Pegboard
- Crawford Small Parts Dexterity
- Box and Block Test
- Bennett Hand Tool Dexterity Test
- Functional Dexterity Test

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Pediatric Normed Dexterity:

- 9-Hole Peg Test:
  - Normed ages 4-19
  - Portable/easy
  - Time: 5 to 10 minutes total
  - Tests speed and dexterity with grasp/release
- Functional Dexterity Test:
  - Norms: ages 3-17 (per new article)
  - Portable
  - Time: 15 to 20 minutes
  - Dynamic in hand manipulation
- Jebson-Taylor Test:
  - Normed ages 6+
  - Not portable: needs to be done in OT dept. for space and supplies
  - Lengthy:
  - Dynamic Functional Dexterity

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- Purdue Pegboard:
  - Normed(?) 2.5 – 19
  - Portable
  - Time: 15 minutes
  - Speed and dexterity
- Box and Block Test
  - Normed: 6-19 year old
  - Portable
  - Time: 10 to 15 minutes
  - Speed: grasp/release

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Pediatric Normed:

- BOT II: Subtest for Manual Dexterity
  - Normed ages 4-19
  - Moderately Portable: done in OT with table
  - Time: 20 minutes
  - Functional Dexterity and Manipulation

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Functional Abilities/ADLs:

- Self reports
- Performance of tests
- Functional capacity tests

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Evaluation/Examination:

- Summarize data to get full picture
- Documentation is important
- Set goals for components to achieve long term functional goals
- Re examine at intervals to determine progress and outcome from treatment

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Issues with the Evaluation Process:

- How do we define limitations?
- We can not just treat and address the components to the hand.
- This is a person, not a “hand patient”.

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References

- Daniels, L., Worthingham, C., Hislop, H. J., & Montgomery, J. (2007). *Muscle testing techniques of manual examination*. Philadelphia: W.B. Saunders.
- Dutton, M. (2012). *Orthopaedic examination, evaluation, and intervention*. New York: McGraw Hill Medical.
- Hunter, J. M., Mackin, E. J., & Callahan, A. D. (1995). *Rehabilitation of the hand: Surgery and therapy*. St. Louis: Mosby.
- Lavelle, K., & Stanton, D. (2013). Measurement of edema in the hand clinic. *Clinical assessment recommendations, 3rd edition.* Retrieved from https://www.asht.org/practice/clinical-assessment-recommendations
- MacDermid, J., Solomon, G., & Valdes, K. (2015). *Clinical assessment recommendations*. Mount Laurel, NJ: American Society of Hand Therapists.

References:

- Magee, D. J. (1997). Orthopedic physical assessment, 3rd Edition. Philadelphia: WB Saunders Co.
- McQuiddy, V. A., Scheerer, C. R., Lavalley, R., McGrath, T., & Lin, L. (2015. Normative values for grip and pinch strength for 6- to 19-year-olds. *Arch Phys Med Rehabil., 96*(9), 1627-33.
- Shechtman, O., & Sindhu, B. (2013). Grip strength. *Clinical assessment recommendations*. Retrieved from https://www.asht.org/practice/clinical-assessment-recommendations
- Skirven, T. M., Osterman, A. L., Fedorczyk, J.,& Amadio, P. C. (2011). *Rehabilitation of the hand and upper extremity*, Sixth Edition. (Chapters 6, 7,11, 12, 18). Amsterdam, Netherlands: Elsevier.

CONTINUED

References

- Sullivan, T., Smith, J., Kermode, J., et al. (1990). Rating the burn scar. *J Burn Care Rehabil,11, 256-60*.
- The hand: Anatomy, examination, and diagnosis, 4th Edition. (2011). In Rayan & Akelman (Eds.),*The American society for surgery of the hand.* Philadelphia: Wolters Kluwer/Lippencott Wilkens & Williams.

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THANK YOU!

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