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Webinar #8 2020

Orthotic Management of Ulnar and/ or Median Nerve Dysfunction

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Learning Objectives

At the conclusion of this session, participants will be able to:

1. Recognize peripheral nerve dysfunction of the hand and fingers that benefit from orthotic management.

2. Learn tips and tricks for working with low temperature thermoplastic materials that benefit specific orthotic fabrication.

3. Identify the steps of fabrication for 2-4 custom orthoses for the thumb and fingers to address the above conditions.

4. Understand the current levels of evidence to support these orthoses as therapeutic interventions.

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Peripheral Nerve Dysfunction

Causes:

1. Infection or disease– polio, leprosy
2. Neurologic – Charcot-Marie-Tooth, spinal muscular atrophy
3. Congenital – absence of thenar muscles
4. Trauma – cervical spine, brachial plexus, lacerations
5. Compression or entrapment

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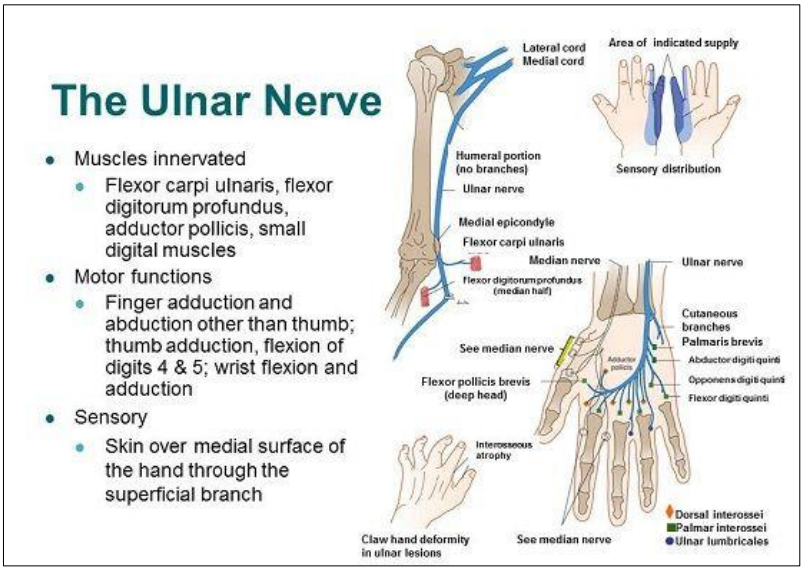
The Ulnar Nerve



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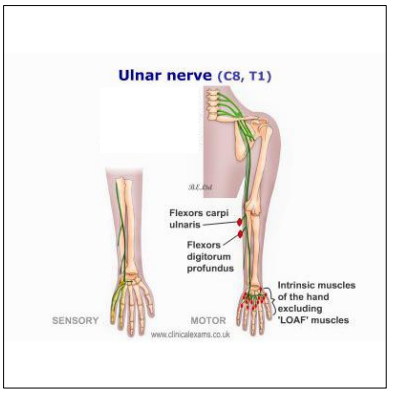
Ulnar Nerve Dysfunction



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Causes:

- Cubital tunnel syndrome
- Impact to the ulnar nerve at the medial epicondyle
- Excessive valgus stress at the elbow (throwing athletes)
- Compression by flexor carpi ulnaris
- Bony spurs at the olecranon and medial epicondyle
- Carpal bone dislocation
- Colles fracture or humeral fracture

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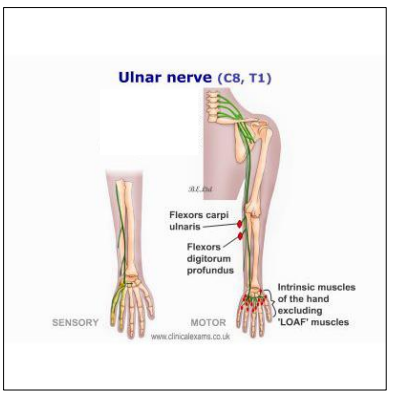
Ulnar Nerve Dysfunction



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Low Nerve Injury

Loss of flexion of the proximal phalanges - paralysis of the interossei and other intrinsic muscles.

Clawing results from the extrinsic muscles hyperextending the proximal phalanges and from the pull FDP muscle, which contributes to poor grasp.

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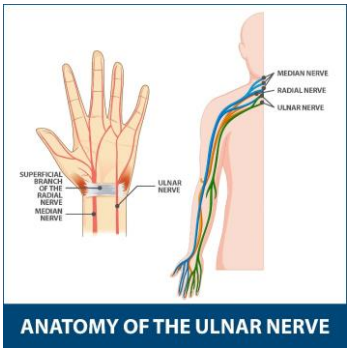
Ulnar Nerve Dysfunction

High Nerve Injury
FDP muscle is also without innervation
DIP joints are no longer flexed in digits 4 and 5.

Milder appearing hand deformity.

Over time, both types (high and low) have deformities that become fixed.



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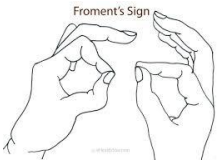
Ulnar Nerve Dysfunction

Flattening of the normal arches of the hand

Hyper-extension of MCP and flexion in PIP and DIP of 4, 5th

Unable to ABD and ADD fingers



Froment's Sign: Compensatory thumb MP hyperextension and flexion by FPL during pinch

Claw hand deformity: MCP joint hyper flexion and PIP joint flexion is caused by loss of intrinsic muscles to combat force of extrinsic flexors- imbalance between extrinsic and intrinsic muscle forces

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Ulnar Nerve Dysfunction

Functional Loss

Grip and pinch are affected

Loss of finger abduction and adduction

Inability to flex the 4th & 5th MCP joints while simultaneously extending the IP joints

Decrease in grip strength

Loss of fine prehension

Sensory Loss

Loss of sensation to the volar surface of the ulnar aspect of the palm distally and the volar surface of the small and ulnar half of the ring finger

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Orthotic Management for Ulnar Clawing

Anti- Claw Orthosis

Goal :

Functional positioning of the digits in MCP joint flexion
(loss of intrinsic muscle function)

Duration: as needed

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Fabrication of the Ulnar Claw Orthosis

https://www.youtube.com/watch?v=LhOvT3NjNr4






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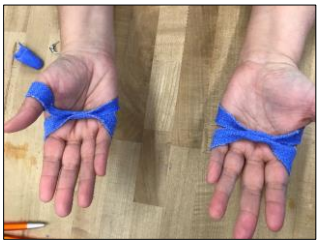
Materials:
Orfit Strips 3.2mm x 12”
or
Orficast 6 cm- folded lengthwise
(either in half or tripled)

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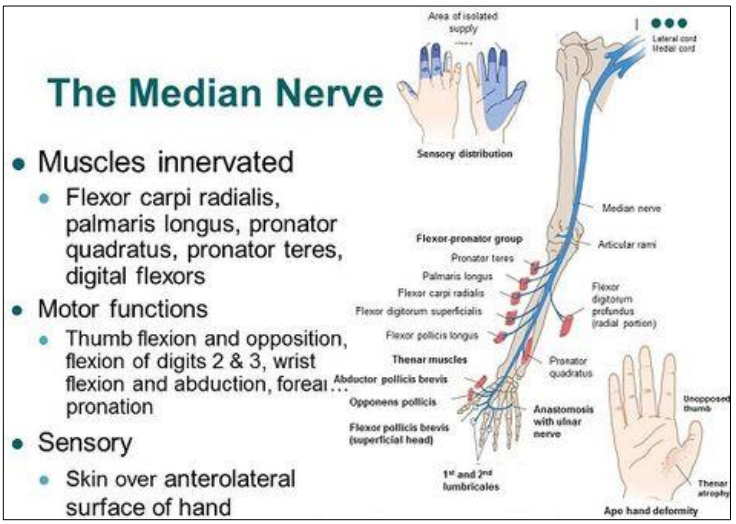
The Median Nerve



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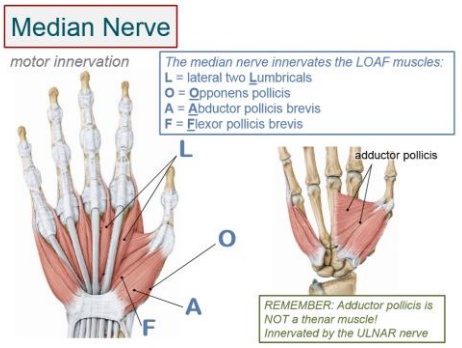
The Median Nerve

Four small muscles of the hand are supplied the median nerve

Remember “LOAF”:

- lateral two lumbricals
- opponens pollicis
- abductor pollicis brevis
- flexor pollicis brevis



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The Median Nerve

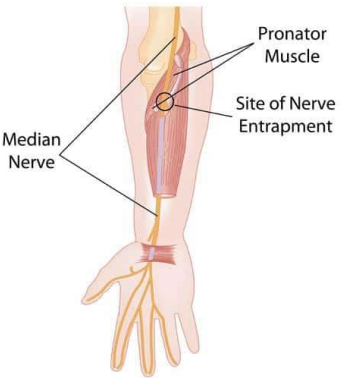
Sites of compression:

Pronator syndrome – between the 2 heads of pronator teres

(tenderness in forearm, pain with repetitive pronation)

AIN compression – motor branch off median nerve (unable to make an ok sign)

Carpal tunnel syndrome (nocturnal symptoms, numbness and tingling, atrophy)



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Median Nerve Dysfunction

Differential Diagnosis:

The clinical evaluation of CTS vs Pronator Teres syndrome differs in the following ways:

Tinel sign is typically absent at the wrist, but may be positive over the proximal anterior forearm

Phalen's test is usually negative in pronator syndrome

Palpation demonstrates tenderness over the pronator teres and likely over the medial epicondyle

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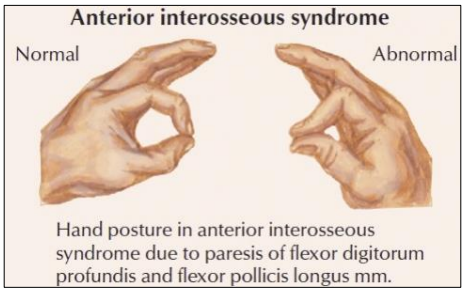
Median Nerve Dysfunction

High Nerve Injury

Above origin of AIN



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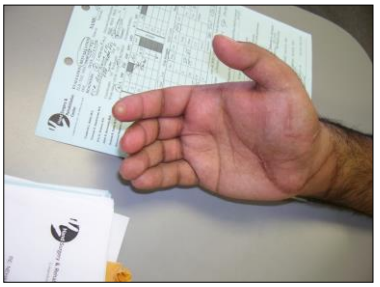
Low Nerve Injury

Thenar intrinsic muscles paralyzed



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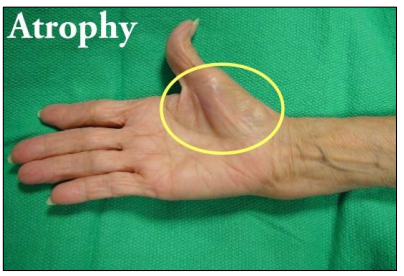
Median Nerve Dysfunction

Symptoms include

- Weakness and /or loss of functional grip and pinch
- Atrophy of thenar muscles
- Sensory Loss- thumb, index finger, long finger, and the radial aspect of the ring finger



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Median Nerve Dysfunction

ADLs are affected including all fine motor tasks

- Difficulty grasping, pinching
- Problems with opening containers
- Pain with holding objects
- Decreased power grip
- Lumbrical muscles of index and middle finger are weak

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Orthotic Management

Recommended Orthoses:

Hand based thumb spica with MCP joint included

Hand based CMC joint orthosis w/out MCP joint

Goal of the Orthosis:

Positioning for maintaining the first web space to provide support, and improve ADL function

Duration: as needed

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Orthotic Options for the Thumb

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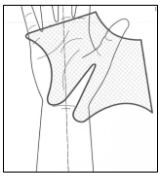
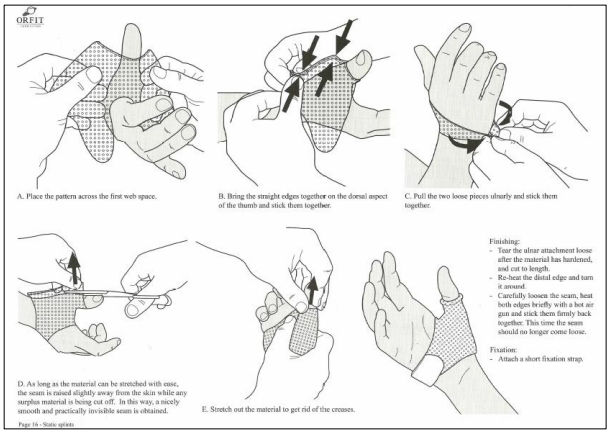
Fabrication of a Thumb Orthosis

Materials:

Orficast More 15 cm / 6”
Orfit Precuts

Sheet Materials:
Classic
Orfilight
Orfit Colors NS





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Fabrication of a Thumb Orthosis

Check out Orfit videos on www.youtube.com!

https://www.youtube.com/watch?v=OvF18kafb1Y

https://www.youtube.com/watch?v=7GrJJ2jVa_M

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Additional Components of Orthotic Management

First Web Spacer- when there is limited opposition and abduction

Functional Web Spacer- when there is limited opposition and abduction

AIN-Pinch Assist With limited FDP and FPL

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Combined Median Nerve/ Ulnar Nerve Dysfunction

Characteristics:

- Clawing of all four digits
- Adduction of thumb
- Inability to oppose and abduct the thumb
- Inability to extend PIP joints

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Indications:

- Spinal Cord Injuries
- Charcot Marie Tooth
- ALS
- Trauma

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Create a Functional Orthosis

Without thumb

With thumb

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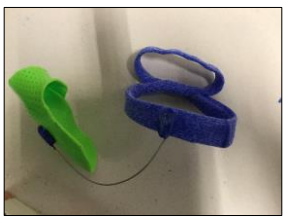
Create a Functional Orthosis



Dynamic thumb attachment

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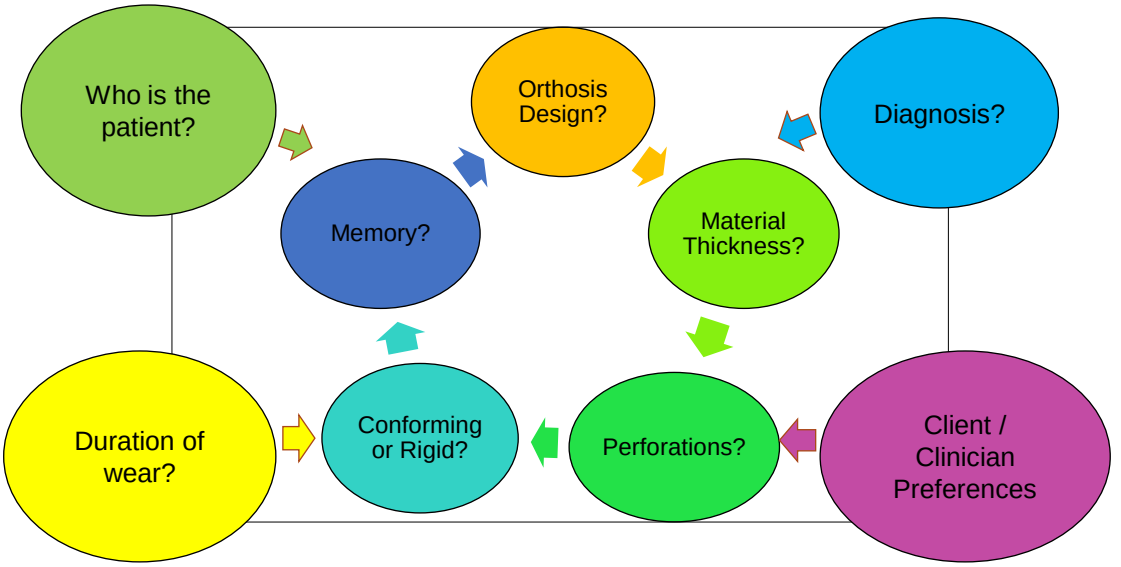
Material Considerations



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Demonstrations

Anti - Claw Orthosis

Orfit Strips 1/8”

Anti - Claw for Ulnar and Median Nerve

Orficast or Orficast More 2.5”

Dynamic

Anti – Claw Orthosis with Thumb

Orfit Colors NS 1/12” and Orficast 2.5”

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For Show

Thumb and Index
Figure of 8 Orthoses for enhanced pinch
Orfit Strips 1/12”

Thumb Abduction Strap
Orficast or Orficast More 2.5”

First Web Spacer
Orficast 2.5”

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Evidence

Chan, R. K. (2002). Splinting for peripheral nerve injury in upper limb. *Hand Surgery*, *7*(02), 251-259.

Choi, J. S., Mun, J. H., Lee, J. Y., Jeon, J. H., Jung, Y. J., Seo, C. H., & Jang, K. U. (2011). Effects of modified dynamic metacarpophalangeal joint flexion orthoses after hand burn. Annals of rehabilitation medicine, 35(6), 880.

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Evidence

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Seu, M., & Pasqualetto, M. (2012). Hand therapy for dysfunction of the intrinsic muscles. *Hand clinics*, *28*(1), 87-100.

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Tips for Increasing Your Client's Compliance with Orthotic Wear

- Make sure client understand purpose of orthosis
- Make sure client understands wearing schedule
- Make sure client has some say in final design (choice of color of material, straps)
- Have client keep a log of orthotic use
- Assess functional status with and without the orthosis

**Measure active and passive range of motion and/or perform a functional assessment prior to orthotic intervention.

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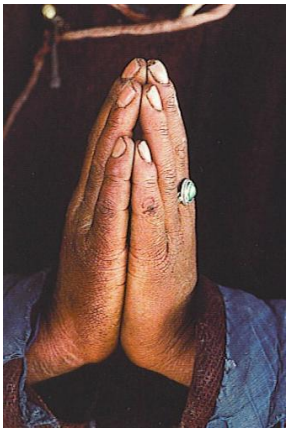

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