Webinar #8 2020

Orthotic Management of Ulnar and/ or Median Nerve Dysfunction

Deborah A. Schwartz, OTD, OTR/L, CHT
Product and Educational Specialist, Physical Rehabilitation
Orfit Industries America
Debby.schwartz@orfit.com

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.
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
Ulnar Nerve Dysfunction

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

Ulnar Nerve Dysfunction

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.
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.

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

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

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

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
Fabrication of the Ulnar Claw Orthosis

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

Materials:
Orfit Strips 3.2mm x 12”
or
Orficast 6 cm- folded lengthwise
(either in half or tripled)
Four small muscles of the hand are supplied the median nerve

Remember “LOAF”:

- lateral two lumbricals
- opponens pollicis
- abductor pollicis brevis
- flexor pollicis brevis
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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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
High Nerve Injury
Above origin of AIN

Low Nerve Injury
Thenar intrinsic muscles paralyzed

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
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

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
Orthotic Options for the Thumb

Materials:

Orficast More 15 cm / 6”
Orfit Precuts

Sheet Materials:
Classic
Orfilight
Orfit Colors NS

Fabrication of a Thumb Orthosis
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

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
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

Indications:

• Spinal Cord Injuries
• Charcot Marie Tooth
• ALS
• Trauma
Create a Functional Orthosis

Without thumb

With thumb

Create a Functional Orthosis

Dynamic thumb attachment
Material Considerations

- Who is the patient?
- Orthosis Design?
- Diagnosis?
- Memory?
- Material Thickness?
- Conforming or Rigid?
- Perforations?
- Client / Clinician Preferences
- Duration of wear?

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”*
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"

Evidence


Evidence


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.
Thank you for your attention!

Debby.schwartz@orfit.com

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