Upper Extremity Orthotics

Pathology and Prescription

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Upper Extremity Orthotic Goals

- Substitute for absent strength
- Assist for weak muscles
- Support injured or diseased segments by limiting motion or load
- Prevention or correction of deformity
- Attachment of assistive devices
Functional Goal = Prehension

Primary Factors: Thumb opposing fingers
- Effective pinch
- Gross grasp
- Positioning the hand in space
3 Point Control Concept
Rheumatoid Arthritis

IP Joints

Findings - “Swan Neck” deformity with hyperextension at PIP and flexion at DIP

“Boutonnière's Deformity” with flexion at PIP and hyperextension at DIP

Orthosis - Metal ring finger orthosis
Finger Ring Orthosis at DIP
Finger IP Joint Contracture

Findings - Flexion contracture at IP joint due to collateral ligament shortening
  Normal motor/sensory
  Normal ROM at MCP

Orthosis - Dynamic springwire finger orthosis

Alternates - “Joint Jacks” and others
Dynamic Finger Orthosis
Hand Finger Orthoses
Distal Median Nerve Injury

Findings - Weakness at thumb
  Sensory loss on palmar surface
  Loss of thumb opposition

Orthosis - Short opponens orthosis
Short Opponens Orthosis
Rheumatoid Arthritis
Base of Thumb

Findings - Tender at CMC joint (base of thumb)
  Synovial thickening
  Strength normal
  Sensation normal
  ROM may be limited by pain

Orthosis - Static plastic thumb spica
Thumb Spica
Dynamic Hand-Finger Orthosis for extensor contracture
MCP Joint Contracture

Findings - Extensor contracture at MCP joint

Orthosis - “Knuckle Bender” dynamic hand finger orthosis
Knuckle Bender Orthosis
Wrist-Hand-Finger Orthoses
Rheumatoid Arthritis

MCP Joint

Findings - Subluxation of MCP joints and wrist
Ulnar deviation of fingers
Synovial thickening of MCP joints
Limited ROM of MCP
Normal motor/sensory? (neuropathy)

Orthosis - Static wrist-hand-finger orthosis for later stage
Severe RA Deformity
Static WHFO
Carpal Tunnel Syndrome

Findings - Compression of median nerve

  Incomplete motor / sensory loss at thumb

Orthosis - Wrist – hand orthosis

  “Cock-up splint”
Wrist Cock-up Splint
CVA with Spastic Hemiplegia

Findings - Flexor positioning of wrist and fingers
Motor-voluntary control absent
Sensation absent, edema present
Tone increased

Orthosis - Static wrist-hand-finger orthosis with
wrist in slight extension, MCP’s in flexion, IP’s extended, thumb in opposition
Static Wrist-Hand-Finger Orthosis
Dynamic WHFO with PIP Extension for long flexor tendon contracture
Progressive WHFO needs regular follow-up and adjustment
Finger Flexor/Extensor Injury and Repair

Findings - Restrictions on ROM at wrist, MCP and IP joints per surgical protocol

Orthosis - Hybrid wrist-hand-finger orthosis with static stabilization of wrist and limited dynamic control of MCP’s and fingers
Flexor Tendon Repair
Extensor Tendon Repair
Distal Ulnar Nerve Injury

Findings - “Intrinsic Minus” hand with hyperextension at MCP and flexion at IP joints

Sensory deficit on palmar surface

Motor deficit of intrinsic muscles

Orthosis – Hybrid Wrist-hand-finger orthosis with MCP block
Hybrid WHFO
Radial Nerve Injury at Elbow

Findings - “Wrist Drop”
- Motor deficit at wrist extensor and finger/thumb extensors
- Sensory deficit at dorsum of hand

Orthosis - Dynamic wrist-hand-finger orthosis with extension assist at wrist and fingers using outriggers and bands
Dynamic WHFO for Radial Nerve Injury
Static Progressive Elbow Wrist Hand Orthosis for elbow fracture
Progressive EWHO for Humerus and Radius Fracture
Shoulder Fracture or Surgery

Findings - Restriction on ROM at gleno-humeral joint per surgical protocol

Orthosis - “Airplane Splint”
Other static shoulder orthoses
Static Shoulder Immobilizer
Spinal Cord Injury C₆ Level

Findings – Wrist Extensors Intact
Long Finger Flexors and intrinsics absent

Orthosis – RIC Tenodesis Orthosis
Alternate – Flexor Hinge Orthosis
Tenodesis Effect
Universal Cuff
Lower Brachial Plexus Injury

Findings -
Motor deficits at hand and wrist with good strength at elbow/shoulder
Sensory deficits in hand
ROM limited due to contracture at hand

Orthosis -
Static wrist-hand-finger orthosis for protection

Alternate -
“Prosthosis” using prosthetic terminal device for prehension
Prosthosis
Thank You