Anterior Orthotic Management for the Chronic Post Stroke Patient

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Outline

Terminology
Physical Evaluation
Design Considerations
Orthotic Design

Terminology

Primary patterning – The positional patterning of the limb during stance phase (weight bearing)
Secondary patterning – The positional patterning of the limb during swing phase
Ramp length – The hypotenuse of the triangle created between the anterior edge of the casting block extending distally to the apex of the 5th metatarsal head.
- Measured on the lateral border of the foot, from the point where the midline of the leg would intersect the ground, anteriorly to the apex of the 5th metatarsal head.
Adjusted Ankle Angle – the calculated ankle angle, that places an appropriate amount of tension on the gastrocnemius at a fixed end range or dorsiflexion stop.
Estimated SVA – The predetermined angle of the orthotic shank based on the patients profile
Casting block height – The amount of block or wedge necessary to accommodate the heel sole differential, angle of contracture at the ankle and/or knee and to place the shank in the desired amount of inclination or reclusion

Physical Evaluation

ROM

• R1, R2 values helps to define the functional and passive Profile of the patient.
• Helps to define a difference between a stiff or spastic muscle
• Gives you clues as to what to look for in the observational gait analysis
• Starts to define the angular parameters of the initial orthotic design.
MMT

- MMT helps to define the patient's physical profile
- Gives you clues as to what to look for in the observational gait analysis
- Start to help you define the necessary mechanical forces that the orthotic design should re-establish.

Design

**Goals:**
- **Alignment**
  - Correct and/or accommodate
  - Align the limb for optimal stance and swing kinematics
- **Stability**
  - Stabilize the limb with the orthosis to maintain the most optimal biomechanical alignment at the appropriate time
- **Clearance**
  - Provide swing phase clearance and proper pre-positioning for stance
- **Kinematics**
  - Improve joint kinematics by reestablishing proper lever arms and rockers
- **Function**
  - Speed, distance, endurance, safety, confidence

Provide and validate your outcome
- TUG, L-test, 6 min walk, 10 meter walk, SF-36 short

New rules.................
(Not validated at this point)

1. Determine the Adjusted Ankle Angle (AAA) or casting angle to achieve optimal tension on the gastro:
   - With knee extended and foot supinated, determine R1 and R2, Then:
     - If (R2) - (R1) < 5, then (R2) - 5 degrees = AAA
     - If (R2) - (R1) > 5, then (R2) - 10 degrees = AAA

2. Determine the Ramp length: by dropping a midline of the shank to the floor on the lateral leg and then measuring from that point anteriorly to the apex of the 5th metatarsal head

3. Determining the Estimated SVA (E-SVA):
   (Note: This rule applies to patients with spastic and/or >3+ quad strength or better)
   If Observational gait analysis reveals this profile during stance phase, your starting point for Orthotic Bench Alignment should be:
   A. IC to LR knee hyperextension: 10 degrees E-SVA
   B. MSt to TSt knee hyperextension: 8 degrees E-SVA
   C. Any phase excessive knee flexion: 6 degrees E-SVA
New rules.................
(Not validated at this point)

4. If a knee flexion contracture is present, the E-SVA should be the greater of the two angles: knee flexion contracture or E-SVA based on rule 3
(Note: With an SVA of 20+ degrees an AFO cannot stop forward progression of the shank. You should expect anterior knee instability during weight bearing.)

Review of Pertinent information

Observational Gait Analysis
Pathologic Gait Profile
ROM
MMT
Ramp Length
Adjusted Ankle Angle (AAA)
Estimated SVA

"The Houston Method"

AAA -20 degrees
E-SVA 8 degrees
Ramp 3 1/8 Inches
Casting Block 1.25"

Casting

Foot plates help to achieve transverse plane foot alignment
Orthotic Alignment

is it the same as in Prosthetics

Vertical
Midline
Crest

Standard AFO casting height doesn't include MTP/knee center

Orthotic Design

Sagittal View
Coronal View

Orthotic Design......Stance Features

Rigid laminate
Vertical Alignment Line
Anterior knee stability with rigid pre-tibial shell and resultant ground reaction force
Pronation, supination, plantar flexion and dorsiflexion controls
Extended Toe Plate (Lever) to Maintain GRF in front of knee through stance
Heat Lever to promote forward progression
Accommodates for plantar flexion contracture, heel/sole differential and tuning wedges

Dynamic Bracing Solutions Balancer

Orthotic Design......Swing Features

Plantar flexion and dorsiflexion controls pre-position limb for weight acceptance
Solid ankle design prevents foot drop/toe drag

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Valgus Control
Vertical Alignment Line
Varus Control

Lateral forefoot Lever
Medial forefoot Lever

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Valgus Control
Plantar/Dorsiflexion
Varus/Valgus controls pre-position limb for weight acceptance

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Valgus Control
Plantar/Dorsiflexion
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Solid ankle design prevents foot drop/toe drag
Thank You

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