AFO
(Ankle-Foot Orthosis)
Training
Important Terms

PlantarFlexion – Flexion of the entire foot downward (i.e. pushing down on the gas pedal)

DorsiFlexion – Flexion of the entire foot upwards (i.e. lifting your foot off the gas pedal)

Charcot-Marie-Tooth Disease (CMT)
- Charcot-Marie-Tooth disease (CMT) is one of the most common inherited neurological disorders, affecting approximately 1 in 2,500 people in the United States.
• The disease is named for the three physicians who first identified it in 1886 - Jean-Martin Charcot and Pierre Marie in Paris, France, and Howard Henry Tooth in Cambridge, England. CMT, also known as hereditary motor and sensory neuropathy (HMSN) or peroneal muscular atrophy, comprises a group of disorders that affect peripheral nerves. The peripheral nerves lie outside the brain and spinal cord and supply the muscles and sensory organs in the limbs. Disorders that affect the peripheral nerves are called peripheral neuropathies.

• **SPASTICITY** – involuntary muscle contractions leading to spasms and stiffness or rigidity.

• **CVA** – (Cerebrovascular accident) The sudden death of some brain cells due to lack of oxygen when the blood flow to the brain is impaired by blockage or rupture of an artery to the brain. A CVA is also referred to as a stroke.
Anatomy of the foot

Bones form the basic supporting structure of your foot. There are 26 bones in each foot.
Etiology (Cause)

- Foot drop is caused by weakness that occurs in specific muscles of the ankle and the foot. The affected muscles participate in the downward and upward movement of the ankle and the foot.
- The specific muscles include the anterior tibialis, extensor hallucis longus, and the extensor digitorum longus. The normal function of these muscles is to allow the toes to swing up from the ground during the beginning of a stride and to control the movement of the foot following the planting of the heel towards the end of the stride. Abnormal muscle function makes it difficult to prevent the toes from clearing the ground during the stride.
- There are three general causes of the muscle weakness. Damage to nerves can affect the transmission of impulses that help control muscle movement and function. Motor neuron diseases such as amyotrophic lateral sclerosis (ALS) or post-polio syndrome, tumors in the brain or spinal cord, or diseases of the nerve roots of the lumbar spine are all neurological conditions that may produce foot drop.
- Second, the muscles themselves may be damaged.
- Third, there can be some skeletal or other anatomical abnormality that affects the movement of the ankle or foot. A combination of these factors can also be involved, as is the case with the drop foot malady known as Charcot foot.
Ossur Orthotics

AFO Leaf Spring

AFO Light

AFO Dynamic
The **OSSUR® AFO Leaf Spring** is a prefabricated, off-the-shelf polypropylene ankle foot orthosis designed to support flaccid drop foot.
OSSUR® AFO Leaf Spring

Selection criteria

**Indications:**
- Drop foot secondary to CVA
- Mild drop foot secondary to other neurological pathologies

**Contra-Indication:**
- Severe Drop foot
- Ankle-foot deformities
- M-L instability
- Long term bracing need
- Spasticity
OSSUR® AFO Leaf Spring

Product description

- Foam padding
- Simple velcro strap
- Open calf-frame
- Open heel-frame
- Flexible footplate
“OSSUR® AFO Leaf Spring
Essential support provided in a light-weight solution”
Innovative Technology

Utilizing years of Prosthetic Carbon Graphite Foot Technology

4/29/2011
The **OSSUR® AFO Light**

The integration of function and comfort in a simple and easy solution.
**OSSUR® AFO Light** integrates **Flex-Foot** technology into **Ossur Orthotics**.

- Dynamic function
- Durable design
- Light weight
OSSUR® AFO Light

Selection criteria

• Indications:
  – Mild to moderate drop-foot secondary to neurological conditions

• Contra-indications:
  – Excessive ankle instability or excessive deformities
  – Severe spasticity
  – Extreme activities

4/29/2011
OSSUR® AFO Light
Product description

Calf piece and velcro strap

Elastic connection strap

Posterior upright:
1. Gastrocnemius curve
2. Achilles curve
3. Calcaneal curve

Thermoformable -tube

Tapered footplate
Ground Clearance *during Mid-Swing*

- Dorsiflexion assist
- Optimal toe clearance
- Reduces need for Hip Hiking
OSSUR® AFO Light

Function

踊 Active Tibial Progression

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### OSSUR® AFO Light

**Product specifications**

#### SIZE SELECTION

<table>
<thead>
<tr>
<th></th>
<th>SMALL</th>
<th>MEDIUM</th>
<th>LARGE</th>
<th>X-LARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Foot Size</td>
<td>8 3/4&quot;-10 1/4&quot;</td>
<td>9 1/2&quot;-11&quot;</td>
<td>10 1/4&quot;-11 3/4&quot;</td>
<td>11&quot;-12 1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>(22-25cm)</td>
<td>(25-27cm)</td>
<td>(27-29cm)</td>
<td>(29-32cm)</td>
</tr>
<tr>
<td>Foot Plate</td>
<td>9 1/2&quot;</td>
<td>10 1/4&quot;</td>
<td>11&quot;</td>
<td>11 3/4&quot;</td>
</tr>
<tr>
<td></td>
<td>(24cm)</td>
<td>(26cm)</td>
<td>(28cm)</td>
<td>(30cm)</td>
</tr>
<tr>
<td>Height Thickest Part Calf</td>
<td>12 1/2&quot;-14 1/4&quot;</td>
<td>13 1/2&quot;-15&quot;</td>
<td>14 1/4&quot;-15 3/4&quot;</td>
<td>15&quot;-16 1/2&quot;</td>
</tr>
<tr>
<td></td>
<td>(32-36cm)</td>
<td>(34-38cm)</td>
<td>(36-40cm)</td>
<td>(38-42cm)</td>
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<tr>
<td>Length Posterior Spring</td>
<td>13 1/2&quot;</td>
<td>14 1/4&quot;</td>
<td>15&quot;</td>
<td>15 3/4&quot;</td>
</tr>
<tr>
<td></td>
<td>(34cm)</td>
<td>(36cm)</td>
<td>(38cm)</td>
<td>(40cm)</td>
</tr>
<tr>
<td>Heel Height</td>
<td>9/16&quot; (1.5cm)</td>
<td>9/16&quot; (1.5cm)</td>
<td>9/16&quot; (1.5cm)</td>
<td>9/16&quot; (1.5cm)</td>
</tr>
</tbody>
</table>

- **Suggested Weight Range:** Up to 220 lbs (100kg)
- **Impact levels:** All
- **Warranty:** 6 months

**SIZES:** available in both left and right
OSSUR® AFO Light
to Flex-Foot

Proportional Response
- Stiffness increases through midstance

Active Tibial Progression
- Controls rate of plantarflexion
- Allow for smooth rollover
- Returns energy at toe off

Full Length Toe Lever
- Full support while foot is loaded
- Reduces impact to contralateral foot
OSSUR® AFO Dynamic

OSSUR® AFO Dynamic integrates Flex-Foot technology into Ossur Orthotics.

✓ Dynamic function
✓ Durable design
✓ Light weight
OSSUR® AFO Dynamic

Selection criteria

- Indications:
  - Mild Knee Instability
  - Ankle instability
  - Drop Foot secondary to
    - CVA
    - MS
    - Charcot Marie Tooth disease
    - Other neurological conditions
OSSUR® AFO Dynamic

Product description

Carbon Fiber, Kevlar and Fiberglass structure

- Proximal velcro strap
- Open structure tibia shell
- Textile cover
- Lateral Support
- Medial Strut
- Tapered footplate
OSSUR® AFO Dynamic

Product description

Carbon Fiber, Kevlar and Fiberglass structure

Strength and durability

Proximal velcro strap

Simple strap mechanism

Open structure tibia shell

Cooler, better anatomic fit

Textile cover

Protects skin

Lateral Support

Support during midstance

Medial Strut

Enhances cosmetics and strength

Tapered footplate

Smooth roll over, energy return

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OSSUR® AFO Dynamic

Proportional Response

Full Length Toe Lever

Our proprietary process for layering carbon fiber material produces an orthotic that responds smoothly and proportionally to the load applied.

Heel Height 9/16”, 1.5 cm

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OSSUR® AFO Dynamic
Features and benefits

**Flex Foot Carbon fiber**
- Creates dynamic motion
- Allows for energy returning
- Highly durable product
- Excellent weight strength ratio
  Allows for **Proportional Response**
  Provides **Active Tibial Progression**

**Gait assistance**
- Controlled plantar flexion
- Creates ML stability at midstance
- Reduces energy consumption by reducing hip-hiking
- Optimal ground clearance
- Creates smooth efficient gait

**Profile**
- Simple strap mechanism
- Fits easily into most shoes
- Easy to don and doff
- Slim profile = less visible

**Footplate design**
- **Full Length** Toe Lever
  allows for progressive stiffness

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OSSUR® AFO Dynamic to Flex-Foot

**Proportional Response**
- Stiffness increases through midstance

**Active Tibial Progression**
- Controls rate of plantarflexion
- Allow for smooth rollover
- Returns energy at toe off

**Full Length Toe Lever**
- Full support while foot is loaded
- Reduces impact to contralateral foot

**Active Heel**
- Tapered design of the heel stores and manages forces at heel strike
Ground Clearance during Mid-Swing

- Dorsiflexion assist
- Optimal toe clearance
- Reduces need for Hip Hiking

Mid-swing
OSSUR® AFO Dynamic Function

Active Tibial Progression

Proportional Response

Active Heel

- Reduces foot slap
- Controlled Plantarflexion
- Stores energy
- Promotes tibia progression

Loading response
# OSSUR® AFO Dynamic

## SIZE SELECTION

<table>
<thead>
<tr>
<th></th>
<th>XSMALL</th>
<th>SMALL</th>
<th>MEDIUM</th>
<th>LARGE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shoe Size</td>
<td>Male 3 to 5</td>
<td>Male up to 7 1/2</td>
<td>Male 8 to 10 1/2</td>
<td>Male 11 to 14</td>
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<tr>
<td></td>
<td>Female 4 to 6 1/2</td>
<td>Female 7 to 9</td>
<td>Female 9 1/2 to 12</td>
<td></td>
</tr>
<tr>
<td>Foot Size</td>
<td>Up to 9&quot; (21 - 23cm)</td>
<td>Up to 10&quot; (Up to 25cm)</td>
<td>10&quot; – 10 3/4&quot; (25 – 27cm)</td>
<td>10 3/4&quot; – 11 1/2&quot; (27-29cm)</td>
</tr>
<tr>
<td>Height</td>
<td>12.6&quot; (320mm)</td>
<td>13 1/4&quot; (340mm)</td>
<td>14 1/4&quot; (360mm)</td>
<td>15&quot; (380mm)</td>
</tr>
<tr>
<td>Heel Height</td>
<td>2/5 (1cm)</td>
<td>9/16&quot; (1.5cm)</td>
<td>9/16&quot; (1.5cm)</td>
<td>9/16&quot; (1.5cm)</td>
</tr>
</tbody>
</table>

- Suggested weight range: Up to 265 lbs (120kg)
- Impact levels: All
- Warranty 6 months
OSSUR® AFO Dynamic

**Durability**

<table>
<thead>
<tr>
<th></th>
<th>Static test</th>
<th>Cyclic test</th>
</tr>
</thead>
<tbody>
<tr>
<td>OSSUR® AFO Dynamic</td>
<td>1019 N (elastic)</td>
<td>300,000 cycles</td>
</tr>
<tr>
<td>Lateral Strut, Carbon AFO</td>
<td>330 N (elastic)</td>
<td>19,322 cycles</td>
</tr>
</tbody>
</table>

Based on ISO, In-House testing our products proves to be more durable (Cyclic) and stronger (Static) than a similar Carbon AFO with a Lateral Strut.

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**OSSUR® AFO Dynamic Function**

**MIDSTANCE**

**MEDIOLATERAL STABILITY**

**Medial Strut**
- Prevent excessive pronation
- Better cosmetics in shoe

**Lateral Support**
- Provides ankle stability
OSSUR® AFO Dynamic

Fitting

ML strut clearance
AP Alignment of the strut
Full surface

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OSSUR® AFO Dynamic

Fitting

Distal Strap

Align / Secure uprights

Fixate strap
OSSUR® AFO Dynamic
Fitting Modification

- Padding material
- Trimming the footplate to fit shoe
- Trimming the lower lateral support member
- Implementing a Foot Orthotic
What are the main benefits of the Medial strut design?

• Better fit in the shoe
• Optimal toe clearance, during swing phase
• More medial support at mid-stance, preventing excessive pronation
• Cosmetically less apparent

What are the benefits of the split anterior shell?

• Better anatomical fit
• Less contact reduces heat and shear
• More comfort
Can the OSSUR AFO Dynamic be altered for customisation?

- The footplate: Yes..
- The strut and the uprights: No..
  Note: grinding the strut and the upright will void the warranty.
- Proximal calf pieces and the lateral support: Yes
OSSUR AFO Dynamic
F.A.Q.

My patient is an excessive pronator, which results in occasional contact with the medial strut and signs of pressure at the medial arch of the foot, how do I solve this?

• Foot Orthotic with the AFO,
• Leave lateral side of foot plate long
• Use a 3mm medial wedge.

Can the OSSUR AFO Dynamic be re-shaped applying heat?

No. Applying heat to the AFO will delaminate the internal structure of the orthosis.

Note: Delaminating the AFO with heat will void the warranty.
RTO’s

- Do not use/Stock
- We Script Out
- Wow, That is Expensive
- We use Camp Toe Off

4/29/2011
Competition

• #1 competitor is the Camp toe off

• Anterior shell allows easy donning and doffing
• Open heel design allows normal biomechanics to occur during gait
• Dynamic strut / foot-plate allows a more normal gait pattern and helps enhance gait capacity
• Ultra-light weight to minimize impedance on the patient
• Ultra-thin foot-plate allows use of most existing shoe wardrobe
• Excellent M-L stability for grossly unstable ankles
• Materials: fiberglass, carbon fiber and Kevlar®. Hook and pile strap closure.
Otto Bock Walk

- Made from preimpregnated carbon fiber with a high volume epoxy matrix for maximum strength and low weight
- Thermoplastic calf band provides increased durability
- Unique posterior design offers energy return while reducing the risk of material failure
- Provides heel compression at initial contact, energy return from mid-stance to terminal stance and easy toe rollover
- Open heel allows for a more comfortable and natural gait
- Full sole plate provides more control for the entire foot while enhancing pressure distribution. Easy to don and doff – slips into any supportive shoe
- ComforT™ calf strap made of Phase Change Material (PCM) designed to actively balance temperature extremes to increase patient's comfort and ultimately their compliance
- Velcro® calf strap is adjustable for the patient's comfort
• British Patent Pending
• Anterior shell (front of brace) is manufactured from a high temperature thermoplastic allowing for adjustments
• Carbon fiber footplate
• Lateral strut is made out of glass fiber
• Only energy return comes from the foot plate since the lateral strut is made from glass fiber, this results in a reduction of energy return.