Orthotics I
Lab1
“Ankle Foot Orthosis”

Al-Mustaqbal University College of Engineering & Technology Department of prosthetics and orthotics engineering

Eng. Aya Talib

What is an AFO?

An **Ankle-Foot Orthosis (AFO)** is an external device applied to the lower limb to:

- Control ankle motion
- Correct deformity
- Provide stability during stance
- Assist toe clearance during the swing phase

Indications

Common Clinical Conditions

- Stroke (CVA) – Foot drop
- Cerebral Palsy
- Multiple Sclerosis
- Spinal Cord Injury
- Peripheral nerve injury (Common peroneal nerve palsy)
- Muscular dystrophy

Function of AFO

- Improve gait efficiency
- Prevent contractures
- Enhance balance
- Reduce energy expenditure
- Improve safety & independence

Biomechanics of AFO

During Gait Cycle

Initial Contact:

- Prevent foot slap

Mid Stance:

- Control tibial progression

Swing Phase:

- Maintain dorsiflexion → prevent toe drag

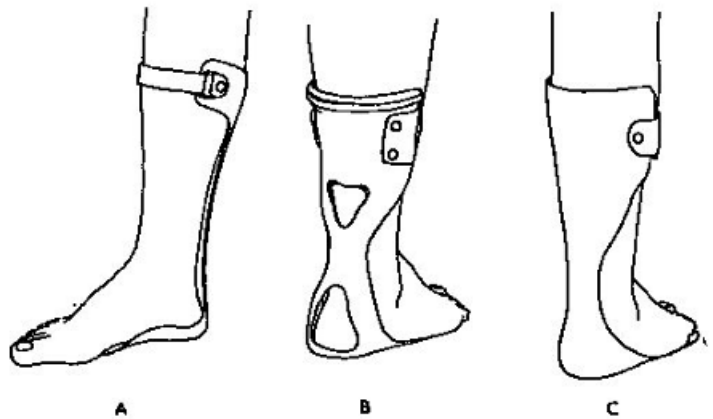
Types of AFO:

- Flexible or Leaf-spring
- Rigid
- Articulated
- Ground reaction floor
- Anti recurvatum
- Conventional

FLEXIBLE AFO

:Flexible AFOs specifications

- Dorsiflexion assistance
- The flexible AFO has a poor medio-lateral stabilization of the subtalar joint
- ,It needs good Plantar flexion muscle
- flexible will help during the push up
- Recommended for no big deformity, no
- .hyper-tone, good control at the knee
  Ex: Some hemi-plegic
- Provides smoother knee-ankle motion
- during walking while preventing excessive .ankle dorsiflexion
- .It also increases knee flexion in stance

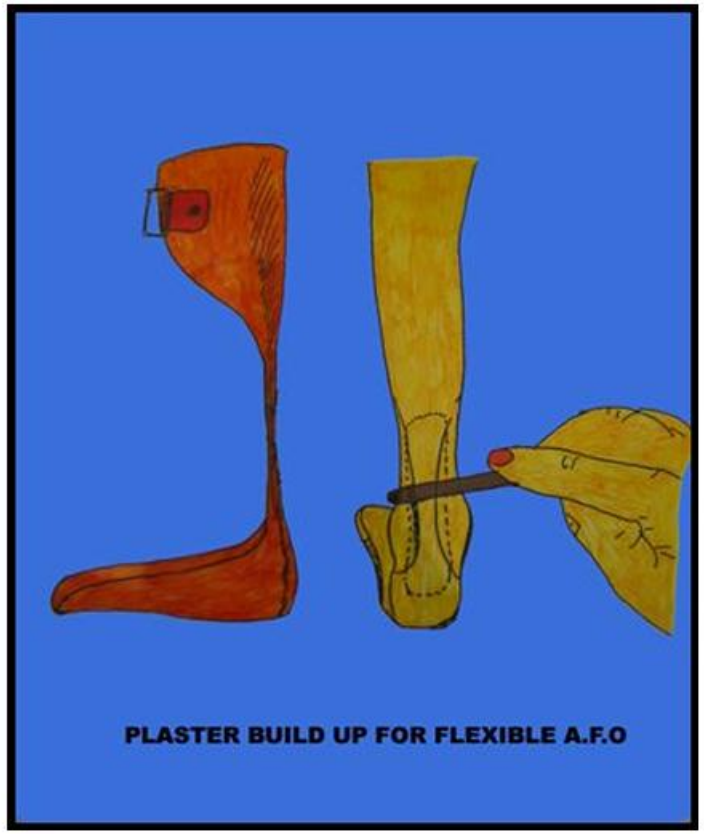


FLEXIBLE AFO

The shell is trimmed narrowest at the level of the mechanical ankle joint so that movement occurs at that point. Subtalar and midfoot movement are controlled by manipulation of the trim lines surrounding them.

For a flexible AFO it is recommended to add some plaster to the Achilles .Tendon

It will avoid pressure or pain during .dorsi-flexion



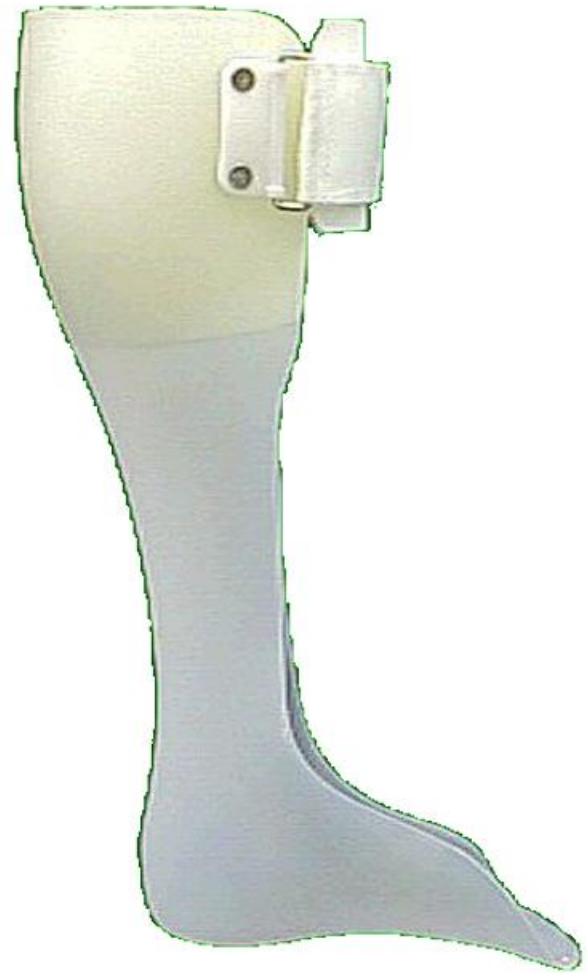
RIGID AFO

:Rigid AFOs specifications

Blocks ankle movements by the rigidity of the walls

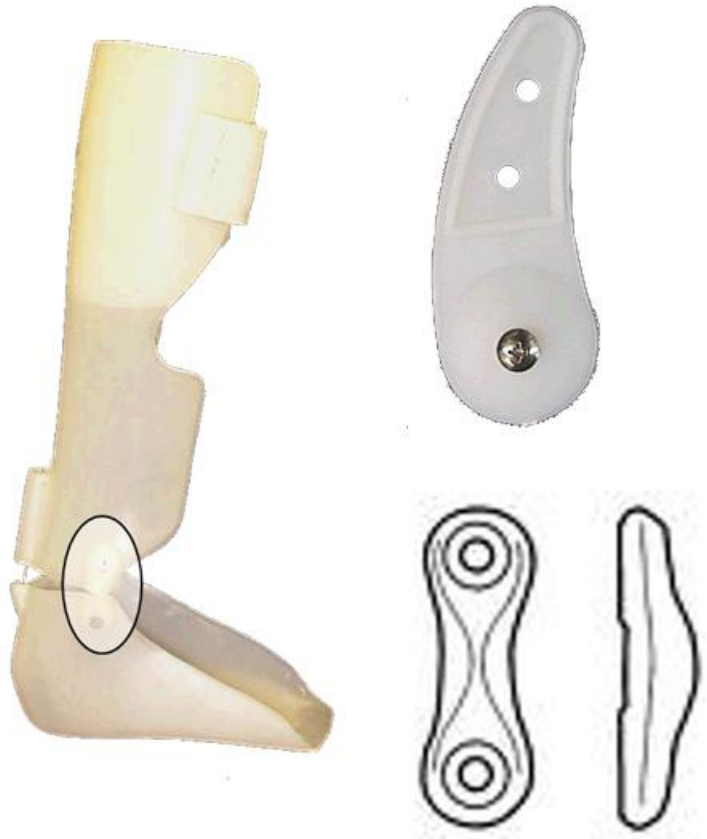
Mediolateral stabilization of the subtalar joint

Possibility of controlling forefoot adduction/abduction



Articulated Plastic AFO

- Free or limited motion
- Tamarack
- Oklahoma

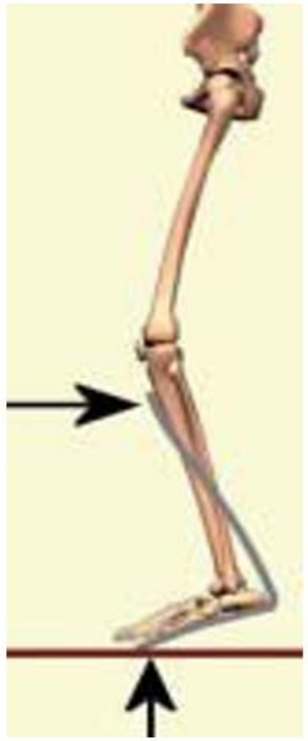


Tamarack:

- Flexible joint
- Easy to align
- Spring effect to take is in its normal position

Oklahoma:

- Rigid joint
- Control in the ML plan
- Need a perfect alignment



Mechanism of action of the GRAFO: By pushing the tibia back, the GRAFO prevents passive ankle dorsiflexion in stance. When the tibia does not come .forward, the femur rolls over the tibia and the knee extends

Ground reaction AFO

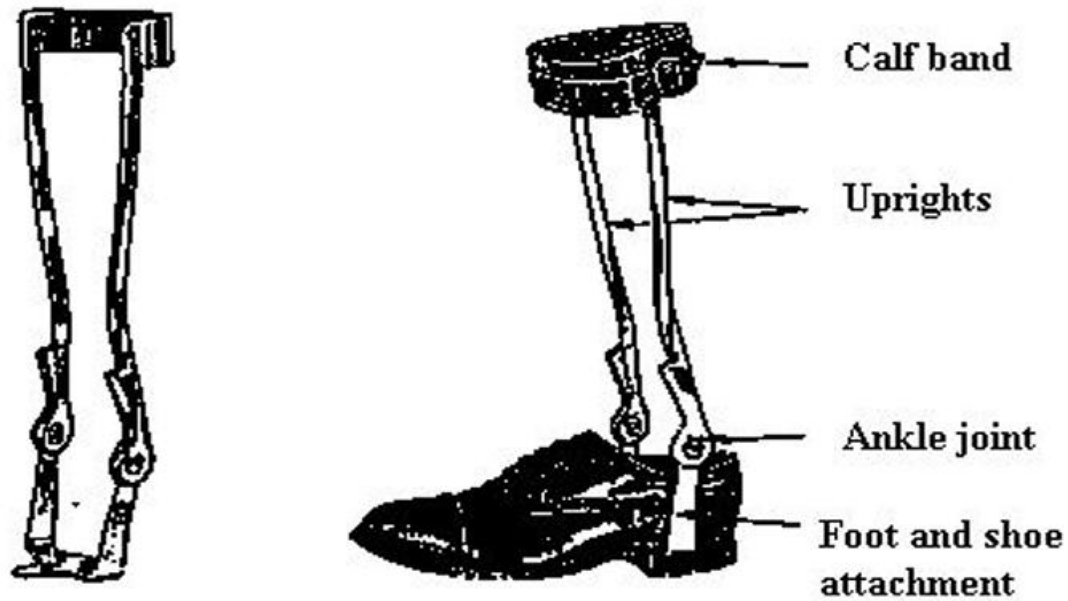
Anti-recurvatum AFO

Slight dorsiflexion to prevent hyperextension during the stance phase

May be solid or hinged, depending on the Patient.

Treatment of genu recurvatum

CONVENTIONAL



The following are situations where the
A conventional AFO should be considered:

- **Oedema (swelling) of the leg during the day**
- **Minimal Sensation below the knee**
- **Allergy**
- **Sweating**

Case 1 – Stroke Patient (Foot Drop)

Patient history

- 58-year-old male
- 3 months post-stroke
- Weak dorsiflexors
- Mild spasticity

Problem

- Foot drop during swing
- Foot slap at heel strike

Orthotic Prescription

Posterior Leaf Spring AFO

Why?

- Assists dorsiflexion
- Lightweight
- Allows controlled plantarflexion

Q / Why not prescribe a solid AFO?

Case 2 – Cerebral Palsy (Crouch Gait)

Patient history

- 10-year-old child
- Spastic diplegia
- Excessive knee flexion in stance

Problem

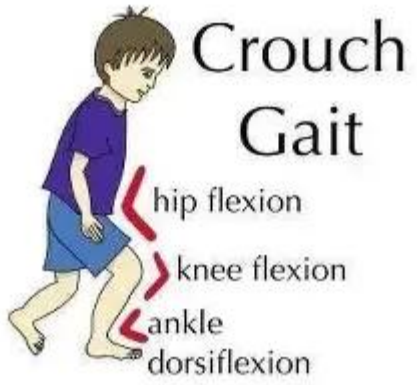
- Poor knee extension
- High energy expenditure

Orthotic Prescription

Ground Reaction AFO (GRAFO)

Why?

- Anterior shell creates knee extension moment
- Improves posture



Q/ How does ground reaction force affect knee stability?

Case 3 – Peroneal Nerve Injury

Patient history

- 32-year-old male
- Trauma-related nerve palsy
- No spasticity

Problem

- Isolated foot drop

Orthotic Prescription

Hinged AFO or PLS AFO

Why?

- Allows normal ankle ROM
- Provides swing phase control

Q/ When would carbon fiber AFO be preferred?