orthotics I

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Lab1

Basic Steps of Orthotics

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What is orthosis?

An orthosis is an external medical device (such as a brace or splint) for supporting, immobilizing, or treating muscles and joints.

What are the main types of orthosis?

- **Rigid Orthotics**
- **Soft Orthotics**
- **Adaptive Orthotics**

What is the typical duration for using orthotics?

Corrective and functional supports are designed to provide stability and correct deformities based on

- Evaluation of the condition.
- assessment
- the duration recommended by the specialist.

for example, Fracture supports, typically used during the post-operative period, are commonly worn for 6 to 12 weeks to assist in the healing of ligaments and bones.

How do we assess and evaluate a patient before selecting the type and design of an orthosis?

•**Gait analysis**: Observe the patient walking, standing, sitting, and standing up to identify any abnormal movements.

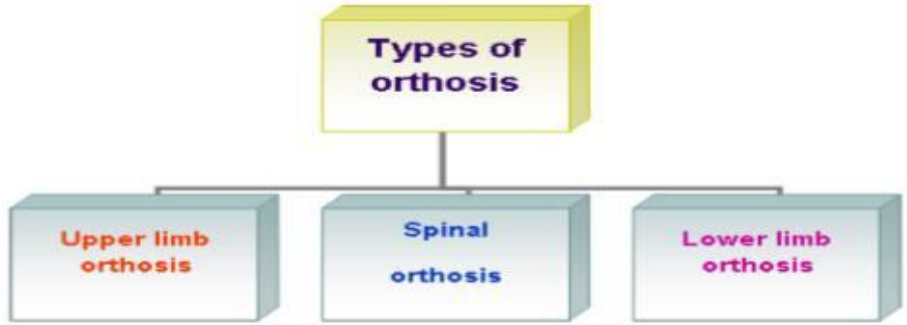
• **Range of Motion (ROM):** Assess the flexibility and range of motion of the joints.

•**Muscle strength**: Test the strength of the muscles involved.

•**Leg length**: Check for any discrepancies in leg length.

• **Back condition: Assess the patient's back condition**.

Types of orthosis



Orthoses are named by the joints they encompass

LL orthoses			
FO	**Foot orthosis**	**AFO**	**Ankle-foot orthosis**
KO	**Knee orthosis**	**KAFO**	**Knee-ankle foot orthosis**
HO	**Hip orthosis**	**HKAFO**	**Hip-Knee-ankle foot orthosis**
		RGO	**Reciprocal Gait orthosis**
UL orthoses			
HdO	**Hand orthosis**	**WHO**	**Wrist-Hand orthosis**
WO	**Wrist orthosis**	**EWHO**	**Elbow-Wrist-Hand orthosis**
EO	**Elbow orthosis**	**SEO**	**Shoulder-Elbow orthosis**
SO	**Shoulder orthosis**	**SEWHO**	**Shoulder-Elbow-Wrist-Hand orthosis**

Ankle-Foot Orthotises (AFOs)

Ankle-Foot Orthoses (AFOs) are devices used to support, stabilize, and correct foot and ankle deformities. They are typically prescribed for patients with conditions that affect mobility, joint stability, or alignment in the lower extremities.

Common Use Cases for AFOs:

1. **Foot drop**: AFOs help patients with foot drop (inability to lift the foot) to walk more easily by providing support to lift the foot during walking.
2. **Stroke**: Patients recovering from a stroke may use AFOs to improve gait and prevent foot dragging.
3. **Cerebral palsy**: AFOs are used to manage spasticity and abnormal positioning of the foot and ankle.

4. **spinal cord injury**: AFOs can help maintain proper alignment and improve stability for those with limited motor function.

5. Arthritis: They provide joint protection and reduce strain on painful or inflamed joints in the foot and ankle.

6.Multiple sclerosis (MS): AFOs can support walking in MS patients by controlling abnormal foot positioning and improving mobility.

Steps in the Casting of AFOs

1. Patient Evaluation:

•The first step involves a thorough evaluation of the patient's condition, including their medical history, gait, range of motion, and any deformities. The clinician will also determine whether a rigid or semi-rigid AFO is needed.

2. Preparation of Materials:

Materials Used for Casting (Creating the Mold):

•Plaster of Paris

- Most commonly used for traditional casting.
- Provides excellent detail and is easy to work with.
- Quick setting time.

Stockinette

•A soft, stretchable fabric placed directly over the skin before casting to protect the skin.

•Helps ensure comfort during the casting process.

Plastic Wrap or Casting Sock (Optional)

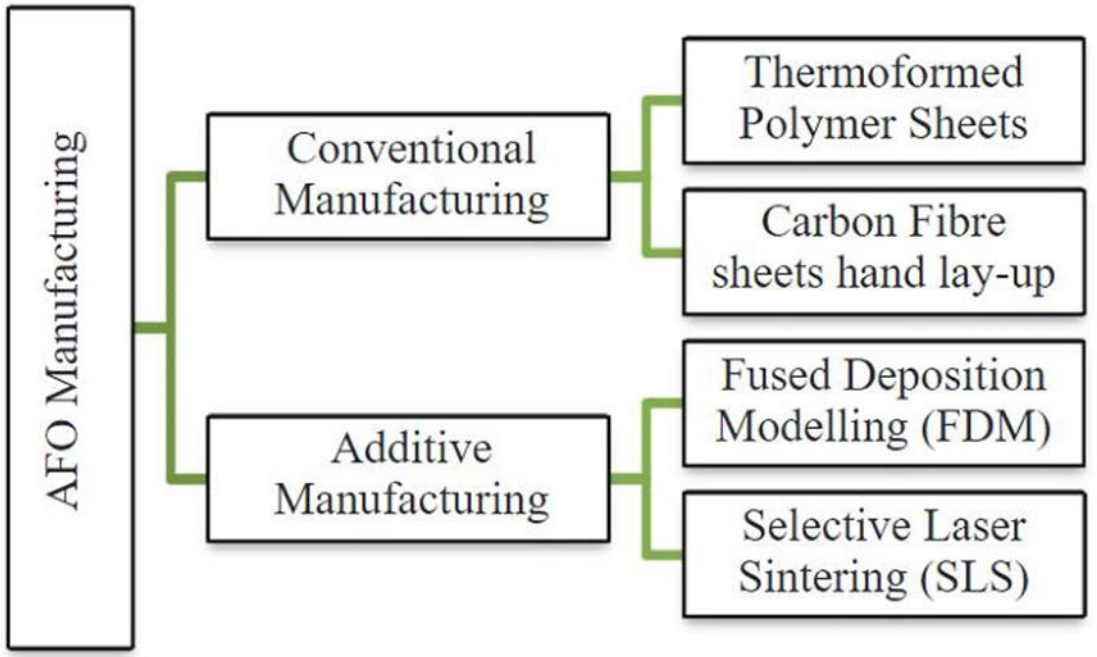
•Used in combination with stockinette to protect the skin further and help in mold removal.

Materials Used for Manufacturing the AFO:

•Thermoplastics

- Most commonly used material for AFO fabrication.
- **Polypropylene**
  - Lightweight, durable, and flexible.
  - Most widely used for custom-molded AFOs.
  - Good for moderate support and control.
- **Polyethylene**
  - Softer and more flexible than polypropylene.
  - Used when more comfort and cushioning are needed, especially for pediatric or sensitive cases.
- **Co-Polymer Plastics**
  - A blend of polypropylene and polyethylene for a balance of rigidity and flexibility.

- **Carbon Fiber**
  - Lightweight and extremely strong.
  - Used for high-performance or dynamic AFOs.
  - Offers excellent energy return (commonly used for athletes or active individuals).
- **Thermoformable Foam (EVA or PE foams)**
  - Used as padding or lining inside the AFO for comfort.
  - Also used for footbeds or custom insoles within the orthosis.
- **Velcro Straps and Buckles**
  - Used to secure the AFO in place.
  - Adjustable for a snug and comfortable fit.
- **Metal Joints or Hinges (in articulated AFOs)**
  - For AFOs that allow some degree of ankle movement.
  - Typically made from stainless steel, titanium, or aluminum.



3. Casting the Leg:

•The patient is positioned in a neutral position, with the foot and ankle in a relaxed and aligned state.
•The clinician wraps the foot, ankle, and lower leg in the casting material. The clinician ensures that the material molds closely to the contours of the foot and lower leg, capturing key features such as the arch, heel position, and ankle joint alignment.
•The clinician may also apply pressure to specific areas if necessary to correct or support any deformities.
•The cast is allowed to harden for several minutes, during which the clinician checks for any necessary adjustments to ensure proper fit and alignment.

The clinician may ask you to walk and assess the range of motion in your leg and foot to evaluate your functional capabilities and observe your typical walking pattern.
A **negative cast** of your leg(s) will then be taken by wrapping plaster bandages around the area. Once the plaster sets—usually within 3 to 6 minutes—it is carefully removed. This cast captures the exact shape of your leg and will be used to create your custom AFOs.
The manufacturing process typically takes **3 to 4 weeks**. An appointment for fitting and collecting your AFOs will be scheduled on the day the cast is taken.

4. manufacturing the AFO:

•The cast is then used as a mold to create the AFO. A thermoplastic material (such as polypropylene) is typically heated and formed around the mold to create the custom orthosis.

•After cooling, the AFO is trimmed, adjusted, and refined to ensure it fits properly and comfortably

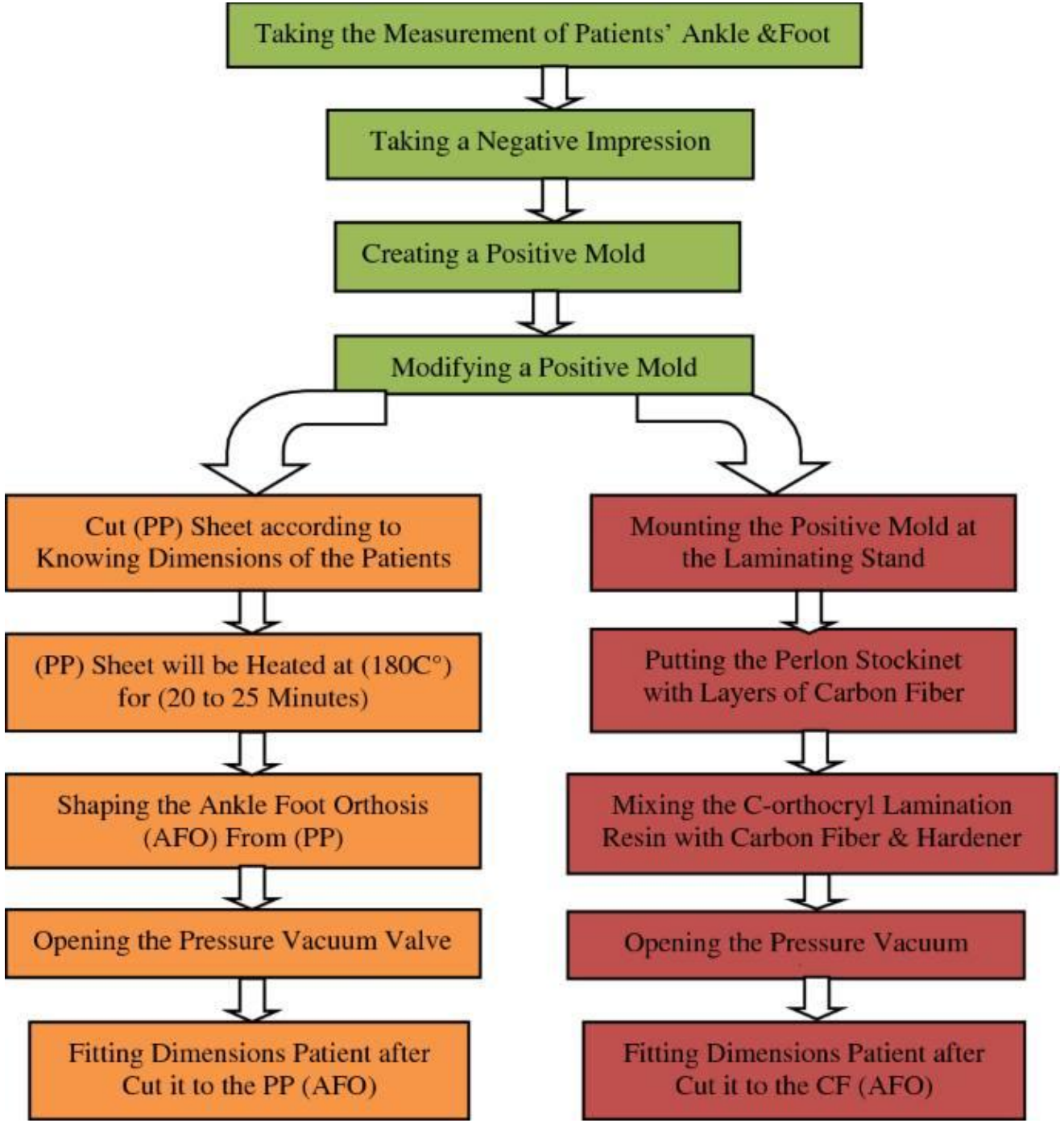
5. Fitting and Adjustments:

•The patient will return for a fitting session where the AFO is tried on and adjustments are made for comfort, alignment, and function.

•The clinician may make additional changes based on the patient's feedback.

6. Follow-Up:

•After the AFO is finalized, follow-up appointments are scheduled to monitor the patient's comfort and function. Additional adjustments may be made as needed.


Taking the Measurement of Patients' Ankle &Foot
Taking a Negative Impression
Creating a Positive Mold
Modifying a Positive Mold
Cut (PP) Sheet according to Knowing Dimensions of the Patients
(PP) Sheet will be Heated at (180C°) for (20 to 25 Minutes)
Shaping the Ankle Foot Orthosis (AFO) From (PP)
Opening the Pressure Vacuum Valve
Fitting Dimensions Patient after Cut it to the PP (AFO)
Mounting the Positive Mold at the Laminating Stand
Putting the Perlon Stockinet with Layers of Carbon Fiber
Mixing the C-orthocryl Lamination Resin with Carbon Fiber & Hardener
Opening the Pressure Vacuum
Fitting Dimensions Patient after Cut it to the CF (AFO)