Al-Mustaqbal University
Collage of Engineering
Prosthetics and Orthotics Engineering

Second Stage

2st term

2025/2026

Prosthetics I

(UOMU0103041)

Lecture 3

Asst. Lect. Muntadher Saleh Mahdi

Muntadher.saleh.mahdi@uomus.edu.iq

Subject: Prosthetics 2
Lecturer: Samer Aswad Alaseedi
sameralaseedi@gmail.com

Lecture 3

The Finishing Process

1. **Preparation**

- Once the prosthetist and the wearer are satisfied with the fit and alignment, the foot component of the prosthesis is detached.
- The remaining structure is then secured in a vertical alignment jig to maintain the correct orientation throughout the finishing process.

2. **Alignment Capture**

- The socket is filled with plaster to create a solid mold. Into this wet plaster, a pipe, held by the alignment jig, is set. This step is critical because once the plaster hardens, it captures the precise alignment needed for the final prosthesis.

- The prosthesis is removed from the jig only after the alignment is solidified, ensuring the maintenance of the desired orientation.

3. **Reassembly**

- With the alignment captured, the final prosthesis can be assembled. Extra alignment devices used during the fitting are removed.
- The final limb is constructed using either endoskeletal or exoskeletal components, depending on the wearer's needs and preferences.

Endoskeletal vs. Exoskeletal

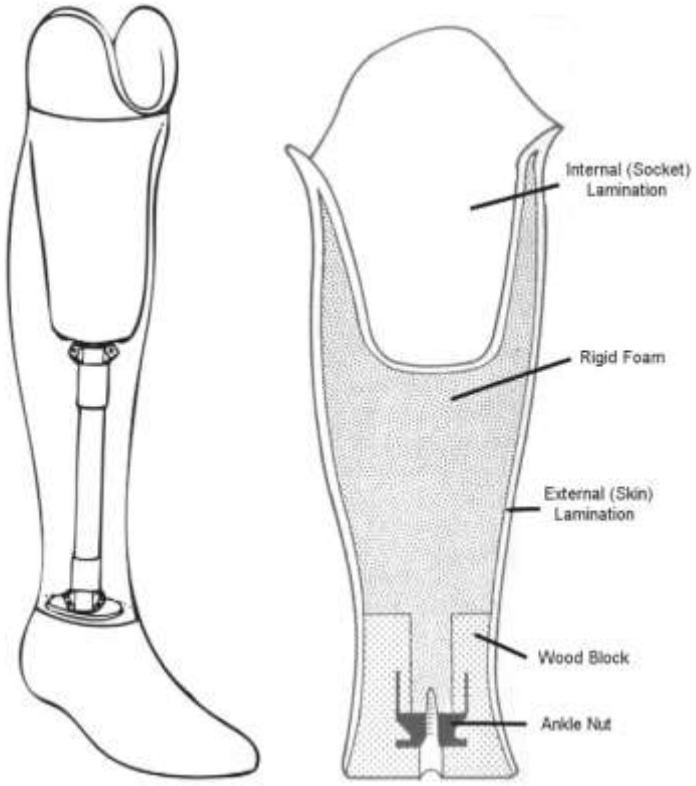
1. **Endoskeletal Prosthesis**

- **Structure** The structural components of an endoskeletal prosthesis are hidden deep within the limb, covered by materials that offer a realistic look, such as foam rubber or latex.
- **Advantages** This design offers a realistic appearance and adjustability. Modular components make it easy to adjust or replace parts without extensive work – much like changing a car tire.
- **Cosmetic Finishing** The external materials can be shaped and finished with various textures and colors. Details such as moles, freckles, pores, and even hair can be added to closely match the user's natural limb.

2. Exoskeletal Prosthetic Finishing

In cases where durability and ease of cleaning are prioritized, an exoskeletal prosthesis is often the choice. The exoskeletal design offers a robust outer shell that is ideal for individuals who may engage in activities that are more demanding on the prosthesis.

Subject: Prosthetics 2
Lecturer: Samer Aswad Alaseedi
sameralaseedi@gmail.com



Fabrication Process

1. **Attachment and Alignment**

   - The socket is connected to the foot using an external composite lamination that is custom-shaped. To achieve this, a wooden ankle block is bonded to the socket with rigid foam within the vertical alignment jig.
   - This foam is critical as it must be firm enough to maintain the precise alignment between the socket and foot that was preserved in the jig.

2. **Shaping**

   The foam and ankle block are then meticulously shaped by hand to mirror the contralateral limb, albeit slightly smaller to account for the thickness of the final lamination.

3. **Lamination and Sealing**

Once shaped, the foam is sealed and laminated with a composite material. This lamination is not just cosmetic; it forms the structural backbone of the exoskeletal prosthesis.

Advantages and Considerations

- **Durability** The exoskeletal prosthesis is characterized by its hard, nonporous, chemically inert, and waterproof surface, making it exceptionally durable and easy to clean.
- **Weight** Typically, exoskeletal prostheses are heavier than endoskeletal versions.
- **Adjustability** Exoskeletal prostheses are less adjustable once fabricated, which can be a consideration in the fitting and long-term maintenance.

Gait Deviations in Prosthetics

Causes and Evaluation

Gait deviations in prosthetic users can stem from various factors, including improper socket fit, misalignment, muscle weakness, or other musculoskeletal pathologies. It's crucial to conduct a thorough evaluation to pinpoint the cause of these deviations and develop a strategy for correction. A review of the biomechanics of normal gait is recommended to understand these deviations better.

Impact of Changes on Gait

Even small changes in a wearer's routine can lead to gait deviations. Such changes might include:

- **Limb Volume Variations** Changes in diet, medication, or activity levels can affect limb volume, altering the fit of the socket.
- **Footwear Alterations** A change in shoe heel height can impact the orientation of the socket to the ground. If the prosthetic components don't accommodate the new heel height, the wearer's gait could be adversely affected.