PRINCIPLES OF PROSTHETICS AND ORTHOTICS

2nd year 1st semester

Lecture 7

Dr. Muslim Muhsin Ali

Dynamic Response Syme Feet

1. Newer Prosthetic Designs

- **Impulse Syme's Foot by Ohio Willow Wood**
- Comprises a Kevlar keel with carbon deflection toe-spring plates.
- The manufacturing technique ensures optimal orientation of carbon fibers, thus evading common issues like wrinkling and deformation.
- This foot alignment adjustability is notable, leading to better gait and energy conservation.
- **Carbon Copy II Syme Foot by Ohio Willow Wood**
- Available in varied heel heights and toe resistances.
- Designed especially for patients weighing up to 250 lb.

- **Steplite Foot by Kingsley**
- It is known for its compressible heel design combined with the buoyancy of a carbon keel.
- It boasts durability and a design that is beneficial for almost every Syme amputee due to its minimal prosthetic clearance requirement.
- Has different versions like the “Strider” and “Flattie” to accommodate varying footwear.

Ossur's Offerings

- The Ossur Low Profile is tailored for active amputees weighing up to 285 lb, and low-activity amputees weighing up to 365 lb.
- It incorporates a flexible double-spring keel and a fenestrated heel, reducing shock.

- **Seattle Light Foot by Seattle Orthopedic Group**
- A dynamic elastic foot ideal for the active individual.

It's worth noting that most Syme prostheses have essentially locked ankles, leading to increased demands on the quadriceps. This design decision has pros and cons, and integrating some degree of adjustable articulated plantar flexion could be a future direction.

2. Addressing Alignment Issues with most Syme prosthetic feet, alignment during dynamic movement is vital but can be challenging because of limited space. However, advances in this area include:

- **Functional alignment device for the Impulse Syme** This device, from Ohio Willow Wood, allows dynamic alignment adjustments during the fitting process, adding great versatility and customization.
- **SL Profile and Lo Rider Syme Feet by Otto Bock** These designs allow angular adjustability, although the height might be restrictive for some amputees.

- **IC20 ProSyme's by Otto Bock** This is a significant addition with a broad range of alignment adjustability and heel height changes.

3. Insights on Optimal Alignment To replicate a natural gait, the Syme foot often needs to be in slight dorsiflexion relative to the shin section. Aspects such as the length of the Syme residual limb, knee flexion contractures, and tibial anatomical adduction angles play a significant role in alignment and subsequently, in the patient's gait and overall experience.

Transtibial Prosthetics

Prosthetic Evaluation in Transtibial Amputations

1. Initial Evaluation and Examination

a. **Physical Examination** The cornerstone of this process begins with an exhaustive physical examination. This includes:

- Inspection and palpation.
- Assessment of muscle performance through manual muscle testing (MMT)

- Evaluation of both active and passive range of motion (ROM).
- Sensory testing and skin integrity assessment.

b. **Interview** Equally crucial is the interview process, which helps glean details about:

- Cognitive level, age, and health history.
- Vocation, avocation, and home living status.

c. **Setting Rehabilitation Goals** This stage offers the golden opportunity to discuss, delineate and set rehabilitation goals that are both challenging and achievable. These goals offer scaffolding for the individual's journey ahead.

2. The Role of Collaboration in Prosthetic Rehabilitation

The adage that many hands make light work resonates profoundly here. Prosthetic rehabilitation is not the sole endeavor of the physician, therapist, or the patient. Each stakeholder, including the prosthetist, brings invaluable information to the table. It is the collective endeavor of all these stakeholders that promises the most optimum outcome.

3. Prosthetic Candidacy

This is perhaps the most crucial juncture in the journey. What determines prosthetic candidacy?

- **Motivation** The fire in the belly of the individual, their sheer will, and belief play pivotal roles.
- **Support System** Peer visitors, those who've trodden a similar path, can offer unparalleled support and inspiration. Their firsthand accounts of their rehabilitation journey can sometimes offer insights that even professionals may not provide. Online platforms, too, offer vast resources and support groups.

4. Challenges and Solutions in Prosthetic Rehabilitation

a. **Dealing with Comorbidities** An amputation doesn’t occur in isolation. Whether it's trauma or disease-induced, it often brings along a suite of other complications.

b. **Customization** The residual limb might not always be in its prime. Still, the expertise of a prosthetist can offer custom solutions:

- Solutions for skin issues: Using suitable interface materials.
- Alleviating pressure points: By reshaping the socket.
- Addressing limb dysfunction: Via specialized prosthetic options.

c. **One size doesn't fit all** This isn't just about the physical fit but also about aligning the prosthesis's functionality with the individual's unique needs.

5. Prosthesis Design – Striking the Right Balance

a. **Weight vs. Functionality** Every added feature to a prosthesis can increase its weight, which in turn can have implications on energy expenditure and fatigue.

b. **Materials and Techniques** Modern prosthetic design has seen rapid advancements, offering increased mobility and energy efficiency.

6. Predicting Functional Outcomes

Most individuals undergoing transtibial amputations can return to their prior level of functionality. However, specific conditions or comorbidities may need special attention.

7. Classifying Functional Potential – The K-level

A critical aspect of rehabilitation is the classification of functional potential. This hierarchical system, known as the "K-levels", ensures that the right prosthesis is prescribed, aligning with the user's ability or potential. This system not only aids in individual rehabilitation but also in regulating Medicare provisions.

Thank You