A CLINICAL PERSPECTIVE ON PROSTHETICS

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INTRODUCTION

To better understand the capabilities of wearable active and passive leg prostheses, it is important to gain a perspective of the history of these devices. Thus, I will provide a general overview of lower limb prosthetic devices that will cover prosthetic device development since World War II [1] as well as the functional and clinical limitations of these devices for people with lower limb amputations. I will also present an introduction to present day micro-processor controlled devices and powered prosthetic devices for different levels of amputation. Sport or activity specific devices will also be discussed as many people with lower limb amputation require prosthetic devices that can improve their sport performance as well as allow them to lead an active lifestyle that would not be possible with conventional prosthetic devices.

TECHNOLOGY

Following WWII, the need for prosthetic devices grew substantially due to injuries sustained in the war. This dramatic increase in service members with amputations facilitated rapid development of lower limb prostheses. To understand the potential functional benefits or drawbacks of these devices, I will establish a timeline of the advancements made in prosthetic devices and the technological development of prostheses up to today (Fig. 1). Further, I will discuss the role and contribution of the Department of Veterans Affairs (VA) in the development and research of prosthetic devices.

CURRENT PROSTHETIC DEVICES

Current day commercially available prosthetic devices and components have the potential to improve locomotion and function for people with a leg amputation. Examples of these prostheses and components include microprocessor controlled (MPC) and powered controlled (PC) prosthetic devices, the C-Leg by Otto Bock (Germany), the Rheo Knee and Power Knee (Fig. 2) by Össur (Iceland), the BiOM T2 System Foot (Fig. 3) by BioOM (USA) and the Proprio Foot by Össur.
Sport specific prosthetic devices like the Cheetah foot (Fig. 4) by Össur can improve activity specific sport performance and I will discuss the implications for future development of these activity specific devices.

**Figure 3. BiOM T2 Foot (BiOM)**

**Figure 4. Cheetah Foot (Össur)**

**FUTURE DEVELOPMENTS**

Clinical indications for future developments are needed in the functioning of prosthetic devices. The future functional and outcome requirements of the amputee population should be considered in developing the next generation of prosthetic devices that include a powered driven or a passive prosthetic device. Considerations for integrated prosthetic devices to include the socket system will also be discussed. Integrated systems can include various levels of micro processing function and communication of control mechanisms in the complete prosthetic device. A brief discussion will follow of the future development and research of neuro-integrated and osseo-integrated (Fig. 5) prosthetic devices.

**Figure 5. Osseointegration**

**CONCLUSIONS**

The history of prosthetic device development post WWII up to present day provides an important context for current devices. The advancement of technology and the role in prosthetic device development to improve function and outcomes for the lower limb amputee will be presented. The clinical considerations will be discussed in the development of the next generation of advanced prosthetic devices for the lower limb amputee population. The continued need for sport performance for amputee athletes and the role of prosthetic devices used in human performance will demonstrate the need for improved future prosthetic device design and development.

**REFERENCES**