

Evidence of Learning #3

Date:

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Analysis:

One of the biggest factors in the overall comfort and effectiveness of a prosthesis is the suspension system used to attach the device to a patient. Three of the most commonly used suspension mechanisms are suction, a vacuum, and a shuttle lock, and there are several variations of each of these that can be adapted to better suit a patient's needs. For example, a vacuum system typically includes a liner that must be placed over the skin before a socket can be placed on top of it. The inside of the liner that touches the skin can be made from different materials, such as gel, silicone, or elastomer, and the outside of the liner consists of a fabric coating to make attaching and adjusting the socket an easier process.

A suction system operates by simply pushing the air out from the socket, and it's a more passive system in comparison to a vacuum or shuttle lock. Through a valve on the outer side of the socket, air is allowed to leave, which ensures a tighter and more effective fit for the patient. Even though a sleeve is typically placed over the system to firmly attach it to the leg and prevent any further rotation or slips between the skin and device, the valve remains uncovered and open. Also, this valve is usually smaller and less visible for below knee prosthetics and larger for above knee prosthetics, because a larger valve is easier to adjust and allows an individual to have a more comfortable fit.

Another suspension system is a vacuum, which is achieved through a pump that pulls out air using a negative pressure environment. Vacuum systems are better with skin issues, allow better blood flow, offer an easier fit than suction, and they are lighter, thinner, and more adaptable since they hold on really well and minimize rotation. There are two different types of

pumps to pull out the air. The first is a mechanical pump that works each time a patient takes a step, and the mechanical pump should be as close as possible to the residual limb to minimize the probability of leaks or the feeling of “dead” weight for the user, because the further away the pump from the limb, the more effort it takes to pick up the leg and move. The second is an electronic pump that can be connected to an app on the user’s phone, allowing the individual to quickly and easily assess mercury levels and adjust the pressure without having to manually exert themselves. Furthermore, a vacuum system can be coupled with an adjustable sleeve, which is flexible and easily accommodates any changes in leg size. This type of sleeve and extra belts can also serve as backup devices for those who are participating in athletic events.

Lastly, a shuttle lock system often serves the purpose of being an individual’s first prosthesis, since the patient’s leg is shrinking rapidly during that first year and hasn’t yet settled into a consistent range of sizes. The pins move and adjust quite easily, no outer sleeve is necessary with this specific device, and similar to a vacuum system, a gel liner with a fabric coating is used to maintain a tight grip on the skin. At the end of the liner, there’s a metal pin, which can be locked directly into the bottom of the socket, so it isn’t as crucial to have a perfect fit between the leg and socket with a shuttle lock system as with other suspension mechanisms. In conclusion, each suspension system has its own pros and cons, so it’s important to be able to assess patients and determine which system would be the most effective for each one.