

Prosthetic Sockets

Striking a Fine Balance Between Form and Function

by Scott Sabolich, CP, LP

The socket is the most critical component of your prosthesis. If it doesn't fit correctly, you can experience pain, sores and blisters, and the prosthesis will feel heavy and cumbersome. Your mobility may be compromised, or the prosthesis may even end up in the back of your closet.

Socket design technology has come a long way from the days of hard plastic and wooden sockets. With the emergence of contoured sockets that fit every aspect of the residual limb, amputees are more comfortable and mobile than ever before. This type of socket distributes weight evenly across the entire surface of the residual limb, eliminating pressure points. Flexible, lightweight materials enable the socket to bend and expand along with the patient's residual limb.

Art Form

Fitting a socket is an art form that continues to evolve. The prosthetist's goal used to be to create a socket from softer materials; now the goal is to make the prosthesis as stable as possible while maintaining comfort. However, although today's materials are much lighter, it's difficult to create an inanimate prosthetic socket to comfortably contain a part of the body that is living and constantly changing.

When creating a socket, prosthetists often feel as if they're expected to stabilize something that seems like a stick (bone)



Scott Sabolich, CP, LP, and Theron Hogue, CP, LP, collaborate on the fit of a socket.

surrounded by Jell-O (residual tissue). On top of that, they're expected to make the casing feel soft and flexible, yet stable and secure.

Each socket is as unique as the person who wears it. A residual limb never keeps the same shape or consistency. To resolve this problem, prosthetists create the shape and size of the socket for the limb within a reasonable range, allowing for volume fluctuations. The wearer must assume the responsibility to keep his or her weight within a range of 2 percent (plus or minus) of their body weight.

Weight Distribution

Where weight is carried within the socket can be a critical issue. With a tighter socket, weight is borne around the thigh of an above-knee amputee. If the above-knee socket is

looser, more weight will be loaded on the bony structure of the pelvis area or the distal (lower) end of a below-knee limb. The goal is to balance both of these issues within a range that's comfortable for the amputee. Some amputees cannot bear weight on the distal end of their residual limb. If you're experiencing pain or redness in certain areas of your residual limb, your prosthetist can help by making slight adjustments to the socket itself or by adding socks or padding.

The use of socks and padding can be explained with this nautical analogy. Think of the residual limb as the rudder of a ship. The water can be thought of as socks. If the water level gets too low, the rudder will drag the bottom; as water is added, the ship will rise, freeing the rudder.

Alignment

Since your body continually changes, your prosthesis also requires regular adjustments to maintain alignment. It's a mechanical device, just like your car, and must be cared for to work properly. Ideally, the alignment of a prosthesis should be checked every six to 12 months. The slightest change in weight or muscle mass can change the alignment and cause problems with your residual limb. Back, hip, and knee problems can also be caused by an ill-fitting socket.

For a new amputee, the residual limb changes so rapidly in a temporary prosthesis that the alignment may require weekly updating.

Socket Care

One of the most important things you can do to care for your socket is to clean it thoroughly every day. Socks and liners should also be cleaned and rinsed well before donning. This can't be stressed enough. Dirty sockets, socks and liners can harbor bacteria, causing odor and skin problems, such as a rash, fungus and redness. Follow the manu-



Distinct channels and grooves are seen in the socket held by Scott Sabolich, CP, LP.

facturer's directions for care and cleaning. If you have any questions, you should discuss the care of your prosthesis and hygiene with your prosthetist.

Socket Replacement

A new amputee with a temporary prosthesis can expect that it will need to be replaced at least once before receiving a definitive prosthesis. The residual limb will shrink drastically over the first few months of wearing the prosthesis, but it may take up to two years to stabilize. Sometimes this volume loss may be handled by adding socks, but there comes a point when the socket can become unstable with too many plies of socks, signaling the need for a new socket. The prosthesis may require several socket changes before the limb matures.

Once the prosthetist has determined that the limb has stabilized, he or she will cast for a definitive socket. Although this is often called a permanent socket, it will need to be replaced. Just as cars wear out, so will a socket and a prosthesis. When in doubt about whether a new socket is required, contact your physician, physical therapist or prosthetist.

A socket normally requires replacement when:

- The socket is worn out or cracked. A typical socket lasts two to four years, depending on your activity level.
- The socket is discolored.
- The socket no longer fits. If the wearer has gained more than 2 percent of body weight, the socket will be uncomfortable and donning will be difficult. More than

2 percent of body weight loss may cause the socket to rotate or cause the limb to piston within the socket.

- There is a change in the size or shape of your residual limb.
- You've had revision surgery.

Weight Management

Weight gain or loss is the primary reason for replacing a definitive socket. The wearer may have to deal with volume change every single hour of every single day. A fluctuation of no more than 2 percent of body weight (up or down) in a properly fitted suction socket is normal; more than this amount may require that the socket be replaced.

Body fluid levels can also change during the day, making the socket feel loose or tight. This can be handled by adding or removing socks. As you become more experienced in wearing your prosthesis, you'll learn what works best for you.

Attitude Is Everything

Amputees can surprise everyone, even their caregivers. After an amputation, an amputee may be seen as too elderly, too frail, or too seriously injured to manage walking with a prosthesis. But determination and desire can enable many people to achieve success against the odds. They don't see giving up and remaining in a wheelchair or on crutches as an option.

Learning how to wear a prosthesis and finding a socket design that works best for you can be a daunting task. Keep a list of questions for your prosthetist between appointments or call and ask. The Amputee Coalition of America is a great source for prosthetic information and can guide you in your search for answers. A support group can also provide some advice and help you realize that you're not alone. ■

About the Author



Scott Sabolich is a third-generation certified prosthetist. He is owner and clinical director of Scott Sabolich Prosthetics & Research in Oklahoma City, Oklahoma.