



MOVING AHEAD

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Function Isn't (Quite) Everything

When rehabilitation professionals get together to discuss prosthetics—whether in general or for a specific patient—functional restoration usually dominates the conversation. Aesthetic considerations as a rule don't command

much attention.

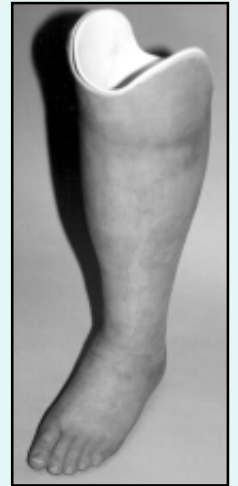
That's generally the case with prosthetic literature as well, as the typical professional paper or promotional article devotes little space to how a patient will look in the prosthesis.

To be sure, restoring lost ambulation or manipulation capability is the most dramatic, and arguably the most important, function of modern prosthetics.

But for many limb-deficient individuals, the *appearance* of their replacement component, from a partial finger prosthesis to an entire leg, is a major lifestyle concern...in some cases the *primary* concern.

Because this aspect of the prosthetic art receives so little attention and because many recent advances in cosmetic finishing have been achieved, we are devoting most of this issue to the topic.

We hope you find the discussion informative and welcome your comments and questions.



Cosmesis—The Finishing Touch

In the rehabilitation community's dedication to restore an amputee to a state of wholeness, function is king...as it should be: Enabling a lower limb-deficient patient to walk anew or an upper-limb amputee to grasp and manipulate again is a marvelous accomplishment.

But another aspect of modern prosthetic management is similarly essential to many patients, one that still emphasizes the "art" of prosthetics in an era generally dominated by scientific advances.

Prosthetics Today

Cosmesis, the external appearance of a prosthetic system, is for the typical amputee an integral ingredient—for some the most significant attribute—of restored wholeness. Some, in fact, consider projecting an image of completeness to be an even more important outcome than functional restoration.

In general, younger, vigorous amputees are more concerned with aesthetics than the larger population of older, dysvascular

patients. For many, a basic level of cosmetic finishing will suffice; however, others with special vocational or lifestyle needs may require advanced shaping, pigmentation and detailing of the external surface. Here, the traditional artistry and craftsmanship of the experienced prosthetist can still be found.

(Continued on page 2)



Courtesy Alatheia Prosthetic Rehabilitation Center

About Moving Ahead

Moving Ahead is a professional newsletter published by Swanson Regional Orthotic & Prosthetic Research Center to inform health care professionals of developments in the orthotic and prosthetic disciplines.

Swanson offers three board-certified practitioners and three state-of-the-art laboratories. The practice has a solid reputation for quality care and patient satisfaction throughout Northwest Ohio and Southeast Michigan and has been in business for more than 22 years.

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Compliments of: Vern Swanson, C.P.; Jeffrey Kuehn, C.P.; and Jon S. Eberlein, CPO.

Amputees Who Don't Like the Appearance

(Continued from page 1)

It is important to note that prosthetic covers and finishes provide protection as well as aesthetic complement to the components they envelop, which may be a key factor in securing reimbursement. Purely cosmetic enhancements are not routinely covered by Medicare or many private insurers. Protective Outer Surface Covering System (POSCS) is the Medicare terminology for the outer "skin" surface that protects the functional prosthetic components and foam cover. To qualify for reimbursement, a POSCS for a medically justified prosthesis should effectively shield internal componentry from liquids, grime and other contaminants.

Cosmesis Forms

The type and degree of cosmesis applied to a prosthetic limb are determined by several factors, including the desires, vocation and lifestyle of the amputee, cost and reimbursement resources, and the construction of the prosthesis. But the most important consideration rehabilitation decision-makers should keep in mind is that amputees who don't like the appearance of their prosthesis probably won't wear it.

• **Exoskeletal shells.** With an exoskeletal system, used today primarily with upper-limb systems, the hard outer shell of the prosthesis can be shaped and colored to complement the contralateral limb to a reasonable extent, and the exterior may be painted for a closer pigmentation match. However, because their outer surface is in fact rigid, exoskeletal systems do not lend themselves to exact cosmetic re-creation.

• **Endoskeletal covers.** The cosmetic foundation for an endoskeletal prosthesis is a foam cover, which provides the desired shape and is usually augmented with some type of exterior finish, ranging from cosmetic hose to a spray-on skin or removable sleeve to achieve the desired final cosmetic outcome.

• **Cosmetic gloves.** Upper-limb prostheses incorporating a mechanical or myoelectric hand-type terminal device are usually covered with a flexible glove that provides protection of the functional components as well as cosmesis. Some offer enhanced cosmetic details, including acrylic nails and hair.

• **Finger prostheses.** Highly-detailed custom-made aesthetic finger replacements can be provided for almost any amputation level, even as minor as a nail loss. These prostheses generally attach to the remaining finger by suction and can be designed to transmit vibrations from the tip to nerves in the residual finger, providing wearers the sense that the prosthesis is an extension of themselves rather than a foreign attachment.

• **Foot shells.** As prosthetic feet have assumed

high-tech design and capabilities in recent years, many now come with standard, highly lifelike cosmetic shells including partial foot designs at various amputational levels. Women amputees appreciate the more-detailed covers' ability to accept nail polish.

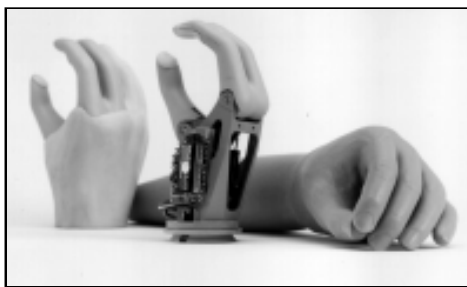
• **Prosthetic "skin."** The cosmesis of an exoskeletal shell or endoskeletal foam cover can be enhanced by a spray-on "skin," or removable sleeve. These POSCS exteriors not only provide a realistic appearance and texture but also create a waterproof protective outer layer, much like human skin. Removable skins can also act as a suspension sleeve for the prosthesis.

• **Passive components.** In some situations, restoration of function is either not possible or not desired. Frequently in such cases, patients desire a purely cosmetic prosthesis to maintain a whole external appearance. This need can be met with a lightweight endoskeletal device, often incorporating a cosmetic hand or foot. Particularly in the case of upper-limb prostheses, a so-called "passive" limb can provide many functional benefits, notably supporting, stabilizing, pushing, pulling, holding and balancing, even though active grasping and manipulation functions are not incorporated.

• **Detailing.** Beyond the basic cosmetic treatment for a prosthetic limb—general shaping and pigmentation to match the contralateral limb—advanced definition and details can be added to the cosmetic finish. These enhancements include veins, skin texture, nails, freckles and other skin variations, and hair, either real or painted on (i.e. the "appearance of hair"). The degree of detailing to be added is primarily a factor of patient desires and funding resources.



Prosthetic sleeves come in a variety of sizes, colors and enhancements, such as the appearance of hair (at right).



Courtesy Liberty Prosthetics & Orthotics Group.

rigid, exoskeletal systems do not lend themselves to exact cosmetic re-creation.

Construction

Today's cosmetic options range from relatively inexpensive off-the-shelf products available in standard sizes and color shades to highly detailed customized products that can add hundreds or thousands of dollars to the cost of a prosthetic limb. Silicone and polyvinyl chloride are the primary construction materials, silicone generally being the more lifelike, flexible and durable. Another recently introduced option is a urethane finish that is sprayed or brushed over a foam cover, producing a texture some believe feels like actual skin.

The traditional method of cosmetic shaping starts with a wood or hard foam (exoskeletal) or soft foam (endoskeletal) "blank." Exoskeletal shells are hollowed out to a thickness of about 1/4 inch,



Courtesy Alatheia Prosthetic Rehabilitation Center.

of Their Prosthesis Probably Won't Wear It

which provides requisite strength at the lowest practical weight, then shaped to match measurements of the sound limb.

Endoskeletal interiors are carved to accommodate knee components and other structures and to encompass the socket.

The exterior is then shaped to mirror the opposite limb. More precise shaping can be achieved if necessary by working from a mold of the sound limb.

The ultimate in shaping is provided by computer-driven scanning and carving systems. Adaptation of CAD-CAM technology to cosmesis fabrication has introduced new accuracy to matching prosthesis finish to a natural contralateral limb. A high-resolution three-dimensional digital scan of the normal limb is reversed to a mirror image and fed into a carving system to create a matching foam cover.



CAD-CAM carver shapes endoskeletal lower-limb foam cover. Courtesy Prosthetics Research Specialists.

The Cosmetic Art

In planning and creating a prosthetic cosmesis, our practitioners employ a detailed knowledge of patient management, materials, shaping, and reimbursement as well as artistic skills. Among these, a keen sensitivity to patient psychological needs rates special attention. Experienced rehabilitation practitioners contend that an amputee's self-image can be as much a determinant of the ultimate rehabilitation outcome as functional capabilities.

Before amputation surgery, some patients believe the prosthesis they receive will make them "good as new," both functionally and cosmetically. Unfortunately, post-surgical reality often comes as a shock. In such cases, we appreciate that providing a cosmesis acceptable to the patient will go a long way toward attaining the functional restoration of which he or she and the prosthetic system are capable. An amputee who does not feel good about the way he

Note to Our Readers

Mention of specific products in our newsletter neither constitutes endorsement nor implies that we will recommend selection of such products for use with any particular patient or application. We offer this information to enhance professional and individual understanding of the prosthetic and orthotic disciplines and the experience and capabilities of our practice.

We acknowledge the assistance of the following resources in compiling and illustrating this issue:

Alathia Prosthetic Rehabilitation Center

Liberty Technology Prosthetics & Orthotics • Otto Bock Health Care

Prosthetic Research Specialists • Seattle Limb Systems

or she looks in a prosthesis typically falls short of functional potential.

Given a favorable amputation level, viable residual limb and overall healthy subject, an experienced prosthetist can normally fashion an attractive cosmesis that closely assimilates the contralateral limb. Certain complications do present aesthetic challenges however.

These include a cosmetically difficult amputation level such as a knee disarticulation, unusual socket and component shapes, residual limb girth, and the patient's natural skin inconsistencies. While such conditions may raise a barrier to aesthetic "perfection," our prosthetic staff is dedicated to providing the best possible cosmetic outcome for each patient referred to our care.

We will welcome the opportunity to discuss cosmetic options and solutions for your amputee patients.

Reimbursement Update

How Much Cosmesis Is Affordable?

On the surface, Medicare and other third-party payers reimbursing the cost of aesthetic enhancements to a prosthetic device might seem unlikely. In fact, while it is probably true that the cosmetic appearance of a prosthesis is a lot more important to the wearer than to the insurance carrier, most amputee patients qualify for at least a basic level of cosmetic enhancement.

The key is that a cover for a prosthesis meets a valuable protective need for the functional componentry it surrounds, cushioning against damage from impact and jarring. Moreover, exterior skin and sleeves provide an outer seal for the prosthesis, serving as a barrier against possible contaminants, notably water and other liquids.

Medicare lists specific reimbursement codes for "...flexible protective outer surface covering systems" and "custom shaped protective covers." Private insurers usually provide similar coverage. Whether special detailing determined to be beneficial for a patient will be covered varies among providers and contracts. (Experience has shown that certain Worker's Compensation carriers are somewhat more liberal in funding aesthetic enhancements in cases resulting from on-the-job injuries.)

When an advanced level of cosmesis is found not to be covered by insurance, patients often choose to pay the additional cost themselves. In such cases, our practitioners are available to discuss the practicality of such a decision.

If you or a member of your staff has a question regarding reimbursement for cosmetic enhancement of prosthetic limbs, we will welcome your inquiry.



Courtesy Seattle Limb Systems.

The Little Things

Rotational Adapters

It may seem incongruous for an above-knee amputee to want or need to cross his/her prosthetic limb over the contralateral knee, but this common sitting position (for non-amputees) does have at least one practical application: Placing the limb in this position puts the prosthetic foot within easy reach for changing or tying shoes or making other adjustments while the limb is being worn.



Though not typically incorporated in a basic A/K prosthesis, the capability of rotating the shin relative to the socket with the knee flexed can be added by placement of a rotation adaptor just above the knee. A release button on the adapter frees the shin for rotation, either medial or lateral, and the lock reengages automatically.



Photos courtesy Otto Bock Health Care.

Rotation capability is also helpful when the wearer is sitting in a confined or limited space, such as behind the wheel of an automobile.

Prescription Notes

Aesthetic considerations when prescribing for a new amputee:

- New amputees are often as much concerned with their replacement limb's appearance as with its function. Cosmesis should be addressed early in prosthetic management.
- Cosmetic covers are seldom provided with a preparatory prosthesis (when used), due to configuration and cost changes as the patient's residual limb and prosthetic performance improve. Many new amputees do not understand that this situation is only temporary.
- A basic cosmesis is considered an integral component of the definitive prosthesis. The exact form and finish are typically determined by the prosthetist and patient together, though physician and/or therapist input is encouraged.
- In general, the cosmesis of endoskeletal systems provide a more lifelike look and feel than exoskeletal limbs. On the other hand, endo covers are less durable than exo shells and require more care—washing, etc. Except for "heavy-duty" applications, endoskeletal designs work well for most patients.
- Though generally not covered by insurance, highly individualized and detailed cosmetic finishes are available for special needs and when "price is no object."

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