

The Hinnant Prosthetics Quarterly

Experience Our Road to Prosthetic Excellence

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Getting the Most out of Summer

Summertime...and the livin' is easy. Warm weather brings opportunities for getting out of the house, experiencing the great outdoors, taking a break from the same-old routine and just enjoying life more. With some minor accommodations, these attributes can apply to people with limb loss every bit as much as anyone else.



Courtesy Extremity Events Network



Photos courtesy Ohio Willow Wood



For starters, a limb deficiency means reduced skin surface, so the body's natural cooling system—sweating—is less efficient.

Enclosed within a well-fitting prosthetic socket, the residual limb is isolated from circulating air, so perspiration cannot naturally evaporate from the skin surface. Moreover, an amputee uses more energy during ambulation than

people without limb loss, which naturally increases the body's temperature and perspiration as well.

Particularly during summer, excess perspiration leading to wet skin and/or prosthetic interface (socket interior, gel liner) can produce a loose fit and reduced suspension, which may cause the limb to detach. In addition, skin gland secretions and bacteria will build up during prosthesis wear, which can lead to infection and potential skin breakdown.

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Recreational Prostheses

There is little reason why most otherwise-healthy amputees cannot participate in popular activities of summer—swimming, sports, fishing, boating, going to the beach, etc. In fact, we can create special-purpose limbs incorporating components designed to allow and withstand the rigors of these particular activities.

Prosthetics Today

Frequently, we can incorporate components from a patient's old prosthesis into a swim leg or other special-use lower limb. For upper-limb patients we can also provide a wide selection of specialty terminal devices uniquely fabricated for particular sports and outdoor activities, including fishing, kayaking, baseball, golf, basketball, photography, bicycling, shooting and archery, among many others.

Summer Precautions

Whatever routine or specialty componentry an amputee may be wearing, the warm, humid weather typically experienced during the summer months presents certain health, fitting and comfort issues not as often encountered at other times of the year.

Perspiration—Amputees have added concerns as to how the body regulates temperature.



Courtesy TRS Inc.

Hinnant Prosthetics Quarterly is a professional newsletter published since 1998 by Hinnant Artificial Limb Co. to keep physicians, therapists and other rehabilitation professionals abreast of the latest trends and technology in prosthetics.

Hinnant has been serving the needs of amputees and patients with congenital limb deficiencies for more than 78 years. We specialize in applying the latest proven technology commensurate with each patient's capabilities, lifestyle and personal desires.

We hope you find our newsletter to be interesting and professionally relevant and encourage your comments, questions and referrals. We also encourage you to visit our website at

www.hinnantprosthetics.com

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Knee Disarticulation—Prosthetic Pros and Cons

Joint disarticulation at the knee, ankle and hip level ranks with the more controversial practices of amputation and prosthetic management. Knee disarticulation has been an option for more than 180 years and offers many benefits, but because the procedure also elicits design and cosmetic challenges, surgeons and patients more often opt for a higher level (and usually less-functional) transfemoral amputation. Thus, knee disarticulations have been estimated to account for only 2 percent of limb loss in America. However, recent studies suggest the inherent functional advantages of this amputation level are translating into growing acceptance among surgeons and prosthetists.

The Benefits...

From a prosthetic standpoint, knee disarticulation (K.D.) may be the best choice for certain patient groups, notably children and trauma and cancer patients whose tibia cannot be saved but the femur is whole with good tissue for padding. Here are some key advantages:

- Because knee disarticulation leaves the femur intact with overlying soft tissue, the residual limb can usually **tolerate distal (or end) weight-bearing**, a key improvement over a transfemoral amputation in which pelvic structures must provide most of the support. When the femur can in fact accept weight-bearing, the prosthetist can design a lower-profile socket with potentially greater comfort.

- **No bones or muscles are cut** in the surgery, so strength, muscle tone and balance are typically good. The intact femur provides a long mechanical lever powered by strong muscles for effective ambulation, better sitting balance and leverage.



Prosthesis for knee disarticulation
Courtesy Otto Bock Health Care

- **Growth plates at both ends of the femur are preserved**, a particular advantage for child patients. Moreover, the bony overgrowth common in children with a transection is usually eliminated.

- By preserving the femoral condyles, a knee disarticulation provides a **prominent base from which to suspend the prosthesis** and help in controlling unwanted rotation.

- As compared with a transfemoral socket, which normally must extend up to the ischium for weight-bearing, the proximal end of a knee disarticulation socket fits much lower on the femur and can be made of softer material, providing substantially more comfort both standing and sitting.



Knee disarticulation leaves a long residual limb.
Courtesy Fillauer Inc.

...And the Drawbacks

On the other hand, the long residual limb with its condylar protuberances carries several disadvantages:

- The bulbous distal end of the residual limb typically **requires a special socket design**, sometimes including one or more cutout openings for donning.

- The socket with distal padding, attachment brackets and knee mechanism results in a long “prosthetic thigh,” which locates the prosthetic **knee axis lower to the ground** than that of the sound knee. (Little evidence exists, however, that this knee level difference is in fact physiologically or functionally harmful.)

- With the prosthesis applied, the residual limb may appear noticeably larger than the contralateral leg, presenting a **self-image problem for some** people. In fact, patients have been known to choose a higher-level amputation largely for cosmetic reasons.

Componentry

The Socket—Because knee disarticulation patients can tolerate distal weight-bearing to differing degrees and residual limb features can vary widely, socket design is highly individualized and depends on the knowledge and experience of the prosthetist.

Various approaches have been used to securely attach a knee disarticulation prosthesis to the intact femur. One popular design employs a flexible gel liner with air expulsion inside a rigid outer socket. The liner simplifies construction but precludes use of condylar suspension and minimizes the benefit of distal weight-bearing.

Some patients with a prominent medial condyle are candidates for a design incorporating a medial door and external strap without an inner liner, effectively reducing external distal socket bulk. Inclusion of inflatable pneumatic pads or silicone bladders can help overcome the difficulty of inserting condyles into a narrow socket but add to the wall thickness and socket complexity.

Knee components—Although relatively few prosthetic knee joints are built specifically for the knee disarticulation level, some of the many knees designed for transfemoral applications can be adapted for a K.D. limb. The problem with these knees is that they most always result in a lower knee center than the sound limb and thus exaggerate the apparent thigh length differential.

While single-axis knees incorporating friction, pneumatic and hydraulic control mechanisms can be used, polycentric designs provide a more proximal knee center and achieve better toe clearance in swing phase. Polycentric knees optimized for knee disarticulations minimize the attachment space beneath the socket and fold under during flexion to minimize the appearance of thigh length discrepancy.

In general, the knee disarticulation offers significant prosthetic advantages and thus is worthy of consideration for many patients facing a lower-limb amputation.



Polycentric knee for K.D. limb
Courtesy Otto Bock Health Care

Prosthetic Limb Alignment Leaps into 21st Century

Down through the years, a good functional prosthetic outcome has depended largely on two elements: a well-designed, comfortable socket with dependable suspension, and proper alignment of the limb componentry to provide the most efficient gait possible.

Historically, alignment has been a learned art, not easily mastered. But now in the 21st century alignment has become measurable science enabling prosthetists to maximize amputee gait performance in minimal time using a technological breakthrough called **Compas™**—Computerized Prosthetic Alignment System.

Compas continuously measures dynamic forces and balance while the patient is standing or walking, indoors or outside, on any terrain. A sophisticated electronic instrument housed in a special **Smart Pyramid™** prosthetic adaptor is attached near the base of the socket to provide direct measurement of socket reaction forces during ambulation and communicates that data wirelessly via Bluetooth to gait analysis software on a PC. During the alignment, a removable unit attached to the Smart Pyramid provides power, microprocessor control and motion sensing.

The system interprets relevant information generated by from a series of amputee steps to provide prosthesis-specific gait analysis and instructions for alignment adjustments. The software compares data from the Smart Pyramid with an advanced computer model of a well-aligned limb to establish whether and how the prosthesis is misaligned and provides the prosthetist with precise coronal and sagittal plane adjustments.

Compas shows the prosthetist precisely what is happening biomechanically, eliminating the need for time-consuming iterative changes to refine alignment based on assumptions. Amputees see and feel the results throughout the alignment process. Incorporating the Smart Pyramid into the prosthesis saves time during the initial alignment and later through decreased need for adjustment.

Compas is one of many high-tech advances raising lifestyle expectations for amputees in the coming years.

What's New



Courtesy Orthocare Innovations LLC

Weathering Summer Heat, Humidity

(Continued from page 1)

A good remedy is to remove the prosthesis, and liner if used, and thoroughly dry the skin, liner and/or interior socket surface, several times a day if necessary. Wearing a limb sock can help wick perspiration away from the skin while providing a cooling effect. Limb socks may need to be changed more than once a day during summer.

Both the residual limb and the socket interior should be washed thoroughly with soap containing hexachlorophene or another bacteriostatic agent daily.

Particularly in warm, humid climates, additional treatment with an antiperspirant may be needed. If over-the-counter brands don't provide needed relief, a dermatologist's prescription for a higher-strength product may prove worthwhile.



Rampro Swimankle with flipper attachments

Residual limb fluctuation—Another concern in the warm summer weather is volume fluctuation as the residual limb swells from the heat. For many amputees, this issue can be resolved easily by reducing sock plies. In some cases, a socket adjustment may be necessary.

Excessive heat may also pose difficulty for donning an above-knee prosthesis. Staying in an air conditioned room for 15-20 minutes or taking a cold shower before donning the limb may help.

If you have questions about getting more enjoyment from wearing a prosthesis in summer, give us a call.



Specialty terminal devices open recreation doors for amputees.

Photos courtesy TRS Inc.

Reaching out to Haiti

(Continued from page 4)

O&P practitioners from around the world are volunteering their time to travel to Haiti and in these newly arriving O&P mobile units. At the same time, a program is getting under way to train Haitians to serve full-time in the country's emerging orthotic-prosthetic facilities.

To help the earthquake amputees of Haiti, visit the websites of Healing Hands for Haiti, www.healinghandsforhaiti.org and/or Handicap International, www.handicap-international.us.



O&P lab built into a shipping container is now serving earthquake victims in Haiti.

Note to Our Readers

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

We gratefully acknowledge the assistance of the following resources used in compiling this issue:

Extremity Games Network • Fillauer Inc.
Ohio Willow Wood • Orthocare Innovations LLC
Otto Bock Health Care • Rampro • TRS Inc.

Hinnant Prosthetics

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Haiti O&P Response Grows

The 7.0 magnitude earthquake that leveled a large part of Haiti Jan. 12 is being pushed off the front page by other news and tragedies these days, but the scope of the disaster and the need for caring response from the international orthotics and prosthetics community have not diminished.

Nearly six months after the worst earthquake to strike Hispaniola in 200 years, the initial estimates of 2000-4000 new amputees, among more than 300,000 people injured, are holding steady. With the country's limited O&P rehabilitation facilities largely destroyed, the need for outside help remains critical.

And the world is responding. Prosthetists-orthotists, used and new componentry, and cash donations from around the world are flowing into the tiny country to help.

Many individuals, manufacturers and O&P practices in the United States and around the world have sent new and used prosthetic components to help Haitian amputees walk again. Lab capabilities are being restored—the central Healing Hands for Haiti rehab facility in Port-au-Prince, leveled by the quake, is back in operation in rented quarters while plans are being developed for a new and better O&P and physical medicine center.

Meanwhile, interested groups have arranged for the outfitting of movable prosthetic labs for shipment to Haiti to meet the urgent need for prosthetic care while permanent facilities are being re-



stored. For example, a group in Jacksonville, Fla., arranged for the conversion of a standard ocean shipping container into a fully equipped O&P fabrication lab complete with patient fitting room. All work was funded by cash or in-kind donations from local businesses and residents.

When completed in May, the lab was shipped to a hospital in Milot, 70 miles north of Port-au-Prince and was seeing patients soon after arrival. Similar efforts are under way in other communities.

Courtesy John Lovejoy, M.D. (Continued on page 3)

An Important Message To Our Referring Doctors **O&P Medicare Referrals at Risk**

As an orthotic and prosthetic facility that appreciates your past referrals and hopes to continue to be able to offer care to your patients, we want to make sure you are aware of a situation that will affect your ability to make Medicare referrals going forward.

CMS (the Centers for Medicare and Medicaid Services) is in the process of implementing new regulations that require all referring physicians to be enrolled in Medicare through the Provider Enrollment, Chain and Ownership System (PECOS) to continue their eligibility to refer their Medicare patients for orthotic and prosthetic services and supplies. These regulations were to take effect next January, but with the passage of the Patient Protection and Affordable Care Act earlier this year, the deadline for enrolling in PECOS was moved up to this July.

Effective July 6, 2010, physicians not enrolled through PECOS are no longer able to refer patients under Medicare for orthotics, prosthetics and supplies, as well as durable medical equipment and eventually clinical laboratory and radiological services.

To correct this situation, doctors who have not already done so will need to re-enroll with Medicare through PECOS. Until that is accomplished, neither our office nor any other O&P facility will be able to provide care to your Medicare patients after July 6, according to CMS.

Information on PECOS and how to enroll is available at www.cms.hhs.gov/MedicareProviderSupEnroll.

We appreciate your previous referrals and sincerely hope we will be able to continue to serve you and your patients in the future.