Phantom Pain Aid Comes from Unlikely Origin

Sometimes remedies for complex problems come from unexpected sources. Katherine Bomkamp is a college political science major whose career goal is to become a corporate attorney. But, oh by the way, she is also developing a potentially breakthrough solution to the widespread amputee phenomenon known as phantom limb pain.

Though originally thought to have psychological roots, phantom pain is now understood to be a result of the brain continuing to send signals and commands to a limb no longer present. An estimated 80 percent of the world’s 40 million amputees experience this sensation to some degree.

While still in high school, Bomkamp met various military amputees while accompanying her father, a disabled Air Force veteran, on lengthy appointments at the former Walter Reed Army Medical Center.

Upon hearing their lingering issues with phantom pain and sensation to some degree. 10 million amputees experience this commands to a limb no longer present. (A side benefit is that the heat also relaxes residual limb muscles.)

When her idea sparked initial acceptance, the young student decided to run with it. She engaged a prosthetic consultant to provide professional expertise and build the first prototype of what became known as the Pain-Free Socket. The product consists of thermo-resistive wiring connected to a battery pack incorporated in a below-knee prosthetic socket. After several generations of development, the device is now awaiting patent approval.

Meanwhile, Bomkamp has written a business plan, formed a company (of which she is CEO) to bring the concept to market, and been inducted into the National Gallery for America’s Young Innovators, among other honors. She hopes to bring the Pain-Free Socket into a limited clinical trial in 2014. Quite a start for a college senior who just turned 22!

C-Brace —— — — — ——— displays Pain-Free Socket prototypes

When sitting in a CJ Socket, the sail, which feels and reacts more like clothing than part of a prosthesis, flattens and conforms to the seat surface, allowing the thigh tissue to spread more naturally and definitely more comfortably. The result is a harmonious interface between anatomy and environment, and sitting on cloth beats sitting on hard plastic any day.

But when sitting in a CJ Socket, the sail, which feels and reacts more like clothing than part of a prosthesis, flattens and conforms to the seat surface, allowing the thigh tissue to spread more naturally and definitely more comfortably. The result is a harmonious interface between anatomy and environment, and sitting on cloth beats sitting on hard plastic any day.

Subsequently, the design was successfully adapted for upper-extremity amputees, including those wearing myoelectric prostheses, who report the socket is lighter, less-restrictive and more comfortable than traditional sockets. The concept is now being extended to below-knee applications as well.

C-Brace a Leap Forward in KAFO Design

The new C-Brace® KAFO (knee-ankle-foot orthosis) applies much of the same advanced technology used in the ground-breaking C-Leg® prosthetic limb to the needs of patients contending with lower-limb dysfunction, notably partial paralysis, post-stroke issues, spinal cord injury and post-polio syndrome. It is the first orthosis to prove both swing- and stance-phase support through hydraulic control of the knee joint. Like its prosthetics forbear, the C-Brace utilizes electronic sensors and microprocessors to perform real-time gait analysis and hydraulics to provide the correct knee response for safe, energy-efficient ambulation. By continually sensing movements of the patient’s knee and ankle, the C-Brace is able to deliver immediate compensatory reactions to enable the wearer to proceed confidently throughout the gait cycle, climb and descend stairs, and change walking speed on all types of terrain.

Key features include:

• Stumble control — Resistance to uncontrolled knee flexion when sensors detect a moment of instability gives the wearer the ability and time necessary to recover and avoid a fall.

• Real-time gait analysis — Each segment in the gait cycle is controlled dynamically and in real time, allowing the patient to walk with greater ease, reduced concentration and considerably less compensation of the sound side and torso...and therefore less fatigue.

• Stumbling and second mode – Selectable modes allow for comfortable static standing and specific settings for therapy or other activities.

• Stance extension damping — Progressive resistance allows natural movement without uncontrolled and early knee and hip extension at terminal stance, resulting in a more natural movement without abrupt changes to the center of gravity, lower back and lower limb joints.

(Continued on page 4)

The Professionals of Choice

O&P UPDATE is a professional newsletter published by Aljan Co. Orthotics, Prosthetics and Pedorthics to assist health-care practitioners in evaluating the needs of their patients and to keep them informed of the evolving trends in O&P.

An ABC-accredited facility, Aljan Co. has been providing outstanding care to patients from South Central Wisconsin for more than 42 years. Our professional staff is educated in the evaluation, fabrication and fitting of all types of custom and off-the-shelf orthotic and prosthetic devices. At Aljan, we pride ourselves in quality workmanship and compassionate care. Each device is designed to accommodate the individual patient’s needs and goals and to ensure maximum comfort and optimal function are achieved.

Katherine Bomkamp displays Pain-Free Socket prototypes

An ABC-accredited facility, Aljan Co. has been providing outstanding care to patients from South Central Wisconsin for more than 42 years. Our professional staff is educated in the evaluation, fabrication and fitting of all types of custom and off-the-shelf orthotic and prosthetic devices. At Aljan, we pride ourselves in quality workmanship and compassionate care. Each device is designed to accommodate the individual patient’s needs and goals and to ensure maximum comfort and optimal function are achieved.

WalkAide

We are pleased to advise our referring physicians, rehabilitation colleagues and patients that the Aljan Company is now a designated Patient Care Center for the WalkAide functional electrical stimulation system, a therapeutic breakthrough for people with foot drop.

We also provide the Bionicare non-invasive, non-drug treatment option for managing osteoarthritic knee pain. For more information, call us toll-free at (800) 903-5409.
A New Answer to Residual Limb Volume Change

As the residual limb loses volume during the day, the socket becomes unstable with resulting increased motion between limb and socket. Hydrostatic lift and weight-bearing efficiency are reduced, and the residual limb moves further into the socket with increased distal pressure, pain, and eventually skin shear and breakdown.

Common methods of dealing with daily volume changes include the flexible socket, consisting of a rigid frame with openings and a pliable interface that can expand and contract to accommodate residual limb expansion; addition and removal of limb socks; pads; inflatable air bladders; fluid-filled bladders; and vacuum-assisted suspension systems. These measures all are intended to keep the residual limb in intimate contact with the socket to enable effective control and propulsion of the prosthesis.

All work to some degree, but none has been shown to be a complete or easy solution to daily volume fluctuations. For example, adding limb socks to compensate for lower-limb volume loss requires sitting down, removing the prosthesis, adding several layers of socks,dominating the limb again, and re-standing. The process requires about 5 minutes.

Enter a radical new design, the CJ Socket, which replaces the entire upper-limb volume of the residual limb and provides skeletal control.

With a CJ Socket, adjustment for daily volume loss requires nothing more than adjusting several Velcro straps to maintain the optimal fit, which can be accomplished in a fraction of the time required for adding socks.

This unique socket was first designed for transfemoral applications with the premise that adjustable velcro straps could be used to re-position the tube in place on the residual limb.

The essential engineering difference in this innovation is a non-elastic but controllable panel called a “bladder” (due to the material’s similarity to that used in a Dacron booting sail), which comprises roughly half of the socket circumference. The bladder is a patient-adjustable Velcro closure. Rounding out the design is a rigid “J” shaped frame, which covers the remaining half of the residual limb, and provides control.

With a CJ Socket, adjustment for daily volume loss requires nothing more than adjusting several Velcro straps to maintain the optimal fit, which can be accomplished in a fraction of the time required for adding socks.

This unique system was first designed for transfemoral applications with the premise that adjustable velcro straps could be used to re-position the tube in place on the residual limb.

Clinical Study to Assess Efficacy of Fat Grafting For Residual Limb Pain

A long-standing challenge for prosthetists and amputees is a bony or irregularly shaped residual limb, which lacks sufficient soft tissue to provide padding around bony results in an effective and comfortable prosthetic fit.

An uneven residual limb surface not only makes a total-contact vacuum seal between anatomical and mechanical surfaces difficult but also provides a source of painful irritation and skin wounds, often leading to a poor prosthetic outcome. Various methods and products have been employed over the years to address this problem, but a reliable solution remains elusive.

Now, a new approach involving fat grafting is being investigated at the University of Pittsburgh Medical Center. Active duty military personnel age 18 and above who have undergone a limb amputation with subsequent pain that limits fitting and use of a prosthesis are being sought to participate in clinical trials at the UPMC Center for Innovation in Restorative Medicine.

Minimally invasive fat grafting is nothing new—plastic surgeons performed some 65,000 such procedures in 2011, removing fat from parts of the body where it is unwanted, or less-needed, and replacing it in a more desirable location to replenish lost shape or fullness. In this experimental prosthetic application, that location would be the residual limb to provide added comfort and tissue padding over bony prominences and peripheral nerve trunks.

But there’s a problem: Fat has little structure or volume, which makes productive grafting into a residual limb particularly challenging. However, UPMC researchers believe they can overcome this issue by stripping the collected fat down to only the most dense, stem-cell-rich component and injecting that refined fat into residual limbs.

Stem-cell-rich fat promotes blood vessel growth and blood flow, volume, and lift, crucial factors for the survival of the fat graft and promoting healing and stability.

The study is scheduled for completion in May 2015.
New Technology at Aljan

We are pleased to advise our referring physicians, rehabilitation colleagues and patients that the Aljan Company is now a designated Patient Care Center for the WalkAide functional electrical stimulation system, a therapeutic breakthrough for people with foot drop. We also now provide the Bionicare non-invasive, non-drug treatment option for managing osteoarthritis knee pain. For more information, call us toll-free at (800) 903-5409.

Phantom Pain Aid Comes from Unlikely Origin

S

ometimes remedies for complex problems come from unexpected sources.

Katherine Bomkamp is a college political science major whose career goal is to become a corporate attorney. But by the way, she also is developing a potentially breakthrough solution to the widespread amputee phenomenon known as phantom limb pain.

Though originally thought to have psychological roots, phantom pain is now understood to be a result of the brain continuing to send signals and commands to a limb no longer present. An estimated 80 percent of the world’s 10 million amputees experience this sensation to some degree.

While still in high school, Bomkamp met various military amputees while accompanying her father, a disabled Air Force veteran, on lengthy appointments to the former Walter Reed Army Medical Center.

Upon hearing their lingering issues with phantom pain and simultaneously seeking a project for her school’s International Science and Engineering Fair, she set out to develop an alternative solution to the powerful and addictive medications often prescribed.

After interviewing various phantom pain authorities, Bomkamp devised a concept based on thermal biofeedback, in which concentrated, controlled heat applied to severed nerve endings in the residual limb would induce the brain to focus on the heat instead of sending signals to a limb no longer present. (A side benefit is that the heat also relaxes residual limb muscles.) When her idea sparked initial acceptance, the young student decided to run with it. She engaged a prosthetic consultant to provide professional expertise and build the first prototype of what became known as the Pain-Free Socket. The product consists of thermo-resistive wiring connected to a battery pack incorporated in a below-knee prosthetic socket. After several generations of development, the device is now awaiting patent approval.

Meanwhile, Bomkamp has written a business plan, formed a company (of which she is CEO) to bring the concept to market, and been inducted into the National Gallery for America’s Young Inventors, among other honors. She hopes to bring the Pain-Free Socket into a limited clinical trial in 2014. Quite a start for a college senior who just turned 22!

C-Brace ——————————

O&P UPDATE

An Aljan Co. Publication

A Division of Burke Labs Inc.

2008 Fish Hatchery Rd.

Madison, WI 53713

Beloit Clinic

Baraboo Clinic

1650 Lee Lane

707 140th St.

Beloit WI 53511

Baraboo, WI 53913

Phone (608) 257-4256

Toll-free (800) 903-5409

Fax (608) 257-7220

www.aljan.com

All contents copyright 2014

Aljan Co. practitioners are available to provide inservices tailored to meet the needs of healthcare professionals, insurance personnel and other groups interested in learning about O&P. Call our office for more information.

C-Brace a Leap Forward in KAFO Design

T

he new C-Brace® KAF0 (knee-ankle-foot orthosis) applies much of the same advanced technology used in the ground-breaking C-Leg® prosthetic limb to the needs of patients contending with lower-limb dysfunction, notably partial paralysis, post-stroke issues, spinal cord injury and post-polio syndrome. It is the first orthosis to prove both swing- and stance-phase support through hydraulic control of the knee joint. Like its prosthetics forbear, the C-Brace utilizes electronic sensors and microprocessors to perform real-time gait analysis and hydraulics to provide the correct knee response for safe, energy-efficient ambulation. By continually sensing movements of the patient’s knee and ankle, the C-Brace is able to deliver immediate compensatory reactions to enable the wearer to proceed confidently throughout the gait cycle, climb and descend stairs, and change walking speed on all types of terrain.

Key features include:

- Stance control—Resistance to uncontrolled knee flexion when sensors detect a moment of instability gives the wearer the ability and time necessary to recover and avoid a fall.
- Real-time gait analysis—Each segment in the gait cycle is controlled dynamically and in real time, allowing the patient to walk with greater ease, reduced concentration and considerably less compensation of the sound side and torso… and therefore less fatigue.
- Standing and second mode—Selectable modes allow for comfortable static standing and specific settings for therapy or other activities.
- Stance extension damping—Progressive resistance allows natural movement without uncontrolled and early knee and hip extension at terminal stance, resulting in a more natural movement without abrupt changes to the center of gravity, lower back and lower limb joints.

(Caption continued on page 4)

The Professionals of Choice

O&P UPDATE is a professional newsletter published by Aljan Co. Orthotics, Prosthetics and Pedorthics to assist health-care practitioners in evaluating the needs of their patients and to keep them informed of the evolving trends in O&P.

An ABC-accredited facility, Aljan Co. has been providing outstanding care to patients from South Central Wisconsin for more than 42 years. Our professional staff is educated in the evaluation, fabrication and fitting of all types of custom and off-the-shelf orthotic and prosthetic devices. At Aljan, we pride ourselves in quality craftsmanship and compassionate care. Each device is designed to accommodate the individual patient’s needs and goals and to ensure maximum comfort and optimal function are achieved.

Our Madison clinic is conveniently located one mile north of the Beltline at the corner of Fish Hatchery Road and Carver Street, where we accept appointments Monday through Friday from 8 a.m. to 3:30 p.m. For your patients’ convenience, we also provide service in Beloit and Baraboo. Please call us at (608) 257-4256 or (800) 903-5409 to schedule an evaluation.