international wound journal

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Innovation in Wound Healing

The dermaPACE™ is a technological innovation based on high energy pulsed acoustic waves developed for the treatment of acute and chronic wounds, such as:

- Diabetic Foot Ulcers
- Arterial & Venous Ulcers
- Decubitus Ulcers
- Post-surgical Wounds
- Traumatic Wounds
- Partial Thickness Burns

- 2-minute treatment time
- No Anesthesia
- Intuitive device is user friendly
- Promotes wound closure, revascularization and tissue regeneration*

Visit us at Booth #1211 during the WUWHS
environment. A right balance of wound moisture is critical to achieve optimal wound healing and to minimize the risk of maceration and pain.

The best practice document is for anyone involved in dressing related procedures. Effective pain management requires the participation of healthcare providers, patients, and policy makers. Communicating and utilizing the best practice guide may provide a difference in alleviating wound-related pain and improving wound care.

**FIRST PATIENTS TREATED IN DERMAPACE DEVICE INVESTIGATION DEVICE EXEMPTION (IDE) CLINICAL TRIAL**

The first U.S. patients have been treated as part of the Investigation Device Exemption (IDE) clinical trial evaluating Pulsed Acoustic Cellular Expression (PACE®) Technology, using the dermaPACE™ device, for the treatment of diabetic foot ulcers.

SANUWAVE has initiated a randomized multi-center prospective controlled study to evaluate the efficacy and safety of the dermaPACE device. Patients in the active study arm receive 4 treatments over a 2 week period with the dermaPACE device which exposes the ulcer to pulsed acoustic energy waves.

"We're very excited to have the opportunity to try this innovative technique with our patients," said Alexander Reyzelman, DPM, of San Francisco, California who performed the first procedure.

"Our goal is to restore function and quality of life to diabetic patients who have been stricken with this debilitating condition by liberating them of the burden of chronic wound care and preventing amputation," said Christopher M. Cashman, SANUWAVE President and CEO. "As our clinical trial continues, we know that we are getting closer to giving the healthcare community a real solution to a demanding medical problem."

SANUWAVE, Inc., the leading provider and developer of Pulsed Acoustic Cellular Expression (PACE) technology, received full approval from the FDA to initiate a multi-center, prospective, randomized clinical trial utilizing its novel dermaPACE device in the treatment of diabetic foot ulcers. As part of the IDE approval, SANUWAVE may enroll up to 18 sites with an enrollment of 180 patients during the trial.

According to Peter Sheehan, M.D., a senior faculty member at the Mount Sinai School of Medicine and a member of the Board of Directors of both the American Diabetes Association and the Wound Healing Society, "In the United States, we have 21 million people with diabetes and 54 million with pre-diabetes, placing 25% of our population at risk for complications of diabetes. So when you factor in that 15% of people with diabetes can expect to get a non-healing ulcer in their lifetime, there's obviously a big clinical need. Any intervention should prove cost effective. It costs roughly $60,000 for lower limb amputation, and the hospitalization alone can cost $16,000 - $20,000 for a patient with a diabetic foot ulcer."

The dermaPACE device received CE Mark approval in March 2007 for the treatment of acute and chronic defects of the skin and subcutaneous soft tissues e.g. post-operative wound healing defects, post-traumatic wounds, deep partial thickness burns, decubitus ulcers, diabetic ulcers, and arterial ulcers. Early European results are very encouraging. The biological working mechanism of dermaPACE is based on the application of high energy pulsed acoustic waves to the affected area. PACE produces stress at a cellular level which lead to an observed immediate increase in microcirculation and a signal for the cellular release of specific proteins (cellular expression) including angiogenic growth factors that have been clinically shown to result in new supportive blood vessel growth, also known as neovascularization. The combined effect has been shown in animal studies and human pilot studies to have a positive outcome on chronic wound conditions.

**EUROPEAN EXPERIENCE WITH PULSED ACOUSTIC CELLULAR EXPRESSION (PACE) TECHNOLOGY**

Pulsed Acoustic Cellular Expression (PACE) Technology has been developed based on early scientific and clinical evidence of the beneficial wound healing effects of extracorporeal shock wave technology (ESWT). The dermaPACE™ device has been developed specifically for PACE wave applications. SANUWAVE™ received CE approval in March 2007. This approval is for the application of pulsed acoustic high-energy pressure waves on acute and chronic defects of the skin and subcutaneous soft tissues - e.g. post-operative wound
healing defects, post-traumatic wounds, deep partial thickness burns, decubitus ulcers, diabetic ulcers, and arterial ulcers.

Extracorporeal shock wave technology (ESWT) was introduced to medical practice nearly 30 years ago for use in lithotripsy, and subsequently it became evident that ESWT also had bone and soft tissue healing effects. Pulsed Acoustic Cellular Expression, known as PACE Technology was developed based on proprietary shock wave energy parameters and a specific defined protocol designed to optimize efficacy in the treatment of soft tissue injury. The dermaPACE device utilizes an Applicator to direct high-energy PACE waves into the wound bed. As the PACE waves penetrate the microcirculatory system, there is an immediate acute inflammatory response resulting in an increase in functional capillary perfusion and vessel permeability index. More leukocytes begin to roll and stick to the vessel walls, finally transmigrating through the vessel wall into the wound bed tissues. Increasing leukocyte activation assists in the inflammatory phase of wound healing by triggering vessel endothelial cells and initiating proangiogenic factor production. These events effectively allow the wound to move through the inflammatory phase and into the proliferation phase. The cells that make up the wound bed are also affected by PACE waves. The PACE waves apply shear forces to the cells. In response to these physical stresses, cells produce and release growth factors and cytokines into the intercellular space. eNOS expression in combination with endothelial VEGF and vWF up-regulation, as well as co-expression of PCNA lead to increased cellular proliferation and tissue regeneration. Almost immediately after PACE application and over the next few weeks an angiogenic response will initiate the revascularization process to create new capillaries within the wound bed, improving hemodynamics of tissue microcirculation and facilitating wound healing.

Several animal studies have reported the effect of PACE waves on soft tissue defects. These promising results led to the development of human pilot studies to determine safety and effectiveness of PACE Technology to initiate healing processes in patients with acute and chronic soft tissue conditions.

In the last decade this technology has been used to successfully treat tendinopathies, long bone fracture, non-union or delayed-union fractures, and avascular necrosis. Shock wave technology has also been shown to have healing effects in several wound indications. Some of the first results were reported by Haupt et al.1 This study, using a porcine model, demonstrated the effects of ESWT at different energy levels and treatment protocols on inflicted, irradiated and non-irradiated partial thickness wounds. Significant enhancement of wound healing was shown in the lower shock wave energy levels in both the acute and irradiated (chronic model) wound conditions. SANUWAVE developed PACE Technology to maximize the benefits of shock wave specific to chronic wound conditions. Further research conducted at the Cleveland Clinic has reported a 13% increase in functional capillary density without damage to the vessels or an increase in inflammatory infiltrates following PACE application.2 Using TUNEL (terminal deoxyxynucleotidyl transferase-mediated dUTP nick end-labeling) a decrease in apoptosis and tissue regeneration was observed after pulsed acoustic wave treatment.3 Further, these applications may significantly increase the efficacy of antibiotics in combating difficult infections.4 Clinical publications have reported the biological response of initiation and acceleration of wound healing in burns,5 traumatic wounds and reconstructive skin flaps,6 and diabetic wounds.7

After receiving CE mark approval for dermaPACE in March 2007 the preclinical data triggered the interest of many physicians and wound nurses, resulting in several small trials. The success of these trials can be surveyed at the WUWH5, where three independent European groups present their results. Van Acker et al, from the University of Gent, will present 12 cases of diabetic foot ulcers of which 7 achieved full wound closure within 15 weeks. Bots et al, from the University of Gent, evaluated the effect of PACE applications for the treatment in diabetic foot ulcers over a period of six weeks in 11 patients. dermaPACE has proven to be effective not only for diabetic foot ulcers but also for venous and arterial ulcers as demonstrated by Knebl et al, from the Sisters of Mercy Hospital in Linz, Austria reported providing data on 10 cases with various etiologies.

Previously Jesche and Petsche et al, from the University of Innsbruck, presented the beneficial effects of dermaPACE treatments in 11 diabetic patients suffering from chronic foot
and leg ulcers at the Wound Care Congress in Houston, Texas, USA in October 2007. During this study, the average reduction in wound size was from 5.1 +/- 5.5 cm² to 0.4 +/- 0.5 cm². All patients experienced improvement, and 63% of patients achieved over 92% closure within 27 days, 75% of patients achieved complete closure within 62 days. Interestingly, this study reported that the initial wound size and depth did not correlate with wound closure time. These early European reports give rise to hope that PACE will be valuable treatment option for difficult to treat chronic wounds.

Pulsed Acoustic Cellular Expression offers an improved standard of care that may shorten a lengthy conservative therapy healing process and may make later operative measures, such as amputation, unnecessary. Given that conservative therapy or standard of care may not be effective for all patients, PACE is a preferable alternative that carries little risk. PACE has been shown to reduce wound size and increase the rate of wound closure, which would improve the quality of life for a patient.

SANUWAVE, Inc. is a global medical technology company focused on the development and utilization of Pulsed Acoustic Cellular Expression (PACE) technology for advanced wound care, orthopedic, cardiovascular and spine/neurological conditions. Headquartered in Alpharetta, GA with international offices in Lengwill, Switzerland and Tokyo, Japan; SANUWAVE is undertaking extensive research into the biological mechanisms and cellular effects of ESWT and PACE, to include anti-inflammatory response, angiogenesis promotion, and bactericidal capabilities.

COLOPLAST INTRODUCES A TOTAL WOUND PAIN MANAGEMENT CONSENSUS AT THE WORLD UNION CONGRESS 2008 IN TORONTO

Pain is a subjective and common experience for people living with chronic wounds. Up to 80% of patients with chronic wounds experience persistent pain between dressing changes.

Although persistent wound pain does not necessarily have a definite trigger, it is often associated with the cause of the wound and local changes in the wound environment. A sudden emergence of wound related pain or an increase in existing pain is often linked to infection, tissue trauma and other key factors that adversely affect wound healing. Despite the importance of pain as a key clinical indicator, it has traditionally been neglected by healthcare providers with a lack of documentation and treatment.

In addition, more and more professionals realize it is no longer adequate to concentrate on pain during dressing change alone to optimize wound healing and patient comfort.

Coloplast is a platinum sponsor of the Third Congress of the World Union of Wound Healing Societies. The objective of the congress in providing evidence-informed information that facilitates best practice and optimal patient care is very true to what we have committed ourselves to provide as part of our proven wound management offerings.

At the Congress we will be hosting a satellite symposium on how to assess and manage total wound pain, including persistent pain between dressing changes and procedural related pain.

The symposium presents a Wound Pain Consensus developed by an International and interprofessional panel and peer-reviewed by the WUWHS scientific board. Best practice sharing within the audience will be facilitated in an interactive way.

All aspects of assessing and documenting wound pain and patient centered concerns are dealt with in the symposium. It will differentiate pain in relation to its origin whether it being due to tissue damage, local infection, dressing change related procedures and provide guidance on how to effectively manage the wound pain with different origins through examples of usage of a new and proven Biatain range of foam dressings (Coloplast A/S), which is also introduced at the congress.

A safety review on topical use of Ibuprofen and new results from a large scale, international, comparative study in a real life setting with a foam dressing with ibuprofen (Biatain Ibu, Coloplast A/S) will be presented and discussed.

The symposium is chaired by Professor Gary Sibbald (MD, FRCPC and chair of the Congress) from Canada and involves an International panel with Diane Krasner (Ph.D., RN) from US, C. Richard Chapman (Professor, Ph.D) from US, Sylvie Meaume (M.D. Derm.) from France and Marco Romanelli (Professor, M.D., Ph.D, EWMA president) from Italy.

The symposium “Assessment and Treatment of Wound Pain” is held on Wednesday June 4th 2008, 4:30-6:00 pm.