



# Section on Clinical Electrophysiology and Wound Management

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CSM 2007

Newsletter of the  
CEWMS of the  
American Physical  
Therapy Association

## President's Message

### Hello to All...Happy Spring !!!

We will start off with the best news of all, membership of the section is at an all time high, as of April 1st 2007 we have 840 members. This is great news for us, but also brings new responsibilities. All of you are looking for increased communication, newsletters, educational opportunities, and support in the area of reimbursement issues. To that end the executive committee agreed to contact APTA and hold a strategic planning meeting on behalf of the section this summer. This will be a great opportunity for us to plan for our future and propel us to even greater heights.

Combined Sections Meeting was held in Boston, Massachusetts, this past February. And despite the Valentine's Day snow storm the meeting was a great success. For the members I had the opportunity to meet with, I thank you for the great ideas. A special thank you goes out to our Program chair, **Karen Albaugh**, she coordinated phenomenal programming and is already planning for 2008. The 2008 CSM meeting will be held in Nashville. Please check Karen's article for details.

Remember to put CSM 2008 on your calendars, join us and check out our new look. We will unveil our new logo and booth at the 2008 CSM meeting, February 6-10, 2008 in Nashville, Tennessee.

From the EMNG arm of our section, APTA through Justin Elliott continues to work with our members tirelessly to monitor and address the continuous threats against our ability to perform EMG's. APTA with our members input has created a brochure, "*Physical Therapists and Electromyography (EMG)*", to assess the issue of PT's performing EMG. If you would like a copy please contact Justin Elliott at [justinel Elliott@apta.org](mailto:justinel Elliott@apta.org).

The WMSIG continues to face reimbursement issues. The fiscal intermediaries across the country are systematically developing Local Coverage Decisions (LCD) to eliminate payment of Unna Boots for venous leg ulcers, chronic venous insufficiency and lower extremity edema. There also continues to be noise indicating that the unna boot code cannot be used for multi-layer compression wraps. We are working with Rhea Cohn at APTA to propose a CPT code specific to multi-layer compression wraps for venous leg ulcers, chronic venous insufficiency, lower extremity edema and lymphedema.

With respect to the Electrotherapy arm of practice, the struggle continues with the National Non-coverage decision from Medicare with regard to *Monochromatic Infrared Energy*. These devices were being used in our diabetic patient population to decrease peripheral neuropathy pain and improve function. Medicare's analysis of the treatment indicates it is experimental and lacks evidence. As always we will keep you posted.

On the national front, APTA is asking all members to **HELP** as the Medicare Direct Access bill was re-introduced to Congress. We need to contact our congressman and request their sponsorship of this bill. If you have any questions, please do not hesitate to contact Michael Matlack in Government Affairs at APTA. His email is [michaelmatalck@apta.org](mailto:michaelmatalck@apta.org).

As Spring rolls into summer, remember to keep the section on your calendars and join us for Annual Conference, June 27-30, 2007 in Denver, CO. If we do not see you at Annual Conference have a **great summer!!**

Your President,  
*Pam Unger*

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# 2008 Candidates

## 2008 Candidates for Section Officers

The Nominating Committee is looking ahead to the 2008 elections. Our Section will have several positions coming open next year: VP/ Education Chair, Secretary, Treasurer, and two Nominating Committee positions. Descriptions of these positions can be found in the Section Bylaws located on our website. If you would like to run for office in 2008, know someone you would like to nominate, or have questions about any of these upcoming positions, please contact me at [kgibbs@txstate.edu](mailto:kgibbs@txstate.edu). The 2008 ballot will be finalized at our business meeting in Nashville, TN, in Feb 08. After nominations from the floor at this meeting, the ballot will be closed, so please let me know prior to this time if you are interested in running for office.

Becoming a Section officer not only provides a great opportunity for networking, but also helps develop leadership skills. Come join the fun and run for an office in 2008!

Karen Gibbs  
*Nominating Committee Chair*

### Clinical Electrophysiology and Wound Management Section

Michael Parker, Editor

### Editorial and Advertising Office

MICHAEL PARKER  
University of Mary  
7500 University Drive  
Bismarck, ND 58504  
[mparker@umary.edu](mailto:mparker@umary.edu)

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American Physical Therapy Association

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**President**  
PAM UNGER  
[punger@celleration.com](mailto:punger@celleration.com)  
[pamcawc@aol.com](mailto:pamcawc@aol.com)

**Vice President**  
VACANT

**Secretary**  
KATHLEEN GALLOWAY  
[gallowayk@mail.belmont.edu](mailto:gallowayk@mail.belmont.edu)

**Treasurer**  
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[jslear1@verizon.net](mailto:jslear1@verizon.net)

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**Program Chair**  
KAREN ALBAUGH  
[wientjes12@aol.com](mailto:wientjes12@aol.com)  
[Karencawc@aol.com](mailto:Karencawc@aol.com)

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[mparker@umary.edu](mailto:mparker@umary.edu)

**Membership**  
KATHLEEN GALLOWAY  
[gallowayk@mail.belmont.edu](mailto:gallowayk@mail.belmont.edu)

**Electrotherapy Practice**  
MERYL GERSH  
[meryl.gersh@mail.ewu.edu](mailto:meryl.gersh@mail.ewu.edu)

**EMG/ENC Practice**  
JAMES (Sonny) T. MILLS  
[jamestmills@verizon.net](mailto:jamestmills@verizon.net)

**Nominating**  
KAREN A. GIBBS  
[kgibbs@txstate.edu](mailto:kgibbs@txstate.edu)

**Research**  
JOHN HALLE  
[hallej@mail.belmont.edu](mailto:hallej@mail.belmont.edu)

**Government Affairs Liaison**  
STACY FISHER-EISEN  
[fisherpt@cox.net](mailto:fisherpt@cox.net)

**Web Master**  
ED SHRANK  
[eschrank@su.edu](mailto:eschrank@su.edu)

#### WMSIG Officers

**President**  
HARRIETT LOEHNE  
[hloehne@earthlink.net](mailto:hloehne@earthlink.net)

**Vice President**  
TERESA CONNER-KERR  
[tkerr@elon.edu](mailto:tkerr@elon.edu)

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STEPHANIE WOELFEL  
[Stephanie.Woelfel@lifecare-hospitals.com](mailto:Stephanie.Woelfel@lifecare-hospitals.com)

**Nominating**  
HEATHER HETTRICK  
[Hh35@nyu.edu](mailto:Hh35@nyu.edu)

**Practice**  
LU KLOTH  
[Luther.Kloth@marquette.edu](mailto:Luther.Kloth@marquette.edu)

**Education**  
TERESA CONNER-KERR  
[tkerr@elon.edu](mailto:tkerr@elon.edu)



# WMSIG Update

CSM 07 provided not only great wound management programming, but also an exciting WMSIG meeting. We had great attendance - an early morning meeting, yet - with good discussion, innovative ideas, and enthusiasm for the coming year.

We now have 97 members on the books. If you would like to be a member or aren't sure your name is on the list, please email me and copy our secretary, Stephanie Woelfel, at Stephanie.Woelfel@lifecare-hospitals.com. No dues - just have to be a member of APTA and the SCE&WM. The more voices we have, the more we can accomplish.

With the Section changing the officers' terms from 2 to 3 years, there were no elections this year. The President, Secretary-Treasurer, and Nominating Committee member will be elected in 2008 at CSM. The Executive Council appointed a new member to each of the Practice and Education Committees. Officers are listed at the front of the Newsletter. Standing Committees are:

## Nominating

- Heather Hettrick, Chair
- Rose Hamm

## Education

- Teresa Conner-Kerr, Chair (always the VP)
- Teri Biven
- Jenna Driscoll

## Practice

- Lu Kloth, Chair
- Diane Merwarth
- Heather Hettrick

We have one Task Force, the Research Task Force, of which Teresa Conner-Kerr is Chair. All Committees are actively working on projects, and we look forward to their reports.

APTA has changed its policy concerning planning for CSM programming, requiring all proposals for 2008 to be submitted online by April 9 this year. The Education Committee will work with the Section Program Chair, Karen Albaugh, who will have the final decision on the presentations, per the policy. This will be a great opportunity for any member to volunteer to present, or recommend a speaker and/or a topic.

A proposal was made at the meeting that the Section ask the APTA to create a Specialist Certification for Wound Management. The proposal was taken to the Section Meeting, where it was passed. We will keep you informed as to the response from APTA.

Those present at the meeting were acknowledged for their activity, awards, and expertise in wound management. It was grand to see so many hands go up when asked who had made presentations, published articles and text chapters, edited text books, done research, earned the CWS® credential, as well as a DPT.

We are members of an elite group - all of us striving to better educate ourselves so that we can better serve our patients. We are all learning new things every day - and WMSIG is a perfect avenue to share our knowledge, as well as ask for advice and guidance. Please email with thoughts, questions, and news anytime, and I will seek answers and keep the membership informed.

*Happy Spring! Harriett*

**Harriett B. Loehne,**  
PT, DPT, CWS, FCCWS

*President*  
hloehne@earthlink.net

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# REIMBURSEMENT NEWS

## Wound Care

by Pam Unger, PT, President SCEWM

Back in August of 2005 I wrote an article entitled, “**Where does low frequency Ultrasound belong?**” For those of our colleagues who are using any one of the 3 devices clinically available the reimbursement picture has not really improved or been clarified.

The 25 kHz devices, which actually come in contact with the wound bed, are generally being billed by physical therapists as selective debridement (97597/97598). Their clinical indication is debridement of the wound bed by the removal of necrotic and devitalized tissue.

The 40 kHz device, recognized as “MIST Therapy™” is a low frequency, non-contact, non-thermal ultrasound that had a FDA indication “to promote wound healing by cleansing and debridement of devitalized tissue.” It also provides cell stimulation beyond the removal of the devitalized tissue, at which point the selective debridement codes are inappropriate for billing.

As a result of this dilemma, Celleration, Inc presented a CPT code application to the AMA CPT panel. While the AMA CPT panel did not approve a category I code which would have gone directly to the RUC for valuing, they did approve a category III code, a tracking code

which will be made available July 1, 2007 for use with providers.

At this point the AMA CPT panel is looking for usage within practice, clinical trials with additional patients and society support. Hence if you are a MIST user, I am encouraging you to get involved. Discuss your successes with the APTA Reimbursement Department (Rhea Cohn or Jim Nugent), or get out your pencil and write up a case series. For additional information, contact Jane Nichols (jnichols@celleration.com) at Celleration, Inc.

Please remember:

Reimbursement is one aspect of wound care that is never far from any healthcare providers mind. We must remember that treatment must be reasonable and necessary. These reasonable and necessary services are items and services used in the treatment of wounds to improve integumentary function. We then cannot receive payment unless there is documentation (progress note, coding, and billing) to determine that these services have been provided.

**Next Issue: What is happening with the Multi-layer Compression Codes?**

## Mark Your Calendars for These Upcoming Meetings

### House of Delegates (APTA)

May 21-23, 2007 ..... Washington, DC

### Advocacy Academy & PT Day on Capitol Hill

May 22-24, 2007 ..... Washington, DC

### WCPT Congress 2007

June 2-7, 2007 ..... Vancouver, BC, Canada

### Annual Conference: PT 2007

June 27-30, 2007 ..... Denver, CO

### State Government Affairs Forum

September 23-25, 2007 ..... Albuquerque, NM

### National Student Conclave 2007

October 26-28, 2007 ..... Valley Forge, PA

### Preview 2020

November 16-18, 2007 ..... Phoenix, AZ

### Combined Sections Meeting 2008 (CSM)

February 6-10, 2008 ..... Nashville, TN

### House of Delegates (APTA)

June 16-18, 2008 ..... San Antonio, TX

### Annual Conference: PT 2008

June 18-21, 2008 ..... San Antonio, TX

### Congratulations

### for Honors/Awards:

### Maley Lectureship Award for 2008 Recipient:

Pamela G. Unger, PT, CWS



# Attempts to Limit Physical Therapists from using EMG/NCV Studies Continues in Several States

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By Jeff Slear, PT, Treasurer SCEWM and Justin Elliot, APTA Government Affairs

Physical therapists' performance of EMG/NCV studies continues to attract the attention of the neurology and physiatrist groups. This despite the fact we would rather be left alone to do our thing!

In New York, Assembly Bill 382 and Senate Bill 686 have been reintroduced for 2007. This legislation would prohibit needle EMG by anyone other than a physician. Justin Elliott of APTA's Government Affairs Department has been working with the legislative chair of New York, Patrick Van Beveren. This legislation has a number of challenges in moving forward – mainly because the New York legislature is one of the most difficult states to get any legislation passed (it took over ten years to enact direct access legislation in NY). The New York Chapter will continue to monitor this legislation and lobby against it.

In Texas, physical therapists doing EMG studies have gotten caught in the middle of an old fashioned “wild west shoot out”. It seems that the Texas Board of Chiropractors put out regulations approximately 1.5 years ago that stated chiropractors were allowed to do needle EMG as well as manipulation under anesthesia. As one can imagine, the Texas Medical Board did not agree, and the Board filed a lawsuit against the Chiropractic Board for over stepping their regulatory authority. Also the Medical Board introduced legislation (Senate bill 1353) that would define needle EMG and manipulation under anesthesia as inclusive in the practice of medicine. Obviously this would preclude anyone, including physical therapists, from doing needle EMG. The Texas PT Association has set up a task force solely for this issue and they have had several meetings regarding this issue. The Texas Legislature adjourns for the year on May 28.

Wisconsin is the 3rd state that is involved with physical therapists and EMG studies. As a background, legislation had been introduced in 2006 that would have prohibited physical therapists from doing EMG studies (See SCEWM Newsletter, Summer 2006, page 11). Thanks to expert testimony by Dr. Lisa DePasquale and

Dr. Richard Nielson as well as efforts by APTA and the Wisconsin Chapter, the legislation never made it out of committee. At the beginning of 2007, a new draft of the bill was circulated for a possible re-introduction of the bill. However, our Wisconsin Chapter actively lobbied against possible reintroduction. In addition, the new chairwoman of the House Health Committee is a nurse. She has requested from the Wisconsin chapter information regarding physical therapists performing EMG studies. She has also requested information from the neurologists as to why physical therapists doing EMG studies are thought to be harmful to the public. Jason Johns of the Wisconsin chapter continues to monitor the situation. Hopefully this will subside and there will *not* be a reintroduction of this bill.

Finally, legislation has once again resurfaced this year in Alabama that would provide for licensure of “electroneurodiagnostic (END) technology practitioners”. This legislation would also provide for regulation of the END practitioners under a newly created Alabama Board of Electroneurodiagnostic Practitioners. HB 483 and SB 346 would prohibit anyone from providing EMG services unless they held an END license. While physicians and audiologists would be exempted from the licensure requirement, PTs would not. However PTs would be eligible for an END license and provided an END license upon application. APTA is working with the Alabama Chapter to lobby against the legislation or provide a specific exemption for PTs from the bill. The Alabama Legislature adjourns for the year on May 21.

Since most state legislatures end their terms in the spring (and the filing deadlines for new legislation as well pass), we can start breathing a bit easier at this point. States with year round legislatures such as New York, Ohio, Wisconsin, and California require constant monitoring. This issue has been around for many years and will continue to be so in the future. With due diligence and the support of all involved, we will continue to preserve the right of physical therapists to perform EMG studies.



The following are Abstracts of the Section's research presented during CSM-2007 in Boston.

### Reliability of a Wound Measurement System

**AUTHORS:** Melody Clayton<sup>2</sup>, Judy Clifton<sup>1</sup>, Richard Kasser<sup>1</sup>

**INSTITUTIONS (ALL):** 1. Physical Therapy, University of Tennessee Health Science Center, Memphis, TN, USA. 2. Physical Therapy, Methodist Healthcare University Hospital, Memphis, TN, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** Measurement of wound surface area (WSA) is a common method for evaluating wound healing and is becoming increasingly important in selecting appropriate wound care billing codes that are based on WSA. The purpose of this study was to assess the intrarater and interrater reliability of a specific wound measurement system.

**Number of Subjects:** Nineteen subjects with 28 wounds participated in this study. All patients received wound care in the physical therapy department of a large, university-affiliated hospital.

**Materials/Methods:** The wound measurement system used in this study consisted of a tracing grid package and a digital tablet with tracing stylus. After opening the three-layer grid package, the protective layer was removed and the transparent contact layer with tracing grid was placed over the wound. A physical therapist (PT) traced the perimeter of each wound on the transparent grid sheet with a permanent marking pen. After disposing of the contaminated contact layer, the PT placed the tracing grid on the digital tablet and retraced the wound outline with the stylus. When the tracing was complete, the tablet displayed WSA in square centimeters. Forty-eight hours later, the same PT used the stylus and tablet to retrace all wounds from the original grids, and WSA values from both sets of tracings were compared to determine intrarater reliability. After receiving instruction in use of the system, another PT used the stylus with the tablet to retrace the original grid tracings made by the first PT. Tracings made by the second PT were compared to the initial tracings made by the first PT to determine interrater reliability. Data were analyzed with a nonparametric statistic (Spearman rank correlation coefficient), because our data were not normally distributed

and therefore failed to meet a basic assumption of parametric testing.

**Results:** There were strong correlations between WSA measurements obtained by the same tester on two different occasions ( $r_s=0.9984$ ,  $P<0.0001$ ) and WSA measurements obtained by two different testers ( $r_s=0.9968$ ,  $P<0.0001$ ).

**Conclusions:** This wound measurement system is reliable for assessing WSA in a variety of wounds; both intrarater and interrater reliability were very high. However, our study was limited to assessing the reliability of the digital tablet.

**Clinical Relevance:** This wound measurement system is portable and easy to use and could be used by wound care practitioners to obtain reliable measures of WSA.

### Changes in Plantar Pressure at the Heel using Traditional Off-Weighting Devices: A Case Report

**AUTHORS:** Ed Mahoney<sup>1</sup>, Bonnie Kulosa<sup>1</sup>, Ashley Carter<sup>1</sup>, James W. Bellew<sup>1</sup>

**INSTITUTIONS (ALL):** 1. Physical Therapy, Louisiana State University Health Sciences Center, Shreveport, LA, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** Off-weighting of forefoot plantar ulcerations is a common clinical practice in many diabetic wound care settings. While many off-weighting devices are available, total contact casting (TCC) is considered the gold-standard for mid- and forefoot ulcers. Plantar heel wounds are much less common, take longer to heal, and may not be adequately addressed with current off-weighting strategies. Therefore, the intent of this study was to evaluate the effectiveness of devices commonly used for off-loading the mid- and forefoot in their ability to reduce rearfoot pressure.

**Number of Subjects:** One 52 year old adult female with a heel ulceration located on the posterior-plantar aspect of the heel, a 20 year history of Type II diabetes, and recent HbA1c of 8.6 was selected.

**Materials/Methods:** Peak plantar pressure of the heel was recorded using a commercially available, in-shoe, pedobarographic measurement system. Pressure sensing insoles were used to quantify heel pressure during casual walking while using four different off-weighting strategies: a DH2 shoe, a heel wedge, a diabetic shoe, and total contact casting. To minimize

inconsistencies of gait, measurement of peak plantar pressure began with the third step and was recorded over at least five steps.

**Results:** Peak plantar heel pressure showed the greatest reduction when using total contact casting followed by the diabetic shoe, heel wedge, and DH2, respectively.

**Conclusions:** Total contact casting provided the greatest reduction in plantar pressure at the heel.

**Clinical Relevance:** Attenuating rearfoot plantar pressures in the management of heel ulcerations represents a challenge to many clinicians. In this single patient report, total contact casting, the gold-standard for off-weighting the mid- and forefoot, also provided the greatest reduction in plantar heel pressure.

### Treatment of Neuropathic Rats with Contralateral, Combined Low and High Frequency Transcutaneous Electrical Nerve Stimulation (TENS) Prevents Mechanical, but not Thermal Allodynia

**AUTHORS:** David L. Somers<sup>1</sup>, F. Richard Clemente<sup>1</sup>, Brad Cipriani<sup>1</sup>, Kristen Graves<sup>1</sup>, Nicholas Lane<sup>1</sup>, Nicole Ross<sup>1</sup>, Adrienne Zeiler<sup>1</sup>

**INSTITUTIONS (ALL):** 1. Physical Therapy, Duquesne University, Pittsburgh, PA, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** We previously reported that treatment of neuropathic rats with TENS through electrodes placed contralateral to a nerve injury could prevent the development of mechanical and thermal allodynia in the nerve-injured paw. High frequency TENS prevents the development of mechanical allodynia while low frequency TENS prevents the development of thermal allodynia. The purpose of the present study was to determine if combining high and low frequency TENS through electrodes placed contralateral to a nerve injury would prevent the development of both forms of allodynia

**Number of Subjects:** Ninety two rats.

**Materials/Methods:** Fifty nine rats received a chronic constriction injury (CCI) to the right sciatic nerve. This procedure produces mechanical and thermal allodynia that is reminiscent of the allodynia experienced by humans with neuropathic pain. On the day of surgery, 17 of these rats received either (determined randomly) left-sided high or low frequency TENS for one hour.

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On the day after surgery, rats received the treatment they did not receive the previous day. This pattern was repeated for a total of 12 days of treatment. The remaining 42 CCI rats were untreated. Sixteen of these rats appeared in previous reports. Thirty three rats did not receive a CCI and served as naive controls. Fifteen of these rats appeared in previous reports. Mechanical and thermal pain thresholds of the right paw were assessed prior to the CCI (baseline) and again 12 days after CCI or on an analogous day if no CCI occurred. The mean percent change from baseline in mechanical and thermal pain threshold was compared between the groups using an ANOVA and post-hoc pairwise comparisons. Alpha was 0.05 for all statistics.

**Results:** Treatment with high frequency and low frequency TENS on alternating days prevented the reduction of mechanical pain threshold that occurred in untreated CCI rats. While untreated CCI rats experienced a mean 42% reduction in mechanical pain threshold, TENS-treated rats experienced only a 16% reduction, and this was not significantly different from the 17% reduction observed in naive controls. TENS treatment was not able to prevent the CCI-induced reduction in thermal pain threshold. The 16% reduction in mean thermal pain threshold observed in TENS-treated rats was not significantly different from the 25% reduction observed in untreated CCI rats or the 10% reduction observed in naive control rats.

**Conclusions:** Combining high and low frequency TENS on alternating days preserves the ability of daily high frequency TENS to prevent mechanical allodynia, but interferes with the ability of daily low frequency TENS to prevent thermal allodynia.

**Clinical Relevance:** If rats with neuropathic pain are like humans, then alternating between high and low frequency TENS on subsequent treatment days would not reduce both mechanical and thermal allodynia. Perhaps other combination strategies for these two frequencies of treatment would prove more effective.

### Non-contact Low-Frequency Therapeutic Ultrasound for Four Cases of Complicated or Difficult-to-Manage Wounds

**AUTHORS:** Jaimee Haan<sup>1</sup>, Sharon Lucich<sup>1</sup>

**INSTITUTIONS (ALL):** 1. Physical Therapy Wound Management, Clarian Health Partners, Indianapolis, IN, USA.

**ABSTRACT BODY: Background & Purpose:** Wound healing modalities available to physical therapists include high-voltage pulsed current (HVPC), high-frequency (megahertz) ultrasound, ultraviolet C radiation, pulsatile lavage with concurrent suction (PLWS), and negative pressure wound therapy (NPWT). Non-contact low-frequency therapeutic ultrasound (LFTU) at a frequency of 40 kHz and a therapeutic range of 0.3-0.8 W/cm<sup>2</sup> is a new modality designed to enhance wound healing. A randomized trial showed improved healing of recalcitrant diabetic foot ulcers with use of non-contact LFTU, but limited data exist for other wound types treated in physical therapy.

**Case Description:** We report 4 cases of atypical wounds in physical therapy practice for which existing treatments were not indicated or yielded insufficient healing. Patients included (1) 78-year-old with full thickness wounds from a burn on the lower extremity who declined surgical intervention; (2) 60-year-old with allergic vasculitis wounds on the lateral leg and dorsal foot with adherent yellow slough and persistent signs of inflammation; (3) 20-year-old with continued significant drainage from a pilonidal cyst in the gluteal midline crease despite surgical repair 6 months prior; and (4) 30-year-old with dehiscence and undermining (5 cm) of an abdominal gunshot wound. In Patients 1 and 2, pain precluded PLWS and sharp debridement. In Patient 3, PLWS elicited significant bleeding. For Patient 4, healing appeared to be regressing with PLWS and lack of insurance precluded NPWT. In all patients, non-contact LFTU was initiated as an adjunct to standard topical therapies and dressings. Complete details of wounds and therapy trials to be provided in the poster.

**Outcomes:** Patient 1 (burn) - Eschar was notably thinned after initiating non-contact LFTU and < 5% after 5 treatments; 100% wound closure was achieved within 2 months of initiating non-contact LFTU. Patient 2 (allergic vasculitis) - Inflammation and induration markedly decreased after 6 treatments; granulation tissue increased (0% to 75%) and eschar decreased (100% to 25%) after 1 month of non-contact LFTU. Patient 3 (pilonidal cyst) - 98% wound clo-

sure with no drainage was achieved after < 2 months of non-contact LFTU. Patient 4 (abdominal wound dehiscence) - Undermining resolved completely within 1 month with non-contact LFTU; wound size markedly decreased.

**Discussion:** Non-contact LFTU had a positive impact on wound healing as follows: decreased eschar in a full thickness burn; decreased pain and inflammation in allergic vasculitis; decreased tunneling and increased mobilization of trapped bacteria in a pilonidal cyst; decreased undermining and bacterial bioburden without traumatizing wound bed in a fragile abdominal gunshot wound. Non-contact LFTU appears to be a useful option when other modalities are not indicated due to pain (PLWS), time constraints (HVPC), or cost (NPWT). Randomized trials are needed to objectively evaluate non-contact LFTU for healing of challenging wounds.

### Altering Frequency with Pulse Duration Influences Muscle Fatigue

**AUTHORS:** C Scott Bickel<sup>1</sup>, Chris M. Gregory<sup>2</sup>

**INSTITUTIONS (ALL):** 1. Physical Therapy, University of Alabama at Birmingham, Birmingham, AL, USA. 2. Physical Therapy, University of Florida, Gainesville, FL, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** Neuromuscular electrical stimulation (NMES) incorporates the use of electrical current to facilitate contraction of skeletal muscle. It is commonly used in clinical settings to mimic voluntary contractions in an effort to enhance rehabilitation. However, one of the fundamental barriers to effectively using NMES is that it inherently causes an increased amount of muscle fatigue as compared to voluntary contractions. The increased fatigue associated with NMES is probably due to the inability to alter recruitment patterns, the inability to modulate firing frequency, or both. The purpose of this study was to determine if there are differences in fatigue with repetitive stimulation when initial starting force is the same between 2 protocols that have the same total charge.

**Number of Subjects:** Ten subjects (29.9 ± 6.7 yrs, 174.2 ± 7.4 cm, 72.7 ± 11.6 kg; 8 male) underwent 2 fatigue protocols (60 contractions: 1 sec on / 1 sec off) performed on their quadriceps femoris muscle on separate days.

**Materials/Methods:** Protocol 1 (P1)  
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utilized a frequency and pulse duration of 50Hz and 200 $\mu$ s, respectively. Protocol 2 (P2) utilized 20 Hz and 500  $\mu$ s. The current amplitude was the same between P1 and P2 and was determined by eliciting 50% of maximum voluntary contraction at 70 Hz and 600  $\mu$ s. A visual analog scale (VAS) was used to assess discomfort associated with the 2 protocols.

**Results:** Initial starting force was the same between P1 and P2 ( $40.3 \pm 8$  and  $40.3 \pm 5$  ft-lbs,  $p > 0.05$ ). P1 caused a  $62 \pm 4\%$  reduction in torque, while P2 resulted in a  $45 \pm 5\%$  decrease ( $p = 0.0005$ ). There were no differences found in the VAS ratings between P1 and P2 ( $15 \pm 3$  mm vs.  $21 \pm 4$  mm,  $p=.18$ ).

**Conclusions:** Initial starting forces between P1 and P2 were the same despite holding amplitude constant and having differences in frequency of activation. Stimulation parameters of equal charge that incorporated both a lower frequency of activation and a higher pulse duration resulted in less fatigue with no difference in perceived pain.

**Clinical Relevance:** The identification of stimulation patterns to maximize muscle performance will allow clinicians to select more physiologically advantageous activation patterns during electrical stimulation to reduce the effect of muscle fatigue.

### Median and Ulnar Neuropathies in University Brass Players

**AUTHORS:** Justin Smith<sup>1</sup>, Cate Langley<sup>1</sup>, Maureen Kendrick<sup>1</sup>, Jeremy Smith<sup>1</sup>, Cara Wilkerson<sup>1</sup>, John Halle<sup>1</sup>, David Greathouse<sup>1</sup>

**INSTITUTIONS (ALL):** 1. School of Physical Therapy, Belmont University, Nashville, TN, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** Peripheral nerve entrapment syndromes of the upper extremities are well documented in musicians. Brass players are at risk for entrapment neuropathies in the upper extremities and are sensitive to mild neurologic deficits. Several university musician populations have been examined to determine the incidence of median and ulnar neuropathies including violinists, cellists, guitarists, pianists, and percussionists. The purpose of this descriptive study was to determine the presence of median and ulnar neuropathies in both upper extremities of university brass players.

**Number of Subjects:** Fourteen volunteer male and female brass instrument players (ages 18-23) were recruited from the Belmont University School of Music and the Vanderbilt University Blair School of Music. Individuals were excluded if they were pregnant or had a history of recent upper extremity or neck injury.

**Materials/Methods:** Subjects completed a history form, were interviewed, and underwent a physical examination. Nerve conduction status of the median and ulnar nerves of both upper extremities was obtained by performing motor, sensory, and F-wave (central) nerve conduction studies. Skin temperature at the wrist was maintained at or above 32 degrees C. After completion of the median and ulnar nerve conduction studies (NCS), the brass players were instructed in upper extremity injury prevention exercises.

**Results:** One subject (8) reported tingling in the 5th digit of the left hand, and one subject (13) reported numbness and tingling in the 2nd, 3rd and 4th digits of both hands. One subject (7) had positive findings on provocative testing (Tinel's sign) of the left median nerve over the wrist. Otherwise, these brass players had normal upper extremity neural and musculoskeletal function based on the history and physical examinations. When comparing the subjects' nerve conduction study values with a chart of normal NCS values, all electrophysiological variables were within normal limits for motor, sensory, and central (F-wave) conduction values. However, comparison studies of median and ulnar motor and sensory latencies in the same and opposite hand demonstrated that five of the 14 brass players (36%) had early evidence of median neuropathy at or distal to the wrist. Three of these musicians had early evidence of median neuropathy at or distal to the wrist in both hands. The other 9 subjects demonstrated normal comparison studies of the median and ulnar nerves in both upper extremities.

**Conclusions:** In this descriptive study of a population of 14 university brass players, five musicians (36%) were found to have early electrophysiologic evidence of median neuropathy at or distal to the wrist or carpal tunnel syndrome. Ulnar nerve electrophysiological function was within normal limits for all subjects examined.

**Clinical Relevance:** University brass players may be at an increased risk

for developing median neuropathies at or distal to the wrist due to their prolonged positioning and repetitive overuse.

### Biochemical Correlates in Response to Acupuncture Insertion at a Myofascial Trigger Point

**AUTHORS:** Jerome V. Danoff<sup>1</sup>, Jay Shah<sup>2</sup>, Lynn Gerber<sup>2</sup>, Libby Takacs<sup>2</sup>

**INSTITUTIONS (ALL):** 1. Exercise Science, George Washington University, Washington, DC, USA. 2. Rehabilitation Medicine, National Institutes of Health, Bethesda, MD, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** Direct physical evidence of tissue responses to acupuncture treatment of myofascial trigger points is limited. For this study a custom developed microdialysis needle capable of sampling the internal chemical milieu was inserted into active and latent myofascial trigger points (MTTrP) in the trapezius muscle and used to elicit a twitch response. Chemical assay was used to determine the levels of a number of analytes including cytokines, neuropeptides, and catecholamines both before and after the twitch.

**Number of Subjects:** 10 participants were examined and determined to belong in one of 3 groups: Active (neck pain, MTTrP present; 4 subjects), Latent (no neck pain, MTTrP present; 3 subjects), Control (no neck pain, MTTrP absent, 3 subjects).

**Materials/Methods:** Several double bore needles the size of standard acupuncture needles were fabricated in which an internal membrane at the needle's tip separated the collection fluid from the internal tissue environment. A micropump moved saline through the needle at 2  $\mu$ l/min which allowed biochemicals to diffuse across the membrane into the collection fluid. These needles were inserted close to MTTrPs in trapezius muscles of subjects (or equivalent locations for Controls) as they lay relaxed on a plinthe. After 5 minutes the needles were advanced into the MTTrPs thereby eliciting a twitch response in the Active and Latent subjects. The new positions were maintained for an additional 6 minutes (total time = 11 minutes). Fluid samples from the system were collected every minute and later analyzed with a chemical assay system for several biochemical molecules.

**Results:** Most of the analytes identified are associated with inflammatory

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responses (primarily cytokines TNF- $\alpha$ , IL-1, IL-6, IL-8, and IL-12) and most increased in response to the presence of the needle (pre-twitch). A complex cascade of changing concentrations for the various analytes was determined, especially at the onset of the twitch response. While concentrations for most analytes decreased after initiation of the twitch, IL-12 concentration increased and continued to increase for several minutes.

**Conclusions:** The presence of an acupuncture needle in the vicinity of an MTrP, here simulated by a microdialysis sampling device identical in size, can be associated with biochemical responses within the tissue. The interaction of these chemicals remains to be determined, but one cytokine, IL-12, does seem to increase in association with the twitch response while others decrease.

**Clinical Relevance:** Many patients with MTrPs have reported pain relief after elicitation of a twitch. This may be related to changing levels of cytokines, as well as other biochemicals. Once a better understanding of the interplay of these biochemical structures within the tissue is available, improved treatments for pain may be developed. The microdialysis system developed for this study has the potential to further evaluate these mechanisms.

### How the Integumentary System is being Addressed in Entry Level Physical Therapy Educational Programs.

**AUTHORS:** Karen A. Gibbs<sup>1</sup>, Harriett B. Loehne<sup>2</sup>, Samantha A. Benitez<sup>1</sup>, Justin C. Byers<sup>1</sup>, Swapnali Y. Chaudhary<sup>1</sup>, Roy D. Garza<sup>1</sup>, Brandon M. Williams<sup>1</sup>

**INSTITUTIONS (ALL):** 1. Physical Therapy Department, Texas State University-San Marcos, San Marcos, TX, USA. 2. Archbold Center for Wound Management, Archbold Medical Center, Thomasville, GA, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** The primary purpose of this study was to determine how the integumentary system is currently being addressed in entry level physical therapist educational programs including number of contact hours, experience of instructors, and topics covered. A secondary purpose was to determine if faculty were utilizing draft curriculum recommendations developed by APTA's Section on

Clinical Electrophysiology and Wound Management (SCE&WM).

**Number of Subjects:** The survey targeted 192 accredited US physical therapy programs. Sixty-eight surveys were returned for a 34.5% response rate.

**Materials/Methods:** An electronic survey consisting of 31 multiple choice and fill in the blank questions regarding program demographics, integumentary topics, and instructor experience was sent to the primary integumentary instructors or coordinators for each of the 192 programs. Frequency analysis was performed on returned surveys.

**Results:** Content hours: 8.6% of programs provided less than 10 contact hours of integumentary content, 22.4% from 11-15, 46.6% from 16-30, and 22.4% offered more than 31 hours. Faculty status: 67.2% listed full-time faculty as primary instructors. The majority of programs, 69.6%, stated they utilized guest speakers at some level with 29.3% stating they depended on outside clinical faculty for primary instruction in this area. Topics covered: 100% of the responding programs included tissue healing, wound characteristics, pressure and vascular ulcers, sensation, pain, and debridement as topics introduced in their programs. Fifty percent of the programs were aware of the SCE&WM's curriculum recommendations, but only 34.1% of those that were aware actually utilized the draft document in developing content and learning objectives.

**Conclusions:** The majority of entry level programs offer 16-30 contact hours of integumentary content delivered primarily by instructors that have at least some degree of clinical experience in wound management. The majority of programs are seeking outside clinical faculty with wound management expertise to supplement or completely deliver integumentary content. Seven general integumentary topic areas were consistently introduced in all of the programs responding to the survey. Uniform inclusion of other topic areas might be improved with wider utilization of the SCE&WM's curriculum recommendations.

**Clinical Relevance:** With the majority of responding physical therapy programs relying at least to some degree on outside clinical assistance in delivering integumentary content to students, continued support from clinicians with wound care expertise

is vital in preparing today's entry level therapists to practice in this field.

### Effects of Infra-red Light Therapy on Peripheral Neuropathy (PN) of the Lower Extremity

**AUTHORS:** Suzanne L. Tinsley<sup>1</sup>, Alicia Brown<sup>1</sup>, Chasity Jackson<sup>1</sup>, Glenn Leach<sup>2</sup>, Kevin Sowell<sup>2</sup>

**INSTITUTIONS (ALL):** 1. Rehabilitation Sciences, Louisiana State University Health Sciences Center, Shreveport, LA, USA. 2. Cornerstone Rehabilitation, Shreveport, LA, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** The purpose of this project was to evaluate the effectiveness of monochromatic near infra-red light energy (MIRE) in reducing symptoms such as pain, loss of sensation, and/or increased risk of falls in subjects diagnosed with peripheral neuropathy.

**Number of Subjects:** Thirty subjects, 16 females and 14 males, from an outpatient physical therapy clinic who had a primary diagnosis of peripheral neuropathy and who had received 45-minute MIRE treatments were used for this study.

**Materials/Methods:** From a retrospective medical chart review of 30 subjects, the following information was collected: age, diabetic or non-diabetic status, number of MIRE treatment sessions, chief complaint (pain, decreased balance and/or falls, or loss of sensation), type of referral (neurologist or other), and Semmes-Weinstein monofilament test score, pain rating on a 0-10 visual analog scale (VAS), and Tinetti Gait and Balance Assessment total score at initial evaluation and discharge. The Wilcoxon Signed Ranks Test was used to compare the results of pre and post scores for all subjects and within each group. The Mann-Whitney test was used to compare the results of all pre and post scores between groups. The alpha value was set at  $p < .05$ .

**Results:** The average age of the 30 subjects was 68 +/- 9 years (range 49 - 83). Seventeen subjects were diabetic and thirteen subjects were non-diabetic. Of the 30 subjects, a neurologist referred two and other specialties referred the remaining twenty-eight. Chief complaints of subjects were pain (19) and decreased balance and/or falls (4). The average of number of visits was 14 +/- 4 (range 5 - 19, median = 15, mode = 18). There was a significant improvement

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in bilateral lower extremity sensation, pain reduction, and overall Tinetti Gait and Balance score following MIRE treatment for all subjects and with-in group comparison. The subjects with diabetes showed a significant improvement in left lower extremity sensation and pain following MIRE treatment compared to the subjects without diabetes, however, there was no difference in right lower extremity sensation and overall Tinetti Gait and Balance total score between the groups.

**Conclusions:** This study suggest that MIRE is an adequate treatment for improving lower extremity sensation, reducing neuropathic pain, and reducing the risk of falls in diabetic and non-diabetic patients diagnosed with PN. The results are in agreement with recent research concerning MIRE for the treatment of PN suggesting improvement in lower extremity sensation and balance. Furthermore, the average number of patient visits in this study (14) was fairly consistent with the average number of patient visits (12) reported in other studies.

**Clinical Relevance:** MIRE may be an adequate treatment for reducing neuropathic pain associated with PN, primary complaint of many patients. It may also be an adequate treatment for improving lower extremity sensation and reducing the risk of falls in patients diagnosed with PN of various origins. This study suggests that this improvement may be achieved in a timely and efficient manner.

### Use of High Intensity Electrical Stimulation to Restore Quadriceps Strength Following L4 Nerve Root Compression

**AUTHORS:** Lynne Sturgill<sup>1</sup>, Tara Manal<sup>1</sup>

**INSTITUTIONS (ALL):** 1. UD, Newark, DE, USA.

**ABSTRACT BODY: Background & Purpose:** Myotomal weakness can result from nerve compression in the lumbar spine. The purpose of this case is to describe the use of electrical stimulation as an adjunct to strengthening of the quadriceps for a theater professor with significant weakness caused by L4 nerve root compression.

**Case Description:** A 63 year old male was referred for evaluation of R leg pain and weakness. His Oswestry Low Back Disability score was 58%. He reported limitations in standing, walking and sleeping. Trunk AROM, especially

extension, reproduced his leg pain which followed an L4 distribution with sensory loss. Manual muscle testing (MMT) showed the R quadriceps strength to be 4/5. The knee jerk reflex was absent on the involved side. Atrophy of the R quadriceps was visible. MRI findings revealed a R focal neuroforaminal disc protrusion compressing on the L4 nerve root. EMG findings suggested abnormalities in motor conduction of both the R quadriceps and anterior tibialis. This patient responded positively to pelvic traction with a marked decrease in leg symptoms. However, there was no change in his MMT findings after 1 month of treatment. Further quadriceps strength testing (MVIC) demonstrated the L quadriceps produced 670N while the R quadriceps produced 225N; a 77% quadriceps deficit. High Intensity NMES was initiated utilizing a 2500 Hz sine wave electrical stimulus at 50 bursts/sec applied to the quadriceps. This stimulus was delivered with a 2 second ramp time for a total on time of 12 seconds and an off time of 50 seconds. The patient was seated on a KinCom dynamometer with the knee positioned isometrically at 60 degrees. The patient received 10 electrically elicited contractions each treatment on a resting muscle at 50% or greater of his MVIC for 11 treatments. In addition, the patient was given a home program of quadriceps strengthening exercises.

**Outcomes:** This patient's R quadriceps strength was measured to be greater than 100% of the L at discharge. He had painfree trunk AROM and no complaints of radiating symptoms. His knee jerk reflex was slightly decreased compared to the uninvolved. He had returned to his previous activity level and his Oswestry was 4%.

**Discussion:** High intensity electrical stimulation was a helpful adjunct in the treatment of a patient with significant quadriceps weakness secondary to L4 nerve root compression.

### Effects of Light Emitting Diode Radiation on the Conduction Parameters of the Superficial Radial Nerve.

**AUTHORS:** Edward Schrank<sup>1</sup>, Todd Telemeco<sup>1</sup>

**INSTITUTIONS (ALL):** 1. Shenandoah University, Winchester, VA, USA.

**ABSTRACT BODY: Purpose/Hypothesis:** To determine the electrophysiological effects of light emitting diode (LED) radiation on the con-

duction parameters of the superficial radial nerve. We hypothesized that there would be a significant difference in peak latency and negative peak amplitude between radiated and non-radiated radial nerve.

**Number of Subjects:** Forty healthy subjects (20-35 years old) with no history of neurological conditions.

**Materials/Methods:** One forearm was randomly selected to be radiated for each subject. Light emitting diode radiation was applied over 1 cm<sup>2</sup> blocks along a 10cm course of the superficial radial nerve measured proximally from the anatomic snuffbox. The electromyographer was blinded to which arm had been radiated. Nerve conduction measurements were taken immediately after the irradiation and again at a 10 and 20 minute interval later.

**Results:** Paired t-test was used to assess the difference between pre test and post test data. After LED laser exposure, a significant decrease in latency was seen between baseline and radiated measurements. No significant difference was seen in amplitude pre and post test.

**Conclusions:** The application of 3 J/cm<sup>2</sup> led radiation over the superficial radial nerve in healthy subjects causes a significant decrease in peak latency measurements and no change in negative peak amplitude.

**Clinical Relevance:** LED radiation is being used as a replacement for laser therapy for pain relief. The effects of LED radiation have been proposed to be the same as that of laser, but little evidence has been produced to validate that claim.

### Is Anodyne Therapy an Effective Treatment for Increasing Sensation and Decreasing Pain in Patients with Diabetic Peripheral Neuropathy? A Literature Review.

**AUTHORS:** Stephanie Keeling<sup>1</sup>, Sonya Sullivan<sup>1</sup>, David A. Boyce<sup>1</sup>, Anthony Brosky<sup>1</sup>, Gina Pariser<sup>1</sup>

**INSTITUTIONS (ALL):** 1. Physical Therapy, Bellarmine University, Louisville, Kentucky, KY, USA.

**ABSTRACT BODY: Purpose:** This literature review explores the evidence regarding Anodyne therapy as an effective treatment for increasing sensation and decreasing pain in patients with diabetic peripheral neuropathy.

**Description:** Diabetes is a disease that effects many people of all ages, over 18 million Americans have diabetes

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and approximately 30% of them develop Diabetic Peripheral Neuropathy (DPN). Peripheral neuropathy is a common side effect of diabetes and has debilitating effects, which include numbness, diminished sensation, pain, and balance problems.

There have been recent reports that the use of the Anodyne Therapy System (ATS) has the ability to reverse some symptoms associated with DPN. ATS is a device that delivers Monochromatic Infrared Energy (MIRE) in a non-invasive manner. MIRE is thought to increase circulation due to the release and/or formation of small quantities of nitric oxide from endothelial and red blood cells. Recent literature surrounding Anodyne therapy suggests that patients suffering from DPN may benefit from the application of MIRE. Seven databases were searched using keyword combinations related to "Anodyne" and "Diabetic Peripheral Neuropathy". The strength of relevant articles was assessed considering factors such as rigorosity of diagnosis, inclusion criteria, randomization, and outcome measures. While not a formal meta-analysis, studies were selected for review that concluded that Anodyne treatment is either effective, has no effect, or has an ambiguous impact. After reviewing the articles, there appears to be some level of evidence to support the use of Anodyne in patients with peripheral neuropathy.

**Summary of Use:** Seven out of 8 studies reviewed, supported Anodyne therapy as effective at increasing sensation and decreasing pain in patients with diabetic peripheral neuropathy. Two of the studies were fairly well constructed and six of the studies were partly funded or supported by either Anodyne or MedAssist (the leading manufacturer of the Anodyne Therapy System). Most of the studies reviewed had relatively small numbers of participants with a mean age of 70 with either type 1 or type 2 diabetes. The literature provides some lower level of evidence that Anodyne is effective in treating patients with decreased sensation and increased pain due to DPN. More quality research is needed to fully determine if Anodyne is an effective treatment. In addition, many questions still remain unanswered regarding the long term effectiveness.

**Importance to Members:** Physical therapists are often consulted regarding alternative therapies, such as Anodyne. Patients should be informed that there is limited and somewhat lower levels

of evidence that support the use of Anodyne therapy. Physical Therapists should also inform patients about potential risks of Anodyne therapy such as burns and in some cases the potential cost of treatment, secondary to current reimbursement rates.

### **Is Therapeutic Ultrasound an Effective Alternative to Bone Scan to Diagnose a Stress Fracture?**

**AUTHORS:** Sherry Roberts<sup>1</sup>, Amanda Martin<sup>1</sup>, David A. Boyce<sup>1</sup>, Anthony Brosky<sup>1</sup>

**INSTITUTIONS (ALL):** 1. Physical Therapy, Bellarmine University, Louisville, Kentucky, KY, USA.

**ABSTRACT BODY: Purpose:** To evaluate the clinical efficacy of therapeutic ultrasound as a non-invasive method to diagnose stress fracture.

**Description:** Physical therapists have long considered therapeutic ultrasound as a non-invasive field expedient method to diagnose stress fracture. Stress fracture of bone occurs as a result of repetitive loading to the bone. Diagnosing a stress fracture is dependent upon accurate assessment of signs and symptoms and medical imaging. Stress fracture may not be seen for weeks or even months using plain film radiography. The current gold standard to diagnose stress fracture is bone scan. Bone scan is an invasive procedure that exposes the patient to ionizing radiation and requires the injection of radiolabeled isotope into the bloodstream.

There are several non-invasive methods documented throughout the literature that may be effective to diagnose stress

fracture. One method is the application of therapeutic ultrasound to the suspect area which can irritate the periosteum and produce pain. If the bone is continuous, pain is not produced through ultrasonic vibrations. The allure of therapeutic ultrasound as a diagnostic tool is that it is inexpensive, non-invasive, requires no special equipment, easy to administer, and can provide immediate feedback regarding a stress fracture.

**Summary of Use:** While not a formal meta-analysis, studies were selected for review and the authors concluded that ultrasound is not as effective as bone scan to diagnose stress fracture. Ultrasound may be more effective than radiographs in the early diagnosis of stress fracture. If a stress fracture is suspected, ultrasound is by no means a substitute for a bone scan. In the event of a positive ultrasound test a bone scan should be conducted in order to verify a stress fracture. In the absence of advanced testing, it is reasonable to utilize ultrasound as screening tool in order to determine immediate management of the condition.

**Importance to Members:** Physical therapists often seek accurate and expedient methods to aide in the evaluation and treatment of patients. Utilizing therapeutic ultrasound as a tool to diagnosis stress fracture has been considered by some as a reliable and valid tool. The current literature does not support ultrasound as a diagnostic tool to determine if a stress fracture of a bone is present. Physical therapists can use ultrasound as a screening tool however; a bone scan should ultimately be utilized to diagnose patients with suspected stress fracture.

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## Welcome New Members

*(from 8/3/06 to 5/17/07)*

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