



Section on Clinical Electrophysiology and Wound Management

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Newsletter of the
CEWMS of the
American Physical
Therapy Association

President's Message

Hello to all of you. I am hoping you are having a very enjoyable summer.

I had the pleasure of representing the section at the Annual House of Delegates meeting in Orlando, Florida. Certainly the most notable activity of this house was to elect a new president. The new officers are;

R. Scott Ward, *President*
Randy Roesch, *Vice President*
William Bandy, *Director*
Joanell Bohmert, *Director*
Aimee Klein, *Director*
John Wallace, *Director*

Congratulations to the Women's Health Section with the support of all APTA Sections and Chapters the house unanimously approved *Women's Health Physical Therapy Specialization*.

There were multiple RC's that related to autonomous practice, marketing of the DPT, and the status of Vision 2020.

The RC of primary interest to the section was concerning *Procedural Interventions Performed Exclusively by Physical Therapists (RC 12)*. The RC was not heard. An overwhelming majority of the members of the House objected to consideration of the motion and therefore it was not heard. Although there was very lively discussion at the motion discussion groups concerning sharp debridement.

We are continuing to work with the State of Washington to resolve their conflict with podiatry regarding physical therapists performing sharp debridement.

Jeremy Michael Foster, PTA, member of the section was recognized at the National Assembly reception at Annual conference. Jeremy has met all of the eligibility requirements for the APTA's Recognition of Advanced Proficiency for the

Physical Therapist Assistant in the *integumentary* category of work.

Our members who perform EMG/NCV's will be pleased to know that APTA has developed a brochure aimed at educating the state legislators on the performance of EMG by physical therapists. The goal of this project is to provide a pro-PT overview of this issue in laymen's term that a state legislator would understand. We will be certain to share the finished project with all members.

There continue to be numerous states that are facing legislative challenges regarding physical therapist performing EMG. The members and the support of Justin Elliott, Associate Director of State Government Affairs, as well as the American Congress of Electromyography are working tirelessly on these issues. The most recent challenges appear to be Nebraska and North Carolina. Please contact Justin Elliott if there are any issues related to EMG that you are aware of.

For our members whose interest is primarily therapeutic modalities, have no fear, the payers continue to question electrical stimulation, light therapy and interferential current. As these issues arise we are in need of clinicians who are willing to offer their clinical expertise and knowledge. Please contact our Electrotherapy Practice Committee chair with your contact information, (meryl.gersh@mail.ewu.edu).

And the greatest news of all is our ever climbing membership. We are now **766 members** strong. I encourage all of you to mark your calendars now for CSM 2007, February 13-18, in Boston, Massachusetts.

I hope you all have a great day and a very enjoyable fall season.

*Your President,
Pam Unger*

2006 Election Results

This year's election ended in May with the following results: Pamela G. Unger, President; Karen Albaugh, Program Chair; Michael Parker, Publications Chair; and Rose Hamm, Nominating Committee Member.

Also included on this year's ballot was an opportunity for the Section to change its bylaws to extend terms of service for officers to three years instead of two years. I am happy to report that the membership elected to make this change. Extending terms of service will allow officers adequate time to learn their roles and responsibilities as well as accomplish goals.

If you are interested in running for office in the future, please contact me at kgibbs@txstate.edu. Nominations from the floor are also taken during the Section's business meeting at CSM. I hope to see you all in Boston for CSM 07.

Congratulations to our returning officers and our newest member of the Nominating Committee. I would like to thank all the members who participated in elections this year!

Karen Gibbs
Nominating Committee Chair

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WMSIG Update

As we encourage all who have a specialty interest in wound management to become certified, this is a reminder that October 14, 2006, will be the last time that someone who has less than a bachelor's degree can take the CWS® Board Exam (materials must be in by September 1, 2006). Beginning in 2007, one must have a bachelor's degree or higher to be eligible to sit for the exam. If you fall into the category of less than a bachelor's degree, you will want to consider taking the exam this fall, or if you have colleagues or staff that do, encourage them to do the same. In 2007 there will be a new category for those who do not hold bachelor's degree, called a Certified Wound Associate (WS-C) ®. Eligibility will include a minimum of documented five years experience in wound care to sit for a certification exam that is being developed. Information is on the www.aawm.org website.

Check out the Advancing the Practice website, www.advancingthepractice.org with its new home page. It is an excellent non-biased resource for wound management news and events.

Don't forget to hold February 14 - 18, 2007, for the APTA Combined Sections Meeting in Boston. Celebrate Valentine's Day with your favorite physical therapy wound care clinicians! Wound Management programming is going

to be great, including a preconference course on debridement. Details will be released soon – check the www.apta.org website.

With the continued growth of DPT physical therapy programs as we try to fulfill the APTA vision of all entry level DPT students by 2020, this is a good time for a review of the proper way to list your designations after your name. The rule of thumb is that your *license* goes first, i.e. PT or PTA, then your highest degree, next any APTA board specialty certification, followed by any other certification, then any honorary designation. For example:

Julie M. Smith, PT, DPT, GCS, CWS, FCCWS

We encourage all clinicians to adapt the proper designations, and to pass the information along to students and colleagues.

If you would like to be a member of the WMSIG, please send me your name and email. There is no additional charge – you just have to be a current member of the SCE&WM. I will try to send broadcast emails when a wound management issue arises. Please let me know if ever there are any concerns in your area of the country.

Best wishes for a good summer for everyone.

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

Abstracts

Special thanks to Dr. John Halle for organizing and submitting the following Abstracts presented during CSM - 2006 in San Diego.

Effectiveness of Reducing Plantar Pressure at the Heel with Traditional Off-Weighting Devices

AUTHORS (*Last Name, First Name*): Bellew, James W.¹; Mahoney, Ed¹; Shelley, Kristen¹; Feirman, Rachael¹; Cunningham, Marshall¹; *McCulloch, Joseph¹*

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

Purpose/Hypothesis: Off-weighting is a common means of managing mid-foot and forefoot ulcerations. While many off-weighting devices are available, little data are available supporting their use in reducing plantar pressure at the heel. Therefore, the intent of this study was to examine the reduction in heel pressure when using various off-weighting techniques.

Number of Subjects: Five men and 5 women (25-34 years) without pathology or ulceration were examined.

Materials/Methods: During this single session design, peak plantar pressure of the heel was recorded using a portable, in shoe, pedo-barographic measurement system. Following calibration to full body weight for each subject, pressure sensing insoles were used to quantify baseline heel pressure during barefoot walking and during walking with, in randomized order, a DH2, diabetic shoe, heel wedge, and total contact casting (TCC). The parameter of interest was peak plantar pressure and was measured from the self-reported dominant foot. One-way ANOVA with post-hoc testing was used to assess differences between devices.

Results: Peak plantar heel pressures were significantly less than barefoot walking ($p < .001$) and total contact casting ($p < .004$) when using the DH2, heel wedge, or diabetic shoe. There was no difference, however, in pressure reduction between the DH2, heel wedge, and diabetic shoe, nor was there a difference between barefoot walking and TCC conditions.

Conclusions: The current gold standard for off-weighting the forefoot, the TCC, was not significantly different than barefoot walking when assessing

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pressure at the heel. When compared to barefoot walking or total contact casting, plantar heel pressure was significantly reduced when using a DH2, heel wedge, or diabetic shoe.

Clinical Relevance: Cost effective means of reducing plantar-pressure at the heel is much desired and many methods are available to the clinician. The gold standard for off-weighting the forefoot is not suitable for the rearfoot. These data suggest that the DH2, heel wedge, or diabetic shoe effectively reduce plantar-pressure better than casting and thus provide the clinician with options to address specific patient needs.

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KEYWORDS: diabetes, wound, pressure.

Susceptibility of Select Wound Pathogens to Graded Concentrations of Chloramine-T: an In Vitro Comparison

AUTHORS (*Last Name, First Name*): Berman, Joseph E.¹; Laatsch, Linda J.²; Kirchner, Phyllis A.²; Anderson, Christopher J.¹; Kloth, Luther C.¹

INSTITUTIONS (*All*): 1. Physical Therapy, Marquette University, Milwaukee, WI, USA.

2. Clinical Laboratory Sciences, Marquette University, Milwaukee, WI, USA.

ABSTRACT BODY: Purpose/Hypothesis: To study the effects of Chloramine-T (Chlorazene, Ferno-Washington, Inc.) on 5 common wound pathogens: Staphylococcus aureus, Methicillin-resistant Staphylococcus aureus (MRSA), Vancomycin-resistant Enterococcus faecalis (VRE) (all gram +), Escherichia coli and Pseudomonas aeruginosa (both gram -).

Materials/Methods: The bacterial pathogens listed above were exposed to the test antibacterial agent at 3 concentrations (200, 300, and 400 ppm) at 3 temperatures (36, 38, and 40°C) for 5, 10, 15, and 20 minutes. All experiments were performed in duplicate,

with a third trial added if results of the first two were disparate.

Pathogens obtained from the American Type Culture Collection. For each pathogen tested, 3-5 colonies inoculated into trypticase soy broth and incubated until turbid. Suspension standardized to a concentration of approximately 1.50×10^8 CFUs/ml using a 0.5 McFarland standard. Mixtures incubated at times and temperatures above, then given sodium thiosulfate to neutralize the antimicrobial agent. Plates incubated for 18 - 24 hours. Since protein at an infection site can interfere with antimicrobial effects, protocol was repeated with the addition of bovine serum.

Results: Gram + bacteria: Chloramine-T was almost completely effective - ie 99.9% reduction in growth - against S aureus, MRSA, and VRE; regardless of concentration, temperature, time or presence of serum. Gram - bacteria: Results similar to above against E coli under all conditions except at 200ppm and 36°C (95-99.6% reduction). Serum significantly affected bactericidal action at 200ppm at all times/temps. There was little effectiveness vs Ps aeruginosa regardless of condition.

Conclusions: In this study, Chloramine-T was bactericidal against S. aureus, MRSA, VRE, and E. coli. These results were shown at concentrations from 200 to 400 ppm, at temperatures from 36 to 40°C) and for exposures from 5 to 20 minutes, even in the presence of serum. The lone exception was against E coli at a concentration of 200ppm. No efficacy was seen against Ps aeruginosa. However, the concentration used may have been substantially higher than that commonly encountered in human wounds.

Clinical Relevance: This compound may be useful during hydrotherapy in the form of whirlpool or pulsed lavage treatment when S aureus, MRSA, VRE or E coli are colonizing wounds. Further testing is needed to study the effectiveness of Chloramine-T against Ps. aeruginosa. Companion studies of this product's cytotoxic effects are underway.

KEYWORDS: Chloramine-T, bacteria, hydrotherapy.

Evidence in Practice: Effectiveness of the Combination of Ice and Electrical Stimulation in Preventing Acute Edema Formation

AUTHORS (*Last Name, First Name*): Buechel, Lisa¹; Radtke, Brenda¹; Schlegel, Dana¹; Zimmermann, Chris L.¹

INSTITUTIONS (*All*): 1. Physical Therapy, Concordia University Wisconsin, Mequon, WI, USA.

ABSTRACT BODY: Purpose/Hypothesis: The purpose of this systematic literature review was to examine the evidence regarding the use of ice and electrical stimulation (e-stim) in combination in the prevention of acute edema formation.

Number of Subjects: Nine studies from peer reviewed journals met the following inclusion criteria: acute edema formation; ice and / or e-stim applied acutely; edema prevention as outcome measure and published in English

Materials/Methods: A literature search was performed using Medline, CINAHL, PubMed, Pedro, and ProQuest. Keywords included "electrotherapy" AND "cryotherapy" AND "edema"; "electrotherapy" AND "edema"; and "cryotherapy" AND "edema". Studies were included using human or animal subjects. A systematic review following a methodology modified from the American Academy of Developmental Medicine and Cerebral Palsy methods evaluated each study's research design, sample size, validity, and statistical and clinical significance.

Results: The initial search criteria identified one human subject and two animal model investigations evaluating the combination of cryotherapy and e-stim (combo). Further keyword expansion resulted in the inclusion of six more studies. Four studies with "Moderate 1 evidence" (randomized, control, 20 sample size, threats to internal or external validity) used animals to evaluate the use of e-stim versus control on preventing acute edema formation. E-stim was statistically significantly better than control in reducing edema formation in 3 of the 4 studies. Four studies with "Moderate 2 evidence" (randomized, control, <20 sample size, threats to internal or external validity) used animals to

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evaluate the use of cryotherapy, e-stim, or combo versus control in preventing acute edema formation. E-stim, ice or combo was statistically significantly better than control in reducing edema formation in 3 of the 4 studies. One study with “Weak evidence” (randomized, <20 sample size, threats to internal or external validity) used human subjects to evaluate ice versus combo in preventing acute edema formation and found no difference between the two modalities.

Conclusions : The strongest evidence reviewed supported the use of e-stim in preventing acute edema formation. Based on the animal model research it would appear that treatment with e-stim, cryotherapy, or combo is better than no treatment at all. There is a complete lack of strong clinically-based human subject research regarding the use of e-stim, cryotherapy or combo in the prevention of acute edema formation. This review identified no evidence favoring the combination of cryotherapy and e-stim versus cryotherapy or e-stim alone in preventing acute edema formation.

Clinical Relevance : Ice and e-stim in combination is commonly used clinically to reduce edema formation. The lack of investigations in human subjects and the limited evidence in animal studies support the need for further studies investigating the combination of ice and e-stim in the prevention of acute edema formation

KEYWORDS: Electrical Stimulation, Cryotherapy, Edema.

Comparison of the Effectiveness of Manually Discharged Multiport Versus Single Port Cleansing Devices on Particulate Removal from Cadaver Tissue

AUTHORS (*Last Name, First Name*): Conner-Kerr, Teresa A.¹; Lewis, Cynthia¹; Horne, Kristin¹; Jonio, Aimee¹; O’Neill, Matthew¹; Primus, Rehema¹

INSTITUTIONS (*All*): 1. Physical Therapy Education, Elon University, Elon, NC, USA.

ABSTRACT BODY: Purpose/Hypothesis: The purpose of this study was to determine the relative efficacy of manually discharged multiport versus single port cleansing devices in remov-

ing particulate from cadaver tissue.

Number of Subjects: Four separate devices were tested using duplicate measures. The four devices included 2 single port (single fluid stream) devices versus 2 multiport (4 fluid streams) devices.

Materials/Methods: A large, irregular full-thickness wound was created over the thigh region of a female cadaver (50 cm at greatest length by 30 cm at greatest width). The wound was surgically created with an irregular pattern that revealed tissue down to the adipose layer. Glass beads of a standard size (3 mm) were used to simulate road rash or wound particulate. Prior to treatment with a test device, 20 glass beads were randomly rubbed into the wound to a level even with the surface of the wound bed. The wound was then treated with each test device for 30 seconds. Subsequently, the wound was examined for any remaining glass beads. The percent recovery and removal of glass beads were determined for each test device using duplicate measures. Time to complete removal of all glass beads from the created wound was also calculated.

In a second set of experiments, a standard amount of graphite particulate was applied to 2 x 2 cm blocks of cadaver skin. A visual rating scale for amount of graphite removed from the tissue blocks along with a digital assessment of wound area cleansed of graphite by the test devices were performed using raters blinded to the particular test conditions.

Results: Initial studies indicate that the manufactured multiport system removed 90% of the implanted beads in comparison to 78% and 63% by the two single port piston syringe systems. The off-label multiport system (ie, 500 cc saline bottle with 4 holes induced in the cap) produced similar results. The multiport systems removed 27-30% more particulate than the single port systems.

Conclusions : Results from this study indicate that manual, multiport cleansing systems are more effective at removing both large and small particulate from simulated wound beds as compared to their single port counterparts.

Clinical Relevance : Manual multiport cleansing devices are more

effective in removing particulate of different sizes from simulated wounds within a short time frame (< 30 seconds) as compared to their single port counterparts. Data from this study suggest that of the manual wound cleansing systems available that multiport systems provide for a more effective means of decontaminating, large dirty wounds in a short time frame.

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KEYWORDS: wound cleansing, multiport systems, debridement.

Physical Therapy Intervention of a Cranial Nerve XII-VII Graft for Facial Nerve Palsy: A Case Study

AUTHORS (*Last Name, First Name*): Denney, Mary A.¹; Partin, Jason¹; Miller, John¹; Landry, Brant¹

INSTITUTIONS (*All*): 1. Program in Physical Therapy, LSUHSC Shreveport, Shreveport, LA, USA.

ABSTRACT BODY: Background & Purpose: Based on an extensive review of the literature, a case study was conducted to present the examination, evaluation, diagnosis, prognosis, intervention, and outcome measures of a patient with FNP who has undergone a cranial nerve XII-VII jump graft. The intent of this case study was to provide evidence-based physical therapy research on the FNP patient’s care process and contribute to research on the utilization of electrical stimulation to treat facial nerve palsy patients after a cranial nerve XII-VII jump graft.

Case Description: A 30 year-old female’s CT scan revealed a left acoustic neuroma after initial complaint of dizziness and hearing loss. A left sub-occipital craniotomy and excision of the neuroma was then performed. As a result of the surgery, the patient developed facial nerve palsy. Initially the patient was referred to speech therapy for facial expression exercises, icing to facilitate activation of the facial muscles, and the use of the EMS-2C electrical stimulation device to promote facial muscle activation. Nine months later the patient received

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a CN XII-VII jump graft. Physical therapy was initiated one month after surgery. The Microdyne II intellect Model 500 was selected for intervention during clinical visits because of its convenience and usefulness in electrical stimulation. Manually modulated pulsed current was delivered on the motor points throughout the distribution of the facial nerve on the left side of the patient's face. A home exercise program including self-massage, e-stim by the EMS-2C, and facial exercises in front of a mirror were completed by the patient daily.

Outcomes: Self-assessment that included a general history, the facial disability index, and an essay on the patient's experiences with facial nerve palsy was completed. The patient evaluation and intervention was obtained from the charted monthly physical therapy treatment sessions. Initially, there was no visual muscle contraction volitionally, or by use of the electrical stimulation. At seven months post-op, the first muscle activation was noticed on the left side of the mouth with attempts at smiling. The patient showed continued improvement each month. At 15 months post graft surgery the patient was discharged with improvements in symmetry, facial tone, increased voluntary motion and a more normal smile.

Discussion: We feel this is in part due to the patient's outstanding dedication to her daily exercise program and e-stim routine. The case study also indicates FNP patients after CN XII-VII graft can benefit from a daily home program as well as physical therapy intervention. In future studies it may be beneficial to include RD and SD testing to show a more objective regeneration in the facial nerve. The classifications systems used in this study to show regeneration of the facial nerve were subjective, and difficult to place our patient in a particular classification because her signs and symptoms differed from the classification systems signs and symptoms.

KEYWORDS: facial nerve palsy, electrical stimulation, CN XII-VII graft.

The Effect of Phototherapy on Delayed Onset Muscle Soreness

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INSTITUTIONS (*All*): 1. Physical Therapy, New York Institute of Technology, Old Westbury, NY, USA.

ABSTRACT BODY: Purpose/Hypothesis: The purpose of this study was to investigate the effects of Phototherapy on Delayed Onset Muscle Soreness (DOMS) of the biceps based on the Visual Analog Scale (VAS), McGill Pain Questionnaire, resting angle (RANG), and girth measurements. DOMS has been shown to peak between 24-48 hours and subsiding within 5-7 days after novel exercise. This pain or discomfort may discourage patients from returning to Physical Therapy or disrupt their progress. Limited prior research utilized parameters on the lower end of the therapeutic dosage levels, excessive induction of DOMS, latency of applying phototherapy, distance between diode application, and array of diode used have failed to prove the beneficial biostimulating effects of phototherapy on DOMS. The hypothesis of this study is that subjects who receive phototherapy will experience less DOMS than subjects who receive sham treatment and the control group.

Number of Subjects: This was a randomized double-blind controlled study with 27 subjects (18-35 years) assigned to one of 3 groups: treatment, sham and control.

Materials/Methods: The treatment group received 8J/cm² of phototherapy each day for 5 consecutive days (Wave lengths of 880 and 660 nm.) to 3 standardized sites over the musculotendinous junction of the biceps. The sham group received identical treatment from a dummy cluster. The control did not receive treatment. The study was completed over 5 consecutive days: on day 1 baseline measurements of RANG and upper arm girths were recorded prior to DOMS induction. DOMS induction involved eccentrically loading the non-dominant biceps to muscular failure utilizing their 1 repetition maximum. Immediately following induction, subjects received one of the 3 treatments. RANG, girth, and pain were assessed by using a series of VAS and the McGill Pain Questionnaire every 24 hours and over the following

4 days, for the 3 groups.

Results: The pain scores at the 48 hour were utilized for data analysis because that is when DOMS peaks. Analysis of the results of the VAS was performed using ANCOVA on the 48 hour scores with the 24 hour scores as the covariate. This was significant ($p=.007$) with relevant post-hoc tests revealing the treatment group exhibited a significant decrease ($p=.031$) in pain as compared to the sham group and ($p=.011$) as compared to the control group. The McGill scores at the 48 hour were analyzed with the Kruskal-Wallis H test and they revealed a significant difference ($p=.049$), post-hoc analysis with the Mann Whitney U test revealed a significant difference between the treatment and the sham group ($p=.011$). There was no significant difference between the groups with respect to girth and RANG.

Conclusions: The results of this study provide scientific evidence that phototherapy, and its current applications provide a beneficial effect to patients who may experience DOMS after a novel exercise session.

Clinical Relevance: The prophylactic use of phototherapy prior to novel exercise may alleviate or reduce the symptoms associated with DOMS. This may assist in improving compliance with new patients.

KEYWORDS: Phototherapy, DOMS, Light.

Carpal Tunnel Syndrome in the Elderly: A Series of Fifty Consecutive Cases

AUTHORS (*Last Name, First Name*): Echternach, John L.¹

INSTITUTIONS (*All*): 1. School of Physical Therapy, Old Dominion University, Norfolk, VA, USA.

ABSTRACT BODY: Background & Purpose: Increasing numbers of elderly individuals are being diagnosed with possible carpal tunnel syndrome and referred for electrophysiologic testing. The purpose of this retrospective study was to examine the results of the electrophysiologic in relationship to several factors. These factors include underlying causes, severity of signs and symptoms, intervention options and outcomes. Using electrophysiologic testing as a reference standard

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,the sensitivity, specificity and related calculations were performed on several clinical test and clinical signs. Included were Phalens test, nerve compression test, Tinel sign and clinical signs of night pain, atrophy ,sensory disturbance.

Case Description: This was a retrospective examination of fifty consecutive cases of carpal tunnel syndrome in elderly individuals referred for electrophysiological testing.

Outcomes: Several factors of interest emerged in this group of elderly subjects. These factors include the rapid onset of significant signs and symptoms, the significant number of subjects with type II diabetes, the apparent lack of repetitive wrist motion as a causative factor and the number of subjects using assistive devices for ambulation. The clinical tests with the highest sensitivity and specificity were Phalens test and the nerve compression test. Atrophy of the thenar eminence of rapid onset was a significant sign of severe nerve compression. Most subjects were treated by surgical intervention after a course of conservative treatment failed to relive signs and symptoms.

Discussion: Outcomes with this group of elderly individuals will be discussed in relationship to causes, clinical signs and intervention outcomes. Possible explanations for the occurrence of carpal tunnel syndrome including the effects of aging as a factoring this population are discussed.

KEYWORDS: Carpal Tunnel.

Symptomatic, Electrophysiologic, and Functional Outcomes in Conservative Care for Carpal Tunnel Syndrome: Comparison of the Manu and Standard Wrist Braces

AUTHORS (*Last Name, First Name*): Galloway, Kathleen¹; Montie, Daryl¹; Walkevar, Sheel¹; Kepsel, Kristen¹; Reed, Julie¹

INSTITUTIONS (ALL): 1. Physical Therapy, Oakland University, Rochester, MI, USA.

ABSTRACT BODY: Purpose/Hypothesis: Carpal tunnel syndrome (CTS) is a common problem in repetitive workers. Conservative treatment

measures have traditionally included standard sleeping braces which maintain the wrist in a neutral position to prevent symptoms. The Manu brace has recently been reported to be an effective intervention for carpal tunnel syndrome. This new brace design proposes to relieve symptoms of CTS by compressing the long bones of the hand, extending the middle two fingers and allowing full motion at the wrist. The purpose of this study is to compare symptoms, functional limitations, and median motor and sensory nerve studies following intervention with each of the braces. Hypotheses: There will be no significant difference between the Manu and the standard neutral wrist brace in any outcome measure.

Number of Subjects: Fifty adult subjects diagnosed with carpal tunnel syndrome will be included in the study. Twenty five will receive the Manu brace and twenty five will receive the standard wrist brace.

Materials/Methods: All subjects will wear the assigned brace for an eight to ten week period. Subjects will complete a Levine carpal tunnel questionnaire and record pain level on a 0-10 scale at the start and at the conclusion of the intervention phase of the study. Median motor and sensory nerve conductions will also be completed at the start and at the conclusion of the study. Compliance will be monitored with patient log books.

Results: A repeated measures ANOVA will be conducted to analyze differences in the outcome measures of symptoms, function, and electrophysiologic data. A preliminary Mann-Whitney U test (N=19)for the initial data collection revealed no significant differences between the Manu and the standard wrist brace in any outcome measure.

Conclusions : Preliminary data analysis reveals no significant difference between the two braces on 6 dependent measures at an alpha of 0.05. This may indicate that the Manu is a viable alternative for conservative bracing in patients with carpal tunnel syndrome.

Clinical Relevance : The Manu brace proposes to relieve pressure in the carpal tunnel by providing compression at the metacarpal heads and extension of the middle two fingers. This positioning is thought to relieve pressure by moving the lumbricals

proximal. It is possible that patients experiencing carpal tunnel syndrome associated with lumbrical involvement may benefit from wearing the Manu wrist brace.

KEYWORDS: carpal tunnel, brace, conservative.

Comparison of Healing Rates for Internal Versus Peri-Wound Electrical Stimulation for Wound Healing: A Case Report

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INSTITUTIONS (All): 1. The ROHO Group, Philadelphia, PA, USA. 2. Department of Physical Therapy, Mercy Rehab Associates, Darby, PA, USA.

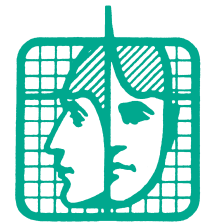
ABSTRACT BODY: Background & Purpose: There are two clinically accepted protocols for the application of electrical stimulation supported by various research studies. The majority of studies discuss the electrode placement with internal stimulation; the electrodes applied directly to the wound bed. However, a few recent studies have demonstrated increased closure rates with peri-wound electrode placement; the electrodes applied to the peripheral tissue surrounding the wound. The objective of this case report was to determine if a difference existed in healing rates between two clinically acceptable protocols.

Case Description: A 32 year-old male with a history of complete spinal cord injury with stage III pressure ulcers on both heels, who was receiving standard nursing care equally to both wounds, was selected. High-volt pulsed current was used daily 6 days a week for 45 minutes. One heel received electrical stimulation with an internal setup while the second heel received electrical stimulation applied peri-wound. Measurements were taken weekly and the percent of closure documented.

Outcomes: Following two weeks of treatment, the wound stimulated with peri-wound electrical stimulation had 93% closure compared to the wound stimulated with internal stimulation, which had 50% closure.

Discussion: It was demonstrated that peri-wound electrical stimulation had a better healing rate than internal wound electrical stimulation. This case

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report also lends support for the need of a randomized, controlled, double blind study to determine if one clinical application protocol is better than another.

KEYWORDS: Electrical Stimulation, Wounds.

The Relationship Between Temperature and Nerve Conduction Characteristics in Non-Impaired Individuals

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ABSTRACT BODY: Purpose/Hypothesis: The purpose of this study was to evaluate the relationship between the nerve conduction characteristics in the median, ulnar and radial nerves and presenting skin temperature in non-impaired individuals as they were subjected to electrophysiological testing.

Number of Subjects: A total of 50-individuals (25-males and 25-females) were recruited from the general public by flyers. The inclusion criteria included age between 20 and 50 years with no history of neuromuscular disease.

Materials/Methods: The subjects received an explanation about the study and were asked to sign an informed consent. Skin temperature was measured with the temperature probe attached to the palmar surface of the hand near the hypothenar eminence. This temperature probe was inputted to the preamplifier of the clinical EMG/NCV machine. Ambient room temperature was monitored and recorded during the nerve conduction velocity testing procedure. The independent variables were 12 motor and sensory characteristics of NCV testing (velocity, distal latency and negative phase amplitude of median, ulnar and radial (sensory only) nerves. All motor

and sensory studies were conducted in accordance to the standardized format described in the NIOSH manual (# 90-113).

Results: Central tendency measurements (mean, median, mode) and measures of dispersion (standard deviation, standard error of the mean, and range) were computed for skin temperature as independent variable and median and ulnar motor distal latency, amplitude and NCV and median, ulnar and radial sensory distal latency and amplitude as dependent variables. The Pearson product moment correlation between the skin temperature and electrophysiological data was computed to evaluate the degree of the relationship. A linear regression analysis was performed in cases where the correlation was significant. Bonferroni Correction Factor was used to find significant correlation of neuronal characteristics caused by low and high skin temperature. The results indicate a significant negative correlation in median motor distal latency, ulnar motor distal latency, ulnar sensory distal latency, median sensory amplitude, and ulnar sensory amplitude and detected skin temperature. All other neuronal characteristics were not correlated with temperature change.

Conclusions : NCV is not significantly affected by ambient temperature ranging from 19.1-26.6 C in the non-impaired sample studied. At ambient 17.8 , the skin temperature of a 21 year old male was 31 C and at ambient 26 C the skin temperature of a 36 year old female was 27.8 C.

Clinical Relevance : This study is the first one to examine the presenting skin temperature of a non-impaired individual and examine the resulting nerve conduction studies. Temperature correction for the performance and interpretation of neuronal conduction (motor and sensory) has been advocated for the past 40-years. This advocacy for temperature correction has in some respects, been based on evidence that was developed using equipment that is not computerized and therefore may be suspect to errors in measurement.

KEYWORDS: Nerve conduction studies, skin temperature, ambient temperature.

Semmes-Weinstein Monofilament Inter-Rater and Intra-Rater Reliability of the Novice Clinician

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ABSTRACT BODY: Purpose/Hypothesis: The purpose of this study is to determine the reliability standards of the Semmes-Weinstein monofilament (SWM) when utilized by the novice clinician. We believe that the inter- and intra-rater reliability of SWM testing performed by a novice clinician will be lower than previously published reliability on expert clinicians.

Number of Subjects: Ten (n=10) healthy volunteers over 50 years of age were recruited to participate in the study. Inter-rater reliability was performed on all ten subjects (n=10), and intra-rater reliability was tested on five subjects (n=5).

Materials/Methods: Prior to evaluating the subjects, three separate third-year Master's level physical therapy students read the instructions provided by the SWM manufacturer and demonstrated their technique with the SWM to an experienced clinician to ensure a standardized methodology. Participants were evaluated by the novice clinicians for sensory perception using SWM at 5 different test sites encompassing the entire sensory nerve distribution on the plantar surfaces of the feet. With the subject blindfolded, the monofilament was pressed against the test site until it buckled and was held in place for 1-2 seconds. Testing was then repeated for each of the sites that pressure was undetected using the next higher grade monofilament until all 5 sites were detected and recorded. The lowest level of monofilament perceived at 3 out of 5 test sites was determined as the aggregate score. To determine intra-rater reliability, each of the detected monofilaments with the addition of one grade above and one below was blinded to the tester and each of the 5 sites was re-tested by the same tester. The sites detected by the subject were recorded and the lowest level of monofilament perceived

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at 3 out of the 5 sites was recorded as the aggregate score.

Results: Using SPSS version 12.0, the intercorrelation coefficient (ICC) for inter-rater reliability was calculated as 0.458 (21.0%) and the intra-rater reliability score was 0.623 (38.8%) when the aggregated values were used.

Conclusions: Results suggest that the use of SWM testing is less reliable for novice clinicians than when compared to previously published research of experienced clinicians. While inter-rater reliability has previously been demonstrated as high as 93%, our study shows an agreement of only 21.0% when performed by novice clinicians. Intra-rater reliability was also much lower in our study, shown at 38.8% compared to previously published numbers as high as 92.0%.

Clinical Relevance: Although the training and education procedures recommended by the manufacturer of the SWM were followed, there was still a difference in the reliability for both inter-rater and intra-rater scores of the novice clinician when compared to previous research for experienced clinicians. These results raise the question as to when a novice clinician becomes as skilled as the expert clinician in the use of Semmes Weinstein monofilaments and what amount of training or experience is needed before reliability will increase.

KEYWORDS: Monofilament, reliability, evaluation.

Longer Electrically Induced Contraction Times May Increase Strength in Quadriceps Femoris

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ABSTRACT BODY: Purpose/Hypothesis: To determine the effect of the electrically induced contraction duration on the change in quadriceps strength after neuromuscular electrical stimulation (NMES). We hypothesized that for a given electrically induced torque (EIT) intensity

([EIT/MVIC]100) a longer contraction will cause significant quadriceps strength increases.

Number of Subjects: Healthy Male (n=3) and female (n=2) subjects (mean age \pm SD 23.6 \pm 2.9 years) volunteered for this study. They completed 1 of the 2 experimental arms of this study. Our goal is to eventually obtain 12 subjects within 2 experimental groups.

Materials/Methods: After approval from the Institutional Review Committee and informed consent was given, all subjects were familiarized with NMES and completed 2 PRE-training right quadriceps strength measurements (maximal voluntary isometric contraction [MVIC] force). Subjects completed 3 maximum contractions and the greatest of the 3 trials was taken as the measurement. Quadriceps force measurements (including EITs) were recorded for computer analysis to the nearest 0.01 N. The instrument was accurate to the nearest 0.59% of a known calibration value (444.8 N). The subjects then completed 12 NMES training sessions over a 4 wk period. During each NMES training session the subject received 10 trains of 50% burst-modulated AC at 50 bursts/second for 15 minutes. The stimulation was on for 15 seconds and off for 75 seconds (1:5 ratio). This on - off ratio is the same ratio used in previous NMES training studies. The current amplitude was adjusted each minute to account for accommodation and to produce an EIT of approximately 40% of the PRE-training MVIC. The subjects completed 1 POST-training MVIC measurement after the 4 wks of NMES training. ICCs were used to compute intrarater reliability for all PRE and POST-training MVIC measurements and the consistency of the MVIC measurement between the 2 PRE-test measurements. A paired t test was performed between the 2 PRE-test measurements, and between the maximum PRE and Post MVICs.

Results: The ICC of PRE and POST-training MVIC measurements over the 4 wk course of the study were 0.91 to 0.98. The between-PRE-test sessions ICC for maximal MVIC measurements was 0.96. The mean difference (6.4%) between the 2 PRE-training strength tests were not ($P > .05$) significantly different. The mean PRE and POST-training MVIC difference reflected a significant ($P = .013$) 26.1% increase in quadriceps torque over 4-wks.

Conclusions: On a small sample of healthy subjects, NMES applied at an electrically induced contraction duration of 15 seconds produced significant quadriceps strength increases over a 4-wk period. Because these are only initial results, more research is needed to determine the strength response to variations in the duration of the electrically induced quadriceps contraction.

Clinical Relevance: The electrically induced contraction duration may give the clinician another intensity-factor to consider besides the %MVIC when designing a patient's NMES program. Increasing the intensity using contraction duration rather than %MVIC may be a more comfortable alternative.

KEYWORDS: Electrical Muscle Stimulation, Electrically Induced Muscle Contraction, Electrically Stimulated Strength Training.

Low or High Frequency TENS Reduces Chronic Inflammatory Muscle Hyperalgesia in the Rat

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ABSTRACT BODY: Purpose/Hypothesis: The purpose of the current study is to determine whether chronic inflammatory hyperalgesia can be reduced by TENS applied either ipsilateral to the site of inflammation, or contralateral to the site of inflammation.

Number of Subjects: Male Sprague-Dawley rats (n=45, Harlan, St. Louis, MO), weighing 250-450 g were used for experiments.

Materials/Methods: Mechanical Testing: Threshold to mechanical stimuli was tested using von Frey filaments, which were applied to the hindpaw bilaterally. A withdrawal response to at least 1 of 2 applications at the lowest bending force

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was interpreted as the mechanical withdrawal threshold in mN (MWT). **Induction of Inflammation:** The rats were injected with 3% carrageenan into one gastrocnemius muscle. A two-week duration was allowed for chronic pain to develop following the injection of carrageenan. **TENS Application:** EMPI TENS units and electrodes were used in this study. TENS parameters included: high frequency (100 Hz) or low frequency (4 Hz), pulse duration 100 μ s, sensory intensity, 20 minutes duration. Sensory intensity TENS was applied in all animals just below motor threshold.

ANALYSIS: A Kruskal Wallis ANOVA examined variability between groups for differences in MWT at baseline, two weeks after injection (pre TENS) and after TENS. Post hoc signed rank test analyzed differences between control, low frequency, and high frequency treatment groups.

Results: Bilateral hyperalgesia developed in all rats 2 weeks after injection ($P=.01$). Ipsilateral application of TENS produced significant increases in MWT both on the side ipsilateral to inflammation ($\chi^2=7.851$, $P=.02$) and the side contralateral to inflammation ($\chi^2=7.795$, $P=.02$). Similarly, contralateral application of TENS produced significant increases in MWT both on the side ipsilateral to inflammation ($\chi^2=10.149$, $P=.006$) and the side contralateral to inflammation ($\chi^2=8.765$, $P=.012$). Both high and low frequency TENS were significantly greater ($P<0.05$ for all cases) than the sham TENS group for TENS applied either ipsilaterally, or contralaterally. No significant differences were found for effectiveness of between low and high frequency TENS treatment for TENS applied ipsilaterally, or contralaterally.

Conclusions: The present results support our hypothesis that TENS applied unilaterally during chronic muscle inflammation, to either the ipsilateral or contralateral side, reduces chronic bilateral secondary hyperalgesia. The fact that both the ipsilateral and contralateral application of TENS decreases hyperalgesia bilaterally supports the idea of a central mechanism for TENS by activating supraspinal inhibitory pathways (Kalra et al., 2001).

Clinical Relevance: Because ipsilateral and contralateral TENS treatments were effective in reducing chronic hyperalgesia in the animal model, this study provides insight into utilizing TENS in reducing chronic pain in humans

KEYWORDS: pain, TENS, analgesia.

Evidence in Practice: Effectiveness of Interferential Current in the Treatment of Acute Pain

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ABSTRACT BODY: Purpose/Hypothesis: The purpose of this systematic literature review was to critically evaluate the evidence regarding the effectiveness of interferential current in the treatment of acute pain.

Number of Subjects: Nine studies in peer-reviewed journals met the following review criteria: keywords “interferential”, and “acute pain”; outcome measures of impairment, functional ability or disability, based on the Nagi Disablement Model; and published in English using human subjects

Materials/Methods: A literature search was performed using CINAHL, MEDline, SPORTDiscus, and PEDro. A modified method of the American Academy of Cerebral Palsy and Developmental Medicine was used for the systematic literature review. Studies were appraised based on design, sample size, internal/external validity, statistical significance, and clinical importance of results.

Results: The nine studies meeting the review criteria were published between 2000 and 2004. Eight of the 9 studies were randomized controlled trials with one having 20 or more participants per group. None had serious threats to internal or external validity. The control group, in most of the studies, received either sham interferential or no interferential current. Study outcomes included measures of impairment (pain threshold, change in pain, McGill Pain Questionnaire, mechanical pain threshold and

subjective pain), functional ability (SF-36, isometric peak torque), and disability (Roland Morris Disability Questionnaire, SF-36, EQ-5D). Two of the 9 studies reported improvements in heat pain threshold, pain intensity and unpleasantness or change in pain for interferential versus control. The remaining seven studies showed no significant benefit to the use of interferential versus other forms of treatment, sham or controls.

Conclusions: This systematic review of nine studies identified strong to moderate level evidence examining the effectiveness of interferential stimulation on acute pain. The outcome of this review would indicate that interferential stimulation is not superior to other forms of stimulation or intervention in the treatment of acute pain. Additionally, there appears to be no one best waveform for interferential in the treatment of acute pain.

Clinical Relevance: Personal experience suggests that current physical therapy practice routinely includes interferential electrical stimulation in the treatment of acute pain. The evidence reviewed gives some support to the use of interferential in the treatment of acute pain however does not recognize it as superior to other currently used forms of acute pain management.

KEYWORDS: Electrical Stimulation, Interferential, Acute Pain.

Effect of TENS on Acute and Chronic Primary Hyperalgesia Induced by Knee Joint Inflammation in Rats

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ABSTRACT BODY: Purpose/Hypothesis: We hypothesized that both low and high frequency TENS would reduce primary hyperalgesia during both acute and chronic stages of joint inflammation.



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Number of Subjects: Male Sprague-Dawley rats (Harlan, 240-360g) were divided into groups by time after induction of inflammation: 4h (n=16), 24h (n=19), and 2 weeks (n=15). Within each group, rats were randomly assigned to receive high frequency TENS, low frequency TENS, and sham TENS.

Materials/Methods: Primary Hyperalgesia Testing: Withdrawal thresholds to knee joint compression were measured with a device consisting of strain gauges attached to forceps. Induction of Inflammation: Rats were anesthetized with halothane and injected with 3% kaolin/carrageenan into one knee joint. Inflammation was allowed to develop for 4h, 24h, or 2 weeks. TENS Application: TENS (EMPI) was applied to the inflamed knee joint as follows: high frequency (100Hz) or low frequency (4Hz), pulse duration 100 μ s, sensory intensity, 20 min duration. Protocol: Compression withdrawal thresholds of the knee were measured before and after induction of inflammation (4h, 24h, or 2 weeks). Rats were randomly assigned to receive high frequency, low frequency or sham treatment as described above, and compression withdrawal thresholds measured after treatment. Analysis: Data were analyzed with a repeated measures ANOVA for differences across time and between groups. This was followed by posthoc testing with t-tests or paired t-tests as appropriate.

Results: There were significant decreases in compression withdrawal thresholds 4h, 24h, and 2 weeks after induction of inflammation for the ipsilateral ($P < 0.05$ for all groups) but not the contralateral knee joint. There was no effect of TENS on the reduced compression withdrawal threshold when applied to the inflamed knee joint 4h after induction of inflammation. However, application of either low frequency ($p = 0.005$) or high frequency ($p = 0.03$) TENS 24h after induction of inflammation significantly increased the compression withdrawal threshold when compared to values after inflammation. Similarly, application of either low ($p = 0.03$) or high frequency ($p = 0.02$) TENS 2

weeks after induction of inflammation significantly increased the compression withdrawal threshold when compared to values after inflammation. No changes were observed in animals treated with sham TENS.

Conclusions : The present results show that TENS reduces primary hyperalgesia during both acute (24h) and chronic (2 weeks) stages of joint inflammation, but not during development of inflammation (4h). Prior work shows that the analgesic effects of TENS utilize central inhibitory mechanisms, which is consistent with

the current data showing the TENS is more effective once central neuronal sensitization predominates.

Clinical Relevance : The choice of TENS as an intervention should be carefully chosen with respect to the desired outcome and known mechanisms of injury. Use of TENS in pain conditions with a strong central component is more likely to be effective than in conditions where primary nociceptor sensitization predominates.

KEYWORDS: TENS, inflammation, pain.

Attempt of the American Association of Neuromuscular and Electrodiagnostic Medicine (AANEM) Bill to limit Physical Therapists from using ENMG Fails in Wisconsin*

The bill (SB 394) that would have limited the use of EMG by physical therapists died in committee following a hearing in the Wisconsin legislature this past spring. Thus, an attempt by AANEM was thwarted following the “excellent, fantastic, testimony” by 2 nationally known experts on EMG, Dr. Rick Nielsen (From Rocky Mountain University and former Chief PT of US Navy), and Dr. Lisa DePasqualle, from the APTA EMG Specialty Council. According to Jason E. Johns, the Wisconsin Physical Therapy Association’s legal counsel representative, “the legislators finally get that the PT profession

is qualified to perform EMG and should not be prohibited from doing so.” Mr. Johns also stated that he anticipates seeing this legislation next session, but emphasized that “we will fight it teeth and nail ...”

The WPTA expressed extreme gratitude to the APTA for making the successful testimony of both Dr. Lisa DePasqualle and Dr. Rick Nielsen possible at the legislative hearing. Further the support of Christy Birrell and Justin Elliott at APTA and all members of WPTA that came out to the hearing to register opposition to this bill were greatly appreciated.

**Information for this article was submitted by Jason E. Johns, Esq. and edited by Luther Kloth, PT, MS, FAPTA, CWS, FCCWS, Professor Emeritus, Department of Physical Therapy, Marquette University, and Michael Parker, PT, PhD, Professor, Department of Physical Therapy, University of Mary.*

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CSM 2007 in Boston, February 14-18th Section Programming

By Karen Wientjes Albaugh, *Program Chair*

Wednesday February 14, 2007 Preconference:

Wound Debridement Workshop

Thursday, February 15, 2007:

Reimbursement issues in wound management

Atypical wounds- recognizing the red flags and making the right referrals

An evidenced-based approach to therapeutic modalities in wound management

Friday, February 16, 2007:

WMSIG Round table meeting, EMG forum,

Electrotherapy forum

Electrotherapy and laser therapy in pain management

Evaluating the current evidence base for iontophoresis and phonophoresis

Case studies in wound management, EMG, and electrotherapy (concurrent)

Section Business meeting

Saturday, February 17, 2007:

Clinical and electrophysiologic effects of aging on neurological function

SCE&WM research platform presentations

Evidenced based practice for the electrophysiologic

evaluation of carpal tunnel syndrome

Please go to www.apta.org website for session information and registration, or contact Karen Albaugh at karen-cawc@aol.com if you have any questions.

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