Introduction

Many things that happen within the walls of a rehabilitation clinic are based on anecdotal evidence and support. Often, therapeutic techniques and methods have scant research to support their validity. Some methods are simply "hand-me-down" recipes of a therapist's predecessor, who has "just always done it that way." This type of passed-on knowledge is being challenged in the current health care marketplace, and rightfully so.

While it is understood that no harm is intended, or for that matter usually inflicted upon the recipient of care, it is no longer acceptable to just avoid harm; rather, it must be proven that the services provided are, in fact, facilitating progress toward recovery. The profession of occupational therapy (OT) is responsible to advance the science of OT, and individual therapists are accountable to patients; therefore, both the profession and the individual therapists must begin to answer the questions that prove the methods legitimate, resource-worthy (cost, time, staff), and effective.

An area of pronounced disconnect between what is done in the clinic and what is supported by quality literature is the therapeutic use of physical agent modalities (PAMs). The clinical use of PAMs is also controversial because of the suggestion that using them veers too far away from the roots and scope of OT. The PAMs are only to be used as an adjunct to therapeutic engagement in occupation, and may enhance clinical practice if used to improve a patient's performance within a given occupational role.

Each day, thousands of patients receive ultrasound, iontophoresis, heat, cold, paraffin, electrical muscle stimulation, and fluidotherapy. It is the right of each patient to ask if his treatment is effective, and it is the responsibility of the therapist to answer. Evidence-based practice is more than a health care trend: it is the standard. It is ethical. It is necessary. It is job security.

This article seeks to explore the literature of the use of PAMs in treating lateral epicondylitis. First, a brief background on lateral epicondylitis will be given. Second, a patient will be introduced, and his course of rehabilitation will be outlined. The treatment options and the clinical reasoning used to drive the planning of his rehabilitation will be examined; this will include reviewing the literature for substantiating evidence on the use of PAMs to treat lateral epicondylitis.

Lateral Epicondylitis: A Starting Point

Lateral epicondylitis, also known as tennis elbow, is typically a work-related, repetitive strain, or idiopathic condition. In 1873, Runge first defined it as pain at the origin of the wrist extensors from the lateral epicondyle of the humerus. There is widespread consensus about the presenting symptoms of tennis elbow; "the most important single diagnostic finding of lateral epicondylitis is the location and reproducibility of the pain." The patient may be easily diagnosed, but both the treatment and cause of the condition are subject of much study and debate.

There are mixed theories regarding the pathophysiology of tennis elbow. For many people, the condition is believed to be one of inflammation and scar formation that causes premature degeneration of the common extensor tendon. Others, however, purport that the term epicondylitis erroneously implies that the condition is inflammatory, stating that when tissue specimens from surgery are examined in pathology, no acute or chronic inflammation is found. As a third alternative explanation for the etiology of epicondylitis, a 1995 study (Boyer and Hastings) suggested that epicondylitis could be related to ingesting antibiotics containing fluoroquinolone.

"In a well-designed study of the histopathology of chronic lateral epicondylitis, it was concluded that the process of epicondylitis is degenerative and not inflammatory." In this study, 11 tissue samples from patients who underwent surgical correction of refractory lateral epicondylitis were compared with a control group of 12 cadaveric specimens. The results of this study showed that none of the 11 surgical samples had inflammatory cells or subtendinous granulation. The value of having the 12 control cadaveric specimens was that it was demonstrated that a definitive pathologic tissue changes. Reagan et al suggest that failed treatment programs are the result of treating an inflammatory process rather than a degenerative one. The pathophysiology of tennis elbow is unclear.

Patient Background

Staff Sergeant John Walker was a 32-year-old, right hand dominant white male. He was on active duty and was stationed...
in Colorado, attached to the 7th Infantry Division. He had been in the Army for close to 15 years. He was referred to OT from the Troop Medical Clinic for right elbow pain. His goal was to "get rid of the pain in my arm so I can work without it hurting again."

Staff Sergeant Walker was a smoker with no relevant past medical history. He reported his pain to be 7/10 on a visual analogue scale when using the arm, and 4/10 at rest. Pain had been present for 6 weeks, progressively worsening. Patient had no recall of trauma, and reported sensation to be normal. No visible or measurable edema at, or distal to, the elbow. No abnormal valgus/varus posture. Patient was able to actively move all upper extremity joints through full range of motion. Pain was reproduced with palpation of lateral epicondyle and while resisting wrist and middle finger extension (elbow extended).

The location of pain was directly over the lateral epicondyle. Patient reported minimal to no pain with palpation over Archade of Frohse with no other radial nerve irritation symptoms. Sensation was found to be intact using the Semmes Weinstein Monofilaments. He could discriminate light touch. Right grip strength with dynamometer was 100 lbs with elbow flexed and 65 lbs with elbow extended. Patient reported pain while gripping in both positions. Left grip strength was 145 lbs with elbow flexed and extended; no pain reported. Dexterity was normal for gender and age, as assessed by the Moberg Pick-up test. During this test, scapular destabilization was noted, as a compensatory movement pattern to avoid full elbow extension.

Staff Sergeant Walker reported a typical occupational pattern for military Soldiers: always engaged in something physical. He was a high school graduate. His military occupational specialty (MOS) was as a 63M, Bradley mechanic. He worked 10-hour days as the sergeant in charge of his motor pool. He was required to supervise junior enlisted Soldiers and enjoyed working alongside them. His work tasks required the following: frequent lifting of vehicle parts greater than 50 lbs; use of wrenches and many other hand tools which required both gross motor and fine motor control and dexterity, as well as strength; work in hard-to-access areas within the vehicles; stooping, bending, and prolonged standing for extended periods of time; reaching, lifting, carrying of medium to large objects; and overhead work. His MOS was demanding, and when his unit was in the field, all these tasks were performed in the elements and with limited access to laborsaving devices.

At the time of initial evaluation, he was having difficulty participating in all work tasks secondary to pain and the decrease of strength that was resulting from pain. He complained of pain for normal reaching tasks, driving, carrying groceries, mowing the lawn, walking his dog, and picking up his children. Additionally, he had stopped participating in his hobbies of archery hunting, bowling, and carpentry for home repairs/improvement; he was diagnosed with right, humeral lateral epicondylitis.

Treatment Options: Engineering the Best Plan

Ultrasound, phonophoresis, iontophoresis, electrical stimulation, manipulation, soft tissue mobilization, neural tension, frictional massage, stretching, icing, splinting, laser, acupuncture, extracorporeal shock wave therapy...there are over 40 treatment options suggested in the literature for the treatment of lateral epicondylitis. These nonoperative treatment options are poorly researched; a sound scientific rationale for the treatment choices is missing.

The most common and widely used treatment of tennis elbow is the counterforce brace, which is based on a mechanical view. The brace is set distal to the common origin of the wrist extensors and is used to create a new origin of pull, thereby relieving the stress of the extensor's origin at the lateral epicondyle. In addition to the brace at the elbow, therapists also splint the wrist in neutral or slight extension to decrease the passive stress on the extensors caused by active wrist flexion. In either proposed pathoetiological scenario, inflammatory or degenerative, this nonelectrical treatment strategy makes sense: it rests the involved area, allowing for healing of damaged (and possibly inflamed) tissues.

In a systematic review of the use of ultrasound therapy for the treatment of musculoskeletal disorders, 38 studies were reviewed. Specifically, this review analyzed studies related to five diagnostic categories, one of which was lateral epicondylitis. Several deficiencies were found in all 38 studies, including small study sizes, lack of long-term follow-up exams, poor statistical power, and no control group. There were six studies reviewed on the efficacy of ultrasound in treating lateral epicondylitis. Three of these studies were assigned a high validity score, but only one study on lateral epicondylitis reported statistically significant and clinically relevant results in favor of ultrasound. This review underscored the need for quality clinical trials of ultrasound therapy, citing that there is "little evidence to support the use of ultrasound therapy in the treatment of musculoskeletal disorders."

In a meta-analysis searching for scientific evidence for the treatment of acute lateral humeral epicondylitis, 78 articles regarding the treatment options were scrutinized. Of the 78 articles found, only 18 studies utilized control groups. These 18 studies were the ones examined by the researchers. They categorized the treatment options into ultrasound, ionization, nonsteroidal anti-inflammatory drugs (NSAIDs), steroid...
injection, and other treatments (physical manipulation, manipulation with forearm straps, and anti-inflammatory topical creams, electromagnetic fields, and placebo). Only one study revealed a significant therapeutic effect; it concluded that ultrasound was better than sham ultrasound. Each study was given a percent score, from 0 to %, based on acceptable study design evaluations. The study that showed ultrasound as an effective treatment earned a score of 44%. Another study, that received a score of 73%, demonstrated that there was no significant difference between ultrasound with phonophoresis and placebo ultrasound or between phonophoresis with or without friction massage.

This meta-analysis offered substantial wisdom in critically analyzing the literature as related to the treatment of lateral epicondylitis: it warned that all studies possibly made type 2 errors, which is failure to capture a treatment effect. In other words, there could have been a difference based on the intervention, but the study was not sensitive enough to determine it. Most of the randomized and controlled trials were poorly designed so results must be interpreted with caution.

After considering the research related to the treatment of lateral epicondylitis, including the use of PAMs, a treatment plan for SSG Walker was designed. In order to improve patient compliance and administrative and therapeutic control, SSG Walker was given a daily treatment schedule. He reported to the OT clinic every morning after the cardiovascular portion of physical training (PT). This allowed him to take part in platoon runs, but eliminated his participation in muscle building exercises of push-ups, pull-ups, and other in-gym circuit weight training. He was placed on a physical profile for 30 days to restrict push-ups and pull-ups, as well as limit his lifting to 30 lbs. He was given a counterforce armband and instructed on proper wear and care at the initial appointment. Additionally, he was given a wrist control splint to wear during sleep to limit prolonged postures of wrist flexion.

During his daily OT sessions, SSG Walker received ultrasound therapy: pulsed (1:4) at 1.0 MHz at an intensity of 1.5 w/cm² for 8 minutes. His ultrasound was given by the Certified OT Assistant, who used a coupling medium to apply the ultrasound directly to the lateral epicondyle. Following each ultrasound treatment, SSG Walker stretched the wrist extensors by actively flexing the digits and wrist (elbow flexed). He continued these stretches while extending the elbow to a tolerable position, using pain as his guide. He was never passively stretched. Following each 1-hour OT session, SSG Walker massaged his elbow for 10 minutes with ice that was frozen in a Dixie cup. He also did this at home 2-3 times each day.

During the initial sessions when he was primarily receiving ultrasound and stretching very gently, the occupational therapist registered (OTR) taught him about proper lifting and activity modification. He was also educated on soft-tissue healing and the importance of rest and a healthy lifestyle. He admitted to working through the pain in order to "get the job done." This was SSG Walker's approach to all tasks, including his carpentry home-improvement hobby. He was asked to keep an activity log for 10 days to track his activities and his pain. After 10 days, he reviewed this log with the OTR and discovered a pattern of pain that worsened after extended periods of repetitive and high-demand (physical) tasks. The initial 10 treatments were primarily a period of controlled rest for his painful upper extremities.

Other treatments included education and practice with force regulation. Staff Sergeant Walker applied excessive force in operating the tools of his trade. The quality of his movement was initially poor, because of pain that was inhibiting him from correctly performing the tasks. He described holding his arm in awkward postures in order to reach work areas inside vehicles. He was educated on principles of joint protection and activity balance.

Toward the end of the second full week of therapy, he reported being pain-free at rest. He then began to complete a series of isometric exercises with his elbow positioned in 90 degrees of flexion. He progressed to isometrics with elbow extended. He then began to progress through isotonic exercises in the same fashion (from elbow at 90 degrees of flexion to full extension). He was also given radial nerve gliding exercises to complete.

He engaged in a Valpar toolbox activity to practice force regulation and force control. During this activity, he was educated on postural control, namely scapular stabilization since this was the most obvious of his abnormal, compensatory movement patterns. He required intermittent verbal and physical feedback for cueing to eliminate scapular destabilizing movements.

After his re-evaluation at 3 weeks, he had completed a full course of ultrasound therapy: 15 sessions. He had been pain free at rest and had progressed to isotonic exercises and was able to participate in a simulated bowling activity using a 3 lbs bowling ball. He was then advanced to a Baltimore Therapeutic Equipment (BTE) program of exercises. These were designed to address the issues of avoiding sustained awkward postures and torque to increase his work tolerance and maintain muscular strength and to address issues of work pace. His recovery was staged so that, eventually, he was able to engage in overhead, job simulation activities with full supervision.

During his fifth and sixth weeks of therapy, he was given
work tasks in the OT clinic. He shelved rehabilitation supplies, swept the pediatric treatment area and waiting room, and hung bulletin board announcements. He reported minimal to no pain during these activities. This helped SSG Walker transition from the patient role to the role of a healthy Soldier tasked to the hospital unit. He was encouraged to help, to the best of his pain-free ability, with clinic maintenance tasks.

Also, during this last week, he worked on mock archery shooting. He brought in his bow from home. He reported that he realized how much less force he needed to apply to “draw” the bow into position than he previously used. He seemed pleased to share his hobby with the OT staff and the other patients. He also was introduced to a new hobby of painting. The painting was affixed to a mirror with the supplies at medium range. He was able to work on fine motor control and upper extremity muscle endurance through these paintings. Contrary to most of his MOS duties and hobbies, painting challenged SSG Walker to use very little force, and train his muscles to respond accordingly.

After 6 weeks of daily treatment, he was re-evaluated. His grip strength in the affected limb had risen by 30 lbs to 95 lbs with elbow extended; and grip increased to by 25 lbs to 125 lbs with elbow flexed. He was no longer tender to palpation, although symptoms could be provoked with forced wrist flexion and elbow extension. His pain was reported at 2 out of 10 with overhead activity, and 0 pain at rest. Staff Sergeant Walker’s response to OT intervention was favorable. He was instructed to return to OT for another follow-up in 6 weeks. During this time away from OT, the OTR referred him to the Wellness Center for an evaluation. He was enrolled in the smoking cessation class, back-health education, and healthy living classes.

Clinical Reasoning: Guiding Model of Practice/Frame of Reference

More important than the question of “what?” to do with a patient, is the logical, but occasionally disregarded, question of “why?” In this portion of the article, explanations for the treatment plan will be covered, including the clinical reasoning used to structure intervention.

The model of human occupation (MOHO) was the model that served as the foundation for assessment and intervention. All three subsystems of the MOHO, volitional, habitation, and performance, were examined. Additionally, under the guidance of this model, the environment of the patient’s performance was considered. This model is compatible with the biomechanical frame of reference which guided the therapist in assessment of movement, pain, strength, endurance, sensation, and manual dexterity. It drove the decision process for activity planning and pacing, splinting, tolerance to task and endurance training, and modalities selected.

The location and severity of the pain, the age and general health of the patient, and the occupational demands and occupational performance abilities were considered. A top-down, client centered approach was used in the overall engineering of the care plan. The treatment sessions were appropriate and meaningful, based on the patient’s occupational history and interests. The patient’s pain and physical capacity to participate was the guide for therapeutic activities and exercises that were used to prepare him to perform his functional occupations for work, home, and leisure tasks. “Active occupation was the primary modality of OT, designed to stimulate function and to lead to improved function.”

The therapist facilitated and guided the process in collaboration with the patient, who experienced personal gratification for his involvement in his own treatment and recovery.

Staff Sergeant Walker was seen daily for command and control issues; in other words, so the OTR could have her eyes and hands on him. When a Soldier is with his unit for regular PT, he is likely to engage in the training regardless of what his profile limits. Also, a daily interaction allows for frequent check-ups and readjustments to care. A less evident motive for daily contact was to establish a rapport with the patient. He was an excellent example of a patient invested in his own rehabilitative care. He learned about his condition and about his MOS tasks that posed at-risk factors.

He was given the counterforce brace in spite of the literature’s questionable evidence base for such a treatment. Despite the flaws in the studies to support counterforce bracing, an overall consensus in the literature seems to be positive. Also, the mechanical explanations for use of the counterforce brace makes sense, and should be examined before discarding a viable conservative treatment option. It was further reasoned that, if for no other reason, the armband served as a physical and proprioceptive reminder to the patient, and as a visual reminder to his squad members in the motor pool. The nighttime wrist control splint, which positioned the wrist in 20 degrees of extension, was issued because the patient reported a sleeping posture of wrist and digit flexion. This treatment is not defined in the literature, but has been anecdotally reported as successful; and like the reasons for the counterforce brace, made sense from a mechanical and anatomical perspective.

In selecting a PAM to use with this patient, ultrasound and iontophoresis were the two considered because of their access in the treatment clinic. To ensure a safe and effective selection, the biophysical properties of the modality and the proposed mechanism of pain modulation were considered, as well as the precautions and contraindications. The studies reviewed for the effectiveness of iontophoresis presented mixed pictures. Bertolucci demonstrated that iontophoresis was more effective than placebo in treating shoulder tendinitis, but the results
may not be indicated for the treatment of lateral epicondylitis (which may or may not be an inflammatory condition). In another study, a case study, iontophoresis was paired with phonophoresis. This combination seemed to irritate and exacerbate the patient’s elbow pain. In this particular case study, the patient’s pain did resolve; however, it was proposed that it could have been a result of the effects of the other treatments given to the patient, including transcutaneous electrical nerve stimulation, forearm epicondyle sleeve, and cryotherapy. This study was flawed because of its lack of control for co-interventions and therefore could not serve as evidence for the use of iontophoresis.

The third study reviewed on iontophoresis evaluated the difference in two NSAIDs used, sodium salicylate versus sodium diclofenac. There were two groups of 20 patients each. Each one received iontophoresis with the corresponding drug of that group. Both groups experienced a decrease in pain over the course of daily treatment for 3 weeks. The only other treatment during this time was rest. Unfortunately, they didn’t use a control group of no treatment or a placebo group, so the results are questionable. This study was not considered as evidence to select iontophoresis to treat SSG Walker. It would have been an obstacle to get permission to access either of the drugs used in this study, as dexamethasone was the corticosteroid used in the OT clinic.

Despite over six decades of therapeutic use, the effectiveness of ultrasound remains questionable when used to treat musculoskeletal disorders. One glaring limit in the research on the use of ultrasound is the lack of reported effective dosage, “there is little scientific basis for dosage selection in clinical practice.” Therefore, the ultrasound treatment was designed after the success reported in Binder’s and Davidson’s study. Both of these studies demonstrated that ultrasound therapy was superior to placebo treatment for pain level and grip strength, and lifting. The dosage was 1:4 pulsed, 1.0 MHz, 1.5 W/cm².

Ultrasound was indicated because SSG Walker was experiencing decreased performance in his occupational role as a Soldier, at home with his home management tasks, and at his leisure pursuits. Ultrasound has been indicated to decrease inflammation or facilitate tissue repair, and given the research, lateral epicondylitis may be the result of either inflammation or tissue degeneration. A consensus on the pathoetiology of lateral epicondylitis is needed in order to select a best treatment course. The patient did not have any contraindications to use ultrasound.

Staff Sergeant Walker used ice massage following each hour of treatment for pain control. He became independent in this modality and reported continuing to utilize this inexpensive and easy to replicate modality at home. Additionally, this is a modality that is “field expedient” and could be accessed while deployed on training exercises.

Modalities were not used as a stand-alone treatment. The ultrasound used was initially paired with rest, splinting, controlled motion, and patient education. This treatment modality was an adjunct to care that served to decrease painful movements so the patient could participate in a therapy program aimed to return to duty (RTD) a viable Soldier.

Clinical observation and activity analysis were powerful in deciding on the rehabilitative course for this Soldier. After SSG Walker’s problems were discerned and his motor patterns evaluated, functional goals were established. These goals were written through collaboration with the patient.

Many imbalances were prominent. Because of the noticeable imbalance of force between extensors and flexors during work, some treatment time was used to teach him about force regulation. Another notable area of imbalance in the patient’s life was between work and rest. Under the volitional subsystem in the MOHO, his motivation and personal causation was examined. Staff Sergeant Walker accurately described himself as a “hard charger.” He was motivated to get back to his hobbies and was driven to RTD. His tendency to be “all work and no play” was addressed through the activity log and education about life balance.

The environment was considered as a vital component to address in therapy because of its influence on occupational performance. The OTR did not do a work site evaluation in this particular case but had done one in the past for another patient. The information gained through that work site analysis was utilized. Changing the work environment was not supported by the command, based on budgetary constraints; therefore, it was the responsibility of the OT staff to educate the patient how to better interact within the environment. This was done from day one, until the final day of therapy. The BTE program was designed to give SSG Walker a workout program to ensure controlled exposure to risk factors of overuse, torque, repetition, and prolonged awkward postures. He was guided through the proper response to each of these risk factors. It was a rehabilitative goal to increase his tolerance to tasks to better match the task demands of his MOS. This program best addressed the performance subsystem within MOHO. His abilities to regulate force, interface with tools and objects, and maintain endurance without pain were improved by the computer feedback and the therapist’s feedback during the BTE activities.

The habituation subsystem of the MOHO was the hardest to influence, as was expected. His habits and role patterns were engrained. He did attend the Healthy Living and Smoking
Cessation classes at the Mountain Post Wellness Center, but was unable to sustain a nonsmoking lifestyle. Based on the education he received in OT, he reported modifying home maintenance tasks of mowing/grooming the lawn, carrying groceries, lifting the children, personal car care, and even walking his dog on a leash. He received education in his role as motor pool sergeant by the lieutenant in the OT clinic. She spoke with him about delegating the more manual, repetitive tasks to his subordinate Soldiers, and enforcing a “smarter” work-to-rest schedule in the motor pool. She educated him on task variability and planning. He did report success in changing his organization of the motor pool’s work schedule.

Conclusions

This article demonstrates the effectiveness of a well-rounded and thoughtfully coordinated treatment plan. The use of PAMs served as an adjunct to traditional OT modalities, with the principle modality being active occupational engagement. The powerful illustration of the effectiveness in OT lies in the unique treatment sessions, designed specifically for SSG Walker. The research reviewed in designing a treatment plan demonstrated that there are few effectiveness studies on the sole use of ultrasound or iontophoresis in treating lateral epicondylitis. What is needed is not replication of the same studies, but new studies that demonstrate that using PAMs, in conjunction with active occupational engagement and progressive, graded exposure to risk factors through well-designed activities, is far better than using PAMs in isolation, or in rehabilitation plans without PAMs. Until the research debt is paid with quality, occupation-focused studies, today’s therapists must be committed to offering patients the best care based on, and perhaps occasionally in spite of, what existing studies suggest. Good clinical reasoning starts with a heart for the safety and improved health of the patient, and with a mind of discernment towards what the published research advocates.

References


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