The Fenzian Unit

Applications to Physical Therapy and Beyond

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Abstract

The field of physical therapy includes many different treatment options in the form of exercises and modalities. The development of a low electrical stimulation signal through the Fenzian unit has provided a new outlook on healing. This device gives information to and receives information from the central nervous system (CNS) through electro-biofeedback and is separated into its own category of modalities (Colthurst, "Discussion on the Fenzian Unit," 2014). The device can be used to treat a wide range of ailments, all with no adverse effects. This makes it a promising tool in the medical field. It is currently being validated as an authentic medical device through clinical studies, yet it has the potential to change the world of healthcare as we know it.

The Fenzian Unit

Applications to Physical Therapy and Beyond

Introduction

Approximately 108 million Americans over the age of 18 acquire a musculoskeletal injury that will last longer than 3 months (Klepps, 2013). Physical therapy is a popular choice for help recovering from these injuries. According to Merriam-Webster, the field of Physical Therapy (PT) is "therapy for the preservation, enhancement, or restoration of movement and physical function impaired or threatened by disability, injury, or disease that utilizes therapeutic exercise, physical modalities (as massage and electrotherapy), assistive devices, and patient education and training" (Physical Therapy, 2014). PT is practiced extensively throughout the United States, caring for all generations. Some basic physical conditions that are treated include arthritis, sports injuries, occupational injuries, post-surgery rehabilitation, musculoskeletal pain, and tendonitis. There are many methods of attending to a patient as listed above, but the use of modalities is a key component in most visits to help deal with pain and induce healing (Spadino, 2014).

Fenzian is a new modality that has only recently been developed. Early development began 12 years ago in 2002, and improvements are still being made today. Fenzian sessions can be performed on all parts of the body. Fenzian was originally designed to have similar effects as acupuncture, which consists of tiny needles being placed in the skin to aid in healing of many different ailments, but Fenzian has more advanced effects. Since its development, many different treatment uses have been discovered. Fenzian is able to treat both acute and chronic conditions. It has also been

used in the acceleration of post–surgical recovery (“Welcome to Fenzian,” 2014). With the progression Fenzian has made in the past 12 years, it is expected that it will be used in healthcare throughout the United States within the next decade.

Common Modalities of Physical Therapy

Modalities can consist of electrical devices or manual techniques. Some important modalities used today include electrical stimulating currents, iontophoresis, cryotherapy, thermotherapy, therapeutic ultrasound, laser therapy, joint mobilization, and massage. Two popular electrical stimulating current methods are neuromuscular electrical stimulation (NMES) and transcutaneous electrical nerve stimulation (TENS).

While similar in that both NMES and TENS use electric current, they accomplish different goals. When providing TENS and NMES, electrodes are placed on the patient near the affected area. NMES is an effective treatment for reeducating a muscle to perform a normal function. This stimulates the muscle to contract, which helps keep it from atrophy. It increases the arterial blood flow to a desired area. It can also be used in wound healing as the positive charge of the direct current at the site of a wound can boost the natural healing process. The electric current of TENS acts as a gateway that inhibits the pain signal of C fibers in the skin to the CNS. An increase of blood flow to the skin can be observed near the electrode. This can bring excess nutrients to the area of choice, which promotes healing. Prentice suggests that TENS can be used in conjunction with acupuncture, a determatome–using trigger, such as acupressure where specific release points on the skin are activated, or motor points (Prentice, 2002).

Iontophoresis also uses electric currents, yet its objective is to transport ions into different target tissues. The transport is transdermal, which allows for a quick delivery

rate and low absorption time compared to ingesting a medication. The ions are transmitted by direct current (DC). Iontophoresis is used to treat many different conditions including burns, scar tissue, calcium deposits, and inflammation.

Some modalities use variations in temperature as a way to influence the body. Cryotherapy consists of many different methods of treatment that involve temperatures below 50° F, which helps induce vasoconstriction, thereby reducing pain and inflammation. Thermotherapy involves vasodilation, relaxing muscles, and increasing elasticity due to treatment with heat. Hydrotherapy can be performed with cryotherapy or thermotherapy, and is performed using different temperatures of water. Hydrotherapy uses the density, turbulence, resistance, buoyancy, hydrostatic pressure, and thermal conductivity of water to speed the rehabilitation of injuries. Treatments using hydrotherapy include whirlpool and a contrast bath. A contrast bath consists of a period of cryotherapy immediately followed by thermotherapy and a second session of thermotherapy. This changes the blood flow to the area, disposing of cellular waste products. Therapeutic ultrasound can be used as a heat modality in which it produces heat deep to the skin that contacts muscle tissue. This is accomplished by vibrational energy produced by sand. The deep heat is beneficial to tissues that cannot be reached by the superficial effects of thermotherapy. Therapeutic ultrasound can be performed at a frequency varying from 1–3 MHz. This treatment encourages soft tissue healing, decreased pain with chronic inflammation, bone healing, and scar tissue contracture.

LASER treatment or light amplification for the stimulated emission of radiation is a relatively newer modality that is used for reduction of pain, wound healing, anti–inflammatory action, and some immunologic enhancements have been seen (Prentice,

2002). New modalities are being invented as research progresses. One such modality is the Fenzian unit.

The Fenzian Unit

What Is it?

The Fenzian unit is a very new modality developed fourteen years ago by the surgeon Dr. James Colthurst and produced by Fenzian Ltd. It is a handheld device that provides "a non–invasive and painless system of treatment, registered for use in treating pain," along with musculoskeletal injuries ("Welcome to Fenzian," 2014). Since the beginning of its development it has been found to have many more applications besides that of treating pain. Fenzian cannot be classified under any previous modalities listed and a new category is being discussed by the FDA (Colthurst, "Discussion on the Fenzian Unit," 2014). One may suggest electro-biofeedback. The World Intellectual Property Organization (WIPO) awarded a patent for the device on August 4th 2011 ("WIPO Assigns Patent to Fenzian," 2011). Following the patent from WIPO, Fenzian Ltd. was granted a United States patent on September 6 2011 under the title "Treatment Apparatus for Applying Electrical Impulses to the Body of a Patient" ("WIPO Assigns Patent to Fenzian," 2011) ("U.S. Patent Issued to Fenzian," 2011). Now that the device has been patented and approved by the FDA, the commercialization of it should begin to spread once it moves out of its research and development phase ("Fenzian Electrical Stimulation," 2014). Currently there are a limited number of practitioners that have Fenzian available to them. It is reasonable to think that there will be a dramatic increase in demand as more people hear about it and see its capabilities. The use of this device

will also rise because it is very portable. Some equipment is hardly used due to its size and difficulty of transport (Colthurst, "Discussion on the Fenzian Unit," 2014).

Background

Inflammation is an important bodily response to most injuries. Many conditions have an inflammatory component, including infections, allergies, back pain, asthma, fracture healing, muscle injury, sinusitis, or coronary artery disease. These all require the same communication mechanism in order to heal. The aim of Fenzian is to shorten or finish a healing process, since healing in the body can be a lengthy process that sometimes may never come about. An understanding of how the body heals and communicates is necessary to comprehend the full functionality of Fenzian treatment.

Wound healing is an extensive process and includes many steps. Once a wound has occurred the first step of healing begins. Platelets accumulate, and the release of growth factors and cytokines such as PDGF and TGF–β is characteristic of hemostasis, the first step of blood clotting. Inflammation is present soon after, as neutrophils arrive at the site and begin to phagocytize, or engulf, foreign substances. Monocytes migrate from the blood into the tissue and become macrophages. They undergo phagocytosis and release PDGF and TGF–β, which attracts fibroblasts and smooth muscle cells. Proliferation begins as fibroblasts and myofibroblasts attach to the fibrin matrix and deposit new extracellular matrix. A final step of collagen remodeling and scar maturation occurs (Colthurst, "Discussion on the Fenzian Unit," 2014).

A scar may be 15 years old, but the scar cells are only 2–3 months old. This means that the scar cells were never replaced with the original type of cells that belong at that site. What is controlling this? If those cells can be reactivated, then the skin cells can

be returned to their normal function. Scar tissue can occur anywhere, including the epidermis, joints, or other areas of injury (Colthurst, "Discussion on the Fenzian Unit," 2014). Some people are prone to hypertrophic and keloid scarring. Hypertrophic and keloid scarring occur from a build up of collagen and glycoprotein. They are usually darker and can form bumps on the skin. A keloid is an overgrowth of this scar tissue in the area, and it can be more unpleasant to look at. Hypertrophic scars tend to stay in the area confined to the injury, while keloids progress past the site of injury (Murray, 1994). There is yet to be a suitable treatment that completely eliminates keloids.

The nervous system is closely linked to the skin. During embryonic development there are three layers that form, the neuro-ectoderm, endoderm, and mesoderm. These layers are present at the beginning of the third week after fertilization has occurred. Both the skin and the nerves are derived from the neuro-ectoderm. Because of this, it is believed that they are closely connected throughout life (Colthurst, "Discussion on the Fenzian Unit," 2014).

The neural plate, the origin of the CNS, develops from the prechordal plate and notochord. These structures found on the ectoderm, the outer developmental layer, produce a fold that fuses together, and the ectoderm closes above the groove. The closing of the fold occurs near the hindbrain and spinal cord, and then it expands on both sides until the entire fold is fused on day 28 after conception. The neural tube consists of the growth of the brain and spinal cord regions, while the neural crest gives way to the peripheral nervous system (Sadler, 2005). The connections of the peripheral nervous system, made from the neural crest, spread widely throughout the body. Together the nerves make up a "meshwork" that has different functions including maintenance and a

response to illness. The organs of the body are connected to the central nervous system (CNS) and the skin by this meshwork. With everything connected, it is easy to spot abnormalities in the body via a change in the impedance of the skin (Colthurst, "Discussion on the Fenzian Unit," 2014). This change in the signal can be analyzed and corrected with the proper equipment.

The CNS is composed of two types of nervous tissue: gray and white matter. White matter has a sheath composed around the axons, which increases the speed of the signal along the axon, while gray matter is lacking this. The white matter connects the body through fast myelinated connections, while the gray matter controls body functions. There is a high amount of electrical activity in the gray matter of the brain and spinal cord. The spinal cord is very complex, and it has different adaptations for different levels of the body. Each level of the spinal cord's gray matter can be likened to a processor, and the entire CNS is like a stack of processors. Each processor has many connections with each level and many connections at each level. These connections send out electrical information from the brain as chemical information in the form of neuropeptides, also known as neurotransmitters (Colthurst, "Discussion on the Fenzian Unit," 2014).

Neuropeptides are a vital component of the body. They signal many different processes throughout the body, but most importantly are involved with the nervous system. The function of neuropeptides that are involved in the nervous system and peripheral tissues is not fully determined. Substance P is a neuropeptide found in the nociceptive sensory neurons (Hokfelt, Broberger, Xu, Sergeyev, Ubink, & Diez, 1999). These mostly unmyelinated neurons can be referred to as C fibers, and they react to noxious stimuli or injury (Panicker & Seth, 2013). These fibers are the most numerous in

the body and comprise approximately 85% of all nerve fibers (Colthurst, “Discussion on the Fenzian Unit,” 2014). C fibers have been shown to be involved in the sensation of pain. The neuropeptides have been seen to be most active in the presence of a stressed or challenged nervous system that is afflicted by disease. This suggests that neuropeptides play an important role in signaling the CNS and alerting it to a problem (Hokfelt, Broberger, Xu, Sergeyev, Ubink, & Diez, 1999). In this instance, each neuropeptide signal comes from a specific area of skin. These signals find their target area in the gray matter, unmyelinated nervous tissue, of the spinal cord. The CNS adjusts its next response according to the information that it has received. The response can signal things like cell replacement, structure, and behavior. These signals or instructions tell the cells that they communicate with what form to take (Colthurst, “Discussion on the Fenzian Unit,” 2014).

The communication between the nerve endings at the level of the skin and the CNS can be viewed as a biofeedback chain (Colthurst, “Discussion on the Fenzian Unit,” 2014). Biofeedback is “an exciting methodology for assessing ‘mind–body’ function” (Zaichkowsky & O'Neill, 2011). Different instruments, such as heart monitors, are used to spot and strengthen internal physiological processes. These processes give valuable information that can help people like athletes learn to control certain biological functions like heart rate or respiration rate. There are different modalities that measure biofeedback. Some valuable to the field of physical therapy are surface electromyography (sEMG) and skin conductance. sEMG measures muscle activity by changes in voltage as a result of depolarization, a gain of positive voltage caused by different ions, via an electrode placed near the muscle. This is helpful for analyzing movements to prevent injury.

Skin conductance measures the sweat response or galvanic skin response, which is the impedance of the electric current through the skin. This is partly how Fenzian analyzes the body. A strong autonomic nervous system is represented by a result of low skin conductivity (Prentice, 2002)(Zaichkowsky & O'Neill, 2011). These modalities can be somewhat useful for the therapist, yet they can only be used in specific cases. They can be combined with other areas of analysis for best results. Fenzian has a wide range of uses, such as finding inflammation hot spots and areas of injury, and operates by employing electro–biofeedback (Colthurst, "Discussion on the Fenzian Unit," 2014).

The electro–biofeedback that is received by Fenzian was first inspired through acupuncture. Acupuncture has been used to reduce pain by activating the afferent nerve fibers or C fibers. The effect of acupuncture on the body is that of inhibition of the synaptic transmission of nociceptive inputs in the CNS (Kagitani, Uchida, & Hotta, 2010). This acts as a gate control similar to TENS (Prentice, 2002). Other responses of the body include somatic, autonomic, and hormonal responses. Alternatives of acupuncture were researched when Russia banned acupuncture using needles during the cold war. One alternative explored was acupressure. Acupressure is a useful alternative that consists of pressing trigger points to clear areas from blocking energy flow. This method was used some, but research was done to find other options. The Soviet aerospace and military scientists discovered that acupressure caused rapid changes of the electrical properties of skin. This research was not readily released due to the secrecy of the Soviet military. Building from this proposed idea of electrical properties of the skin, Fenzian was designed to stimulate the neurological network that is connected through the skin (Colthurst & Giddings, 2007).

How it works

Fenzian can be described as "a form of process medicine" (Colthurst, "Discussion on the Fenzian Unit," 2014). It produces biphasic signals of 10–50 μs using an alternate current waveform generator to send electricity through two sets of electrodes that are in contact with the skin. It is able to recognize changes in skin impedance and create output signals that are similar to skin impedance via a detector. The first signals sent determine a hot spot, or variation in the electrical activity in the skin. They travel through the C fibers to the "processors" of the spinal cord. From there the signals go to the CNS and trigger cellular activity, which will yield a healthy or abnormal response. This causes a return signal to the Fenzian unit. Based on the response of the electro–biofeedback of the nervous system, the duration of the succeeding biphasic signals will vary. The "spine centers" located in the spinal cord are in communication with the device; the succeeding signals from Fenzian cause the CNS to release neuropeptides at the nerve endings which control the cell replacement, structure and behavior (Colthurst & Giddings, 2007) ("WIPO Assigns Patent to Fenzian," 2011) (Colthurst, "Discussion on the Fenzian Unit," 2014) ("Fenzian Electrical Stimulation," 2014) ("Welcome to Fenzian," 2014). Dr. Colthurst suggests, "all cells in the body have identical DNA," and the type of cell they become is completely dependent on the instructions they receive. He describes Fenzian as a "negotiated treatment" (2014). Fenzian is able to aide the CNS in giving "directions," which is sometimes just the normal nerve impulse that is absent, to the cells by using this low intensity signal. This signal is different than the traditional TENS unit, which uses large impulses that only act as a gate control to block the signal of pain (Colthurst,

"Discussion on the Fenzian Unit," 2014) ("Fenzian Electrical Stimulation," 2014). The instructions generated by Fenzian do much more than block pain signals.

Fenzian Treatments

Physical ailments that are treated by Fenzian run from head to toe. There are over nineteen different conditions in the head and neck region alone that have been successfully treated by Fenzian. Some major conditions include conjunctivitis, tonsillitis, cervical spondylosis, Bell's palsy, dental abscesses, chronic otitis, osteoarthritis, and osteoporosis. Examples of shoulder pathology treated include dislocation pain, frozen shoulder, and scapular fractures. There are a variety of ailments that might respond to treatment in the chest region such as pneumonia, atrial/ventricular septal defects, cardiac arrest and arrhythmias, chest wall shingles, and many others. Disc prolapse, scoliosis, syringomyelia, and urological pain are among some of the conditions of the back available for treatment. The hip and abdominal symptoms treated consist of ligament injuries, irritable hip, Crohn's disease, irritable bowel disease, menopause symptoms, and ulcerative colitis as well. Fracture repair, Raynaud's disease, post–surgery of tendons and nerves, sprains, carpal tunnel syndrome, and tennis elbow comprise some of the ailments in the hand, wrist, and elbow that are treatable with Fenzian. The toe and ankle can be treated for ligament sprains, calcaneal spurs, metatarsal fractures, and plantar fasciitis. Lastly, a few of the treatable conditions for the knee are ligament damage including ACL, PCL, MCL, LCL, meniscal tears, and Osgood Schlatter's disease ("Welcome to Fenzian," 2014). Other treatable conditions may include burns, wounds, ulcers, and bruises (Colthurst & Giddings, 2007) (Colthurst, "Discussion on the Fenzian Unit,"

2014). Some of the conditions treated, such as asthma, have been recently discovered as additional perks that should bring more attention to this device in the future.

Case studies. Fenzian has proven to be a very safe and effective treatment option. It has had much success with no adverse side effects after over 900,000 treatments. Dr. Colthurst began treating individuals at a clinic in Berkshire, England, but Fenzian treatments have spread from this location as Fenzian has now become more publicized ("Welcome to Fenzian," 2014)(Colthurst & Giddings, 2007).

A medical review of the clinic in England was published as a starting point of the evidence in favor of Fenzian. The data consists of 600 patients that were treated with the Fenzian unit. Their treatment incorporated the standardized protocols involved for their particular condition. This study is listed as an audit, which suggests it cannot be listed as an ethical review. There were a variety of patients of a wide range of ages, both male and female. Most patients were not referred by doctors, since Fenzian did not have any clinical evidence at this time. The majority of patients had a chronic illness and had already exhausted most other treatment options. The conditions of the patients varied from things like back pain, eczema, sinusitis, knee pain, neck pain, headaches, irritable bowel syndrome, asthma, and abdominal pain. The treatment time of each afflicted area was approximately 20 minutes with repeated treatments performed when deemed necessary. Patients received 5 total treatments on average. The outcomes leaned towards the category "feeling much better" compared to "no change." The outcome of "much better" was higher in the patients who had only been dealing with the area of complaint for 0–6 months. Over 75% of those with complaints of an illness longer than 6 months had positive reactions to treatment. More than 80% of patients within each different

condition of complaint were “cured,” “much better,” or “better.” Younger patients were seen to have better responses to Fenzian, but 70% of the patients of 60 years and older were in the positive outcome category. There were no negative side effects from the treatments, and those patients who died had an advanced malignant disease before starting treatment. Interestingly, patients who that had an illness for more than 8 years showed significant improvements. This occurrence is unlikely to manifest on its own, and “it could be argued that patients who have been through routine treatment pathways before presentation for Fenzian treatment have effectively acted as their own controls” (Colthurst & Giddings, 2007).

When speaking with Dr. Colthurst, he presented six different cases with Fenzian treatment to me. The first case (figure 1) constitutes of bilateral chronic leg ulcers in a 39 year old professional dancer. The patient had been dealing with these raw painful leg

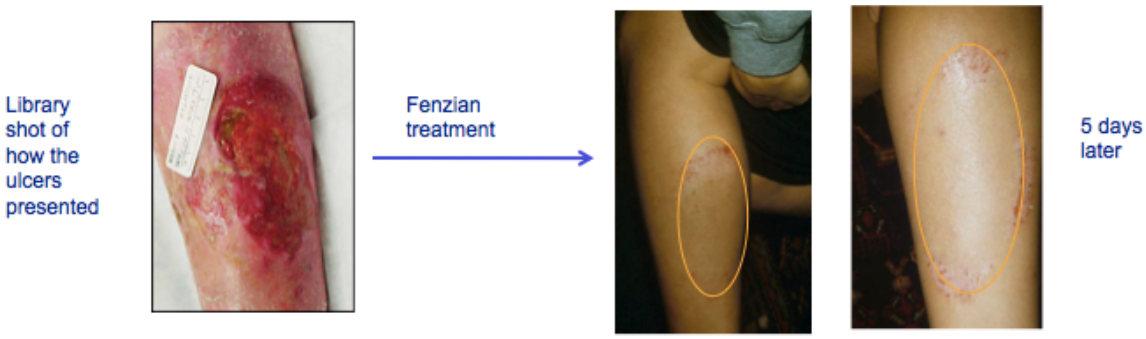

Figure 1: Fenzian treatment of bilateral chronic leg ulcers. (Colthurst, “Discussion on the Fenzian Unit,” 2014)

ulcers for 7 years. The cause was unknown. The ulcers healed so quickly that after the 3rd visit they had been covered up by new skin. This skin growth was from the end up and not the normal edge in growth. Four treatments were performed in total. It is currently 6 years later and there has been no reoccurrences or signs of ulcers post–Fenzian treatment. The second case (Figure 2) deals with an acute chronic MRSA infection. The patient had

Figure 2: A before and after shot of a patient with acute chronic MRSA infection (Colthurst, "Discussion on the Fenzian Unit," 2014)

a wound that had been infected with MRSA for 8 months. They had many different treatments that attempted to rid them of the infection including continuous antibiotics and 2 surgical drainages. The patient's dressings were also changed twice a day. The patient began Fenzian treatments, and after 8 treatments over the duration of 10 days the infection was eradicated. The third case (Figure 3) is that of a painful bruise that was

Figure 3: Fenzian treatment of a painful bruise with swift healing (Colthurst & Giddings, 2007)

treated over the period of 8 days. The expected outcome of this injury is healing, yet the outcome was much quicker than without Fenzian treatment. The fourth case (Figure 4) involved a patient that was post knee replacement surgery and had fallen on the same

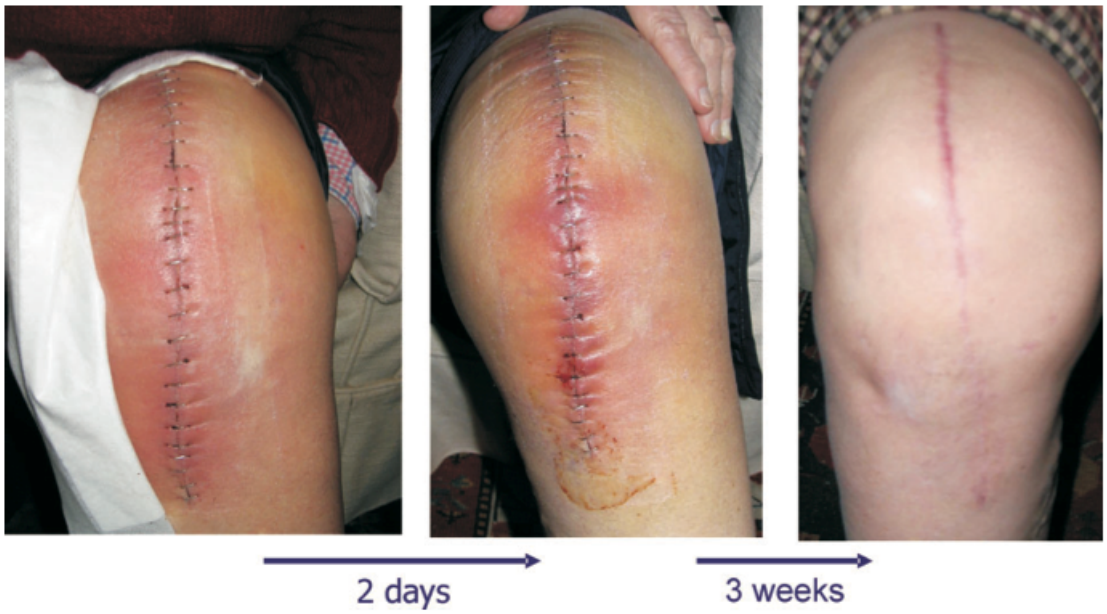

Figure 4: Healing of Knee Post-surgery Fall.
Patient post knee replacement surgery fell on knee. A summary of Fenzian treatment over 3 weeks is shown. (Colthurst & Giddings, 2007)

knee. Due to the severity of this fall the replacement would have been replaced, but the patient had Fenzian treatments performed. Over a period of 3 weeks the knee was fully healed. This saved the patient from having another surgery done. The fifth case (Figure 5) involved a man with very bad ulcers on his ankle. He was told that foot needed to be

Figure 5: New blood vessel formation observed after 9 Fenzian treatments (Colthurst & Giddings, 2007)

amputated and came to the clinic as a last resort. After 9 Fenzian treatments the ulcers had completely disappeared, and there was new blood vessel formation where the ulcers

had been. The sixth case (Figure 6) involved a soccer player who had lost the cartilage in the medial compartment in his knee. He began Fenzian treatment in late December of 2008, and there was new cartilage growth within 3 months of treatment. This variety of different cases and extremes is great evidence towards the validity of Fenzian treatment and its progression (Colthurst, Discussion on the Fenzian Unit, 2014)(Colthurst & Giddings, A retrospective case note review of the Fenzian electrostimulation system: a novel non-invasive, non-pharmacological treatment, 2007).

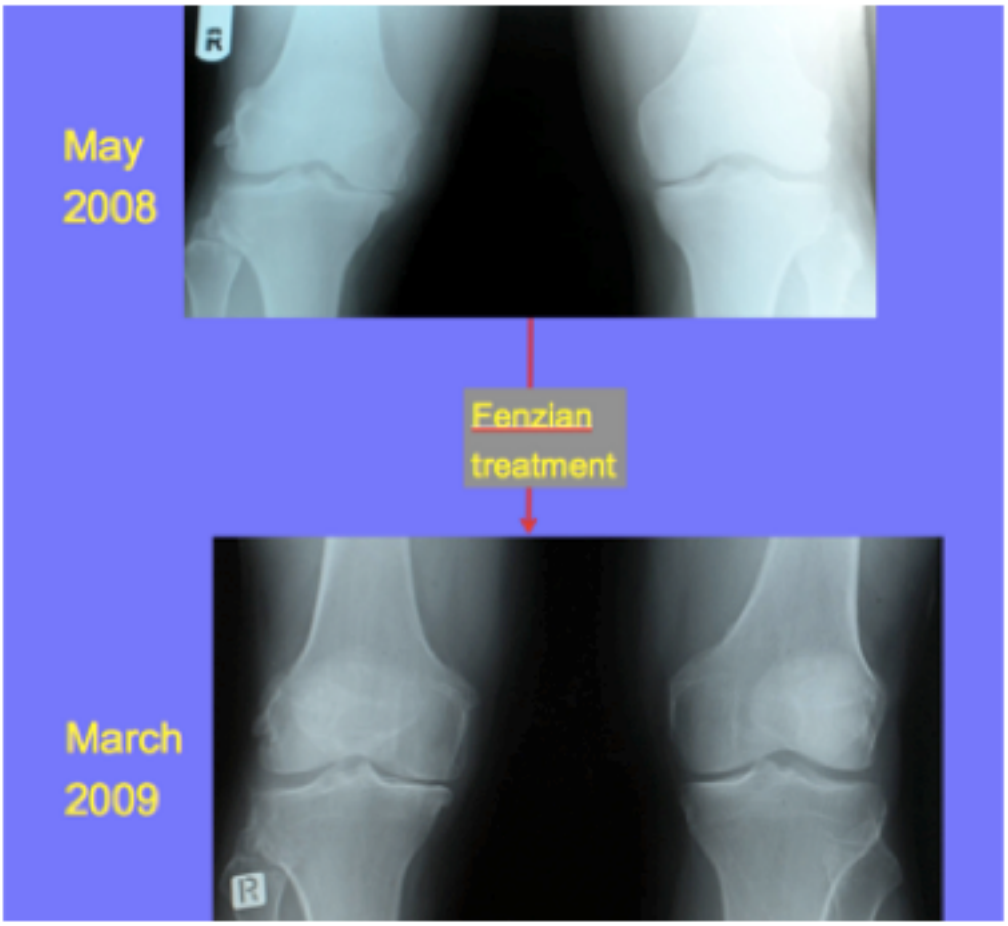

Figure 6: Re–growth of Cartilage in Medial Compartment of Knee (Colthurst, "Discussion on the Fenzian Unit," 2014)

A shared case study from another doctor using Fenzian had unbelievable results. A Mrs. VW was diagnosed with pneumonitis in 1986. The pneumonitis proved

unresponsive to antibiotics; she also had migrating arthritis. When the doctor first saw systemic lupus erythematosis (SLE), which is an autoimmune disease where different tissues of the body are attacked by the body's own immune system**, s**he was given high dose steroids. These helped suppress her illness, yet they caused some side effects. She had periodic relapses of SLE, and endured through each manifestation of the disease including poly–arthritis, pleurisy, pericarditis, nephritis, and conjunctivitis. Along with SLE, she experienced incidences of severe anemia and thrombocytopenia. SLE, as well as complications of drug therapy, caused her to be admitted to the hospital on an average of 4 times per year. She had been on different doses of corticosteroids since diagnosis in 1986, along with some non–steroidal anti–inflammatory drugs including azathioprine and methotrexate. Other drugs that she was prescribed include omeprazole to counter side effects of the steroids and fosamax for osteoporosis. She took calcium supplements along with multivitamins and minerals, and she counteracted her depression from chronic illness with sertraline and citalopram. She had many complications including oral thrush, Cushing's syndrome, peptic ulceration, and progressive osteoporosis. She needed several skin grafts due to squamous cell carcinoma. In 2003, she had to be in intensive care due to a perforated duodenal ulcer. A sinus developed from the ulcer to the uterus. She had other complications that occurred, but it was difficult to tell if it was side effects to the drugs, symptoms of SLE, or an intercurrent disease. Reducing the dosage of steroids yielded a decline in steroid toxicity and Cushing's, but this was not an option as the symptoms of SLE would flair up. SLE would continually flair up with various manifestations along with adverse side effects to the drugs. These were triggered by infections and sometimes lasted for months. She never had a full symptom free

remission, and thus had a poor quality of life. By 2004, her medication had increased, and she was house-bound and in constant discomfort. She was constantly fatigued mentally and physically. All treatment options had been attempted, in all combinations and doses. She began Fenzian treatment in March of 2004. She was treated every second day on her back and on the inflamed joints. Each area was treated for duration of 20 minutes. After a few weeks, the treatment was reduced to once very two weeks. She was weaned off of the anti–SLE medication, and the symptoms of Cushing's disappeared. She showed signs of increased energy and an impressive increase in quality of life. She became active again and stopped taking her depression medication (Colthurst, "Discussion on the Fenzian Unit," 2014). This case study is just one of the incredible stories associated with Fenzian.

There are many other success stories involved with the Fenzian unit. A big proponent of Fenzian has been the NBA. Todd MacCulloch suffered from the neurological disorder Charcot–Marie–Tooth while playing on the Philadelphia Seventy–Sixers. This caused him pain while walking. Since treatment began, he has had much less pain and his symptoms have decreased (Donnellon, 2005). Steve Nash of the Phoenix Suns heard of Fenzian through Todd MacCulloch, and he received treatments for many different painful injuries. He claims, "Fenzian dealt with my old nagging painful conditions and the immediate reduction of pain and discomfort of the acute conditions to my ankles, legs, and upper body." Nash's teammate, Kurt Thomas, had this to say about Fenzian, "Fenzian has me feeling better than I have in many years" (Lichtman, 2014). Richard Midgley, another professional basketball player, played for the BBL. Midgley said in an interview, "as soon as I went out on [the] court the knee would kill me." He was referred to Fenzian treatment for his tendinitis while in California. Midgley has been

back playing basketball without pain since treatment with Fenzian ("Basketball: Midgley to consider retiring," 2007). Dave Roberts of the San Francisco Giants has used Fenzian since 2006 for pain relief from workouts and injuries. Dr. Corey Lichtman is a chiropractor that utilizes the Fenzian unit. He has treated many professional and semi–professional athletes. Dr. Lichtman treated Nathan B. of the San Diego Thunder after Nathan suffered a UCL tear during practice. He recovered in half the time and did not even require surgery. Fenzian is not only involved in the professional sports world, but it is also used to treat regular patients. Heather C. raves, "WHAT A MIRACLE DEVICE!" She was unable to work out due to shoulder pain, but after fewer than 10 Fenzian treatments she is virtually pain free and able to return to her regular schedule (Lichtman, 2014).

Fenzian has not only been used with humans, but animals can be treated as well. The use of Fenzian in specialized veterinary clinics may be an option for the future. Fenzian can help with musculoskeletal related injuries in animals. Dogs can tear muscles and tendons in their legs, which could be treated with Fenzian to ensure a fast, safe healing process. Horses with injuries to the ankles tend to be euthanized, as there is no way for them to remain laying down for extended periods of time. Physical therapist Paul Spadino has treated a hunter-jumper horse with ankle tendon injuries. Some other horse injury conditions treated include scar tissue build up and shoulder injuries. They showed increased signs of recovery with the treatment, and their regular mobility returned (Spadino, 2014).

Published Literature

The Fenzian device has been studied a significant amount for the time period that it has been available. A few focused studies include how the degenerate wave (DW) of Fenzian effects things like osteoblasts, collagen I fiber, mesenchymal stem cells, blood flow, haemoglobin levels, and asthma (Griffin, 2014)(Griffin, Iqbal, Sebastian, Colthurst, & Bayat, 2011). In a study done by S. Griffin, DW was seen to increase differentiation in osteoblasts, as well as increase synthesis of collagen I fiber by up–regulating gene expression (2014). The effect of different electric stimulation including DW on bone marrow mesenchymal stem cells (BMMSCs) was studied. BMMSCs are crucial in the healing of fractures. It was found that out of all waves tested (direct current, pulsed electromagnetic field, DW, and capacitive coupling), DW had the greatest proliferative and least apoptotic and cytotoxic effects. Under DW influence BMMSCs were seen to invade collagen with a larger expression than normal. It was determined that treatments with DW on fractures may increase the rate of recovery and healing (Griffin, Iqbal, Sebastian, Colthurst, & Bayat, 2011). In order to test this a short experiment was established.

The effect of DW on acute cutaneous wounds was studied. Twenty volunteers had a biopsy performed on their right arm at day 0 and their left arm at day 14. DW treatment began on day 14 on both arms, and the wounds were analyzed objectively throughout. This studied the effects of DW on old wounds and fresh wounds. DW was shown to speed up the healing process, which is evidenced by enhanced angiogenesis, reduced inflammation, and advanced remodeling stages. An increased number of the cytokine Interleukin–10 (IL) was found in ESD14, the cells of study. IL–10 inhibits inflammatory cytokines such as IL–1, IL–6, and IL–8, as well as the migration of macrophages and

neutrophils to the injured area. This suppresses the swelling and pain of inflammation. Sebastian describes Krt17 being a marker for completion of re–epithelialization and inflammation. Neuropeptides are known to affect the activity of inflammatory cells, so it is suggested that the DW directed by Fenzian treatment is stimulating these neuropeptides. During the healing process, granulation tissue, which consists of new blood vessels and connective tissue, is laid down. Type I collagen is seen to increase expression as the granulation tissue is replaced with neo–dermis (Sebastian, et al., 2011). A similar procedural study was conducted using DW to treat punch biopsies on volunteers. DW was found to increase blood flow and haemoglobin levels to the area of treatment without causing a change in the time of wound closure. It is suggested that DW may heighten acute cutaneous healing (Ud-Din, et al., 2012).

Scar tissue. One specific item that is commonly treated with Fenzian is scar tissue. Scar tissue can be a big problem, whether it is in a joint or on the skin surface causing keloid fibroblasts. A study tested different electrical stimulation (ES) including DW on the collagen expression of normal and keloid human fibroblasts. Keloids were chosen for study due to their high collagen I production. Treatment of normal and keloid fibroblasts with each type of ES yielded collagen I upregulation in lower electric fields. When the electric field strength was increased, DW was seen to down regulate collagen I expression in keloid fibroblasts. With this field strength, DW also showed low cytotoxicity to normal fibroblasts in comparison to the other ES. This leads DW to be suggested as a treatment option for those with keloid disease (Sebastian, Syed, McGrouther, Colthurst, Paus, & Bayat, 2010). The positive results of DW were combined with positive results from photodynamic therapy (PTD), a therapy that treats malignant

areas on the skin using a cream (photosensitizer) that becomes toxic once treated with direct light, as a follow up study. PDT and DW were used in conjunction in an attempt to enhance the effects on keloids that each individually cause. This combination therapy is suggested to be more effective (Sebastian, Ernest, Allan, Colthurst, & Bayat, 2011).

Asthma. A surprise discovery for the Fenzian is the treatment of asthma. It was originally discovered when patients who were receiving Fenzian treatment for a separate condition also experienced a reduction in their asthma symptoms. Dr. Colthurst proposes, "biofeedback might influence bronchial smooth muscle constriction or perception of asthma control" (Cooper, Boscardin, Colthurst, & Kleerup, 2008, p. 516). This is a great breakthrough for the progression of Fenzian. Three clinical studies have been established throughout the world to gain data so the FDA may add asthma to the list of approved uses of Fenzian for treatment in the future ("Welcome to Fenzian," 2014).

A valuable research project done by Dr. Cooper shows some promise in treating asthma with Fenzian. Cutaneous electronic stimulation (CES) via the Fenzian unit was included with normal asthma treatment over the period of 6 weeks. This study used 20 subjects between the ages of 18 and 65 that had mild-to-moderate persistent asthma for 3 months or more. Each subject used a short-acting bronchodilator, or rescue inhaler, 4 or more days in a period of 2 weeks. Subjects were treated with CES 14 times over a period of 6 weeks. Ten of the subjects were treated with an inactive device. A double blind was established to eliminate biases. Neither the personnel performing the treatment nor the subjects knew who was given the actual treatment. The Asthma Control Questionnaire (ACQ) was given to each patient to determine asthma control, symptoms, and quality of life (Figure 7). Subjects who were given treatments with the actual unit produced a better

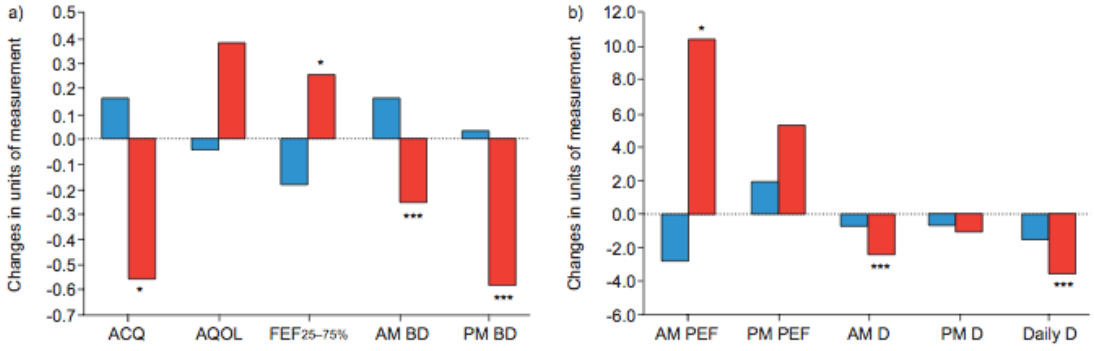

Figure 7: Changes in key outcome measures with sham (blue) and FenzianTM (red) treatments. FenzianTM is manufactured by Eumedic Ltd (Hungerford, UK). ACQ: Asthma Control Questionnaire (a reduced score indicates improvement); AQOL: Asthma Quality of Life; FEF: forced expiratory flow between 25 and 75% of forced vital capacity (L?s–1); AM BD: morning bronchodilator use (puffs); PM BD: afternoon bronchodilator use (puffs); AM PEF: morning peak expiratory flow (L?min–1); PM PEF: afternoon peak expiratory flow (L?min–1); AM D: morning dyspnoea score; PM D: afternoon dyspnoea score; Daily D: daily dyspnoea score. *: p,0.05; ***: p,0.001. (Cooper, Boscardin, Colthurst, & Kleerup, 2008)

score with the ACQ post study, while those treated with the inactive device had a worse ACQ score post treatment. The evidence of this study proposes that "CES with Fenzian might offer a novel alternative to conventional pharmacotherapy in patients with mild persistent asthma." The mechanism behind this is still unknown, yet it most likely involves a neuropeptide signal for the bronchial smooth muscle to relax due to the electro–biofeedback of Fenzian (Cooper, Boscardin, Colthurst, & Kleerup, 2008).

A study in Barbados was performed as further research to the one previously mentioned. Barbados is a good place to perform a study on asthma, since 13 percent of emergency room visits are due to asthma. Many in the area of Barbados are nervous about side effects of long–term medication use. Because Fenzian is a non–invasive, symptom-free therapy, it is very marketable in this area ("New Asthma Study," 2013, par. 2). Subjects that were diagnosed with asthma were treated with Fenzian 16 times over 4 weeks. An assessment similar to an ACQ was given to subjects to monitor treatment. There were a total of 10 subjects with asthma in this study. Quality of life and

asthma control showed improvements, and 90% of the patients said that their asthma symptoms had decreased. Post–treatment assessments were taken one month later, and lung functions showed signs of improvement (Diette, et al., 2012).

Conclusion

In conclusion, modalities are a crucial part of PT that can greatly influence the rehab of a patient. With new modalities such as the handheld Fenzian unit, the opportunities for quick, easy, and painless treatment are beginning to become available. The progression of this device is imperative to not only the field of physical therapy but also the entire medical community. The mass amounts of various treatments that are available at a low cost and without adverse effects could revolutionize the way health care is done. My only fear is that because it is such a low cost to treat clients, the executives of the industry will attempt to make it an “alternative medicine” to keep profits high. The clinical studies presented so far make a good case for the validity of the device, and with this support Fenzian can become a more commercialized product.

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