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A major effect of MicroVas treatments is the stimulation of muscle. The electrical waveform directly depolarizes the muscle cells causing them to contract. There is also depolarization of the motor nerves which in turn depolarize the muscles through the motor end plates. It is felt however, that the major effect is through the direct depolarization of the muscle cells. Many of the effects from MicroVas treatments are from simulating muscular exercise. Before considering these effects, consider for a moment what actual exercise does in the body in the terms of stimulating healing, repair and remodeling.

The Healing Effects of Aerobic Exercise

Aerobic exercise such as walking consists of repetitive muscle activity with increased blood flow. Heart and lung function is increased. Arterioles in the capillary beds dilate causing increased blood to pass through the capillary beds, some of which was shunted around the capillary beds when at rest. Muscles pump blood through the venous beds more rapidly. Oxygen levels rise in the tissues as a result of the increased blood flow. Endorphins are released in the spinal cord which promotes a sense of well being while exercising and later cause the release of greater amounts of HGH (Human Growth Hormone) while sleeping. HGH in the circulation is then metabolized by the liver into TGF2 (Tissue Growth Factor 2) which in turn accelerates healing, repair and strengthening in the muscles, as well as bones and connective tissue. Nitric Oxide is increased in the arteries which promote dilation and stimulate the remodeling of the circulation. Nitric Oxide is a gas and is able to diffuse throughout the tissues as it is about the size of an Oxygen molecule. The sum of these effects is to cause healing, strengthening and remodeling throughout the entire body including the musculoskeletal system and the organs. That is why exercise is fundamental to preventing many degenerative diseases.

The Healing Effects of Anaerobic Exercise

Anaerobic exercise such as weight lifting or isometrics, generates many of the same benefits that aerobic exercise does but there are a few notable differences. Because anaerobic exercise is not accompanied with a large movement of blood through the capillary beds yet the metabolic demands are high, the partial breakdown of glucose to lactic acid occurs. The buildup of lactic acid in the muscles triggers a cascade of chemical signals to accelerate remodeling of the circulation to increase its capacity to deliver oxygen and nutrients. Angiogenesis is stimulated in the capillary beds. Arteries and veins are stimulated to enlarge increasing collateral pathways. The contraction of muscles under anaerobic conditions causes the muscles to trigger a marked increase in Nitric Oxide. Currently the thought is that anaerobic exercise increases levels of Nitric Oxide more than aerobic exercise. This is why weight lifting can cause such marked changes in the size, strength and tone of muscles. Creatine is released in the muscles which promote strengthening and remodeling. Endorphins elevate and HGH is stimulated even more so than with aerobic exercise. Most good exercise routines combine both of these types of exercise since they are complementary for a good overall conditioning program.

MicroVas Therapy Simulates Aerobic and Anaerobic Exercise

So what is MicroVas actually doing through muscle stimulation? The waveform that MicroVas

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uses is a biphasic square wave of short duration with a duty cycle of 4 seconds, that is, 2 seconds on, 2 seconds off. The effect on the muscles is to cause a corresponding contraction and relaxation cycle when the pads are placed over the major muscle groups such as the extensors and flexors of a limb. This cycling simulates aerobic exercise and pumps blood through the venous beds. Oxygen levels in the tissues rise within minutes of the onset of the treatment and have been measured using transcutaneous oxygen probes. Many of the healing and remodeling effects of aerobic exercise have been observed to occur with MicroVas treatments.

In addition to the simulation of aerobic exercise the biphasic square wave causes muscle fasciculation. The fasciculation causes portions of the muscle to randomly contract to nearly their maximum tension and relax. This simulates isometric exercise such as weight lifting but since the muscle is not contracting in bulk and the flexors and extensors are contracting at the same time there is no significant net movement of the limb. This anaerobic exercise apparently stimulates significant amounts of Nitric Oxide production in the limb as the observed effects of the treatment far outweigh what the expected results would be for a low impact aerobic exercise program alone. MicroVas treatments simulate aerobic and anaerobic exercise at the same time. Elevated Nitric Oxide levels vasodilate the circulation while the pumping action unloads the venous beds and increases the pressure gradients across the capillary beds. The result is a rapid and marked improvement in tissue oxygen and nutrient levels in patients with conditions of severe vascular compromise. Impairment in circulation of course is the underlying cause of many of the conditions for which MicroVas treatments are used. The generation of Nitric Oxide and its diffusion throughout the tissues is a main reason that MicroVas electrical stimulation is given not only to the area that is being treated but also to major muscle groups proximal and distal to the area whenever possible. The major muscle groups are treated with pads on the extensors and flexors at the same time.

The Importance of MicroVas Therapy for Severe Deconditioning

Since the most significant effect of MicroVas treatments is the simulation of exercise and since exercise is essentially what many patients need, the question may be asked; why give MicroVas treatments? Why not just encourage patients to exercise their way to health on their own? The answer gets to the core of the reason to use Microvas therapy and its greatest need. When a person is young to middle aged they can stay healthy, vigorous and active by regularly exercising. As a person ages, for a variety of reasons including the stress of exercise itself, fatigue, joint pain etc. they give up a more active life and exercise routines and become more sedentary. Obesity, low thyroid, hypertension and various other cardiovascular and degenerative conditions settle in until patients feel as if their body protests when they are doing any level of activity even walking. Patients are in a vicious cycle, they need to exercise to slow down the degeneration while exercise causes such discomfort that they won't do it. It is a significant milestone along the way on this downward spiral when a patient stops walking and becomes chairbound or dependent on a scooter to get around. Walking provides the minimum level of stimulation to the body to direct it in the processes of maintaining all the structures and systems. When a patient ceases to walk, an escalation of degenerative processes occur that eventually lead to death. Additionally there is a marked increase in the cost of healthcare for patients between the time they stop walking and die. So it is very important to keep patients active and walking as long as possible for their quality of

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life among many other reasons.

MicroVas treatments can help people who have recently stopped walking or on the verge of stopping by promoting circulation, healing and strength in their legs. Here is the typical American patient scenario; they have obesity and diabetes which brings on peripheral neuropathy causing deterioration in their gait and balance. This is often coupled with degenerative joint disease in the hips and knees which makes walking painful. The patient fears falling, uses walking aids for awhile and walks as little as possible. Their legs become weak from the lack of activity and they have difficulty getting out of a chair. Soon they are using a scooter. The problem with telling these patients to exercise is that it won't happen, they will just deteriorate.

MicroVas treatments are very effective in beginning the reconditioning necessary to help patients resume an active ambulatory status. When patients receive MicroVas treatments their level of exertion is low. They generally sit in a chair and experience only small movements of their limbs. Since the treatments are "non weight bearing", they don't have the issues they would have with walking or using a treadmill. The patients experience improved strength and balance at the same time through the response of the muscles and nerves.

Principles of Application

Because of the benefits of recruiting large muscle groups in promoting healing and the effects upon the circulation, it is important to treat large muscle groups proximally and distally to the area of concern whenever possible. For example; if you are treating a knee problem you will place pairs of pads over the knee, thigh and calf. In addition the pads should be placed over the flexors and extensors to stimulate them at the same time. The largest pads possible for the muscles being stimulated should be used. There is one exception to this; If the patient is very large, that is, has a thick layer of adipose under the skin, the machine may be maxed out with the settings at "10" without obtaining full muscle fasciculation. This is because the machine cannot maintain a high enough current density when there is such a large pathway for the current to travel through the limb. When this occurs choose the next size smaller pad and place it transverse to the center of the muscle body to concentrate the current and stimulate as many of the muscle fibers as possible. The stimulation does give the muscles a workout and may cause the patient to experience moderate muscle soreness after the treatment if they are markedly deconditioned. When giving a treatment the intensity should not be turned up to the point that it is painful, but should be high enough to cause as much muscle contraction as can be tolerated. This muscle soreness usually stops after a few treatments. As exercise would do, the muscles increase their tone and strength over a series of treatments. The patient should also be started on a regular exercise program when they begin the MicroVas treatments. Of course regular exercise and MicroVas treatments are synergistic. Their capacity for regular exercise will be initially severely limited but will increase quickly as they receive the MicroVas treatments. One of the best exercises a patient can do to get overall conditioning and still be non weight bearing is swimming.