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The Direct Bactericidal Effect of Electric Current

A major problem encountered in wound care is colonization of the wound with a mixture of benign skin bacteria and pathogens. This is encountered whenever the wounds are deeper than the skin. This problem is independent of the cause of the wound, which may be due to trauma, infection, diabetes, arterial insufficiency or venous insufficiency. Before epithelialization can take place over the wound a granulation base must form. The granulation tissue progresses in step with neovascularization of the wound base. The granulation tissue also contains many undifferentiated cells, which eventually transform into the many cell types and structures necessary to reconstruct the wound area. While this process is going on with the development of the granulation base, skin bacteria and pathogens move in and inevitably colonize the wound surface. If the bacteria stay on the wound surface it is not a problem. If they invade into the newly forming granulation tissue an unhealthy inflammatory response sets in causing tissue necrosis. Wound healing is often a delicate balance between growth and death of new tissue necessitating the use of such antibacterial agents as Silvadene cream and debriding agents. When the bacteria colonize within the granulation tissue it becomes disorganized on the cellular level and fails to progress in the differentiation and reconstruction activities. It becomes what is commonly known as “Proud Flesh”. If this occurs debridement must be done to remove this granulation tissue gone awry along with any necrotic tissue that has formed. The wound healing process can be set back substantially.

MicroVas treatments are very effective in aiding the process of wound healing because the electrical currents have been found to have a direct bactericidal effect in the wound base. How this occurs is not well understood. It is possibly due to the effect electric current has on the cell membranes of bacteria in forming ionized extracellular substances and disrupting the transmembrane transport of vital substances for the bacteria. At the same time the various cells of the body do not appear to be stressed or inhibited by the electric currents, rather they appear to thrive in them accelerating their growth rate and activity. The bactericidal properties have been recognized in several other electrical therapy devices developed over the past few decades, so this effect is not new or unique to MicroVas.

Treating the granulating base with MicroVas therapy appears to keep down the bacterial load in the wound and prevents the undesirable colonization throughout the granulation tissue that often results in tissue necrosis and the formation of the undesirable infected proud flesh. There is much less “slough” formed due to less tissue necrosis. Debridement is required much less often. These are all great benefits for the caregiver battling with the difficulties in healing wounds in patients who are weak and debilitated and prone to repeated setbacks. Good wound care techniques are still required because as the capillaries bud and grow in the granulation tissue they leak high protein content serosanguinous transudates which must be removed with absorbent dressings. Otherwise these transudates will form excellent culture media for bacterial growth and increase the bacterial load in the wound. MicroVas treatments can help keep the granulating base healthy by placing a pad directly over the wound using the “wet pad setup” and keeping the current at a gentle setting because of the sensitivity of the regenerating nerves.

The Bactericidal Properties of Nitric Oxide

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Nitric Oxide production by muscle activity as discussed under muscle stimulation is very beneficial to kill bacteria. Nitric Oxide is a gas similar in size to Oxygen and rapidly diffuses throughout the tissues when generated by large active muscle groups such as the quadriceps. Nitric Oxide is toxic to bacteria. Depending on the level of the gas in the tissues, it will inhibit their growth or kill them. Nitric Oxide is also generated by White Blood cells to kill bacteria in addition to hydrogen peroxide and other superoxide radicals. Because of this effect the control and resistance to infection is increased throughout the treated limbs during a course of treatments. To take advantage of this effect of Nitric Oxide to inhibit bacterial activity, many large muscle groups should be treated on the patient at the same time. For example; any infected condition in a leg that is treated with MicroVas should be treated bilaterally with all major muscle groups from thighs to feet.

Augmenting the Effectiveness of Antibiotics

When dealing with difficult infectious conditions the standard of care today is to use potent antibiotic regimens. These expensive and powerful antibiotics have been designed to have a high bactericidal rate at moderate tissue concentrations. They have been designed to penetrate the tissues readily and are usually given intravenous for maximum effectiveness. Sometimes agents are added such as Clavulanate to inhibit the antibiotics excretion and maintain higher sustained tissue concentrations. Some parts of the body can be difficult to penetrate in spite of this. These include bone, abscesses and the central nervous system. MicroVas treatments can greatly augment the effectiveness of antibiotic therapy in many difficult cases. MicroVas treatments increase the perfusion of blood in the tissues. They do this through pumping and vasodilating the circulation. Increased perfusion in turn achieves higher tissue levels of antibiotics and a more rapid and decisive response to therapy. Amazingly good outcomes can occur when combining MicroVas treatments with standard care for a variety of infectious conditions.

Deep abscesses in the body can be decisively improved in their course by initially draining them in the standard fashion, placing the patient on appropriate antibiotics and treating them with MicroVas daily for a week. The abscessed area should be treated directly and the regional area treated as well.

Cases of Osteomyelitis are usually difficult to resolve and often require extended courses of antibiotics up to 4 weeks. The bone when it is broken down by the bacteria forms a sequestrum which behaves similar to an abscess and becomes difficult to penetrate with antibiotics. Sometimes the infection will return after a few months because it was never fully eradicated even though an extended course of antibiotics was given. MicroVas treatments help antibiotics penetrate the bone and greatly improve the outcomes. The author has seen several patients with conditions of chronic recurring Osteomyelitis that had received multiple rounds of antibiotics over a period of time as long as 10 years with repeated failures finally resolve with a course of MicroVas treatments.

Septic joints are another infectious condition that can be greatly improved in their response through MicroVas treatments combined with appropriate antibiotics. Again, MicroVas treatments can aid in the penetration of antibiotics into the joint space. MicroVas treatments can decrease the septic destruction of the joint structures that usually occur to some degree in these cases. Septic

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destruction usually leads to some degree of lifelong arthritis in the joint.

Boosting Tissue Immunity with MicroVas Therapy

There are many diseases where the tissue immunity- the ability to resist bacterial infection is greatly reduced. A prime example is Diabetes. These infections often begin with a rather innocuous event such as a minor scrape or puncture to the skin. This then becomes a serious infection because the tissues are not able to respond to the challenge appropriately. Underlying this problem can be circulatory insufficiency, tissue hypoxia or various metabolic stresses such as diabetes. The more co morbidities a patient has, the more the tissue immunity may be compromised. Because MicroVas treatments promote such basic things as circulation and increased oxygen levels as well as metabolism, many cases of infection associated with non-healing wounds will resolve with MicroVas treatments where they would not otherwise.

MicroVas treatments for Dog, Cat and Human Bites

MicroVas treatments can be helpful for wounds contaminated by bacteria such as bites by humans, dogs and cats. These wounds tend to be inoculated with a high load of various pathogenic bacteria. Standard methods to clean and debride these wounds should be used followed by one or two MicroVas treatments. The bactericidal effect of the treatment in combination with the increased blood perfusion and oxygenation can help reduce the bacterial load and greatly reduce the incidence of infection.

Chronic Inflammatory states associated with bacterial colonization

Chronic Sinusitis is a condition that is associated with inflammation and swelling of the sinus tissues, obstruction of the ostia that communicate with the nasal passages and overgrowth of bacteria that colonize the sinuses. With the advent of CT scans chronic sinusitis has been found to be far more prevalent than previously thought, many people have been found to have it when they did not know they had it. Chronic sinusitis can be associated with nose congestion, polyps, chronic allergies, headaches and facial pain. MicroVas treatments can reduce the bacterial load and inflammation in these conditions and bring about a resolution of the problem. MicroVas treatments can be used alone or, when there is an acute infection present, MicroVas treatments can be given in combination with appropriate antibiotics for a rapid resolution of the problem. Other chronic inflammatory states associated with bacterial colonization can also be treated with MicroVas with an expected similar improved outcome.

Principles of Application

Several of the effects of MicroVas treatments mentioned above come from regional treatment, that is treating areas bilaterally and distal and proximal to the actual area being treated. These include generating Nitric Oxide in the tissues, increasing tissue perfusion to enhance the effects of antibiotics and boosting tissue immunity. The standard pad setups are followed for these.

The other benefits mentioned above are obtained by treating the area directly. These benefits

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include the bactericidal effect on healing wounds, augmenting the effectiveness of antibiotics, treating bones, joints, abscesses, bites and chronic inflammatory conditions. Joints are best treated by placing a pair of pads on opposite sides of the joint to generate the largest electric field while minimizing the interference of other non treated structures. For example: Treat the knee with a medial and lateral placement to avoid the patella. Treat the elbow with an anterior posterior position since there is more room to generate a larger diameter electric field through the joint.

When doing direct treatments on wounds it is best to use a wet pad setup and place a pad that is large enough over the wound spanning the edges of the surrounding skin. The mate of this pad does not have to be a wet pad if there is a good location for a gel pad to be placed on the opposite side of the limb. If Silvadiene cream is present on the wound it should be removed before doing the treatment as the MicroVas treatments can act as an iontophoresis treatment and push the Silvadiene into the circulation. An alternate pad positioning which is not quite as effective is to place a pair of pads on each side of the wound as close to the edge as possible to achieve an effect through the wound.

Treating the sinuses would consist of 4 small 2x2 inch pads placed over the maxillary and frontal sinuses with their paring across the nose. Treating any other small area would follow the same principle of using pairs of pads sized for the area with preferentially placing pads on opposite sides of a limb or area to generate an electric field through the area or if this is not feasible, placing pads side by side across the area being treated with a space between pads equal to the size of the pads to allow an electric field to properly form across the area.