



The Institute of Regenerative & Molecular Orthopedics

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The Application of DC Micro-current Stimulation in conjunction with PRP and Adult Stem Cell injection Therapy

Does electricity make a difference for stem cells? We have been intrigued by electricity and its use in the body for centuries. I first became aware of the use of electricity in the field of stem cells because bone stimulators, DC Stimulators for wound healing, etc.. Dr. Carl Brighton and Dr. Hungerford performed research at the University of Pennsylvania on bone healing. Dr. Brighton initially taught us the concept of electrical stimulation will cause bones to heal which typically were slow to heal. The mechanism of action for this stimulation involves turning on certain genes in chondrocytes and increasing the cell wall permeability of the chondrocytes.

What does this all mean, well first of all the chondrocytes are those cells that produce cartilage that is found on the ends of the bone. The cartilage acts as a shock absorber and allows our joints to glide smoothly. We develop osteoarthritis when the cartilage becomes damaged. When the cartilage is damaged than joint begins to hurt and the function is diminished. We now have an osteoarthritic joint that causes pain, swelling and somewhat disables the patient. The reason why the joint becomes damaged is that the chondrocytes have lost the ability to repair the damage. As we become adults the genes of the chondrocytes become silenced. A silenced gene is a gene that at one time was functional but at reaching a certain age the gene is programmed to stop functioning. When the gene stops functioning damages continues to accumulate. We know if the gene can be turned back on the chondrocytes might than try to repair the damage. The trick is to get the genes to turn back on. We know that adult stem cells can affect chondrocyte genes in that they can recruit the chondrocytes to accomplish repair work.

We are currently utilizing knee sleeve like legging and a DC stimulator, the Micro-Z Mini made by Prizm Medical. It is not designed per se to support the joint but encase the joint in a micro DC electrical field. The sleeve has silver fibers throughout the fabric. These silver fibers conduct a micro electrical DC current around the joint. These sleeves are described as a pacemaker for microcirculation around the joint. In the past, electro therapy has been difficult to administer because of a lack of precision in where to apply the electrodes and a loss of conductivity over a period of time.

Research shows that the micro-amperage delivered falls precisely within the narrow "biological waveband " of the body's electromagnetic energy. These sleeves do not mask the pain but instead the micro DC amperage electrochemically fuels the body's natural healing mechanism. This is done in a variety of ways including improving cell function and increasing microcirculation to the involved area. The good thing about these knee sleeves is that they come in several forms including gloves, sleeves, stockings with new ones being developed all the time including ones for the shoulder and hip.

The interesting fact that drew my attention to these stimulators is the fact that much research has been done with them in regards to diabetic wounds. What I noticed was that the results with diabetic wounds were similar to what was seen with stem cell injections. The wounds would heal dramatically quicker than would otherwise happen. When studying the effects on DC current on the body we see many of the same phenomena that occur with stem cells and PRP injections. We see an increase in one of the most important growth factors, which is called VEGF, or vascular endothelial growth factor. This growth factor is extremely important in that it helps establish a blood supply. Think of stem cells

as an advancing army. Like any army supply lines are needed. In this case the supply lines are the blood vessels. VEGF helps to establish this supply by causing angiogenesis or the formation of blood vessels. Logic says that something that increases growth factors is a good thing. Growth factors attract stem cells and cause stem cells to become more active and help them actually recruit other cells to help in the repair process. This DC stimulation certainly does this. Also the DC Stimulation increases microcirculation to the area. Other studies have shown an increase of approximately 500% in ATP production. ATP is what gives the cells energy. If we can increase ATP production we will increase healing by allowing cells to be healthier and more efficient. When ATP production is down, cells age more rapidly and may simply die from the lack of mitochondrial function. The same studies show that the DC current at >500uA greatly enhanced amino acid production and protein synthesis. Amino acids and proteins are the building blocks of the body and repair cannot occur without them.

The other intriguing aspect of the Micro-Z Mini DC stimulator is that it is mainly used at night while one is sleeping. The human body goes into a natural state of healing when it is in a sleep cycle. The body produces 70% of its growth hormone during sleep. Fibroblasts are more active during sleep. When all these factors are taken together we start to see some significant improvement with the Micro-Z Mini stimulators. My experience with these stimulators so far has been excellent. They seem to make patients get better quicker. I have used these products on a number of professional athletes with excellent results. It dramatically speeds up their recovery from an injury. The reason for this is that the stimulator is increasing circulation and stem cells locally to the area. In this case we are not just talking about joint injuries but soft tissue injuries as well.

I feel that these Micro-Z Mini stimulators are going to become a significant part of Regenerative Medicine. It appears that these stimulators will enhance stem cell performance with essentially no risk to the patient. Typically I have the patients use these braces overnight, but they can also use them during the day based on life style of the patient.

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