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Mohd. Maroof Siddiqui

Department of Electronics and Communication Engineering, Integral University, Lucknow, India,  
maroofsiddiqui@yahoo.com

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# Electronics Signal Help in the Treatment of Paralysis

<sup>1</sup>Mohd. Maroof Siddiqui

Department of Electronics and Communication Engineering,  
Integral University, Lucknow, India  
Email: maroofsiddiqui@yahoo.com

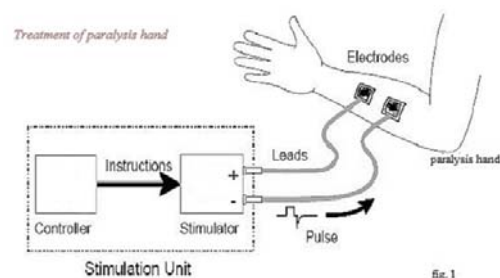
**Abstract:** This paper is designed to introduce the reader to how electronics signals (current) help in the treatment of paralysis patient. The electrical impulses are used to block the pathways of the transmission of pain, are passed on to the effected portion of the body through a pair of electrodes and excite the particular portion of the body. Any signal generated device excite the nerve of particular part of body called Stimulator. In this paper study of different type of stimulator will help in the treatment of paralysis. The material covered in this paper will assist the reader in knowledge of how the electrical current works as medicine and play a major role in diagnosis of the paralysis and know about the how to treat a paralysis patient.

**Keywords-** Causes of Paralysis, Electrical current work as medicine, Spinal cord Stimulator

## I. Introduction

**Paralysis** is loss of muscle function for one or more muscles. Paralysis can be accompanied by a loss of feeling (sensory loss) in the affected area. Paralysis is most often caused by damage in the nervous system, especially the spinal cord. Other major causes are stroke, trauma with nerve injury, poliomyelitis, amyotrophic lateral sclerosis (ALS), botulism, spina bifida, multiple sclerosis, and Guillain-Barre syndrome. Temporary paralysis occurs during REM sleep, and dysregulation of this system can lead to episodes of waking paralysis. Drugs that interfere with nerve function, such as curare, can also cause paralysis. Electronics signal can help in the treatment of paralysis, if give the small amplitude current in a particular portion of body it may work as medicine. The various types of stimulators are used for pain relief. The electrode impulses are used to block the pathways of the transmission of pain. The pulses are passed on to the electrical impulses are produced in a battery powered pulse generator. The pulses are passed on to the effected portion of the body through a pair of electrodes. The electrical impulses are applied to the skin overlying any painful area of body. The electrodes provide mild electrical stimulation these signals

abstract the pain signals travelling along the nerve pathways before they can reach the brain.



## II. Causes of Paralysis

**Paralysis** is a medical condition characterized by the inability to move one or more muscles. In most cases, a person experiencing paralysis also loses all feeling in the affected area. Paralysis may be temporary, depending on the cause. If it is the result of damage to the nervous system, it is usually consistent. Sleep paralysis, on the other hand, only affects a person during the time that immediately precedes sleep or immediately after waking up. There are many potential causes of paralysis.

The two most common causes of paralysis in the world are stroke and trauma, particularly to the nervous system or the brain. Certain diseases or afflictions, such as poliomyelitis, peroneal dystrophy, spina bifida, amyotrophic lateral sclerosis, Bell's palsy, Guillain-Barre Syndrome, and multiple sclerosis may also cause paralysis to occur. Botulism, paralytic shellfish poisoning, and certain types of poisons, particularly those that directly affect the nervous system, may also lead to paralysis. The precise type of paralysis a person experiences depends on the underlying cause. With Bell's palsy, for example, the paralysis is usually localized, which means it only affects a small area of the person's body. Typically, only one side of the person's face becomes paralyzed as the facial nerve on that side becomes inflamed.

When only one side of a person's body is affected, paralysis is considered unilateral. When it affects both sides, it is bilateral. A person who has experienced a stroke, on the other hand, may experience weakness throughout his or her body. This is referred to as global paralysis. Conversely, the person may only experience weakness on one side of his or her body. Medically, this is known as hemiplegia.

Generally, the most severe form of paralysis is caused by damage to the spinal cord. A person who experiences trauma in his or her upper spinal cord may develop quadriplegia as a result. A person who is quadriplegic is unable to move his or her arms and legs. Injury to the lower spinal cord may cause paraplegia, which results in either the legs or the arms becoming paralyzed

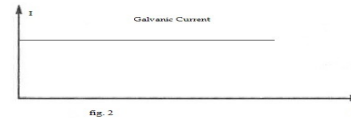
### III. Electrical Current work as Medicine

An exciting movement has taken place in the use of electricity to speed recovery from injuries and relieve pain by delivering very small amounts of electrical energy that facilitates the movement of ions in human soft tissue. The human body is basically made up of 67% salt water in which ions are transferred via electrochemical processes. When an injury or disease occurs, this normal process is disrupted. Low energy levels introduced effectively to the human body may facilitate the natural healing process. Electrotherapy is the treatment of patients by electrical means with the application of an electric current to stimulate a tissue in order to bring about physiological changes for therapeutic purposes for healing or restoring a lost function. Here electrical current work as medicine. Different types of electrical current are given below which are use in the treatment of paralysis:

#### i. Galvanic Current

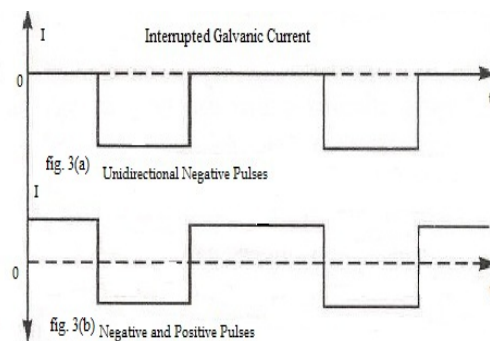
A steady flow of direct current (DC) is passed through the skin (tissue) producing a chemical effect used in treatment of paralysis and disturbance of blood flow. Galvanic stimulation is most useful in acute injuries associated with major tissue trauma with bleeding or swelling. Galvanic stimulators apply direct current. Direct current creates an electrical field over the treated area that, theoretically, changes blood flow. When a steady flow of direct current is passed through a tissue, its effect is primarily chemical. It causes the movement of ions and their collection at the skin areas lying immediately beneath the electrodes. The effect is manifested most clearly on a bright red coloration which is an expression of hyperaemia (increased blood

flow. In general, the intensity of the current passed through any part of the body does not exceed  $0.3$  to  $0.5$   $\text{ma}/\text{cm}^2$  of electrode surface. The duration of the treatment is generally 10-20 minutes.



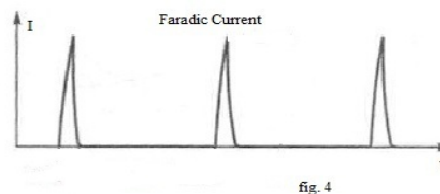
#### i. Interrupted Galvanic Current

Interrupted galvanic current is a series of negative rectangular pulses. Figure 3 (a) shows the unidirectional, interrupted galvanic pulses which create the ionization of the patient's skin and produces discomfort and inflammation. The discomfort is reduced by the application of a positive current, Figure 3 (b), in between the negative pulses and proportional to the time interval. That is, a charge balance is obtained.



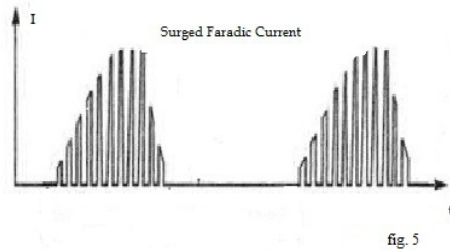
#### ii. Faradic Current

As shown in fig. 4, Faradic current is a sequence of pulses with a defined shape and current intensity. The pulse duration is about 1ms to 20 ms is used for treatment of muscle weakness. Faradic current acts upon muscle tissue and upon the motor nerves to produce muscle contractions. There is no ion transfer and consequently, no chemical effect. This may be used for the treatment of muscle weakness after lengthy immobilization and of disuse atrophy.



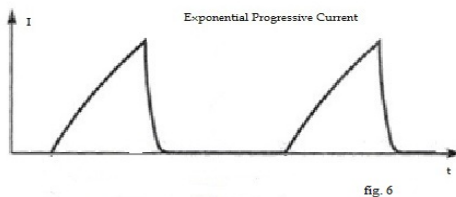
### iii. Surged Faradic Current

If the peak current intensity applied to the patient increases and decreases rhythmically and the rate of increase and decrease of the peak amplitude is slow, the resulting shape of the current waveform is called a surging current (fig.5). The main field of application of the faradic surge current is in the treatment of functional paralysis. This type of current is usually required for the treatment of spasm and pain



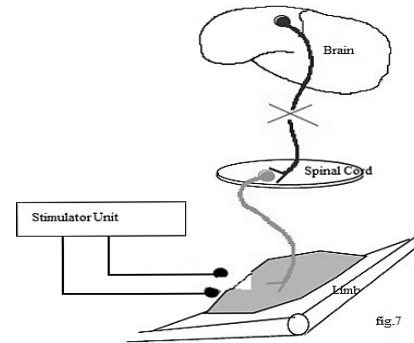
### iv. Exponentially Progressive Current

Exponential Progressive Current (fig.6) pulse used for the treatment of severe paralysis. The main advantage of this method lies in the possibility of providing selective stimulation for the treatment of the paralyzed muscles. With these kinds of pulses, the surrounding healthy muscles, even in the immediate neighbourhood of the diseased muscles, are not stimulated. The slope of the exponential pulse is kept variable.



## IV. Spinal Cord Stimulator

Spinal cord stimulation is provided by placing the electrodes close to the spinal cord for relief of pain. A spinal cord stimulator is a device used to exert pulsed electrical signals to the spinal cord to control chronic pain. The electrodes are placed close to spinal cord by surgery through skin. The applied electrical impulses develop an electric field in and around spinal cord, which then causes depolarization or activation of a portion of the neural system resulting in physiological changes.



The stimulus implant is a RF coupled type and the stimulus pulse frequencies ranging from 10 to 1500Hz, pulse width from 100 to 600 $\mu$ s and controllable amplitude from 1 to 15mA delivered into a load of 300 to 1500 $\Omega$ . Spinal Cord stimulation has been of great benefit to some patient with multiple sclerosis and other neurological disease. Implantation of stimulator/lead & electrode in back bone which see in below X-Ray Report.(fig 8)



## V. Bladder Stimulator

The bladder stimulators are useful when emptying of bladder is not possible due to urinary tract infection, paraplegia and chronic infection. A technique has been developed to activate the reflex by remote electronics stimulation of a permanently implanted spinal electrode, with the help of which paraplegic is able to empty the bladder completely without the use of a catheter. The two lead wires are flexible, silastic coated and are made of stainless steel and are connected to a receiver with a circumference of 3cm. The receiver is placed in the subcutaneous tissue on left or right side of patient's waist. The treatment for a bladder control problem depends on the cause of the nerve damage and the type of voiding dysfunction that results. In the case of overactive bladder, your doctor may suggest a number of strategies, including bladder training, electrical stimulation, drug therapy,

and, in severe cases where all other treatments have failed, surgery

**Bladder training-** A bladder diary a record of your fluid intake, trips to the bathroom, and episodes of urine leakage. This record may indicate a pattern and suggest ways to avoid accidents by making a point of using the bathroom at certain times of the day a practice called timed voiding. As you gain control, you can extend the time between trips to the bathroom. Bladder training also includes Kegel exercises to strengthen the muscles that hold in urine.

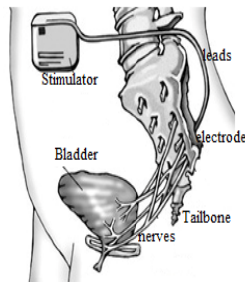


Fig 9 Bladder Stimulator

Mild electrical pulses can be used to stimulate the nerves that control the bladder and sphincter muscles. (See Figure 9 above - A device can be placed under your skin to deliver mild electrical pulses to the nerves that control bladder function.) Depending on which nerves the doctor plans to treat, these pulses can be given through the vagina or anus, or by using patches on the skin. Another method is a minor surgical procedure to place the electric wire near the tailbone. If you have this procedure, it will involve two steps. In the first step, the wire will be placed and connected to a temporary stimulator, which you carry with you for several days. If your condition improves during this trial period, then you go on to the second step. The wire is placed next to the tailbone and attached to a permanent stimulator under your skin.

## VI. Cerebellar Stimulator

The Cerebellar Stimulation is useful in the treatment of epilepsy. Stimulation to cerebellum is provided by transcutaneous inductive coupling through an antenna fixed subcutaneously on the chest. It is delivered through from pairs of platinum discs fixed on a plate of silicon coated mesh. The electrode bearing placed on birth the anterior and posterior Cerebellar cortex. Normally the rectangular pulses of 1ms width, with

0.007-0.2kHz and an intensity of 0.5 to 14V are generally used.

Cerebellar Stimulator implantation uses electrical impulses to regulate uncoordinated neuromuscular activity. Originally developed to prevent seizures in patients unresponsive to drug therapy. The device may also provide better neuromuscular control in patients with cerebral palsy. Possible benefits for such patients may include reduced spasticity & abnormal movements, improved muscle & sphincter control, clearer speech & decreased seizure activity. However, not all patients realize these benefits & in those who do, improvement may occur only over several months or even years. The Cerebellar stimulator consists of two surgically implanted Cerebellar electrodes attached to either an internal or an external power

source & pulse generator. The generator sends electrical impulses to the Cerebellar cortex.



fig 10 Cerebellar Stimulator

Before beginning implantation surgery, the surgeon makes a small scalp incision & drill hole through the skull in the right occipital area (This hole will help relieve postoperative intracranial hematoma or excessive edema.) Then he drills two burr holes in sub occipital area and carefully places an electrode pad on the surface of each lobe of the cerebellum. Using X-Rays, he checks electrode placement & adjusts the position as needed

## VII. Conclusion

This paper has presented the electrical current will help in the treatment of paralysis. It aims to promote technology innovation to achieve a reliable and efficient outcome from the various shapes and

magnitude of currents play major role in the treatment of paralysis. This is my initial work on this topic; I continue work & consult with experts & find out some new type or shape of current which will most effective in the treatment of paralysis. More research and development efforts are needed to fully implement the proposed vision.

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