Transcutaneous Electrical Nerve Stimultion

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Abstract—***The main objective of the project is to relieve the pain of the patients by giving electrical shock to them through the conducting electrodes that are placed on the area of pain, effectively without any side effects unlike the case of dosage of drugs where there are many side effects. The conducting electrodes generate pulses through the skin. Here one more objective is to set the mode of operation depending on the level of the pain and age factor and to set the time for which the pulses should be given. One more constraint is to relieve the pain of the patients easier with less cost when compared to drugs.***

Keywords—muscleafferents; paraesthesia; paingate; mechana receptors

I. INTRODUCTION

Pain is an unpleasant sensory and emotional experience associated with actual or potential damage, or described in terms of such damage. Pain serves as an essential defense mechanism to protect one's body from potential damage.to relieve pain for patients we can stimulate the nerves in the body,nerves can be stimulated by applying low amplitude signals to muscle afferents.this can be obtained by using power source,micro controller. By changing the program in the micro controller we can change the amplitude of the signal.

II. TENS

Bio-telemetry is the electrical technique for conveying biological information from a living organism and its environment to a location where this information can be observed or recorded. Transcutaneous electrical nerve stimulation (TENS) is a therapy that uses low-voltage electrical current for pain relief. TENS is a small, battery-powered machine about the size of a pocket radio. Usually, you connect two electrodes (wires that conduct electrical current) from the machine to your skin. The electrodes are often placed on the area of pain or at a pressure point, creating a circuit of electrical impulses that travels along nerve fibres.When the current is delivered, some people experience less pain. This may be because the electricity from the electrodes stimulates the nerves in an affected area and sends signals to the brain that block or "scramble" normal pain signals. Another theory is that the electrical stimulation of the nerves may help the body to produce natural killers.

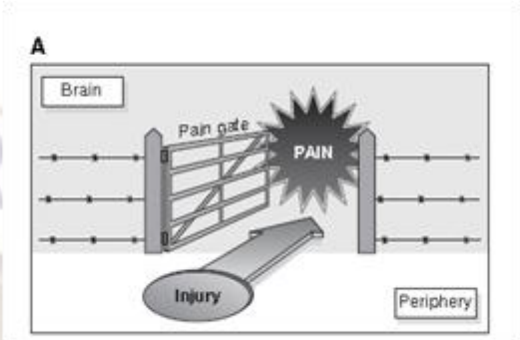

Fig. 1. Pain gate A

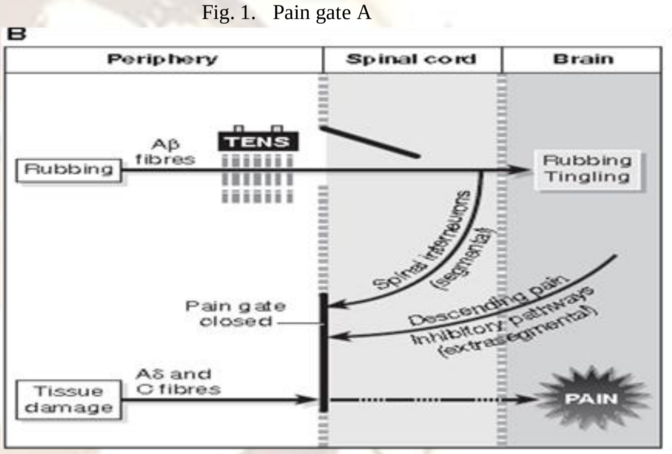

Fig. 2. Pain gate B

A. PAIN GATE'A'

Under normal physiological circumstances, the brain generates pain sensations by processing incoming noxious information arising from stimuli such as tissue damage. In order for noxious information to reach the brain it must pass through a metaphorical 'pain gate' located in lower levels of the central nervous system. In physiological terms, the Gate is formed by excitatory and inhibitory synapses regulating the flow of neural information through the central nervous system. This 'pain gate' is opened by noxious events in the periphery.

B. PAIN GATE'B'

The pain gate can be closed by activation of Mechanoreceptors through 'rubbing the skin'. This generates activity in large diameter Aβ afferents, which inhibits the onward Transmission of noxious information. This closing of the 'pain gate' results in less noxious information reaching the brain reducing the sensation of pain. The neuronal circuitry involved is segmental in its organization. The aim of conventional TENS is to activate Aβ fibres using electrical currents. The pain gate can also be closed by the activation of pain-inhibitory pathways which originate in the brain and descend to the spinal cord through the brainstem . These pathways become active during psychological activities such as motivation and when small diameter peripheral fibres (Aδ) are excited physiologically. The aim of AL-TENS is to excite small diameter peripheral fibres to activate the descending pain-inhibitory pathways.

III. FUNCTIONING

The aim of TENS is to activate selectively large diameter Aβ fibres without concurrently activating small diameter Aδ and C (pain-related) fibres or muscle efferent. Evidence from animal and human studies supports the hypothesis that conventional TENS produces segmental analgesia with a rapid onset and offset and which is localized to the dermatome. Theoretically, high-frequency, low-intensity pulsed currents would be most effective in selectively activating large diameter fibres, although in practice this will be achieved whenever the TENS user reports that they experience a comfortable paraesthesia beneath the electrodes. TENS currents are usually delivered between 10 and 200 p.p.s., and 100–200 μs with pulse amplitude titrated toproduce a strong comfortable and non-painful paraesthesia. As large diameter fibres have short refractory periods they cangenerate nerve impulses at high frequencies. This means that they are more able to generate high-frequency volleys of nerve impulses when high-frequency currents are delivered. Thus, greater afferent barrages will be produced in large diameter nerve fibres when high frequencies (10–200 p.p.s.) are used. The pattern of pulse delivery is usually continuous, although conventional TENS can also be achieved by deliveringthe pulses in ‘bursts’ or ‘trains’ and this has been described by some authors as pulsed or burst TENS. It is likely that continuous TENS and burst TENS produce similar effects when delivered at a strong but comfortable level.

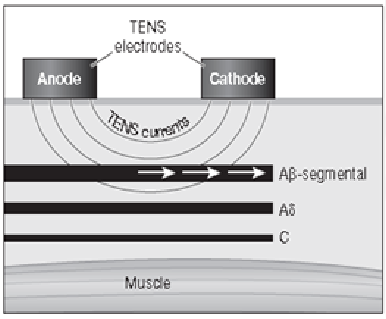

Fig. 3. Stimulation of Afferents

IV. ELECTRODE

The discovery that transcutaneous peripheral nerve stimulation provided nearly identical analgesic levels as dorsal root stimulation revolutionized electro analgesia, and it almost goes without saying that the non invasive, easy to employ nature of TENS is one of the modality’s biggest assets. The electrode, the interfacing agent between the skin and machine, has undergone almost as much evolution as the TENS unit itself. The very nature of peripheral transcutaneous nerve stimulation is such that electrical currents must be applied for longer periods of time in greater amounts. While the process of transferring an electrical current from machine to peripheral nerve may seem relatively simple on the outside, several notable problems present ranging from the actual transfer of the current to skin irritation to cost. Several distinct solutions currently are in use, and all present with a variety of tradeoffs which is shown in table. Generally speaking, properties of a good electrode for TENS use include low cost/use ratio, good adhesion, comfortable, non-irritating to skin, good electrical conductivity, and easy to use. Standard EKG or EEG electrodes were initially used for TENS with limited success, as these were designed for much lower amperage and much shorter usage than is needed for effective TENS. It quickly became apparent based on excessive skin irritation and poor adhesion and subsequent non uniform current distribution that new electrode solutions were needed.

V. ADVANTAGES OF TENS

TENS has many advantages when compared to other treatments of pain management. They are:

TENS is very Effective

It is Safe

It has no side effects

It is easy to use when compared to long-term drug therapy.

Due to small size and light weight of tens device, we can integrate with other medical devices

VI. APPLICATIONS OF TENS

People can use TENS to relieve pain for several different types of illnesses and conditions. They use it most often to treat muscle, joint, or bone problems that occur with illnesses such as osteoarthritis or fibromyalgia, or for conditions such as low back pain, neck pain, tendinitis, or bursitis. People can also used TENS to treat sudden (acute) pain, such as labour pain, and long-lasting (chronic) pain, such as cancer pains.

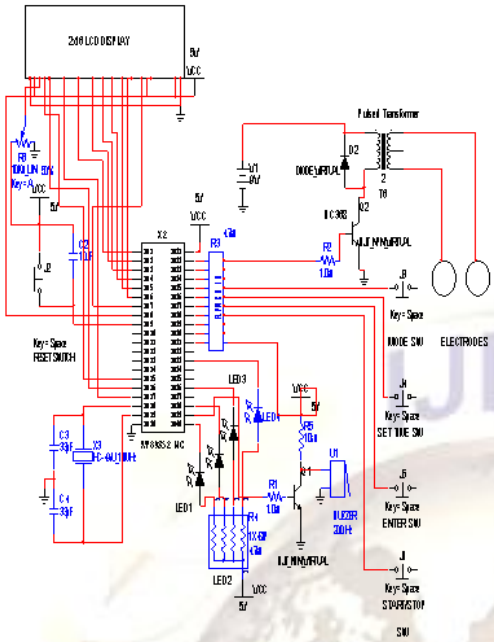

Fig. 4. Circuit diagram of TENS

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