

Non Invasive Treatment to Relieve the Pain due to Headaches & Sinus using Vibration on Acupressure Points



C. Jim Elliot, S. Anitha, T. S. Nithya, M. Sandhiya, A. Manisha

Abstract: Headache is a common term that causes pain in the region of head, neck, and scalp. It is a neurological disorder. The nerves are tending to be in under stress condition. The main causes of the headache are due to stress, depression, tension, anxiety and due to some climatic changes, etc. Headache is classified into different types. Migraine, cluster headache, sinus, normal headache are some of the types of headache. Most headaches can be treated with some medication and neuro stimulator devices. This paper involves the usage of vibration by non-invasive method on the acupressure point of the human body which can relief the pain. The acupressure point is a pressure point, when used in a correct method will lead to decrease the level of pain. The vibration is provided by the motor vibrator and the frequency of the vibration is controlled by the arduino (Atmega 328). Frequency changes can be monitored by the pc. This vibration based treatment will effectively reduce the pain and also the device is cost effective and more comfortable to the patient.

Keywords: Acupressure, Headache, Migraine, Neuro-stimulator and Vibration Sensor.

I. INTRODUCTION

Almost everyone must have had a headache. Headache can be classified into two types, episodic and chronic form. About 4% of populations are affected by the chronic headache. Headache is a most common form of a pain in the region of head or face, neck, scalp. Migraine, cluster headache, sinus headache, tension headache are some of the common types of headache. Migraine is a most common type of headache that causes severe pain in one side of the head. It causes a throbbing sensation. A migraine attack will last for about 4 to 72 hours. It is associated with nausea, vomiting and photophobia. Sinus headache is caused due to infection in the sinuses. Sinuses are the air filled space in face. Sinus is referred as a pressure or a pain around the eye, nose,

forehead and cheek. Cluster headache is the most painful among the other types. Cluster headaches are found in 1 or 2 people out of 100 hence it is considered as a rare type of headache. Cluster headache normally affects the area around the eye and also one side of the head. It causes a severe pain around the eye. Tension headache is the most common type of headaches which causes pain on the forehead. It can cause a mild and moderate pain around the forehead and neck region [2]. It is the most common form of headache and it affects people of all age groups. This headache is caused due to the tension, stress, etc.

Treatment for the headache is taking oral medication. Medication can reduce the level of pain. The pain relievers such as aspirin, ibuprofen, triptans, ergotamine, etc., are used to reduce headache. But over dosage of these drugs may cause some side effects such as toxicity, ulcer, parathesia etc. The neuro stimulator devices such as cefaly device, spring Transcranial Magnetic Stimulator, gamma core etc., are also available to control the migraine and sinus. The neuro stimulator devices fall under the category of non-invasive technique. The nerve decompression and nerve stimulation works on the principle of invasiveness. This involves some surgical procedures. The headache can be controlled by stimulating the nerves in various areas such as vagus nerve, occipital region, vestibular region etc. Non-invasive treatment is also available. In order to make a patient more comfort, vibration based treatment is developed which is a handheld device. The vibration is produced from the vibrating motor and these vibrations are placed on some specific acupressure point which can relieve the headache pain. The vibration may also stimulate some nerves which is responsible for a particular headache.

II. LITERATURE SURVEY

A several invasive methods for the treatment for headache had been followed in the earlier stage. Bloodletting is an earlier method to treat headache. This method involves opening of vein or artery of the head to remove the blood. The invasive method for the treatment of headache is nerve decompression which is widely used. In this method the meshed nerves are decompressed by creating a small amount of pressure to cure the headache. Occipital nerve, supraorbital nerve, and supratrochealar nerve are the nerves which are involved in the decompression method. Another method is neuro stimulation method. It is minimally an invasive technique. In this method the electrical current excites the nerves which deliver the pain signal to the brain.

Manuscript published on 30 December 2019.

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The non-invasive method of treating headache is a magnetic stimulation. Using magnetic field, the stimulation is applied to the back side of the head [1]. The magnetic field induces the electric current. Neuro modulation is another method for treating headache. The nerve that is responsible for causing pain can be isolated and small electrode is placed near the nerve to stop the pain. In neuro modulation, a mild electric current is produced by the vibration. The neuro stimulation devices such as cefaly, Transcranial Magnetic Stimulator, Spring Transcranial Magnetic Stimulator (TMS), mini, gamma core are available for treating headache which is approved by the Food and Drug Administration (FDA). Cefaly is a neuro stimulation device used for the treatment of migraine. This device stimulates the trigeminal nerve in the forehead. The cefaly device magnetically connected to the electrode which is placed in the forehead of the patient. The device produces micro pulse. This micro pulse stimulates the trigeminal nerve that reduces the pain. Spring TMS is a device used of treating migraine. It uses magnetic field to send an energy pulse through a skull. The pulses carry a mild electric current that reaches the brain tissue and reduces the level of pain. Gamma core is another device used to treat migraine and cluster headache. This device delivers a small amount of electric current to the region of neck. These electric current stimulates the vagus nerve through the skin.

The area in the body which is sensitive to the pressure is called pressure point. Acupressure is defined as giving a pressure to a particular part of the body using thumb and other fingers. The acupressure point is a point which lies on meridian. Any pressure which is given by the thumb or finger to the meridian will lead to the clear of blockage. The pain is created by the blockage. Acupressure is a medicine technique which is similar to the principle of acupuncture. The headache can be naturally treated using the acupressure point. It is a traditional Chinese therapy. The massage therapy on the head and shoulders can relieve the headaches. This involves stimulating some pressure point on the head. The acupressure point for treating headaches are drilling bamboo, union valley, gates of consciousness, third eye point, should well, wind mansion, heavenly pillar, temple, wind screen, daith, hairline curve, and above tears [Fig. 1]. These are the

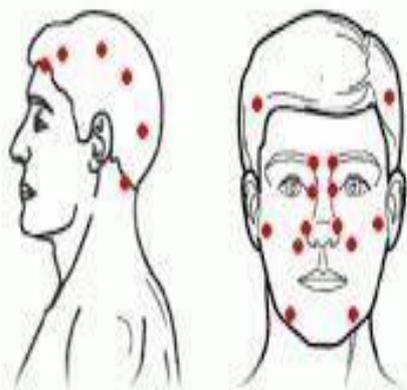


Fig. 1. Acupressure points in Head pressure point which is used for treating different types of headache.

Vibrational medicine is one of the most widely used fields in medicine. It is also used for the treatment of many disease conditions. The vibration may be given to the entire body or

on some specified areas of the body. The vibration can relieve the pain, change the elasticity of the blood vessels, improve the blood flow in the circulation, increase the muscle strength and flexibility and also improve the mental health. The vibration therapy has made its existence in the 19th century. The vibration serves as sensory distraction and it relieves pain. The vibration provides a massaging sensation to the body. This project involves the vibration based device for treating headache. It is in the form of hand held device which is very easy for the doctor to use for the therapeutic purpose. The vibration therapy is based on the principle of frequency.

III. MATERIALS & METHODS

A. Arduino (ATMEGA 328)

Arduino (ATMEGA 328) is a microcontroller which is used to control the entire system. It includes both programmable circuit board and software (IDE-integrated development environment) that runs on the system. It is easy to handle both hardware and software. It acts as an open source electronic platform. Arduino will be able to read inputs such as a finger on a button, activating a motor, turning on LED etc. The advantages of arduino are cost effective, simple, clear programming environment etc. The arduino consist of 14 pins. Each pin operates at 5V. The maximum current receive or provide is 40mA. Fig.2 depicts the block diagram of the experimental setup.

B. Potentiometer

The potentiometer is an electrical instrument. It acts as a variable resistor and consists of three terminals.

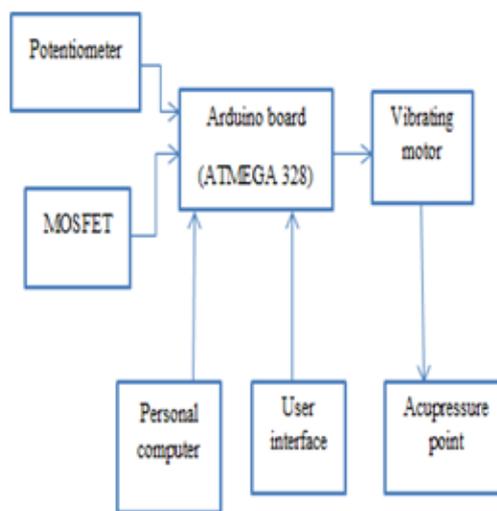


Fig. 2. Block Diagram

It is commonly called as pot. The first and second terminals are connected to a resistive element and adjustable wiper is connected to the third terminal. A wipers position determines the output. The potentiometer is manually adjustable. The range of potentiometer starts from 10KΩ, 22KΩ, 47KΩ, 100Ω, etc. here the potentiometer is used to control the rpm of the vibrating motor.

C. Vibration Motor

A device which generates vibration mechanically is called as vibrator. The vibrating motor are of two types, they are coin or flat type and cylinder or bar type. The bar type vibrating motor is used here. The bar type vibrating motor consist of weight, spacer, permanent magnet, commutator brush, brush holder, and feed terminal. The vibrating motor is improperly balanced. (i.e. there is a off centered weight attached to the motor rotational shaft that produces a centrifugal force while rotating).

D. MOSFET

MOSFET is an electronic component used to amplify an electric signal. It is a semiconducting device. It consist of three terminals namely source, drain, and gate. The MOSFET is used to control the voltage and current flow between the source and drain.

IV. METHODOLOGY

The device consists of vibrating motor, potentiometer, and MOSFET which is connected with the arduino board. The programming of arduino has given through the personal computer. The potentiometer acts as a variable resistor. The potentiometer controls the rpm of the motor. The arduino which act as a microcontroller is charged and controlled by the personal computer. Keypad is connected with the arduino which act as a user interface. The specific condition is given to the arduino through the keypad. The vibrating motor is connected to the control unit. This control unit is controlled by personal computer. The frequency can be changed according to the vibration needed which in turn. The vibration is produced from the vibrating motor which is given according to the persons need. The analog signal is given to

Fig. 3. Experimental Setup



control the device which is in the form of power.

The power given to the device is 5V to 7V. The power supply between 5V to 12V is good. If the supply is less than 5V the arduino become unstable. If it is greater than 12V the arduino board become damage. Then the analog signal is converted into digital sample. The output is controlled by the potentiometer. The frequency given to control the headache is between 0 to 150Hz. Digital samples are between 0 to 1023, hence it is converted for the frequency between 0 to 150Hz and then it is given to a potentiometer. The potentiometer controls the speed of the rotation of the

vibrating motor. MOSFET is used here. The purpose of MOSFET is to control the current flow. This device can be manually operated. This device will relieve the pain caused due to headache and sinus.

V. RESULTS

The non-invasive treatment for headache was given to 6 (4 female and 2 male) subjects and the results were found to be positive based on the feedback given by the subjects. While a few faced irritation since they are not familiar with procedure.

VI. DISCUSSION

This non-invasive method for treating headache is drug free and user friendly. The device can be used for all types of headache pain. The pain is relieved by the usage of vibration. This device doesn't have any side effects. This device can be manually operated without the help of physicians and it is cost effective. Without age discrimination everyone can use this device for the headache. The acupuncture method is an oldest Chinese medicine used in an ancient period. By this project it is brought back. The vibration motor has to be fixed into a soft mold so that it doesn't cause any untoward irritation on the skin.

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