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A Review on Headache Measurement Techniques.

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ABSTRACT

This paper surveys about the brief description of headache and its types and various methodologies used for the headache measurement. The measurement process is associated with either Electromyography (EMG) or Electroencephalography (EEG) or Active Release Technique or 133Xe Inhalation Technique. These techniques are studied to observe headache abnormalities in the human beings. These techniques are used differently for evaluating and recording the electrical pulses arise in the head. When brain veins are electrically or neurologically activated then the signal is analysed to detect headache abnormalities.

Keywords: Active release, EEG, EMG, Inhalation

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INTRODUCTION

Headache is a pain in the head and neck region which may be a disorder for various or symptom of a disease. Headache is also termed as 'cephalalgia'. The doctors & medical experts have divided headache into primary and secondary. According to International Headache society, primary headache are those headache which are not caused due to underlying of medical conditions. Primary headache are of three types: migraine, cluster and tension headache. 90% of headache is considered to be the primary headache whereas secondary headache considered to be caused due to medical condition or disease.

Primary Headache

Migraine headache are those headache which is caused due to the pulsating pain in the veins. This pain can lasts up to 72 hours. The pain is typically occurs in one side of the head. This kind of headache becomes worse with physical activity like nausea, vomiting. The patients suffering from migraine headache are often hypersensitive to lights, sound, odours etc. The two types of migraine headache are classic & common headache respectively.

Cluster headaches are recurrent sudden brief attack and severe pain on one side of the head, usually the region around the area of eye. Other names for these headaches is histamine cephalalgia, Horton neuralgia etc. Cluster headaches may last between five minutes to three hours; they may occur suddenly o every other day or can be occur eight times per day. The pain of a cluster headache is severe enough as it sometimes makes the patient to consider suicide. Patients with cluster headaches are very much restless; because of its pain they may pace the floor, weep, or bang their heads against the wall in desperation to stop the pain. In addition to these, person with cluster headaches often have a congested nose, watery eyes, drooping eyelids, swelling in the area near the eyebrows, and heavy facial perspiration.

Tension headache are the most common headache which occurs in general human beings. Other names for this headache are muscle contraction headache, stress headache, ordinary headache, and psychomyogenic headache. The patient will usually describe the pain of a tension headache as bearable pain. This pain arises although sore or tense areas in the muscles of the patient's forehead, neck, or upper shoulder area.

Secondary Headache

Secondary headaches are caused by diseases or disorders, they are categorized as either inflammatory or traction headaches. Traction headache arise as a results of the pulling, stretching, or displacing of structures that are sensitive to pain, as example: When a brain tumour pressed on the outer layer of nerve tissue that covers the brain. Infectious diseases of ears, sinuses, teeth or other parts of the head result in the inflammatory headaches.

HEADACHE MEASUREMENT METHODS [1-14]

Using Electroencephalography (EEG)

Electroencephalograph is nothing but the measurement of the electrical generated signal in the region of anatomical area bordered by the face at the front, and by the neck at the sides and back of human body. EEG actually measures the fluctuation in the voltage generated by the pulse which is of ionic current flow within the neurons of the brain. With respect to various diagnostic tools in the modern day world like Image processing in CT and MRI, the use of EEG has been little decreased. EEG continues to be still a valuable tool for research and diagnosis. Electrodes with very high accuracy are required for the measurement in this process. Electrode locations along with their names are specified by the International 10–20 system. This ensures that the naming of the electrodes is consistent in almost all places and laboratories. Depending on the headache level of the patient small number of electrodes are used when recording EEG signals from neonates. Additional electrodes are added when there is a demand in increased spatial resolution for a particular area of the brain.

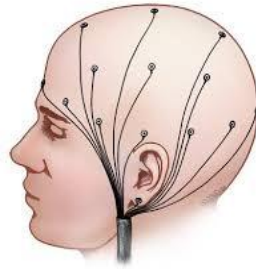


Figure 1: Detection using EEG

At the time of recording, a sequential activation of procedures may be used. These processes induce normal or abnormal EEG activity which may not otherwise be able to observe. These techniques include hyperventilation, stimulation, eye closure, mental activity always sleep and sleep deprivation. During epilepsy monitoring, a patient's typical seizure medications may be withdrawn. Digital EEG signals are stored electronically and ready to filter for display which will show the proper activities and the impulse of the nerves in the head.

Using Electromyography (EMG)

Electromyography is a test that checks the health of the muscles and the nerves that controls the muscles. The healthcare provider will have to place the electrodes above the skin of that particular area of muscle of the human body. The electrode will collect the electrical activity generated by the muscle of that particular area.

Normally EMG testing is done by two different processes. They are the Intramuscular EMG and the Surface EMG. The Intramuscular EMG is performed with the help of a needle electrode which measures the conducting function of nerves. The needle is inserted with a very light force and the various activities of the nerve functioning is detected. Proper needle EMG placement is very important for accurate representation of the muscle. The fats present in the human body can be a distortion to the signals. The more body fat a person has, the weaker the EMG signal will be. The other process of the EMG testing is the Surface EMG in which the surface electrodes are used in a probe attached to the EMG sensor to determine the surface muscle activities. It is generally applied in the skull in the head or joint of the bones for muscle activity difference detection. Surface electrodes provide only a limited assessment of muscle activity. The signal is recorded with more than one electrode because one single electrode will not be able to record the potential difference (voltage difference). For these purposes a minimum of two electrodes are required. The main disadvantage of this process is that surface electrodes are restricted to superficial muscle. The tissue present inside the muscle varies depending upon the weight of the individual and cannot discriminate between the discharge of adjacent muscle.

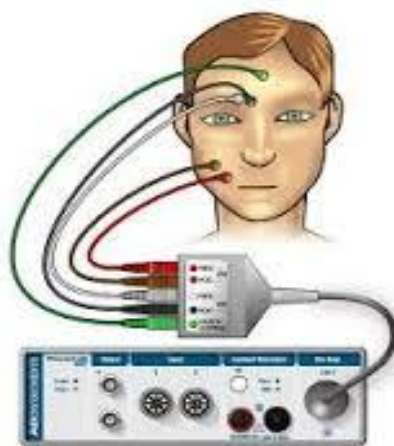


Figure 2: Detection using EMG

EMG can also be used for detecting the amount of fatigue present in muscle. The various changes in the EMG signal can signify muscle fatigue: and make increment in the mean absolute value of the signal, continuously increase in the amplitude and duration of the action potential of the muscle and an overall shifting over to lower frequencies. Observing the changes of different frequency level the most common way of using EMG is to determine the different levels of fatigue. The low conduction velocities enable the slower motor neurons to remain active. So this is one of the method of headache measurement.

Using ¹³³Xe Inhalation

In this technique of measurement the non invasive regional cerebral blood flow were made by ¹³³Xe inhalation method with altogether 71 patients who were suffering from different types of headache out of them which 32 patients were age matched. In this method Flow Gray is calculated by the compartmental analysis from the X-ray subjected gamma curves, and extra cerebral flow indices (EFI) were calculated.

When FG in the group is N=13 with common migraine was significantly higher compared to the comparable group measured in the headache free interval which is N=12. Serial measurements which are made during this progression showed the mean increase in the FG as the headache worsened. The mean Fg which were observed in the patients suffering from migraine for 2-48 hrs, has increased significantly during this immediate post headache interval compared to the patients who were free of headache for more than 6 days. This showed the similar results for the patient suffering from the cluster headache. So it can be concluded that inhalation is one of the proper method for headache measurement.

Using Active Release Technique (ART)

This work evaluates the effect of Active Release Technique on tension type headaches. In this process, two parameters Headache Disability Index (HDI) and Quadruple Visual Analog Scale (QVAS) was filled by the participants to measure the functional impairment. At a frequent visit, a QVAS was complete to track the progress or non progress and a HDI was completed by the participants. The HDI mean of the studied participants was 22.7 prior to treatment and 15.7 to the post treatment. The QVAS mean prior to treatment was 35.2 and for the post treatment mean was 29.3.

So in this process it is can see that number of participants was doubled and ART has improved the symptoms associated with Tension Headache. This data was compared to the original study which was done by M. Diller D.C. and R. Smith D.C. it is found that ART is an appropriate alternative for headache.

CONCLUSION

Thus this paper provides different headache measurement processes like using EEG and EMG. Both these process are used for getting the absolute result for the skull nerve activities. EEG is mostly used for determining the headache in different medical centre. For determining the pulse in the forehead a large number of electrodes have to be applied on the head which is a complete mesh. Proper placements of the electrodes are required over the scalp for the observation of accurate output. To reduce the complexity of this process, headache measurement is proposed by the EMG which usually detects the muscle movement. So when the EMG detector along with the 3 electrodes are placed in the forehead over the surface of the veins, a sudden change in the muscle activity can be seen in the value which varies due to the frequent change of the pulse. A person is considered to be suffering from headache if the rate of the pulse in forehead increases. So this is the most convenient process which is used for the headache measurement.

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