EFFECT OF EXERCISE IN RESTING TREMOR USING SENSOR ANALYSIS

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BACKGROUND: A tremor refers to involuntary, rhythmic muscle movements which involve twitching or oscillatory movements of one or more parts of the body. Resting tremor occurs during rest which is a predominant feature of Parkinsonism. The subjective assessment is by the unified Parkinson’s Disease Rating Scale, a clinical standard scale for parkinsonism tremor assessment. The sensor-based tremor measuring device was used in the study for the prediction of tremors.

OBJECTIVE: To detect the effectiveness of sensor analysis of resting tremor in Parkinsonism.

METHODOLOGY: STUDY TYPE: Experimental; STUDY DURATION: four weeks; STUDY SETTING: SRM medical college and hospital. PROCEDURE: 12 samples are taken. The resting tremors will analyse by using a sensor-based device then, exercises for upper limb tremor is given for four weeks then again after exercise, tremor will be analysed using a sensor-based device to interpret the differences in the tremor after the therapy.

RESULT AND CONCLUSION: The study shows a significant correlation between pre-test and post-test values by using a vibration sensor as an outcome measure.

KEYWORDS: Resting tremor, sensor-based device.

I. INTRODUCTION

Tremor means a swift back movement of the body¹. In clinical practice, it occurs as a common disorder that occurs with the motor. A tremor activity involves contraction and relaxation of the muscle. Tremor is an involuntary activity and affect the head, upper limb, trunk and lower limb but commonly present in the hands.

In a neurological syndrome, one of the common sign is tremor and it can also be a sign which may be associated with disorders in the brain components which controls the muscles throughout the body. Neurological disorders can cause tremor which includes stroke, traumatic brain injury and other neurodegenerative diseases².

Other causes of parkinsonism may also include the use of drugs, mercury poisoning, and the consumption of alcohol. Resting tremor, which occurs as a solitary symptom and may also be present in various disorders which may occur in more than twenty-five per cent of patients with Parkinsonism, present along with action tremor, in association with resting tremor.

To and fro movement in parkinsonism, the main symptom which is present in about 70% of patients. It is present in the patient’s head, hand, feet with some specific frequency of about 3.5–7.5 Hz and amplitude vary in range and speed. The tremor is characterized as a "pill-rolling” action³.

Parkinsonian tremor occurs after 60 years. Parkinsonism tremor characterizes as different types: action, rest and postural tremor. Among these types Resting tremor is the common type. Postural tremor occurs when a person maintains a position against gravity. Carrying out a particular task, during voluntary contraction of a muscle that refers to action tremor.

In Parkinsonism, pure rest tremor is rare ⁴. Rest tremor is a combination of a postural tremor and will disappear on tasks that induce action tremor.
Hence, previously the only way of treating Parkinson was using drugs. But mostly the affected persons hesitate to use drugs due to their side effects. So thereby preferring exercise is harmless and using a sensor is non-invasive which works using reflex inhibition technique.

Sensors are used in this study which measures frequency and amplitude. It is thin, low power, small and it has a complete accelerometer with voltage outputs\(^1\). So this study was discussed with the bioengineering team and been made for the analysis for the patients. Along with the outcome by giving a set of exercises to reduce tremor.

**AIM OF THE STUDY**

To find the effectiveness of exercise in resting tremor using sensor analysis.

**NEED FOR THE STUDY**

There is no portable device to measure tremors so far in the studies. Hence for detection as well as for treatment analysis, it is essential as an assessment tool.

II. METHODOLOGY

- Study design: Experimental
- Study duration: four weeks
- Sampling method: Block randomization
- Study setting: SRM medical college and hospital

**Inclusion criteria:**

- Parkinson patient with resting tremors

**Exclusion criteria:**

- Parkinson without resting tremors
- Parkinson along with any other debilitating conditions

III. PROCEDURE

A portable Parkinsonism tremor assessment was used. The subjects were taken according to the inclusion criteria and willing for the study. According to the unified Parkinson’s disease rating scale. Initially, they were assessed using the Tremor rating assessment scale\(^2\). This study was discussed with the bioengineering team and was approved by the scientific committee and the team of people were analyzed and discussed the analysis and the outcome of the study.

Then the patient was assessed using a sensor by placing the sensor over the distal extremity with the help of a strap and the values were calibrated which was connected to a monitor. Since it is non-invasive and controlled by owning it does not harm the patient. Then a series of hand exercises were prescribed for over four weeks. The exercises which include hand tremor are hand range of motion exercises, pegboard exercises, mirror therapy, hand dexterity exercises, hand resistance exercises and coordination exercises.

After four weeks again the patients resting tremors were analyzed using the sensor as an outcome measure.
IV. DATA ANALYSIS

The values of resting tremors were analyzed using a vibration sensor. The data obtained were tabulated and statistically analyzed using the SPSS 17. The mean and standard deviations of all variables were analyzed paired “t” test was used.

TABLE 1 Statistics

<table>
<thead>
<tr>
<th>Pair 1</th>
<th>pre-test</th>
<th>Mean</th>
<th>N</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre-test</td>
<td>1.9725</td>
<td>12</td>
<td>.08519</td>
<td>.02459</td>
<td></td>
</tr>
<tr>
<td>post-test</td>
<td>1.4775</td>
<td>12</td>
<td>.32847</td>
<td>.09482</td>
<td></td>
</tr>
</tbody>
</table>

TABLE 2 Paired Samples Test

<table>
<thead>
<tr>
<th>Paired Differences</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error Mean</th>
<th>95% Confidence Interval of the Difference</th>
<th>t</th>
<th>df</th>
<th>Sig. (2-tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>pre-test - post test</td>
<td>.49500</td>
<td>.29737</td>
<td>.08584</td>
<td>.30606</td>
<td>.68394</td>
<td>5.766</td>
<td>11</td>
</tr>
</tbody>
</table>

Comparison of pretest and post-test analysis mean values show that there is a statistically significant decrease in the mean value of pre-test from 1.97 to post 1.47.

V. DISCUSSION

According to the study, Parkinsonism is a neurological disorder with disabling pathology which has affected globally about more than millions of people. Hence, this disease has much influence on the quality of life of patients that leads to increasing the level of care and expenses for the health of society. This study focuses on the use of wearable devices that is for early diagnosis, tremor, motor fluctuations, motion analysis of the body and long-term monitoring analyse. This study also gives recommendations for future improvements.

• Recent advances in approximating motor deficits in Parkinson using objective wearable technologies, using a gyroscope and accelerometer. It is into clinical trials.

• Some technologies or devices were shown as helpful to differentiate between healthy subjects and Parkinsonism patients and their validity in the differential diagnosis in movement disorders and the predictive values in the premotor stage.

However, wearable accelerometer and gyroscope used sensors that access the quantification for both patient care and clinical trials to measure the movements that help to gain and allow continuous monitoring of longterm motor alterations or disturbances.

The sensor used in the study can analyze the frequency and amplitude of resting tremor. It further required to use this kind of sensor along with postural and action tremor, which coordinate in doing activities. Hence, the exercise regimen for the patient to improvise more based on outcome and the functional activities of the patient as well.

Hence in our study, we especially concentrated on resting tors and gave the interventions which show significantly on comparing pre and post values by using vibration detection sensor as an outcome measure and our sincere thanks to the biomedical department and scientific team for the development of the device.
LIMITATIONS

- Initially, discussing with bioengineering and interpreting the ideas was very difficult.
- There is only a small number of samples were taken for the study.

RECOMMENDATIONS

- Since it can be done by own, a home-based protocol can be given, instead of a daily visit for the therapy session.
- In future studies, Randomised control trial can be done. Also, the future study can be done on the topic “DETECTION AND INTERVENTION OF TREMORS USING PORTABLE SENSOR DEVICE IN UPPER LIMB”
- This sensor analysis can also be done in other neurological problems to improve the quality of life.

VI. CONCLUSION

This study shows the significant correlation between pre and post-test by using a vibration sensor as an outcome measure.

CONFLICT OF INTEREST

There is no conflict of interest

SOURCE OF FUNDING

There is no fund by any agencies for the study.

ETHICAL CLEARANCE

The study was approved by the scientific committee of the SRM Institute of science and technology.

REFERENCES


