ASSESSMENT OF FASCICULATIONS BY ULTRASOUND IN NEUROLOGICAL DISEASE

INTRODUCTION:
Fasciculations indicates the presence of a denervating disease especially those of the anterior horn cells. Even normal people may have fasciculations, termed benign fasciculations because they have no associated muscle weakness or wasting. 70 percent of people have fasciculations which are spontaneous yet benign. Fasciculations that appear on muscle surfaces are visible in clinical inspection. But those occurring deep within the body of a muscle are recorded using needle EMG. Neuromuscular disorders can be diagnosed using muscle USG.

MATERIALS AND METHODS:
The aim of our study is to analyse the fasciculations in multiple sites by clinical, EMG and ultrasonogram and to find the usefulness of ultrasonogram in identifying fasciculations both occult and manifest. Results: Among 30 patients with history of fasciculations the number of muscles detected by clinically, EMG and myosonography was 54.61 and 90 respectively.

Discussion:
High degree of correlation was found between the EMG detection of fasciculations and Ultrasound detection of fasciculations which was statistically significant 0.024 with a p value of <0.005. USG can detect occult fasciculation which is difficult to detect by EMG.

Conclusion:
Fasciculations can be confirmed by using neuromuscular ultrasound in both clinical and subclinical situations. Painless and noninvasive Neuromuscular ultrasound by detecting the occult fasciculations enhances the diagnostic accuracy.

KEYWORDS: NEUROMUSCULAR ULTRASONOGRAM, ELECTROMYOGRAM, FASCICULATIONS
Fasciculations was predominantly seen in Deltoid muscle followed by biceps. Other areas were fasciculations observed are chest wall, shoulder area and back muscles. Para spinal area was the least amount of fasciculations detected.

**Table 1: Association of fasciculations with various disease**

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Frequency</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>ALS</td>
<td>15</td>
<td>50.0</td>
</tr>
<tr>
<td>BFS</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>Brachial amyotrophy</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>Radiculopathy</td>
<td>3</td>
<td>10.0</td>
</tr>
<tr>
<td>Hyperthyroid</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Madras MN</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>MMNCB</td>
<td>2</td>
<td>6.7</td>
</tr>
<tr>
<td>Postpolio syndrome</td>
<td>1</td>
<td>3.3</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>100.0</td>
</tr>
</tbody>
</table>

**DISCUSSION:**

It is a muscle twitch that occurs due to the spontaneous firing of a single motor unit. They appear on the surface of the muscle as rapid fine, flickering and occasionally vermicular contraction. They are irregular in both the timing as well as location of the muscle.

It may be appropriate to perform the ultrasonographic evaluation first, as it can then be used to guide the electro diagnostic study and perhaps link the number of electrical stimulations from nerve conduction studies and EMG needle sticks needed. Spontaneous discharge of muscle fibers occur in those muscles that are denervated. They have sharp positive waves and fibrillation potentials when these are isolated in nature found using EDX they are insufficient to diagnose a disorder with loss of axons.

Comparative study of fasciculations using clinical, EMG and ultrasonographic assessment (reimer et al) showed the effectiveness of current inspection, myosonography and electromyography for the detection of fasciculations which are an important clinical entity.

**Comparative study involving muscle sonography and EMG (wenzel et al)**

The prevalence of fasciculations in the 10 muscles of lower extremity were evaluated. 54 patients suffering from a variety of neuromuscular diseases were chosen, while 58 healthy people formed the control group. Screening of each muscles for 10 second by myosonography found fasciculations in 8 muscles of the control group (19%), 41 people with disease (76%) had fasciculations in 10 muscles. Surface EMG for 10 seconds detected fasciculations in 30 patients (56%) and 5 subjects of 9% of the control group.

In a 20 minute recording time 55 control subjects (95%) and all the patients were found to have fasciculations. But artifacts were common in surface EMG and less in USG. So myosonography was accurate in 79%. Convenience and reliability of muscle USG over surface EMG is proven.

In our study of 30 patients EMG was compared with myosonography in the detection of fasciculations. The correlation coefficient between EMG and USG was 0.024. High degree of correlation was found between the EMG detection of fasciculations and Ultrasound detection of fasciculations which was statistically significant with a p value of <0.005. USG detected more percent of fasciculations when compared to EMG. USG is noninvasive and fasciculation can be easily detected.

In our study 3 persons had benign fasciculations and USG detected fasciculations. No cause could be found for the benign fasciculations after investigations.

USG can detect occult fasciculation which is difficult to detect by EMG. Different sites examination by EMG to search for occult fasciculations is difficult since patient may experience pain and technically difficult. But USG can be judiciously used to detect occult fasciculations. In our study of 30 patients with history of fasciculations the number of muscles detected by clinically, EMG and myosonography was 54, 61 and 90 respectively. So 36 muscles with occult fasciculations were detected by USG. Many fasciculations, detected by either electromyography (EMG) or by ultrasound, are not clinically apparent, as clinical recognition depends on their proximity to the surface of the muscle, the depth below the skin, and the size of the motor unit involved. Needle EMG shows alteration of serum CPK that interferes with the diagnosis whereas neuromuscular ultrasound is noninvasive and there is no interference with CPK.

Larger muscle region are sampled using USG which have high sensitivity towards the detection of fasciculations. EMG has less sensitivity than USG in this regard because the samples are smaller. Needle EMG is a painful and inconvenient procedure while USG is an easy noninvasive and safe procedure without any inconvenience to the subjects.

Ultrasound may be slightly more sensitive than EMG at detecting fasciculations, probably because it samples a larger muscle region than needle EMG, but it can sometimes be difficult on ultrasound to detect fasciculations in patients who are unable to completely relax.

**Conclusion:**

Neuromuscular ultrasound is a useful technique in neurology especially in confirmation of fasciculations in both clinical and subclinical situations. The utility of neuromuscular ultrasound in detecting occult fasciculations enables diagnostic accuracy of anterior horn cell disease. It is comparable to needle EMG in detecting fasciculations. Hence Neuromuscular ultrasound is a non invasive, painless tool for utility in the evaluation of fasciculations.
References: