

Amplitude of A delta Fiber Action Potentials Objectively Discriminate Severe Chronic Spine Pain Patients from Controls

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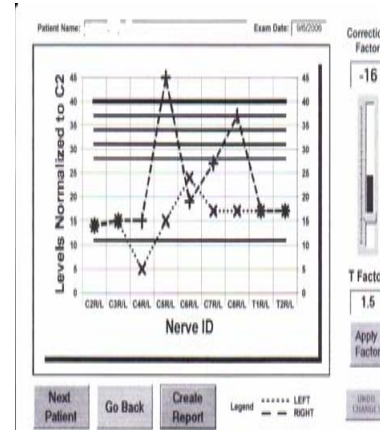


How do you measure chronic spine pain?

Spine complaints are second only to upper respiratory problems as a reason for patient visits. Objective validation of the spine pain complaint is a major problem in the assessment and treatment of chronic spine pain. Is your treatment plan helping the patient get better? How do you know if someone is symptoms magnifying? Should you prescribe more opioids if the patient continues to complain of pain? Patient symptom description is purely subjective as is the VAS score. In the evaluation of acute coronary syndrome, a serum troponin has a sensitivity of 99%. By contrast, the sensitivity and specificity of the physical examination, imaging studies and needle EMG studies is low. As a result of this, litigation costs for spine pain are billions of dollars. Most chronic spine pain patients get labeled as symptom magnifying, drug seeking, by some health provider sooner or later. Clinical assessment comes down to clinical judgment which may be biased both philosophically and economically. There is a great need for a completely objective test of pain severity.

Measures

In evaluating the patients, the visual analogue scale (VAS) ratings of pain today and pain over the past month was assessed. Patients and controls underwent range of motion measurements of the lumbar spine and a neurological examination. In addition, the sum of the sensory nerve conduction measures (NS score) was measured for each patient and control.



SEVERE PAIN
NS score = 45

MILD PAIN
NS score = 12

Results

The measurements of the A delta action potentials were all much lower in the chronic spine patients. The patients with the more severe pain had lower action potential. Range of motion studies in the pain patients revealed limitations.

Two- Sample T- Test: Controls, Spine Pain Patients

| | N | Mean | SD | SE |
|------------|----|------|------|-----|
| Controls | 20 | 200 | 57 | 15 |
| Spine Pain | 20 | 20 | 12.1 | 3.1 |

Conclusion: Using a two sample t test, it is concluded with high confidence that the mean maximum A delta fiber action potential in controls does in fact differ significantly from spine pain patients.

Conclusions

Needle EMG studies are thought to be objective markers of nerve injury. Often, when a needle EMG study is negative, the patient's complaints of numbness, tingling, and pain are labeled as functional. The main problem with needle EMG is that they are measuring large caliber afferent fibers which are physiologically unrelated to pain which is mediated by pain fibers. It has been reported that up to 50% of electrodiagnostic studies evaluating possible radiculopathy reported as normal may have a compressive radiculopathy that is not being detected. Quantitative sensory testing has been suggested as an alternative. These procedures assess the small pain fibers which represent roughly 70% of the peripheral nervous system. The A delta fibers mediate the sensation of cold and the first components of pain and have a conduction velocity between 2 and 30 m/sec. However, since QST has used the patient response as the end point, it has been considered too subjective a test. To avoid this, in this study we took measurements from a potentiometer placed at the level of C6.

We have found that in chronic spine patients there is chronic hyperstimulation of A delta fibers and measuring this appears to be useful as an objective marker of severe spine pain.

Further research is needed to confirm these preliminary findings. Study of the sensory nerve conduction velocity of C fibers and A beta fibers would also be useful.

Overview of Study Design and Hypothesis

In this pilot study, sensory nerve conduction velocity was evaluated by stimulating the A delta fibers in the peripheral dermatomes from 0 – 10 mA and 0 – 50 volts at 250 Hz using a Neural Scan device. Pathology in the pre-Dorsal Root Ganglion fibers is detected by comparing the amplitude initiating A delta conduction. An objective response to this peripheral stimulus was measured by a potentiometer placed at the level of spinal C6. This measured the action potentials of the A delta fibers. Results do not depend on patient cooperation. The Null hypothesis was that there was no difference in the potentiometer readings comparing a group of severe pain patients to controls.

Subjects

A group of 20 chronic lumbar spine pain patients were studied, 10 males and 10 females. Average age was 46 years, mean duration of pain was 48 months. These were matched to a group of 20 controls, 10 males and 10 females. Average age was 32 years.

