

# Neuro Mobility and the Treatment of Nerve Root Injuries

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Frustration is often the operative word when it comes to the rehabilitation of a nerve root injury. The normal course of treatment — which includes non-steroidal anti-inflammatory drugs (NSAIDs), modalities such as electrical stimulation, ultrasound, heat, ice, massage and strengthening exercises for the neck, shoulder girdle and upper extremities — often brings about less than optimal results. It seems as if rest is one of the only modalities that truly works, but time is a luxury that is rare in the National Football League.

## Neurodynamics

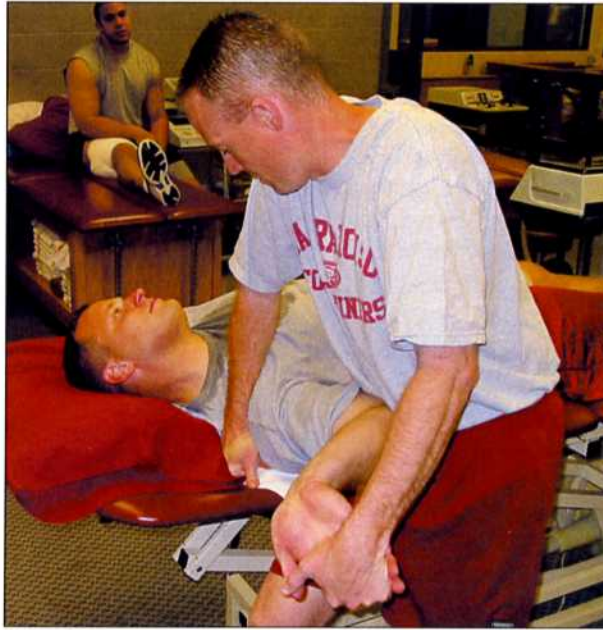
A relatively new concept of therapeutic treatment for nerves is known as Neurodynamics. Very simply, the idea behind Neurodynamics is that the nervous system is a continuum with the physical abilities to “communicate via electrochemical means.”<sup>1</sup> The concept of a therapeutic treatment for nerves has actually been around since the 1880’s, when it was referred to as nerve stretching,<sup>2</sup> but it was not really developed or applied in manual therapy until about 25 years ago by Australian

“Very simply, the idea behind Neurodynamics is that the nervous system is a continuum with specific physical properties.”

Physiotherapist David Butler. Butler re-introduced the concept into the United States when he published his book *Mobilisation of the Nervous System* in 1991. Over the last year the methods described and taught by Butler have become an integral part of the San Francisco 49ers athletic training staff’s treatment protocol for stingers, brachial plexus strains, nerve root irritation, nerve contusions as well as many lumbar and lower extremity issues.

## Properties of the Nervous System

The nervous system utilizes mechanical, electrical and chemical properties to execute its function in the body. To illustrate the mechanical quality of nerve tissue, consider what happens during athletic activity. When a football is thrown, for instance, elbow flexion and wrist



San Francisco 49ers assistant athletic trainer Todd Lazenby performs Median nerve tests ULNT1 & 2A on defensive tackle Bobby Setzer.

extension occur simultaneously, both stretching and compressing the Ulnar nerve. The nerve must possess elasticity to accommodate the changes in length and resist pressure changes. This is also illustrated along the spinal canal, where the length of the spinal cord can increase up to 10 centimeters from the resting length to when the spine is flexed.

The health of the nerve is dependent upon the ability of its cell, the neuron, to nourish itself with axoplasm. Axoplasm surrounds the neurons and provides a medium for the transmission of signals to other neurons via neurotransmitters. If the nerve becomes ischemic via entrapment, the viscosity of the axoplasm increases from its normal consistency (5x greater than water) to a much thicker, gel-like substance. This decreases normal neurological transmission and increases the chance for chronic pain through abnormal impulse generation.<sup>2</sup>

The chemical property or health of the neuron is therefore dependent upon the axoplasm, whose viscosity is dependent upon the ability of the nerve to glide and move. If a nerve is gliding normally, the axoplasmic flow is maintained and the health of the system is ensured. The function of movement also relates directly to the ability of the nerve to conduct electrical impulses, which is the third component of Neurodynamics.

## Blood Flow

The nervous system is very “blood thirsty” and neurons can demand as much as 30 percent of the total oxygen pumped from the heart. A lack

of blood flow can adversely affect the function of the nervous tissue and an increase in the length of a single peripheral nerve by as little as eight percent is enough to starve that nerve of blood and oxygen. However, based on the fact that normal nerve tissues act as a continuum, as much as a 20 percent change in length will not result in ischemia as the system pulls movement from different areas and directions to compensate.<sup>2</sup> So very simply, the importance of movement for a nerve is paramount. Any impingement on the nerve, whether from a disc herniation, spur, soft tissue hematoma, etc., can compromise nerve function.

## Testing for Neurological Entrapment

Injuries to the brachial plexus, nerve roots and other tissues throughout the upper body are common in football. Neurological disorders in the upper body will

often manifest themselves in symptoms along the upper trunk or anywhere along the distribution of the median, ulnar, radial nerves, or any combination thereof.

To differentiate which nerve is involved, it is necessary to perform Upper Limb Neurodynamic Tests (ULNT) for each nerve tract. The tests should first be performed on the uninvolved side to allow the patient to become comfortable with the testing procedure. When testing the involved side, it is important to note at what point in the range of motion symptoms occur and how severe those symptoms are. Dynamically adding in cervical lateral flexion towards the uninvolved side will also increase the tension placed upon the nerve.

## Upper Body Tests

We use three common upper limb tests as described by Butler.<sup>2</sup> They include the following nerve tests:

- The median tests (ULNT1) includes shoulder abduction, wrist and finger extension, forearm supination, shoulder external rotation and elbow extension. The addition of shoulder depression to the test (ULNT2A) increases the tension placed upon the plexus, and nerve roots and tract.
- The radial test (ULNT2B) involves shoulder depression, elbow extension, shoulder internal rotation, wrist and thumb flexion and shoulder abduction.
- The ulnar test (ULNT3) requires shoulder girdle depression, shoulder external rotation,

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shoulder abduction, elbow flexion, forearm pronation and wrist extension.

The testing is done from proximal to distal to simulate how the tension or the slack of the nerve is taken up during normal activity, but can be altered to simulate the sport-specific functions when the patient experiences symptoms. These tests not only are diagnostic measures to determine the amount of involvement, but also become a method of treatment for these injuries.

## Treatment

When using these tests as mobilizations, it is important to perform high repetitions within a pain-free range of motion. The exercises are performed only to the point of discomfort, but you will note that range of motion will improve and the severity of the symptoms will diminish as the number of repetitions increase. The player should be retested daily to determine if progress is being made. This can be seen through an increase in range of motion before the symptoms occur and an overall decrease in the severity of symptoms.

## Case Study

A 23-year-old rookie defensive lineman with a history of brachial plexus strains in college suffered four stingers during the course of the 2000 NFL season. The fourth injury occurred on December 23, 2000, the final game of the season, when he jammed his neck while hitting an opponent on kick-off coverage. Initially, the injury produced diffuse pain at the C7-T1 level with burning sensations down both arms. These symptoms were very similar to previous injuries except that he had prolonged upper extremity weakness with this event.

He was removed from the game and X-rays taken at the stadium were negative. Postgame

examination revealed a resolution of the majority of symptoms. No sensory or motor deficits were present and he had a negative Spurling's sign. One month later, he contacted the athletic training staff complaining of chronic right upper trapezius and central neck pain with neck extension. An MRI revealed cervical stenosis at the C3-4, C4-5 and C5-6 levels — although there was no evidence of disc herniations. There was also foraminal narrowing due to spurting at the same levels.

## Neurodynamic Testing and Treatment

Neurodynamic testing revealed increased sensitivity in the median, radial and ulnar nerve tracts. Three sets of 30 repetitions of the neural mobilization exercises as described above were performed, along with manual cervical strengthening in a pain-free range of motion. In addition, the player performed self-mobilizations as part of a home rehabilitation program.

## Results

The athlete experienced immediate relief of right upper trapezius muscle symptoms after the initial treatment. Re-testing after one day of treatment in the training room and two days of self-treatment at home revealed a decrease in symptoms as seen by a greater pain-free range of motion. Over the next 17 days, utilization of the neurodynamic mobilizations — coupled with the cervical, scapular and shoulder girdle strengthening — resolved the right trapezius pain as well as his symptoms with cervical extension. He continued with the self-mobilizations as part of his conditioning program until he returned for training camp.

We feel incorporating Neurodynamics into this player's treatment protocol hastened the alleviation of the symptoms because:

- He was not taking any NSAIDs during the course of the treatment.
- He had no improvements in the symptoms with rest-only from January to March.
- Once we initiated the neurodynamic treatments, his symptoms decreased immediately and then resolved shortly thereafter.

Although released prior to the start of the 2001 season, the athlete was able to participate in all practices and scrimmages throughout training camp with no restrictions on his activity and without a recurrence of symptoms.

## Conclusion

We have had great success incorporating these techniques into our rehabilitation programs. Although very effective in the treatment of brachial plexus disorders, we also use neurodynamic-based treatments with lumbar injuries or general muscle strains, as often times these injuries may have a neurological component. As with all treatment programs, the speed of the rehabilitation progression is dependent on the patient, but we feel that these techniques provide us an additional means to get our athletes back on the field as fast as possible.

Todd Lazenby is the assistant athletic trainer San Francisco 49ers.

## References

<sup>1</sup>Butler, David. *Mobilisation of the Nervous System: Diagnosis and Management of Physical Dysfunction of the Nervous System in a Pain Sciences and Clinical Reasoning Framework. Continuing Education Course Workbook (15th ed.)*, 1991.

<sup>2</sup>Butler, David. *The Sensitive Nervous System*. Adelaide, Australia: Noigroup Publications, 2000.

Please refer to the NeuroOrthopedic Institute's website at [www.noigroup.com](http://www.noigroup.com) if you have questions regarding neurodynamics, continuing education courses or David Butler's book, *The Sensitive Nervous System*.

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