

# Neurology & Neurosurgery Associates, P.A.

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## ***Is That The Question?***

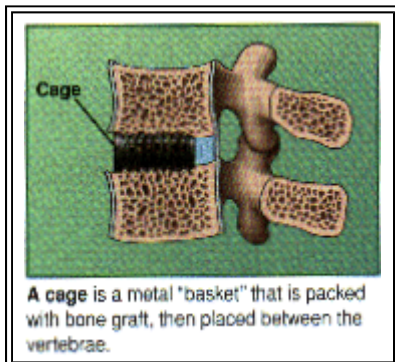
# **To Fuse or Not To Fuse**

Fusion of the spine remains one of the most controversial areas in the treatment of spinal disorders. Spinal fusions have been performed for more than fifty years with varying success. Technological advances have decreased risk and increased benefit but failure to relieve symptoms long-term continues to plague patients and doctors. The concept is simple. If a joint or bone becomes unstable and painful, and cannot be replaced, fuse it. This was the treatment for arthritic joints years ago. Now these arthritic joints are replaced. When fractures heal or degenerative segments in the spine fuse spontaneously, pain improves. Very old spines, with advanced arthritis fusing multiple discs, are stiff but often less painful. Unfortunately, replacement of spinal segments remains impractical.

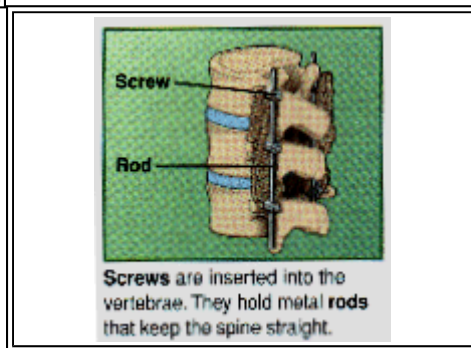
Good bone healing is essential to the long-term success of any fusion. When the patient's body incorporates bone graft, the fusion will last a lifetime. Many factors affect bone healing. Negative factors include advanced age, osteoporosis, infection, radiation, lack of immobilization and nicotine. Positive factors include good nutrition and blood supply, compression on graft and adequate immobilization.

Braces have been used for decades to immobilize the spine and promote fusion. The old "body cast" has been replaced by hard plastic clam shell type braces. These are better tolerated by patients but are still cumbersome and uncomfortable. They do not completely immobilize the spine and also allow muscles to weaken because they are not being used. Fractures and fusions fail to heal more often when just an external brace is

used.



Spinal instrumentation developed several decades ago. Various materials have been used to fix bones together until the bone heals three to six months after surgery. These devices provide maximum immobilization of the involved segment. This shortens the time in the brace, or eliminates the brace completely. Patients can be quickly mobilized and return to rehabilitation. Implantation of the instrumentation is not without risk. Blood loss and tissue trauma are greater, but benefit to risk ratio is still favorable.



While the general principles are the same, fusions of the cervical, thoracic and lumbar spine present different problems. The spine can be approached from the front (anterior) or back (posterior). Because of ease of access, the cervical spine is most commonly approached from the front.

The chest and abdominal cavities make anterior approaches to the thoracic and lumbar spine more difficult, but technological advances are making this more practical. The relative weight supported and forces tolerated are greater as one moves lower in the spine. Lumbar fusion constructs must support the entire upper body while cervical fusions need only support the head.

Indication for fusion is probably the most controversial issue. The least controversial indication is trauma that results in gross instability. Fractures of bones and joints that result in a spine that will not support weight bearing need fusion. Tumors and infection sometimes weaken the spine to the point where fusion is done to re-establish weight bearing. The most controversial indication for fusion is degenerative disc disease. Opinions range across a wide spectrum. Relatively mild degenerative changes are sometimes assumed to cause pain and are therefore fused. However, most experts believe that this type of fusion drastically over treats patients. Fusion for spondylolisthesis (subluxation) and gross instability on flexion extension (bending) x-rays is less controversial and more successful. These are still big operations so risk to benefit ratios must be weighed carefully.

Future developments include chemicals to stimulate bone growth and instrumentation placed through less invasive operations. Disc and joint replacements are not yet available but in development.

John C. Amann, M.D., F.A.C.S.

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# Neurologic Injuries in Athletics and Exercise

## CERVICAL SPINAL CORD INJURY

Along with head trauma, cervical and lumbar spine trauma is the most common. The anatomy of the spinal vertebral column is designed for the greatest movement and flexibility in the cervical region, which makes this area the most easily injured. The low back has support from the strong paraspinal muscle groups, and trauma here often results in musculoskeletal pain. The spinal vertebral column serves as protection for the spinal cord, and neck injuries are often diagnosed appropriately as muscle strains. However, as with concussions, education for assessment of this injury is essential.

Neurologic signs of cervical spinal cord injury (myelopathy) weakness of extremities, spasticity of extremities, difficulty walking, or controlling lower extremities, impaired sensation in extremities, increased muscle stretch reflexes, can have bowel or bladder problems.

If a spinal cord injury is suspected, this is a true emergency. Emergency personnel are notified and the athlete is transported to the nearest hospital. The head and neck are to be immobilized to halt any further progression of injury from the trauma.

## MULTIPLE SCLEROSIS AND EXERCISE

Multiple sclerosis is an inflammatory, demyelinating disease of the central nervous system. It affects about 250,000 persons in the United States, with a greater percentage being women. Unfortunately, the disease strikes in the age range of 20 to 40, when individuals are more physically active. The natural history of the disease is variable. It can present with a slow progression of symptoms over years, or a relapsing and remitting character to the symptoms. There are therapies to treat the symptoms chronically, as well as intravenous medications to rescue patients from an exacerbation. However, the mean duration from disease onset to need for assistance with ambulation has been reported at about 15 years.

Some symptoms of multiple sclerosis are visual impairment (loss of vision, blurred vision, double vision), weakness, sensory disturbance, motor incoordination, tremor, gait disturbance.

The relationship between multiple sclerosis and exercise has been controversial. It has long been thought that exercise and its effects (heat production, tachycardia, hyperventilation) may precipitate an exacerbation of the disease. Many studies have approached this issue for objective data. In one 1996 study, multiple sclerosis patients were randomized into exercise and non-exercise groups, and studied over 15 weeks of aerobic training. The training included three 40-minute sessions per week, and various parameters were measured. The exercise group had significant improvements in aerobic capacity upper and lower extremity strength, and reductions in body fat and blood lipids. This group also reported improvements in mood, bowel and bladder functions, and a

reduction in fatigue. There was no significant change on the Expanded Disability Status Scale, however, in this 15 week period studied, and there were no adverse effects from the exercise training program. Although exercise did not improve the objective disability, it was safe, it improved the patients' quality of life, and provided a positive perspective.

For patients who are heat sensitive, exercise can still be pursued with cooling access, or at cool times of the day. Exercise programs for multiple sclerosis patients should be entered with physician guidance, as we cannot forget that the disease can potentiate postural hypotension or heart rate variations.

## **PERIPHERAL NERVE INJURIES**

Most injuries of the extremities are orthopedic conditions. However, sports can produce entrapment syndromes of peripheral nerves, and a diagnosis and prognosis are important issues. Entrapment syndromes more commonly involve the median nerve and its branch-es (baseball pitchers), ulnar nerve, and tibial nerve (runners). Peripheral nerve injuries are also viewed in severity.

Some more common peripheral nerves to be injured, and their mechanism axillary: anterior shoulder dislocation from direct impact peroneal: knee dislocation, prolonged or chronic direct ice application, severe ankle sprain ulnar: Prolonged or chronic direct ice application, subluxation from direct impact musculocutaneous: shoulder dislocation, brachial plexus injury.

### *Classification of peripheral nerve injuries*

**Neurapraxia:** A focal area of demyelination of a nerve.

**Axonotmesis:** Loss of axonal fibers, but a connective tissue sheath (epineurium and perineurium) remains intact. Regeneration of nerve fibers is possible.

**Neurotmesis:** Loss of nerve fibers and connective tissue sheath. Results from complete transection of a nerve. Regeneration of nerve fibers is less likely.

An evaluation by nerve conduction studies and electromyography is required for accurate location and diagnosis of peripheral nerve injuries. One common injury (mostly in football) is termed a "stinger" or "burner". It involves pain and tingling sensations to the arm on the side of the injury, and can involve weakness of the deltoid and upper arm muscles. The mechanism of injury is sudden lateral flexion of the neck. The symptoms typically last for seconds to minutes. There is still debate whether these symptoms are a result of irritation to the brachial plexus, nerve roots, or the spinal cord. Return to play includes returning to baseline neck range of motion, full strength, resolution of pain, and wearing a cervical neck roll.

## **EPILEPSY AND ATHLETICS**

Epilepsy is a disorder that affects one percent of the U.S. population by age 20, and 3 to 4 percent by age 80. Of the persons affected, 75 percent have the first seizure by age 30. The etiologies of epilepsy are numerous and include genetics, central nervous system infections or tumors, head trauma, developmental disorders, and stroke. Still, about 50

percent of epilepsy cases have no specific identifiable cause. There are many questions to answer in the consideration for an individual with epilepsy to participate in athletics: will there be breakthrough seizures? Is there greater risk for trauma? Let us first begin with the classification of seizures.

### ***International Classification of Epileptic Seizures:***

**Partial seizures (focal onset), simple partial (no impairment of consciousness), complex partial (focal onset followed by impairment of consciousness, or impairment of consciousness at onset), partial seizures evolving to secondary generalization.**

**Generalized seizures (convulsive or non-convulsive), absence seizure (typical, atypical, myoclonic), clonic seizure, tonic seizure, tonic-clonic seizure, atonic seizure.**

**An impact seizure results from sudden direct contact producing a derangement in the brain electrochemical conductance. Post-traumatic seizures occur in about 5 percent of patients with cerebral trauma, and in about 15 percent with severe head injury. Seizures occurring within one week after head injury have not been correlated to epilepsy. However, seizures occurring after one week or a remote time following head injury can be considered post-traumatic epilepsy, and warrant neurological evaluation.**

**Management of seizures in athletes. requires a close rapport between the physician and the athlete. Anti-epileptic medications should be selected with understanding of the athlete's sporting ambitions, and with consideration to the medications side effects. For example, phenobarbital can be very sedating in some individuals, and carbamazepine and phenytoin can impair motor coordination at high levels.**

***Most common reasons for breakthrough seizures:* Non-compliance (routines disturbed from holidays, vacations, or lack of education for need of medication), sleep deprivation, fatigue, alcohol, illicit drugs use, concurrent illnesses, emotional, mental, physical stress, menstrual cycle in some women.**

**Studies have addressed whether exercise precipitates seizures or lowers seizure threshold, and this has not been convincingly demonstrated. In fact, the U.S. Department of Health, Education, and Welfare Commission for the Control of Epilepsy and its Consequences has stated that "physical activity also appears to play a role in seizure prevention." Seizures have rarely been found to occur during exercise. It is postulated, and reported, that this may occur from inhibition of epileptogenic discharges from stimuli such as arousal, alertness, concentration, and biochemical changes such as metabolic acidosis.**

**Although studies have not shown clinical seizures during exercise, increased epileptiform activity on electroencephalograms in the recovery phase and post-exercise period has been reported. The studies did not report clinical seizures during the post-exercise period.**

**Epilepsy does not increase the risk for injury, and the literature does not suggest that epilepsy patients are predisposed to immediate or early seizures after head injury. Traumatic injuries to epilepsy patients have no different sequelae. There is no evidence to support that sudden death in epilepsy patients is related to exercise, and morbidity**

and mortality is not known to be increased in epilepsy patients participating in sports (with the exception of swimming, aquatic sports, boxing).

*Risks of sports in patients with epilepsy:*

High risk, Scuba diving, long-distance swimming, hang gliding, auto racing

Moderately High, Football, lacrosse, rugby, wrestling, boxing, soccer, hockey

Moderately Low, Baseball, basketball, gymnastics, sailing, windsurfing, martial arts, horseback riding

Low Risk, Track and field, hiking, cross-country skiing, crew, golf, tennis, badminton, archery, bowling, canoeing

Because seizures present with many manifestations and because the natural history of epilepsy is so varied, there are no universal guidelines for patients' participation in athletics. It is recommended that well-controlled seizure frequency and well-tolerated anti-epileptic medications without side effects govern the decision to play sports. Boxing does carry the risk for increasing seizure frequency and further danger, and is not mended.

I would offer these three keys in the decision making process: 1. Seizures are correctly diagnosed, managed, and appropriate safety cautions are used. 2. Compliance and avoiding lifestyle behaviors that provoke seizures is strongly pursued. 3. The patient, parents, coaches, physician all fully support the plan and decisions.

Exercise and competitive athletics offer a great deal of emotional, physical and psychological satisfaction. Many questions of patients with neurologic disease remain to be answered, but recently, many myths have already been corrected.

Shailesh Rajguru, D.O., Neurologist

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