

Leading the way in the treatment of scapula winging

Dr Rahul Nath's research team performed a meta-analysis study comparing long thoracic or spinal accessory nerve decompression and neurolysis versus muscle and tendon transfer operations and reported that these nerve surgeries are more effective techniques in correcting winging scapula in comparison with muscle and tendon transfer operations. Dr Nath's work advocates that these techniques should be considered a primary modality of functional restoration.

The scapula (shoulder blade) is a large, important bone with a complex structure that helps make up the shoulder joint. The scapula has many important muscles attached to it. These muscles are responsible for stabilising the shoulder joint, as well as providing arm movement. When these muscles are too weak or paralysed, a person's ability to stabilise the scapula is limited and this may cause 'winged scapula.' Scapula winging is a rare but often debilitating condition where, instead of lying flat, the shoulder blade protrudes from the back in a wing-like appearance. Scapula winging can affect the ability to lift, pull, and push heavy objects, and consequently impacts on the ability to carry out many daily activities of living. It may cause pain and weakness, limits shoulder elevation, reduces the range of motion and in some cases can cause deformity. Cosmetically, patients may find it distressing if their winging is very noticeable.

Scapula winging is caused by severe injury to the muscles that control the scapula or to the nerves that supply these muscles. One common cause is injury to the serratus anterior muscle. Without this muscle, the arm cannot be raised above shoulder level. The serratus anterior is innervated by the long thoracic nerve (LTN). The unique structure of the LTN predisposes it to injury: it is a long nerve, small in diameter and fragile-appearing, with less 'cushioning' connective tissue than its neighbouring nerves. LTN injury can occur acutely

from a blow to the shoulder, unusual twisting of the neck and shoulder or results from activities involving repetitive movements, for example from athletics, tennis and other sporting activities, or through household activities such as hedge-clipping or digging.

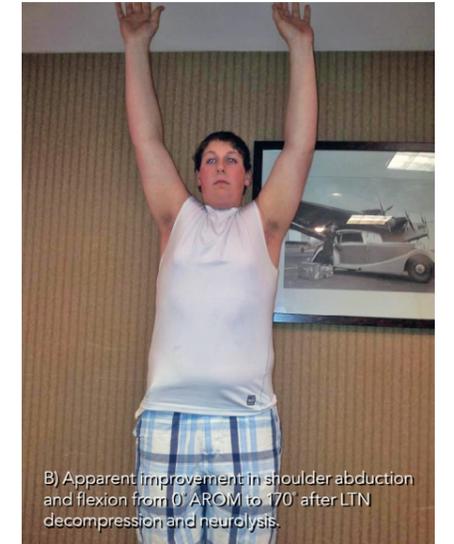
A SMART DIAGNOSIS

Diagnosis of scapula winging begins with a thorough physical examination by a specialist, and the severity of winging is assessed by the range of shoulder motions that can be performed by the patient. Standard x-rays, an MRI of the shoulder, neck, or scapula and electrical testing (called needle electromyography, or EMG) of affected nerves and muscles are commonly used methods for confirming the diagnosis.

Dr Rahul Nath, Institute Director and Founder of the Texas Nerve and Paralysis Institute is an expert on winging scapula and other neuromuscular disorders, having treated several thousand children and adults during his 27 years of practice. In a 2010 study, Dr Nath explored an alternative diagnostic test for identifying the types of nerve injuries that are common causes of winging scapula. Using a pain-free, computer-based pressure-specified sensory device (PSSD), he assessed whether patients had nerve compression. In his study, 30 patients with winged scapula were evaluated. Results with PSSD were compared with standard needle electromyography measurements (EMG). Dr Nath found that not only was PSSD consistently more sensitive than EMG, it could identify injuries that were completely undetected by EMG. Since



Figure 1: A) A 13-year-old boy with right winging scapula resulting from exercise and over use of the arm.



B) Apparent improvement in shoulder abduction and flexion from 0° AROM to 170° after LTN decompression and neurolysis.

PSSD can also distinguish whether the nerve is healing (regenerating) or failing to heal, it is an ideal tool for assessing outcomes from surgical treatment following nerve injury.

TREAT THE CAUSE, NOT THE SYMPTOMS

If winging scapula does not heal over time with physiotherapy, or if the condition is very severe, then corrective surgery is recommended to restore the function of the shoulder. Often, tendon transfer surgery is carried out. During the procedure, a healthy tendon and muscle are transferred from one location to another to substitute for the damaged muscle and tendon.

Clinical studies carried out by Dr Nath suggest that directly addressing the nerve injury itself, rather than replacing the tendon and muscle, is a far better approach to treating winging scapula effectively. Dr Nath has investigated two microsurgery techniques for the treatment of scapula winging: decompression and microneurolysis. During decompression surgery, compression of the nerve is released by carefully removing a section of the affected muscle. Then, scar tissue that may have built up around the nerve itself is surgically removed (microneurolysis) to further relieve any pressure, allowing the nerve to function normally. In essence, the forces pinching the nerve are surgically removed. Like a garden hose that has been uninked, the flow of power to the muscle

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In a large clinical study, Dr Nath treated 50 patients with scapular winging due to LTN injury using decompression and microneurolysis. Half of the patients had pain caused by the winging,

which improved in 73% of patients after surgery. Recovery of the serratus anterior muscle improved within 24 hours in 50% of the patients. 44 (88%) patients had significant improvement to the scapular winging within one day to three months. To quantify the impact of the surgery, patients were asked to



Figure 2: A) A 33 year-old female patient with right winging scapula before surgery. B) The same patient with normal appearance of her right scapula, five months after LTN decompression and neurolysis.

complete a standardised WHO quality of life survey: 98% of patients reported 'good' or 'excellent' outcomes. Poorer outcomes were reported in patients who had had their injury longer than eight years. Dr Nath concluded that nerve decompression is the treatment of choice for patients who have had the injury for less than eight years.

RAPID RECOVERY

In another clinical study, Dr Nath assessed treatment of patients with winging scapula caused by LTN injury. As before, decompression and microneurolysis were carried out for all patients. By measuring nerve conduction and muscle contraction before, during and after surgery, Dr Nath determined that the treatment resulted in the very rapid recovery of the affected nerve and the serratus anterior muscle, giving rise to the recovery of shoulder movement. Muscle improvement was quantified by measuring the angle at which the arm could be abducted. Remarkably, within just one day following surgical treatment the 13 patients enrolled in the study had on average an increased angle of abduction by 59%, and this improvement was maintained until the last follow-up (an average of 2.3 years). Dr Nath's study demonstrates that even several years after the onset of scapular winging, the LTN and serratus anterior muscle can maintain the ability to

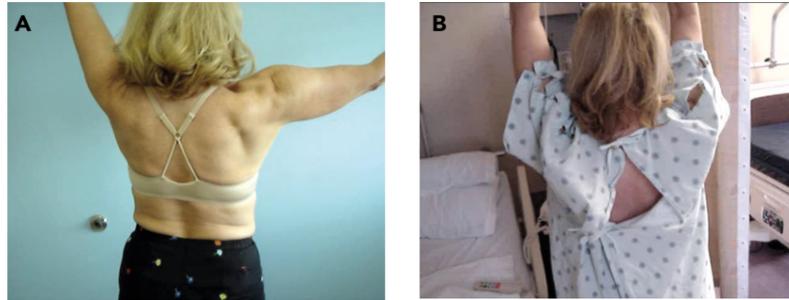


Figure 3: Abduction improvement one day after LTN decompression and neurolysis. A) Preoperative maximal humeral elevation of 103° as seen the day before neurolysis. This patient had been experiencing winging for 4.5 years. B) Postoperative abduction of 176° documented on the day after surgery.

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recover function within a relatively short time period.

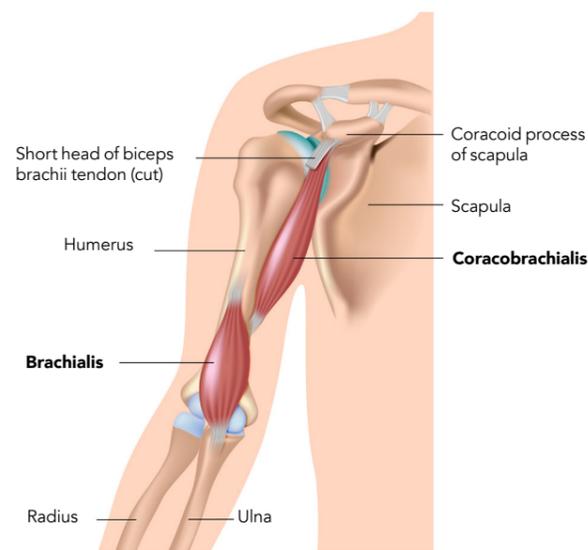
EXPLORING THE TREATMENT OF CHOICE

To fully investigate the value of his surgical treatments for LTN injury, Dr Nath and his team carried out a large meta-analysis – combining results from multiple studies to explore which treatment offers the benefit to patients. The first of its kind, this study compared outcomes from decompression and microneurolysis surgery carried out by Dr Nath with outcomes from standard

muscle and tendon transfer operations carried out by others. Dr Nath treated 25 patients with winging scapula and carried out a thorough follow up one year after nerve decompression and neurolysis. After surgery, shoulder flexibility dramatically improved from an average of 104 degrees to 167 degrees, and shoulder abduction increased from an average of 97 to 157 degrees. Improvements seen by patients was significantly superior compared to outcomes resulting from muscle and tendon transfer operations published by others.

Through the largest clinical study of LTN decompression and neurolysis to date, Dr Nath demonstrates the importance of this treatment for scapular winging patients. The use of microneurolysis treats the cause of the problem rather than the result of the injury, and shows positive outcomes for patients, with improved function, loss of winging, and pain relief. Surgical outcomes from LTN decompression and neurolysis are significantly better compared to other procedures, suggesting that it is the treatment of choice for restoring shoulder function.

Find out more about treatment of winging scapula at the Texas Nerve and Paralysis Center <http://www.drathwingingscapula.com>.



Deep Muscles of Arm
(right arm, anterior view)



Behind the Bench

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Detail

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Bio

Dr Nath serves as a Reconstructive Microsurgeon and as the Director of Texas Nerve and Paralysis Institute at Houston, USA. He received his MD degree in 1988 from Northwestern University, The Feinberg School of Medicine, Chicago. This was followed

by internship and residency at Northwestern and at the Department of Surgery in plastic and reconstructive surgery, Washington University in St. Louis, followed by two fellowship years in peripheral nerve injury. He joined the Faculty at Baylor College of Medicine in 1996, and he served there until 2004.

Research Objectives

Dr Nath's research team performed a meta-analysis study comparing long thoracic or spinal accessory nerve decompression and neurolysis versus muscle and tendon transfer operations

and reported that these nerve surgeries are more effective techniques in correcting winging scapula in comparison with muscle and tendon transfer operations. Dr Nath's work advocates that these techniques should be considered a primary modality of functional restoration.

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<http://www.drathwingingscapula.com>

Personal Response

You have shown that following surgery, damaged muscle and nerves have the ability to recover very rapidly. Are the mechanisms of recovery understood?

Yes. During decompression surgery, compression of the nerve is released by carefully removing a section of the affected muscle. Then, scar tissue that may have built up around the nerve itself is surgically removed (microneurolysis) to further relieve any pressure. This enables the nerve to work more normally.