Open Anterior Release of the Superior Transverse Scapular Ligament for Decompression of the Suprascapular Nerve During Brachial Plexus Surgery

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Reconstruction of the suprascapular nerve (SSN) after brachial plexus injury often involves nerve grafting or a nerve transfer. To restore shoulder abduction and external rotation, a branch of the spinal accessory nerve is commonly transferred to the SSN. To allow reinnervation of the SSN, any potential compression points should be released to prevent a possible double crush syndrome. For that reason, the authors perform a release of the superior transverse scapular ligament at the suprascapular notch in all patients undergoing reconstruction of the upper trunk of the brachial plexus. Performing the release through a standard anterior open supraclavicular approach to the brachial plexus avoids the need for an additional posterior incision or arthroscopic procedure. *(J Hand Surg Am. 2016;41(7):e211–e215. Copyright © 2016 by the American Society for Surgery of the Hand. All rights reserved.)*

Key words Brachial plexus, nerve decompression, nerve entrapment, shoulder reconstruction, suprascapular nerve.

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After an upper brachial plexus injury, shoulder reconstruction is essential to help restore upper limb function. These injuries commonly include C5 to C6, C5 to C7, or complete plexus injuries (C5–T1). The suprascapular nerve (SSN) is reconstructed to restore abduction and external rotation of the shoulder. Tendon transfers can be used to restore these functions but they are technically difficult and less successful outcomes are achieved in adults compared with pediatric patients because of the weight of the upper limb. Nerve transfers are favored if the patient presents within 9 months of their injury.

To optimize the success of a nerve transfer, any distal compression points should be released to prevent a possible double crush syndrome.[1] The superior transverse scapular ligament (STSL) runs from the coracoid to the suprascapular notch forming the suprascapular foramen. The SSN passes through the foramen and can become entrapped, resulting in loss of abduction and external rotation of the humerus, neurogenic pain, and marked impairment of shoulder function. Release of the STSL achieves both of these goals; it resolves any potential entrapment and prevents a double crush syndrome.

INDICATIONS

Many patients will recover spontaneously after a postganglionic neuropraxia or axonotmetic injury to the upper trunk of the brachial plexus. However, in patients with more severe injuries, such as a neuroma-in-continuity or neurotmesis, surgical intervention

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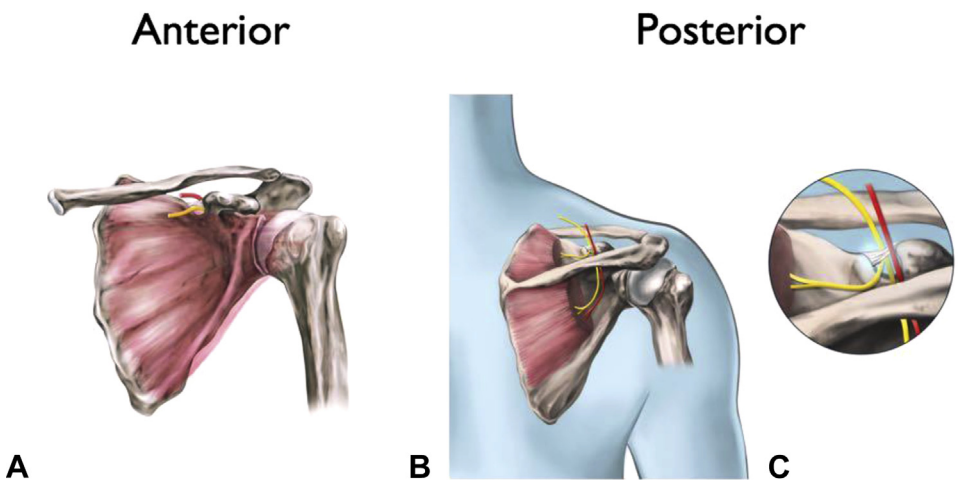

FIGURE 1: Anatomy of the SSN. **A** Anterior view of the SSN. From an anterior supraclavicular brachial plexus approach, the authors release the STSL. **B** Anatomical relationship from a posterior view. This is the traditional approach for an SSN decompression. However, it requires a position change and an additional incision if performed during brachial plexus exploration and reconstruction. **C** Anatomical relationship of SSN and artery to the STSL. Both the nerve and the artery must be identified before release of the STSL, to avoid injury. The SSN travels below the STSL through the suprascapular foramen. The path of the suprascapular artery can vary. Most frequently (73.8% of the time), it travels superior to the STSL.

is indicated. If the physical examination, diagnostic imaging, and electrodiagnostic testing suggest a preganglionic injury or a neurotmetic injury, a nerve transfer is performed to coapt a branch of the spinal accessory nerve to the SSN.

To optimize outcomes, it is generally best to operate within 6 months of a peripheral nerve injury for patients without evidence of adequate reinnervation.[2] Nerve exploration and reconstruction can be performed early if a root avulsion is suspected because there will be no spontaneous recovery in these cases.[3]

CONTRAINDICATIONS

If a patient presents in a delayed (9−12 mo) or late (over 12 mo) manner after injury, the likelihood of success with a nerve transfer is greatly diminished because of prolonged denervation of the target muscles and degeneration of the motor end plates. In these cases, nerve transfers can still be performed with a guarded prognosis up to approximately 12 months after injury for adult patients or up to 18 months after injury for pediatric patients. Alternatively, in these cases, tendon transfers (most commonly, the trapezius muscle) or muscle transfers (most commonly, a pedicled latissimus dorsi or free-functioning gracilis) can be performed. Shoulder arthrodesis can be considered as a final surgical option.

Severe medical comorbidities or traumatic brain injury must be considered on an individual basis before any brachial plexus reconstruction. Brachial plexus surgeries can require prolonged operative times and the recovery period is lengthy as nerves regenerate and target muscles are reinnervated.

It is imperative to prevent stiffness and joint contractures preoperatively by engaging the patient in daily physiotherapy exercises for all denervated joints of the upper limb.

SURGICAL ANATOMY

The SSN originates from the upper trunk of the brachial plexus, 2 to 3 cm above the clavicle. It is formed by the C5 and C6 spinal nerves[4] at Erb's point, just proximal to the division of the upper trunk into anterior and posterior divisions. The SSN runs superior to the brachial plexus. It passes caudally and posteriorly under the omohyoid and trapezius muscles, lateral to the scalenus medius, and through the suprascapular notch beneath the STSL.[5] The SSN then passes through the supraspinatus fossa deep to the supraspinatus muscle, travels around the lateral border of the spine of the scapula (the spinoglenoid notch), and enters the infraspinatus fossa deep to the infraspinatus muscle.

An anatomic study by Yang et al[6] demonstrated that the average height and diameter of the suprascapular notch were 5.8 and 7.8 mm, respectively. The SSN traveled through the notch and under the STSL in all dissected cadaver shoulders (n = 103). The average length and width of the STSL were 11.2 and 3.4 mm, respectively. A bony bridge replaced the ligament in 4 cases (3.7%). One cadaver did not have a discrete suprascapular notch or STSL.