



Original Article

Surgical management of winged scapula/shoulder disability in adults who failed conservative treatments

Rahul K. Nath, Chandra Somasundaram

Department of Research, Texas Nerve and Paralysis Institute, Houston, Texas, United States.

E-mail: *Rahul K. Nath - drnath@drnathmedical.com; Chandra Somasundaram - chandra@drnathmedical.com



***Corresponding author:**

Rahul K. Nath,
Department of Research, Texas
Nerve and Paralysis Institute,
Houston, Texas, United States.

drnath@drnathmedical.com

Received : 26 June 2021

Accepted : 27 July 2021

Published : 16 August 2021

DOI

10.25259/SNI_639_2021

Quick Response Code:



ABSTRACT

Background: Scapular winging, muscle weakness, chronic discomfort, and overall impairment of shoulder function are commonly caused by injuries to and/or compression of the upper brachial plexus, long thoracic, and accessory nerves. These injuries can have significant social and financial impacts on patients.

Methods: Twenty-one adults who sustained shoulder injuries (a bilateral injury in two patients and a total of 23 shoulder surgeries) presented with winged scapulas, limited shoulder range of motion, and severe shoulder pain.

Results: Patients underwent unilateral decompression, neurolysis of the upper brachial plexus/long thoracic nerve (LTN), and partial resection of the scalene muscle. The mean shoulder abduction/flexion improved significantly, and 15 of 21 (71%) patients regained full range of motion (180°) postoperatively. In addition, the winged scapula appearance improved significantly in 20 of 21 patients (96%) postoperatively.

Conclusion: All except one of 21 patients with scapular winging, muscle weakness, chronic discomfort, and overall impairment of shoulder function improved following unilateral decompression, neurolysis of the upper brachial plexus/LTN, and partial resection of the scalene muscle.

Keywords: Anatomical posture, Long thoracic nerve injury, Shoulder range of motion, Sports and recreational related physical activities, Winging scapula

INTRODUCTION

Scapular winging, muscle weakness, chronic discomfort, and overall impairment of shoulder function are commonly caused by injuries to and/or compression of the upper brachial plexus, long thoracic, and accessory nerves.^[1-8] Injury to the long thoracic nerve (LTN), which arises from the roots of the fifth, sixth, and seventh cervical nerves (C5–C7), is the most common cause of scapular winging. Because the LTN is long, thin, and runs superficially to the serratus anterior (SA) muscle, rendering it vulnerable to trauma. Injury to the LTN can cause weakness or paralysis of the SA muscle, which stabilizes the scapula and supports the shoulder abduction. Repeated use of strong forces, such as muscle strengthening exercises can cause soft tissue damage and dysfunction of the shoulder joints in adults. The compensatory muscle activity required to maintain the scapular mobility is associated with pain, spasm, and tendonitis around the shoulder joint.^[5] Timely diagnosis and management can reduce a significant loss of activity time or recurrence, leading to further disability. Nonoperative treatment includes medical and physical therapy. Surgical treatments are neurolysis, transposition, neurotomy, nerve transfer, and tendon transfer.^[4]

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Here, we report the anatomical and functional improvements in 21 sports and recreational related upper extremity-musculoskeletal disorders in adult patients after decompression and neurolysis of the upper brachial plexus and LTNs.

MATERIALS AND METHODS

Twenty-one patients (a bilateral injury in two patients and 23 shoulder surgeries) underwent surgeries and postoperative evaluations. The mean time interval between the onset of injury and surgery was 2.3 years. Preoperatively, the extent of scapula winging was severe in 10 of 21 patients (48%) and moderate in other 11 of 21 patients (52%) [Table 1]. Nerve conduction velocity and electromyography examination reports were obtained for the patients to assess the regional sensory or motor loss of the nerve injury.

Surgery

An incision was created over the area where the LTN exited through the middle scalene muscle, about 3 cm superior to the upper clavicular border. The supraclavicular nerves were identified and retracted laterally. The upper trunk of the brachial plexus was identified deep in the anterior scalene fat pad; the fat pad was retracted, and the underlying upper trunk of the brachial plexus was identified. There was epineural scarring that was released sharply. The substance of the upper trunk was entered, and the perineurium was dissected using microsurgical instrumentation and high magnification. Major fascicle groups were separated through internal neurolysis to decompress the upper trunk internally. The upper trunk was decompressed surgically with partial release/excision of the anterior scalene muscle and dissected around the lateral and posterior aspects of the upper trunk - (i.e. where the LTN exited the middle scalene muscle). The LTN also was noted to have an hourglass-shaped impingement at this exit point, and the nerve was circumferentially neurolysed. The perineurium of the LTN was then dissected; several fascicles were separated using internal microneurolysis. In addition, the middle scalene muscle was resected partially to decompress the LTN.

Statistical tests included; the paired Student’s *t*-test with Analyze-it 2.12 software in Excel 2003 (Analyze-it, Leeds, UK; Microsoft, Redmond, WA). A value of *P* < 0.05 was considered statistically significant.

RESULTS

Postoperative clinical assessment

The anatomical appearance of the winged scapula improved significantly in 20 of 21 patients (96%) after the surgery [Table 1 and Figure 1]. Eleven of 21 patients (52%) had

Table 1: Shoulder disability in adults: improvements after decompression and neurolysis of the upper brachial plexus and long thoracic nerves with partial resection of the scalene muscles.

Patient Group (number of patients)	Age range at the time of surgery	Average time-year between injury and surgery	Gender and number of patients	Follow-up months (Mean)	Preoperative ESW* (Mean)	Preoperative Flex° (Mean)	Preoperative Abd° (Mean)	Postoperative ESW* (Mean)	Postoperative Flex° (Mean)	Postoperative Abd° (Mean)
Baseball (1)	20	1	M - 3	23	1	30	30	4	180	180
Basketball (1)	33.2	6.2	M - 1	11	2	180	120	4	180	180
Bowling (1)	54.9	7.9	F - 1	10	2	120	120	4	180	180
Football (1)	23.5	3.5	M - 1	8	1	180	180	4	180	180
Skiing (1)	21.8	1.5	M - 1	6	1	120	120	3	180	180
Tennis (1)	70.3	1.3	F - 1	12	2	120	120	4	180	180
Exercising (4)	24.5-69.5	0.5-3.5	M - 3	2-17 (32)	1-2 (1.5)	30-180 (120)	90-180 (135)	2-4 (3)	120-180 (150)	120-180 (150)
Pull Ups (2)	28.5-49.5	0.5	M - 2	4-6 (5)	1	120	90-120 (110)	3	180	180
Weight-lifting (11)	21.5-52.9	0.3-6.9	M - 11	2-12 (7.0)	1-3 (1.3)	90-180 (130)	90-180 (120)	2-4 (3.5)	120-180 (175)	120-180 (150)

restoration of a near healthy appearance of the scapula. All except one patient showed remarkable recovery of the affected shoulder functions [Table 1 and Figure 1]. Fifteen of 21 (71%) patients recovered full range of motion (180°), and the mean shoulder abduction and flexion improved significantly postoperatively ($P < 0.001$) while the extent winging of the scapula scores also significantly improved [Table 1].

DISCUSSION

The LTN injury and paralysis of the SA muscle are well documented in professional athletic and non-professional sports and recreational-related activities. Muscle-strengthening exercise such as weightlifting is more likely to cause shoulder damage in adults, while sports-related activities can cause shoulder injury in youth [Tables 2 and 3]. In general, an early surgery of the affected nerve provides a better outcome. Recently, Camp and Birch^[2] reported no correlation between delays in surgeries and postoperative shoulder movements in 111 nerve injury patients. They also found a delay of over 40 months for a patient who still had a good functional outcome, whereas Ng and Wu^[6] found none of their patients recovered fully if the duration of winging lasted over 3 years. However, approximately half of their patients with serratus anterior muscle dysfunction were due to neuralgic amyotrophy (NA), and these NA patients had a worse severity of winging than the patients with traumatic cause. Of 21 patients in our report, 14 patients had over 1 year between the onset of injury and surgery. The other seven patients underwent surgery less than a year after the onset of the injury. The improvement in shoulder abduction and

flexion in these two groups of our patients were about the same (>120 and reached up to 180°) postoperatively [Table 3].

Göransson *et al.*^[3] reported a greater improvement of 44° in shoulder abduction in winged scapula patients who underwent neurolysis compared to nerve-grafting (30°). All 21 patients in our report underwent decompression and neurolysis; the improvement was >120°. Fifteen patients achieved full range of motion (180°) postoperatively.

Table 2: Physical activities (exercise, sport, and recreational-related) that caused the shoulder disability in our study.

S. No.	Physical activity	Number of patients
1.	Weightlifting	57 (49%)
2.	Exercise	20 (17%)
3.	Swimming	5 (4.3%)
4.	Water skiing, boarding and surfing	4 (3.4%)

There are three patients (2.6%) in each of the activities in parenthesis (Yoga, Cycling/Biking, Baseball, Tennis, and football), and two patients (1.7%) in each of the following activities: Basketball, Golf, Skiing, and Wrestling. There is one patient (0.9%) in each of the following activities: Volleyball, Playing pool, Kickboxing, Bow Hunting, Bowling, gymnastics, and Rugby. Total - 116.

Table 3: Incidence of shoulder injury in adult versus youth in our study.

Physical activity	Adult patients	Youth patients
Weightlifting	57 (84%)	11 (16%)
Sport-related activities	39 (48%)	42 (52%)
Exercises	20 (51%)	19 (49%)



Figure 1: (a and b) A 50-year-old male patient who had winging scapula and shoulder disability due to weightlifting. (c) Postoperative photograph showing recovery of the winged scapula/full active range of motion (shoulder abduction of 180°).

CONCLUSION

Twenty of the 21 patients in this report achieved functional shoulder movements and a healthy appearance of the scapula after decompression, and neurolysis of the upper brachial plexus and LTNs, with partial resection of the scalene muscles.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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How to cite this article: Nath RK, Somasundaram C. Surgical management of winged scapula/shoulder disability in adults who failed conservative treatments. *Surg Neurol Int* 2021;12:407.