

Botulinum Toxin for Management of Thoracic Outlet Syndrome: A Case Series

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Overview

We aim to evaluate the impact of botulinum toxin injections on symptom, function, and quality of life in patients with thoracic outlet syndrome (TOS) using a mixed-methods approach of retrospective chart review and patient interviews.

Introduction

- TOS is characterized by compression or injury of neurovascular structures within the thoracic outlet¹
- Clinical features include upper extremity pain, paresthesia, weakness, swelling, pallor, and coolness¹
- Estimated incidence is approximate 3 per 100,000 individual, although the true prevalence is likely higher²
- Most common in women aged 20-50 years; may arise from congenital anomalies (e.g. cervical rib) or acquired causes (e.g. trauma)³
- Individuals with TOS experience reduced quality of life and increased anxiety and depression levels⁴
- Botulinum toxin injections are a minimally invasive treatment targeting muscle hyperactivity that contributes to neurovascular compression
- However, evidence for its efficacy remains mixed: a 2011 randomized controlled trial found no significant improvement⁵, while 2023 systematic review reported symptom improvement in 46-63% of patients⁶
- Limited qualitative data exist describing patient lived experiences and perceived benefits following botulinum toxin treatment for TOS

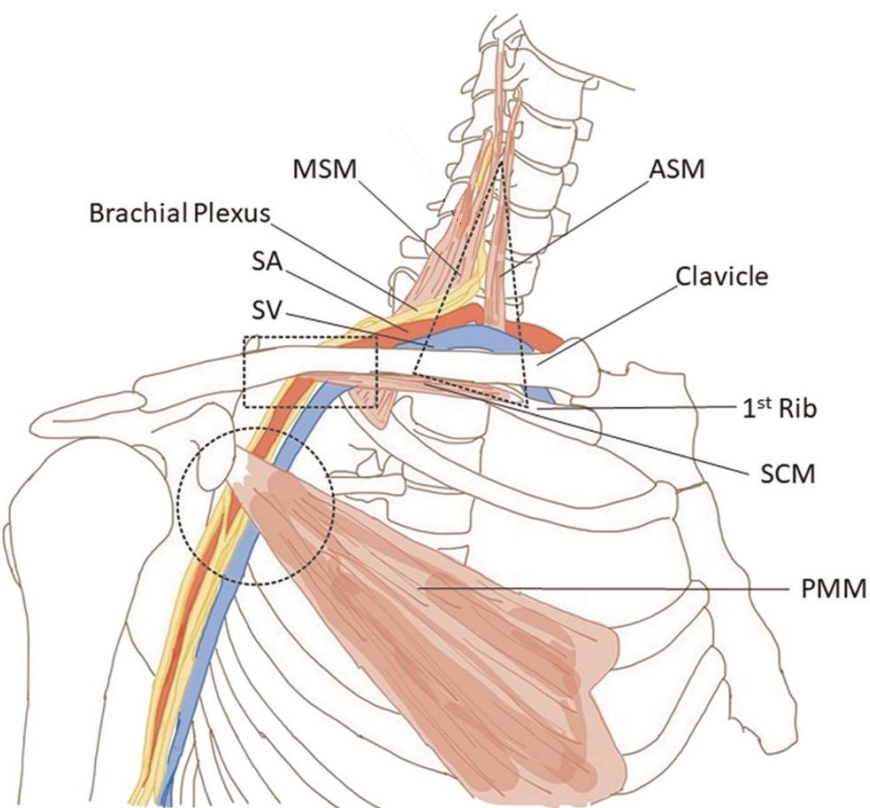


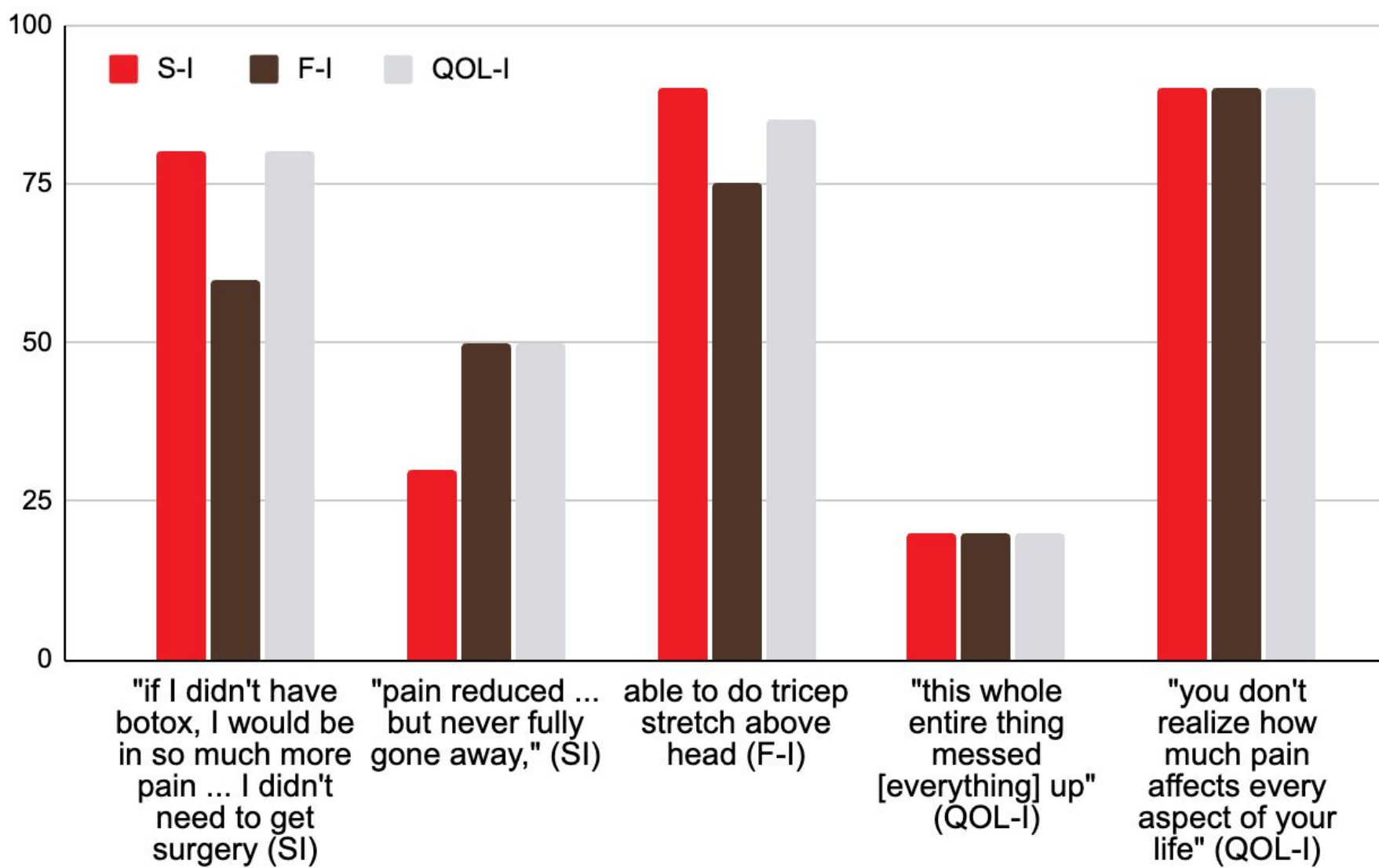
Figure 1. Thoracic Outlet Anatomy¹
Dotted lines indicate anatomical spaces where the compression may occur: triangle (interscalene triangle), rectangle (costoclavicular space), circle (retro pectoralis minor space). ASM, anterior scalene muscle. MSM, middle scalene muscle. PMM, pectoralis minor muscle. SCM, sternocleidomastoid muscle. SA, subclavian artery. SV, subclavian vein.

Preliminary Results

Figure 2. Patient Demographics and Clinical Characteristics

Characteristics	n = 5
Age in years, mean±SD	41.8±4.7
Sex, n (%)	Female, 4 (80%); Male, 1 (20%)
Race, n (%)	White, 5 (100%)
Comorbidities, n (%)	Obesity, 3 (60%); Spondylosis, 3 (60%); Anxiety, 2 (40%); Depression, 2 (40%); Anemia, 2 (40%); GERD, 2 (40%)
Age at diagnosis in years, mean±SD	39.6±4.4
Affected side, n (%)	Right, 3 (60%); Left, 1 (20%); Bilateral, 1 (20%)
Symptoms before treatment, n (%)	Numbness, tingling, weakness, radiating pain, loss of function of arm or fingers, exacerbated by overhead activities, 5 (100%)
# of injections, median (range)	3 (2 - 5)
Reported adverse reaction, n (%)	Difficulty swallowing now resolved, 1 (20%); Weakness of neck now resolved, 1 (20%)

Figure 3. Patient Reported Percent Improvements



Methods

- Adult patients treated at Brown University Physical Medicine & Rehabilitation between September 5, 2023 and June 27, 2025
- Met ≥3 of 4 diagnostic criteria with exclusion of alternative diagnoses⁵
 - Pain or paresthesia in upper limb
 - Symptoms worsen with arm elevation
 - Tenderness above clavicle
 - Positive EAST (elevated arm stress test)
- Received botulinum toxin injections for treatment
- 13 patients currently identified; 5 completed interview
- Retrospective Review: Data extracted from electronic medical record
- Patient Interviews: Patient reflect on three domains with narrative responses and rating of perceived improvement on a 0 to 100% scale
 - Symptom improvement (S-I)
 - Functional improvement (F-I)
 - Quality of life improvement (QOL-I)

Preliminary Discussion

- Thus far, patients were predominantly White women aged 30-50 years with classic TOS symptoms, most commonly affecting the right side
- Minor adverse effects from injections were reported, resolving over time
- All patients reported some symptom improvement (S-I), though responses varied greatly (20-90%), reflecting individualized effects
- Functional improvement (F-I) and quality of life improvement (QOL-I) generally mirrored symptom improvement (S-I)
- Patient quotes highlighted benefits, including improved pain control, regained mobility, and avoidance of surgery
- Given the study is in progress and the current sample size is limited (n=5), no generalizable conclusion can yet be drawn
- Ongoing work aims to complete interview with remaining patients

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