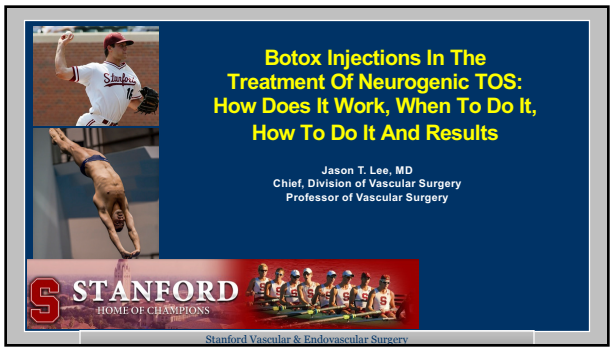

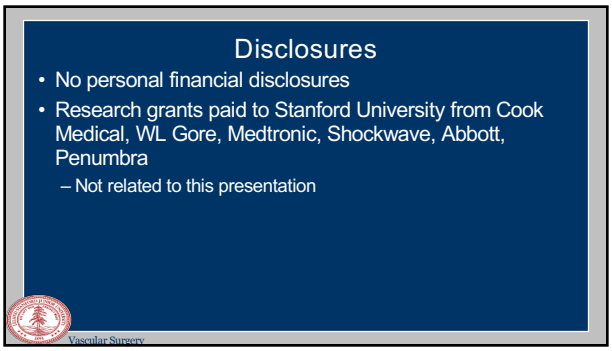

Difficulty of nTOS diagnosis

- Patients with nTOS present with vague symptomatology and objective diagnostic criteria are not clearly defined.
- SVS guidelines have been developed to produce consistency in diagnosis, treatment and outcomes.

Reporting standards of the Society for Vascular Surgery for thoracic outlet syndrome

Karl A. Illig, MD,[a] Dean Donahue, MD,[b] Audra Duncan, MD,[c] Julie Freischlag, MD,[d] Hugh Gelabert, MD,[a] Kaj Johansen, MD,[e] Sheldon Jordan, MD,[d] Richard Sanders, MD,[b] and Robert Thompson, MD,[f] *Tampa, Fla; Boston, Mass; London, Ontario, Canada; Sacramento and Los Angeles, Calif; Seattle, Wash; Aurora, Colo; and St. Louis, Mo*

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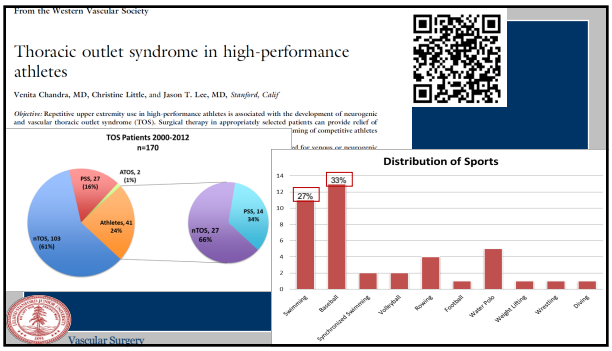
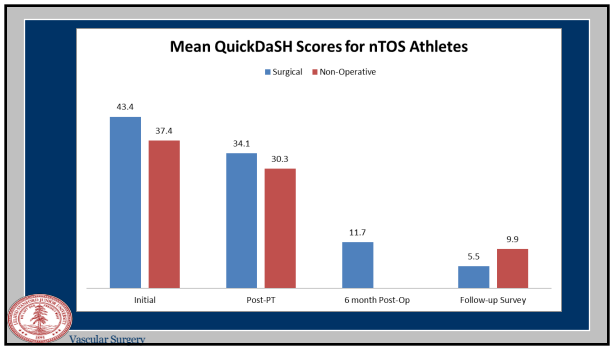
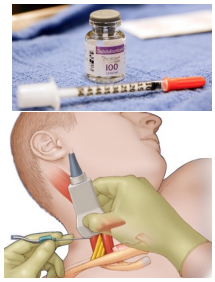


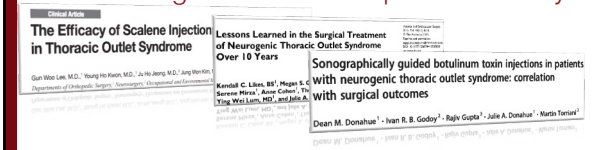


How to decide who does well with nTOS

- Botulism toxin injection (BTI)
  - muscular paralysis from temporary chemodenervation
  - decreased brachial plexus compression
- Can be therapeutic and diagnostic



Some studies demonstrate improvement with BTI as a diagnostic and therapeutic modality…



while others show no difference in outcomes…

Botulinum toxin injection for management of thoracic outlet syndrome: A double-blind, randomized, controlled trial

Heather C. Finlayson[a,b,*], Russell J. O'Connor[a,b], Penelope M.A. Brasher[c], Andrew Travlos[a,b]

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Original Research

Impact of Scalene Muscle Botulinum Toxin Injection With and Without Surgery in Neurogenic Thoracic Outlet Syndrome

Original Research

Neurogenic Thoracic Outlet Syndrome in Division 1 Collegiate Athletes: Presentation, Diagnosis, and Treatment

Original Research

Impact of Scalene Muscle Botulinum Toxin Injection With and Without Surgery in Neurogenic Thoracic Outlet Syndrome

- Review of consecutive patients who had scalene muscle botox injection for nTOS from 2000-2020.
- Botox injections done by Sports Medicine
  - Ultrasound guided injection of 50 units of botox to anterior scalene muscles.
- Surgical decompression via supraclavicular approach

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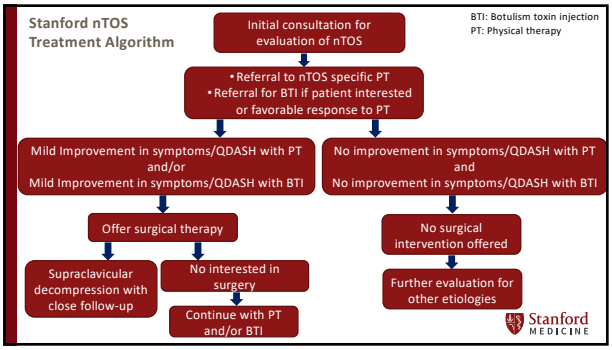
Stanford nTOS Treatment Algorithm

BTI: Botulism toxin injection
PT: Physical therapy



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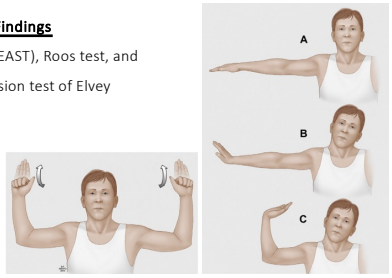
Positive physical Exam Findings

i.e. elevated arm stress (EAST), Roos test, and modified upper limb tension test of Elvey



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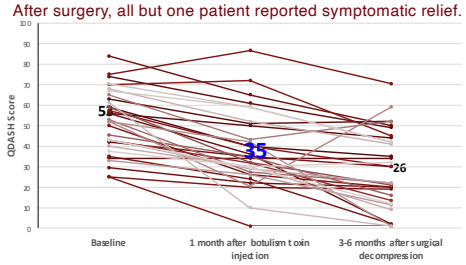
- After Botox, 77.9% reported relief.

After surgery, all but one patient reported symptomatic relief.



- After surgery, median QDASH score improvement of 21 (range: 10-40).
- 96.8% reached MCID QDASH score after combination therapy.

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Botox+Surgery more likely to have relief after initial Botox and overall relief & MCID QDASH improvement

Variable		BTI (N=46)	BTI + Surgery (N=31)	P-value
Relief after initial Botox		69.6% (32/46)	90.3% (28/31)	**0.03***
MCID* QDASH change after BTI		78.3% (18/23)	80.6% (26/31)	0.6
Overall relief		69.6% (32/46)	96.8% (30/31)	**0.003***
Overall MCID* QDASH Improvement		78.3% (18/23)	96.8% (30/31)	**0.032***
Overall QDASH change (median, IQR)		16 (-6-32)	21 (10-40)	0.258
Overall degree of relief	Mild	14.6% (6)	10% (3)	0.803
	Moderate	22% (9)	20% (6)	
	Significant	63.4% (26)	70% (21)	

*MCID: Minimal Clinically Important Difference

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Predictors of relief following Botulinum toxin injection

Variables	Odds ratio	95% CI	P-value
Symptom relief after BTI			
Gender (female)	6.6	1.01 - 43.49	0.049*
Positive physical exam finding	8.97	1.24 - 64.97	0.030*
MCID change in QDASH after BTI			
Longer symptom duration	0.5	0.22 - 1.13	0.094
Significant degree of relief after BTI			
Gender (female)	3.22	0.90 - 11.57	0.073

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Summary

- In our experience of Botox scalene injection in nTOS patients, BTI is helpful in alleviating symptoms prior to definitive surgical decompression
  - Reassures patients of diagnosis
- In appropriately selected patients, Botox followed by first rib resection provides additional symptom improvement over Botox alone
  - Nearly all reporting relief and reaching clinically important differences in QDASH score after combination therapy.

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