RAPID RESEARCH

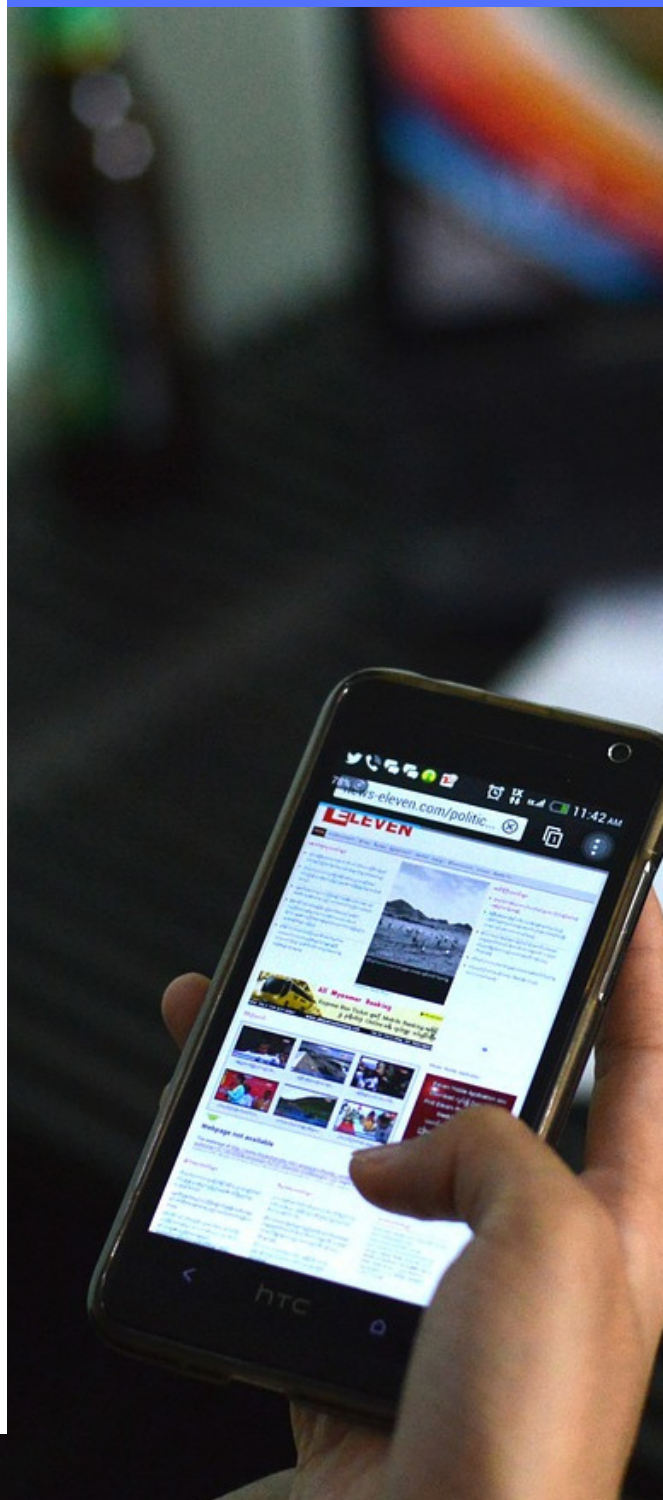
@physicaltherapyresearch

October 2021

Inside This Week:

Thoracic Outlet Syndrome (TOS)

- Essentials of Thoracic Outlet Syndrome
- Thoracic Outlet Syndrome in High-performance Athletes
- Algorithm for Surgery Selection in Patients with Neurogenic TOS

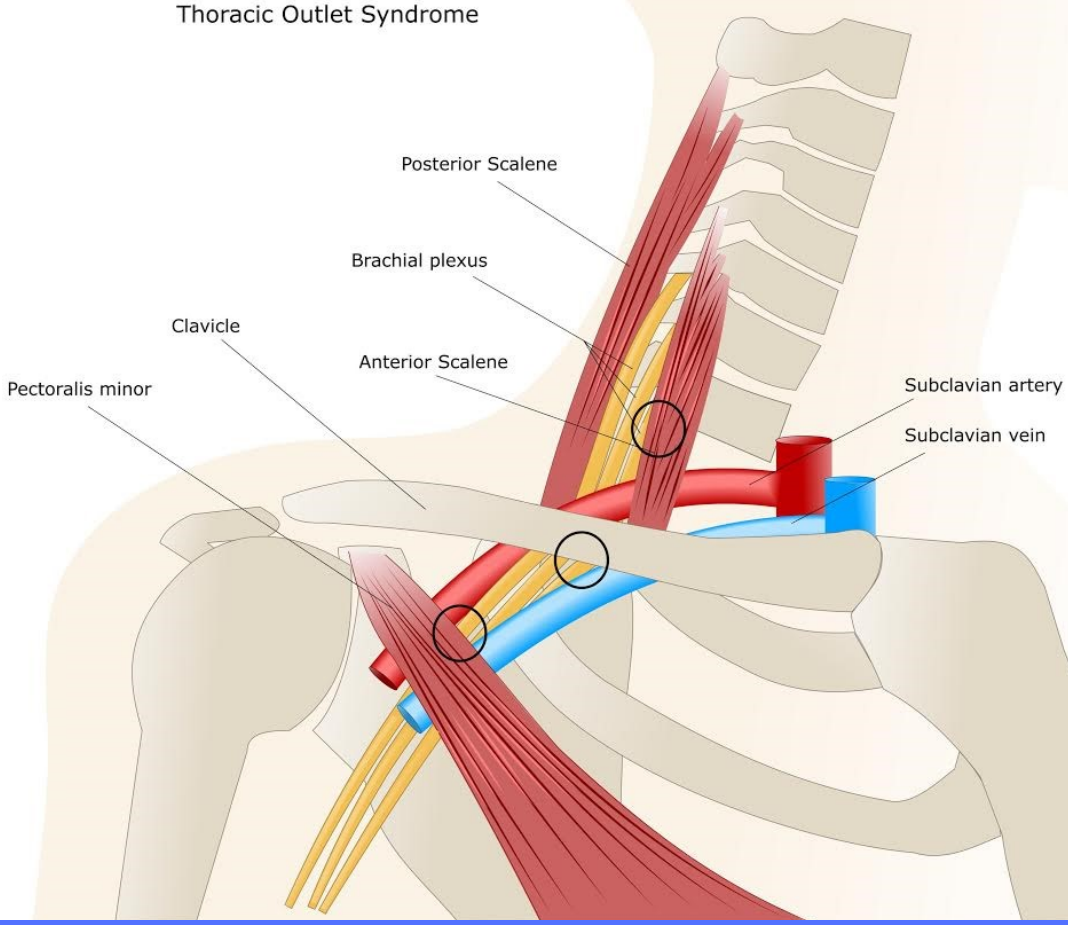


OCTOBER 2021

ESSENTIALS OF THORACIC OUTLET SYNDROME

Click for Full Text (Chang & Kim 2021)

Thoracic outlet syndrome (TOS) is a group of disorders involving compression of the nerves and/or blood vessels in the thoracic outlet region. This narrative review described TOS pathophysiology, clinical evaluation, differential diagnoses, and treatment.



KEY FINDINGS

Currently, TOS is classified as:
Arterial vascular, Venous vascular, True neurologic, Traumatic Neurovascular, and Disputed.

Pathophysiology:
Most frequent cause: Brachial plexus compression.
Hypertrophy of scalene muscles, decreased tone, or shortening, contribute to ~70% of cases.
Ectopic cervical ribs and prominent C7 transverse processes, cause ~30% of cases.
Repetitive exercises or muscle imbalances can also induce TOS.

Clinical Evaluation:
Clinical symptoms vary according to their pathology.
Clinical Tests commonly include: Wright, Addson, Halsted, Roos, & ULTT **(SEE NEXT PAGE)**
Ultrasonography, MRI & CT can be helpful in the diagnosis of TOS.

Differential Diagnoses:
TOS is frequently misdiagnosed because other disorders show similar symptoms.
For example: Raynauds, Rotator cuff tear, Cervical radiculopathy, Cubital tunnel syndrome, Guyons canal syndrome, Pancoast tumor, etc. **(SEE NEXT PAGE)**

Treatment:
Initial conservative therapy includes:
Patient education (postural mechanics, relaxation techniques), Exercise (stretching and strengthening of targeted muscles), and Activity modification.
Surgical treatment, such as first rib and/or cervical rib resection, may be considered.
Thrombolysis or embolectomy is the most effective treatment for arterial TOS.

MAIN TAKEAWAYS

Many patients present with upper limb pain with or without motor weakness, however only a few are likely to have TOS.

To ensure diagnostic accuracy and appropriate treatment, clinicians should have some knowledge of TOS.

This review provides the essential knowledge for clinicians to diagnose and manage TOS in clinical practice.

CLINICAL TESTS

Table 1 Diagnostic tests for thoracic outlet syndrome

Test	Maneuver	Positive result
Adson maneuver	The affected arm is abducted 30° at the shoulder and maximally extended. The patient extends the neck, turns the head toward the symptomatic shoulder, and inhales deeply	Decrease or absence of ipsilateral radial pulse
Wright maneuver	The shoulder on the symptomatic side is abducted above 90° and externally rotated	Decrease or absence of ipsilateral radial pulse
Halsted maneuver	The affected arm is abducted, extended to 45°, and externally rotated. The examiner applies downward traction to the arm and turns the patient's neck away from the affected side	Decrease or absence of ipsilateral radial pulse
EAST (Roos test)	The arms are placed in the surrender position with shoulders abducted to 90° and in external rotation and the elbows flexed to 90°. The patient slowly opens and closes the hands for 3 min	Provoking pain, paresthesia, heaviness, or weakness
ULTT	Position 1: Arms abducted to 90° with elbows flexed; Position 2: Active dorsiflexion of both wrists; Position 3: Head is tilted ear to shoulder in both directions	Positions 1 and 2 elicit symptoms on the ipsilateral side, while position 3 elicits symptoms on the contralateral side

DIFFERENTIAL DIAGNOSIS

Table 2 Differential diagnoses for thoracic outlet syndrome and their distinguishing clinical features

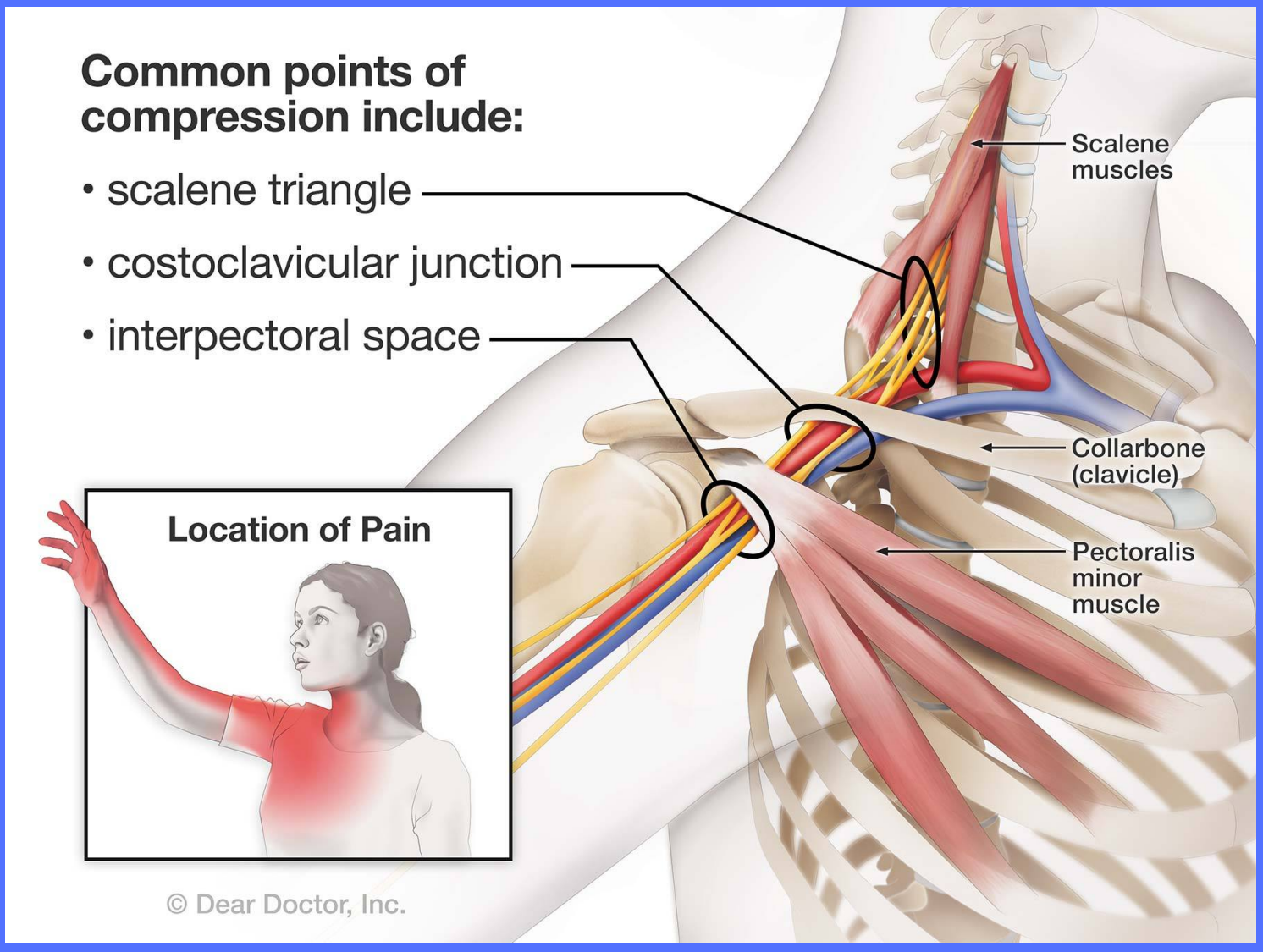
Disorder	Distinguishing features
Raynaud's syndrome	Cold fingers, color changes in the skin in response to cold or stress that are relieved by warmth
Vasculitis	Severe sudden-onset pain involving more than one limb, elevated C-reactive protein level, skin lesion (*e.g.*, purpura, petechiae, ulcer)
Rotator cuff tear	Pain during shoulder movement that is easily differentiated by ultrasound
Cervical radiculopathy	Acute pain (disc rupture), insidious onset (spinal stenosis), spurling sign (+), denervating potential of cervical paraspinalis on electromyography
Cubital tunnel syndrome	Tinel sign (+) over cubital tunnel; Differentiated by nerve conduction study
Guyon's canal syndrome	Tinel sign (+) over Guyon's canal; Differentiated by nerve conduction study
Neuralgic amyotrophy	Extreme sudden-onset pain followed by rapid motor weakness and atrophy
Pancoast tumor	Pain in the shoulder radiating to the inner part of the scapula, possible Horner syndrome, tumor on the apex of the lung
Complex regional pain syndrome	Diffuse pain, predominant vasomotor features, history of stroke, trauma, or peripheral nerve injury

OCTOBER 2021

THORACIC OUTLET SYNDROME IN HIGH-PERFORMANCE ATHLETES

Click for Full Text (Chandra et al. 2014

This research evaluated the ability and timing of competitive athletes to return to high-performance level after TOS treatment and surgery.



KEY FINDINGS

41 competitive athletes underwent evaluation or surgical treatment for all forms of TOS;
66% nTOS patients & 34% were Paget-Schroetter syndrome (PSS) patients

All PSS patients underwent thrombolysis/anticoagulation treatment, followed by 1st rib resection.

Most nTOS patients were treated with TOS-specific physical therapy (PT).
67% of nTOS athletes ultimately underwent supraclavicular first rib resection and brachial plexus neurolysis.

Return to full competitive athletics was **achieved in 85% of all patients.**
93% of the PSS patients and 81% of the nTOS athletes
Average of **4.6 months after the intervention.**

In the nTOS cohort successfully returning to sport:
7 (32%) were treated only with PT.
83% of athletes whom underwent surgery for nTOS.

Recurrence of symptoms was noted in **2 nTOS (7%) and 2 PSS (14%) athletes.**

MAIN TAKEAWAYS

This research documented favorable outcomes for **treatment of high-performance athletes** who present with **venous or nTOS.**

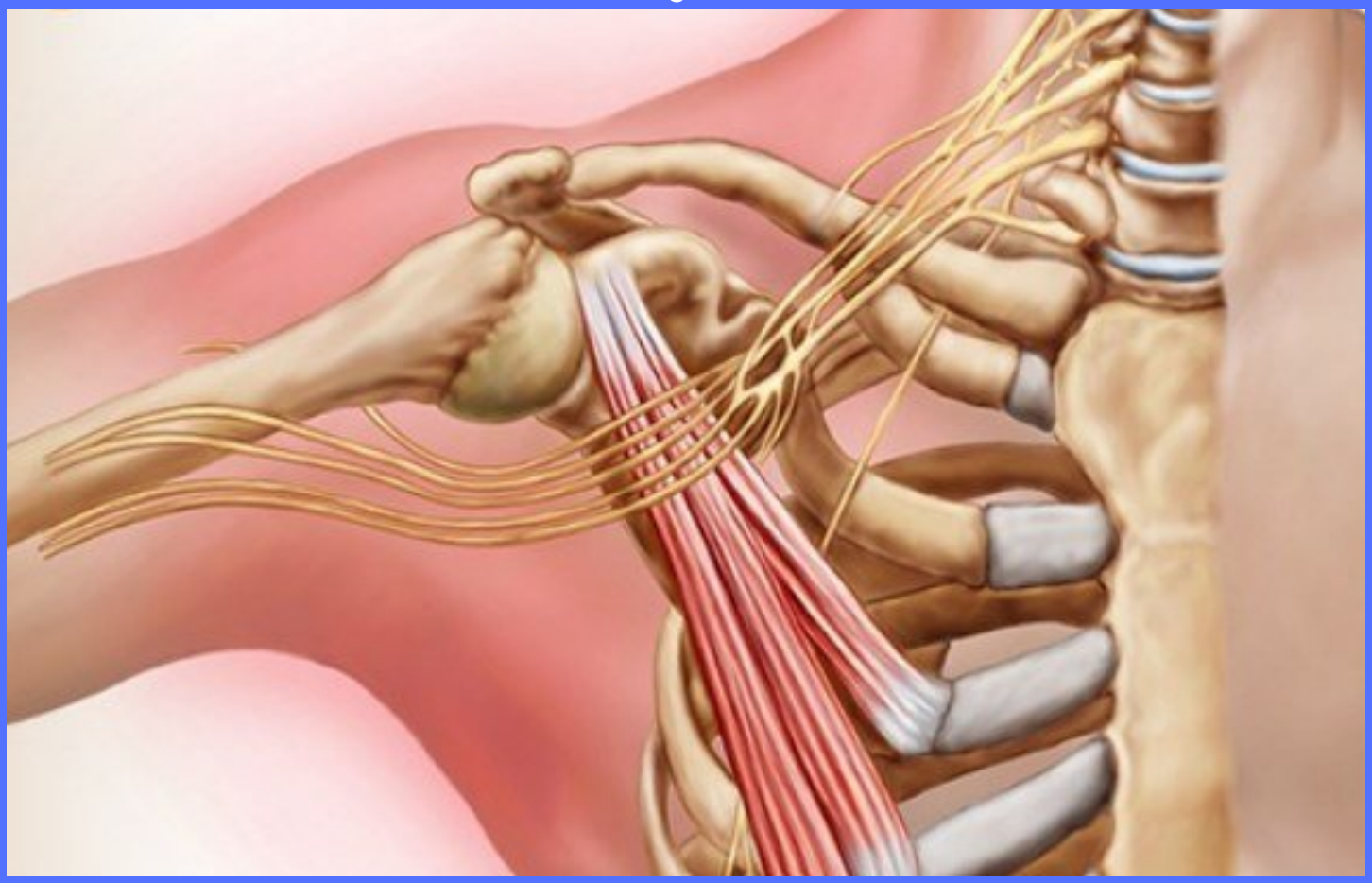
80% to 90% of high-performance athletes returned to their prior level of competitive sport with:
Standardized treatment algorithms
Prompt diagnosis and recognition
TOS-specific PT
Selective surgical management

OCTOBER 2021

ALGORITHM FOR SURGERY SELECTION IN PATIENTS WITH NEUROGENIC TOS

Click for Full Text (Chandra et al. 2011)

This research developed and analyzed surgical outcomes using a treatment algorithm for nTOS utilizing objective disability criteria.



KEY FINDINGS

Period 1:
93 Patients treated for nTOS from 2000-2009 were reviewed, most patients were offered surgery with documentation of appropriate symptoms.

34 patients underwent first rib resection
In operated patients, **47% showed compression** of their thoracic outlet arterial flow on provocative positioning.
Based on subjective improvement of symptoms, **56% of patients at 1 year had a positive outcome.**

Period 2:
In 2007 patients which benefited most from surgical intervention were determined.

All patients were prescribed PT, and **24 (41%) were eventually offered surgical decompression.**

21 patients underwent surgery consisting of first rib resection, middle and anterior scalenectomy, and brachial plexus neurolysis.

At 1-year follow-up, **90% of patients expressed symptomatic improvement** with the mean post-op QD disability score decreasing to 24.9 and 1-year QD scores improving down to 20.5

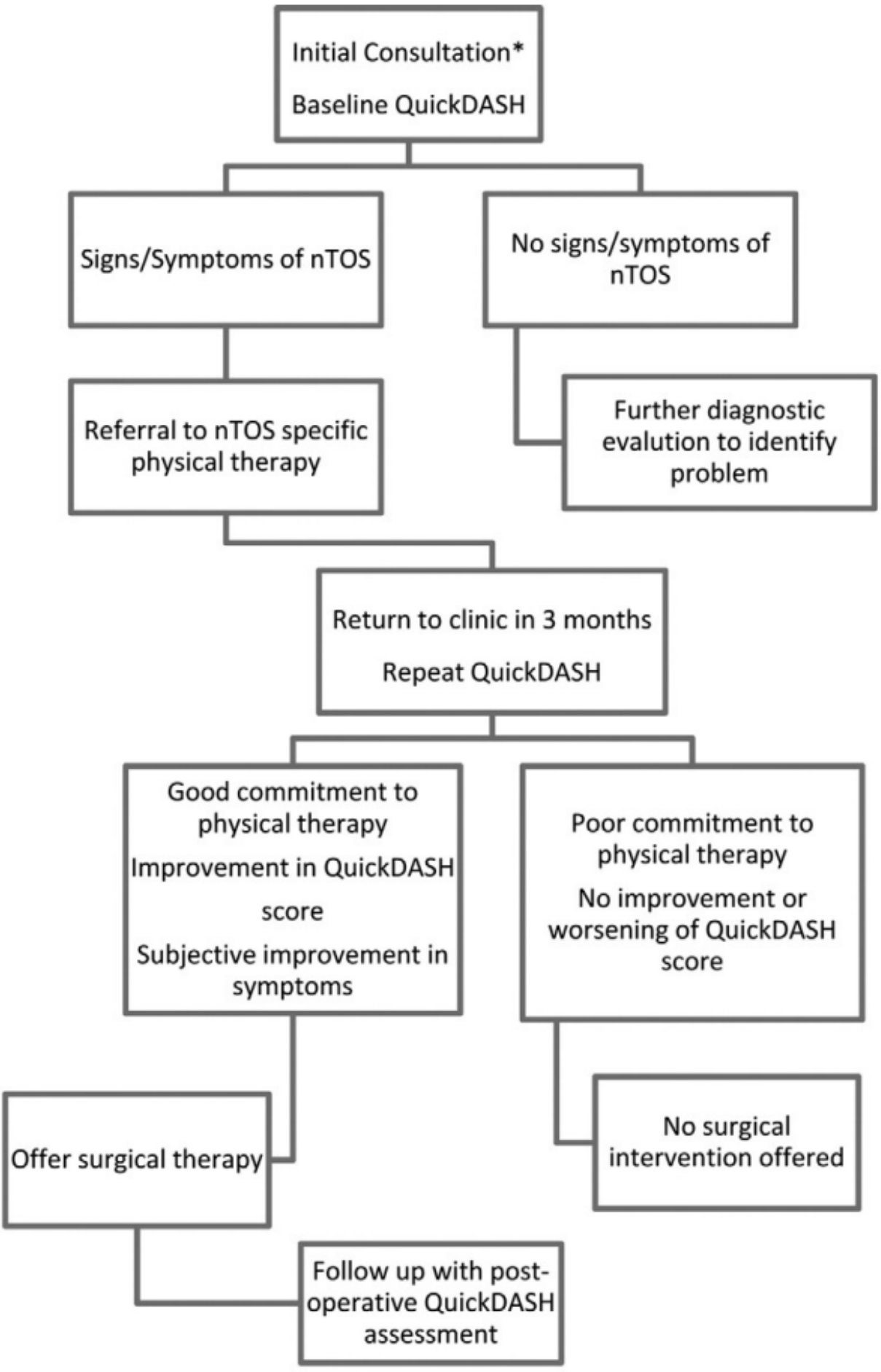
MAIN TAKEAWAYS

This highly-selective algorithm for nTOS surgery **(SEE NEXT PAGE)** leads to **improvement in overall success rates documented subjectively and objectively.**

Compliance with TOS-specific PT, improvement in QD scores after PT, young age, and competitive athletics **are associated with improved surgical outcomes.**

Long-term follow-up will be necessary to document sustained symptom relief and to determine who the optimal surgical candidates are.

SELECTIVE SURGICAL ALGORITHM



GIVE US YOUR FEEDBACK!

MEMBERS

We are on a mission to make research more accessible, easier to interpret, and quicker to implement.

Help us by giving 1 minute of your time to leave feedback for us.

We would greatly appreciate any feedback you have, as it helps us continually improve!

Leave Review