



LECTURE 09 · RU-RMT 20 PATHOLOGICAL TREATMENTS

Thoracic Outlet Syndrome

Upper-extremity pain or compromised function from compression of the neurovascular structures of the anterior neck

How this lecture fits together

From the surface of the skin to the structures beneath the collarbone. TOS is a compression of the nerves and vessels of the thoracic outlet — a complex, contested condition worked in an endangerment zone, so caution leads throughout.



01 · Understanding

The three types, the anatomy, the compression sites, and what TOS is mistaken for.



02 · Assessment

Why diagnosis is hard, the provocative tests, the symptoms, and our scope boundary.



03 · Planning

Conservative care, medications, goals, posture education and frequency.



04 · Protocol

Treating by etiology, the endangerment zone, positioning and hard cautions.

What you will be able to do

By the end of this lecture you will understand the three forms of TOS, recognise when it is beyond your scope, and treat the structural form safely once it is diagnosed.



Classify & locate

Distinguish neurogenic, venous and arterial TOS, and the three compression sites.



Respect the scope

Recognise that diagnosing TOS is beyond RMT scope — wait for medical assessment.



Read the symptoms

Identify the neurogenic and vascular symptom patterns, and what to refer.



Treat with caution

Work the scalenes, pec minor and posture gently, within the endangerment zone.

DEFINITION

What is thoracic outlet syndrome?

Thoracic outlet syndrome (TOS) is upper-extremity pain and / or compromised function resulting from compression, irritation or injury to the neurovascular structures of the anterior neck.



A compression

Nerves and / or vessels are entrapped as they pass through the thoracic outlet.



Of neurovascular structures

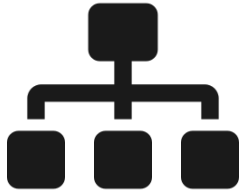
The brachial plexus, subclavian artery or subclavian vein — in the anterior neck.



Causing pain & loss

The result is upper-extremity pain and compromised function of the arm and hand.

Source: *Thoracic outlet syndrome covered in Rattray & Ludwig (2000), Clinical Massage Therapy.*



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SECTION ONE

Understanding TOS

TOS is really three conditions sharing one location. Knowing the anatomy of the thoracic outlet — and what TOS is so often confused with — is the whole foundation.

A contested condition



Controversial

Its cause, diagnosis and treatment are all debated — some question whether it exists.



Mimicked by trigger points

Trigger points in the primary neck muscles can imitate TOS.



Who it affects

Onset usually between ages 20 and 50; three times more common in women.

Classified by what is compressed: TOS is grouped as neurogenic, venous or arterial, depending on which structures are affected.

Classified by the structure compressed



Neurogenic

Compression of the brachial plexus — by far the most common form, at about 95% of cases.



Venous

Compression of the subclavian vein — cyanosis of the arm is specific to this form.



Arterial

Compression of the subclavian artery — an absent pulse in the arm is specific to this form.

Source: *Classification per Rattray & Ludwig (2000), Clinical Massage Therapy.*

The common form — 95% of cases

Neurogenic TOS is compression of the brachial plexus, and it accounts for the great majority of cases. The nerve roots involved decide where the symptoms travel.



Causes

Neck injury, whiplash, a fall, or repetitive movement.



C8-T1 → ulnar

The most-involved roots cause pain and paraesthesia along the ulnar pathway — the 4th and 5th fingers.



C5-C7 → radial

Almost as often, symptoms radiate to neck, ear, upper chest and back, and outer arm along the radial pathway.

The vascular forms

Far less common than neurogenic TOS, the vascular forms compress the vessels travelling under the clavicle — and they show themselves in the colour and temperature of the arm.



Venous TOS

- Subclavian vein obstruction — congenital anomaly or arm overuse.
- Pitching, swimming, weight-lifting, overhead work; also posture, pregnancy, obesity.
- Cyanosis of the affected arm is specific to this form.



Arterial TOS

- Subclavian / axillary artery stenosis or aneurysm.
- Secondary to a cervical-rib congenital anomaly.
- An absent pulse in the affected arm is specific to this form.

The thoracic outlet & brachial plexus

The thoracic outlet spaces sit anterolaterally, between the clavicle and the first rib (T-1). Through them runs the brachial plexus — a bundle of the C5–T1 nerve roots that travels from the neck, under the clavicle, out to the axilla and down the arm.



The plexus

C5, C6, C7, C8 and T1 roots form a sensory and motor network.



Five major nerves

The median, radial, ulnar, musculocutaneous and axillary nerves.



Feel and move

It carries sensation to the brain and motor signals out — so you can feel a mug and grasp it.

The three compression sites

All forms of TOS are entrapment syndromes. As the nerves and vessels travel to the arm, there are three places they can be compressed — and the plexus passes through each in turn.



Scalene triangle

Between the anterior and middle scalene muscles.



Costoclavicular space

Between the clavicle and the first rib (T-1).



Pectoralis minor

Between the pectoralis minor and the rib cage.

Source: *Compression sites per Rattray & Ludwig (2000), Clinical Massage Therapy.*

What entrapment does

Whether the trapped structure is nerve or vessel decides the picture. The severity of pain and the degree of functional loss track the extent of injury to the structure.



Nerve compression

- Pain along the nerve pathway.
- Paraesthesia — numbness and tingling — and loss of function.
- Neurogenic symptoms occur in about 95% of cases.



Vessel compression

- Compromised blood flow to or from the limb.
- Colour changes — blanching (pallor) and cyanosis (bluish).
- An uncomfortable cooling of the upper extremity.

Contested, but generally good

Reported occurrence varies widely, and some clinicians doubt the syndrome exists at all. Despite that uncertainty, the outlook is reassuring — with one important caveat.



Good prognosis

All forms have a good prognosis; vascular forms often resolve quickly with treatment.



Neurogenic is slower

Neurogenic TOS rarely progresses, but takes longer to resolve.



If left untreated

Permanent nerve damage and, rarely, loss of limb use can follow.

TOS is a great mimic

TOS symptoms overlap with, are mistaken for, or coexist with a long list of other conditions — which is exactly why a medical diagnosis must come first.



Neurological & musculoskeletal

- Carpal tunnel syndrome; ulnar nerve compression at the elbow.
- Rotator cuff injury; brachial plexitis.
- Multiple sclerosis; spinal cord injury or neoplasm.



Vascular & systemic

- Superficial thrombophlebitis; vasculitis.
- Diabetes; hypothyroidism.
- Fibromyalgia.



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SECTION TWO

Presentation & Assessment

Diagnosing TOS is hard, contested, and not the RMT's job. Our task is to know the picture, recognise what is beyond scope, and wait for the medical word before we treat.

Why TOS is hard to pin down

Symptoms are subjective, chronic and shared with other conditions; sensory complaints are hard to measure, and the physical exam is often completely normal. As a result, the label is frequently “nerve compression syndrome” rather than TOS.



Hard to measure

Subjective, chronic symptoms and frequently normal physical findings.



Imaging helps a little

Neck and chest X-rays show skeletal or clavicular abnormality; arteriography and venography show blood-flow problems.



Best for neurogenic

Nerve-conduction studies are the best indicator of neurogenic TOS.

Useful, but unreliable

Provocative tests reproduce or exacerbate the symptoms by stressing the thoracic outlet. They are widely used, but considered unreliable — and they belong to the diagnosing physician, not the RMT.



EAST

The elevated arm stress test — inconclusive, but the most-used TOS screen.



Costoclavicular

Stresses the space between the clavicle and first rib.



Unreliable alone

Provocative tests carry many false positives — best combined, and physician-administered.

Source: Provocative-test cautions consistent with Rattray & Ludwig (2000), *Clinical Massage Therapy* and clinical literature.

Neurogenic TOS — a constellation

The phrase “constellation of symptoms” fits TOS well — the complaints are varied, widespread, and may be unilateral or bilateral.



Pain & paraesthesia

Pain along the mid-upper arm, forearm and 4th–5th fingers; tingling in all fingers, especially the 4th and 5th.



Weakness & cold

Arm or hand weakness, and intolerance to cold.



Neck & head

Neck pain at the trapezius or below the clavicle; headache in the occipital region.

Venous & arterial TOS

The two vascular forms look very similar, with two distinguishing signs. Both deserve prompt medical attention.



Swelling & paraesthesia

Arm swelling, with hand and finger paraesthesia.



Pain, pallor, paraesthesia

Arm or hand pain, pallor, or paraesthesia.



The distinguishing signs

Cyanosis is specific to venous TOS; an absent pulse is specific to arterial TOS.

Where treatment helps — carefully

Once TOS is diagnosed, massage can genuinely help the muscular and symptomatic picture — but the origin of the condition lies in an endangerment zone, so even discovering the signs is approached with caution.



Pain & paraesthesia

Address the pain and paraesthesia that accompany the condition.



Hypertonicity & trigger points

Release the compensating hypertonicity and trigger points around the outlet.



With caution

The origin sits in an endangerment zone — assess and treat it gently and deliberately.

Source: *Treatment focus consistent with Rattray & Ludwig (2000), Clinical Massage Therapy.*

Wait for the diagnosis

This is the most important rule in this lecture. Assessing for the presence of TOS is well outside the scope of most massage therapists — even pulse-taking is not taught in most schools.

Wait until a medical professional has diagnosed the condition before you treat. *After that assurance, a verbal symptom history with ROM and palpation can guide care. If there is any doubt about the pain's origin, or if swelling and heat are present, refer immediately.*



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SECTION THREE

Treatment Planning

TOS is treated conservatively, and massage has a real place once the diagnosis is in. The plan sets careful goals, teaches the client to protect the outlet, and commits to consistent work.

Conservative care leads

TOS is usually treated conservatively — physical therapy combined with pain relief. Surgery is rarely necessary, and much of the gain comes from changing how the arm is loaded and positioned.



Conservative first

Physical therapy with pain-relief medication is the usual approach.



Mind sleep posture

Avoid sleeping supine with arms up behind the head, or prone with arms overhead.



Avoid overhead loading

Counsel against prolonged overhead arm positioning that closes the outlet.

What clients may be taking

Note all current medication in your history. Anticoagulants in particular signal a vascular concern and change how you work.



Common classes

- NSAIDs — ibuprofen (Motrin, Advil).
- Non-opioid pain reliever — acetaminophen (Tylenol, Panadol).
- Tricyclic antidepressants — doxepin (Sinequan); muscle relaxants, temporarily.



The vascular flag

- Anticoagulants — warfarin (Coumadin).
- A rare emergency vascular TOS may receive IV heparin in hospital.
- Anticoagulant use means lighter pressure and extra screening.

Reasonable aims for the RMT



Ease & relax

Decrease pain and relax the hypertonic muscles around the outlet.



Calm & perfuse

Reduce sympathetic nervous-system activity and increase circulation to compromised structures.



Teach better habits

Coach more efficient postural, breathing and compensating habits.

Source: *Treatment goals consistent with Rattray & Ludwig (2000), Clinical Massage Therapy.*

What the client changes at home

Because TOS is largely structural and postural, lasting relief depends on what the client does between sessions — opening the outlet rather than closing it.



Posture & breathing

Lengthen the front of the chest and neck; retrain breathing away from the upper accessory muscles.



Protect in sleep

Avoid overhead arm positions in bed that compress the outlet through the night.



Gentle stretch

Pain-free stretches for the scalenes and pectorals — never into numbness or tingling.

How often, and for how long

TOS rewards consistent, longer sessions that taper as symptoms settle. Infrequent work will not produce the desired results.



At diagnosis

60–90-minute sessions twice a week, while pain and discomfort are at their worst.



As pain decreases

Weekly until symptoms resolve, then every other week for about three months.



Maintenance

Monthly 60-minute sessions as part of the client's ongoing self-care.



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SECTION FOUR

Massage Protocol

Treatment follows the anatomy: the scalenes, pectoralis minor and costoclavicular region, plus the compensators. All of it sits in an endangerment zone, so focus, gentleness and a clear head are non-negotiable.

Treat by etiology

In an ideal case the client arrives with a clear diagnosis — “TOS of neurogenic origin,” say, or “of vascular origin.” That tells you which compression site to focus on, and gives you a clear map for proceeding.



Know the origin

A medical or PT diagnosis names the type and, often, the structure at fault.



Map to the site

Recall the three sites — scalenes, costoclavicular, pec minor — and target accordingly.



Plan the route

With the map clear, plan a focused, anatomy-led treatment.

Source: *Etiology-led approach consistent with Rattray & Ludwig (2000), Clinical Massage Therapy.*

When the picture is vague

More often the client arrives with vague upper-extremity symptoms after seeing several physicians with little relief. Unless the TOS has a pathologic origin — a tumour or thrombus — it is a structural problem that intelligent massage can usually help.



Vague presentation

A general set of arm and hand symptoms, and a frustrated client.



A structural problem

Absent a pathologic origin, the cause is postural or overuse-driven entrapment.



Treat the whole girdle

Work the entire shoulder girdle, neck and upper back rather than chasing one point.

Where the work lives

The specific structures correlate to the manifesting symptoms — and the compensating, postural muscles must be addressed alongside them.



Anterior scalenes

Release the scalenes that form the upper border of the outlet.



Pectoralis minor

Address the pec minor and the costoclavicular region beneath the clavicle.



Compensators & posture

Treat the upper trapezius, levator scapulae and the postural muscles that perpetuate it.

Source: Target structures per Rattray & Ludwig (2000), *Clinical Massage Therapy*.

You are in an endangerment zone

It bears repeating: this work is performed in what is rightly called an endangerment zone. The neck is congested with vascular and nervous structures that, compressed too long, can compromise brain function.

Focus, keep a clear head, remember your anatomy, and proceed gently. *There is no place here for distraction or force — awareness of what lies beneath your hands is the technique.*

Positioning & the longer session

Positioning is a genuine challenge here — the usual choices may be ruled out by the client's discomfort, and the client always leads the way.



Supine, pillowed

Side-lying and prone may be too uncomfortable; supine, comfortably pillowed, is often the only option.



The client leads

Let the client's comfort set the position — never force a posture that provokes symptoms.



Plan for 90 minutes

There is a great deal to do, so this protocol moves from the usual 60 minutes to 90.

No heat or cold on swollen structures

Temperature can be dangerous in TOS. The vascular forms can involve a thrombus, and heat over one is hazardous.

Apply no hot or cold packs to swollen neck, shoulder or arm structures. *If you are not certain there is no thrombus, hot packs can exacerbate TOS. Without a physician's permission, leave heat and cold off the neck, chest, arm and hand entirely.*

Don't reproduce the symptoms

Stretching can re-create the very compression you are trying to relieve. Let the client's symptoms set the limits of every movement.



Avoid the trigger position

If raising the arm overhead causes numbness and tingling, do not take ROM toward that position.



Pain-free range only

Keep passive and active ROM well short of any position that reproduces symptoms.



Gentle, never aggressive

Even with trigger points and hypertonicity, avoid stripping and aggressive ROM.

The non-negotiables



Screen comorbidities

Proceed only after considering the contraindications for every existing condition.



No heat or cold without clearance

Keep heat and cold off the neck, chest, arm and hand without a physician's permission.



No aggressive technique

Even with trigger points and extreme hypertonicity, no stripping or aggressive ROM.



Refer on doubt

Any doubt about the pain's origin, or swelling and heat — refer to a physician at once.

Source: Contraindications & cautions per Rattray & Ludwig (2000), *Clinical Massage Therapy* and the lecture protocol.

A safe treatment sequence

Frame the focused outlet work inside warming and gentle movement, and finish by integrating the whole girdle — always within the client's pain-free range.



Warm & settle

Gently warm the region and settle the nervous system — no heat over swelling.



Release the outlet

Scalenes, pectoralis minor and the costoclavicular region, gently.



Address compensators

Upper trapezius, levator scapulae and postural muscles.



Integrate & educate

Gentle pain-free movement, then posture, breathing and self-care.

Carry these into the clinic



Diagnosis comes first

Assessing for TOS is beyond RMT scope — wait for the medical diagnosis.



Three types, three sites

Neurogenic (95%), venous and arterial; trapped at the scalenes, costoclavicular space or pec minor.



Know the vascular signs

Cyanosis points to venous, an absent pulse to arterial — refer these promptly.



No heat over a possible thrombus

Keep heat and cold off the neck, chest and arm without physician clearance.



Gentle, never aggressive

Endangerment zone — no stripping or aggressive ROM, even with trigger points.



Posture is the cure

Teach postural, breathing and sleep habits that open the outlet.

Sources for this lecture

Rattray, F. & Ludwig, L. (2000). Clinical Massage Therapy: Understanding, Assessing and Treating Over 70 Conditions. Toronto: Talus Inc. — thoracic outlet syndrome: classification, the compression sites, treatment goals, the endangerment zone and contraindications.

Travell, J.G. & Simons, D.G. Myofascial Pain and Dysfunction: The Trigger Point Manual. — trigger points of the scalenes and neck that mimic and accompany TOS.

Canadian Massage Therapy Council for Accreditation (CMTCA). Competency standards — scope of practice, the anterior-neck endangerment zone, screening and referral.

RU-RMT 20 — Lecture 09 (Thoracic Outlet Syndrome). Course lecture notes: classification, anatomy and pathophysiology, assessment, treatment options and the hands-on protocol.



UP NEXT — LECTURE 10

Bicipital Tendinosis

From the thoracic outlet down into the shoulder. Next: degeneration of the biceps tendon — its overuse origin, assessment, and the friction and eccentric-loading approach to healing it. Bring your tendon anatomy.