



RUHANI COLLEGE

OF HEALTH BUSINESS AND TECHNOLOGY

Lecture 09 — Thoracic Outlet Syndrome

Student Handout · RU RMT 20 Pathological Treatments · Ruhani College · Registered Massage Therapy Diploma Program

How to use this handout: it follows the lecture in the order it is delivered, so you can annotate it as we go rather than copying slides. Everything examinable in this lecture is here. Work through the review questions at the end without looking back, then check them against the answers.

Learning outcomes

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.

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.

General Information — A contested condition

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

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.

The Three Types — 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.

Neurogenic TOS — 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.



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Venous & Arterial Tos — 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.

- Cyanosis of the affected arm is specific to this form.
- 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.

Venous TOS — — Subclavian vein obstruction — congenital anomaly or arm overuse.

Arterial TOS — — Pitching, swimming, weight-lifting, overhead work; also posture, pregnancy, obesity.

Pathophysiology — 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.

Where It Gets Trapped — 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.

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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.

The Consequence — 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.

- Colour changes — blanching (pallor) and cyanosis (bluish).
- An uncomfortable cooling of the upper extremity.

Nerve compression — — Paraesthesia — numbness and tingling — and loss of function.

Vessel compression — — Neurogenic symptoms occur in about 95% of cases.

— **Pain along the nerve pathway.** — — Compromised blood flow to or from the limb.

Morbidity & Prognosis — 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.

What It Imitates — 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



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Vascular & systemic

- Carpal tunnel syndrome; ulnar nerve compression at the elbow.
- Rotator cuff injury; brachial plexitis.
- Multiple sclerosis; spinal cord injury or neoplasm.
- Superficial thrombophlebitis; vasculitis.
- Diabetes; hypothyroidism.
- Fibromyalgia.

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.

A Difficult Diagnosis — 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.

The Provocative Tests — 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.

Signs & Symptoms — 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.

Signs & Symptoms — Venous & arterial TOS

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

Swelling & paraesthesia

Pain, pallor, paraesthesia

The distinguishing signs

Arm swelling, with hand and finger paraesthesia.

Arm or hand pain, pallor, or paraesthesia.

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

What Massage Can Address — 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.



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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.

Know Your Scope — 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.

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.

Treatment Options — 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.

Common Medications — What clients may be taking

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

The vascular flag — — Non-opioid pain reliever — acetaminophen (Tylenol, Panadol).

— **NSAIDs** — **ibuprofen (Motrin, Advil)**. — — Tricyclic antidepressants — doxepin (Sinequan); muscle relaxants, temporarily.

Common classes — — A rare emergency vascular TOS may receive IV heparin in hospital.

— **Anticoagulants** — **warfarin (Coumadin)**. — — Anticoagulant use means lighter pressure and extra screening.

Therapeutic Goals — 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.

Self-Care & Posture — 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.

Massage Session Frequency — 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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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.

The Ideal — 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.

The Real World — 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.

The Target Structures — 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.

The Overriding Caution — 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.

Getting Started — 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.

A Hard Rule — 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.

Stretch With Caution — 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.



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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.

Contraindications & Cautions — 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.

Putting It Together — 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.

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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.

Key takeaways — 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.

References and further reading

- 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.

Review questions

Answer these from memory before checking the answers below.

1. Define thoracic outlet syndrome and name its three types.
2. Name the three principal sites at which compression occurs.
3. Why is thoracic outlet syndrome described as difficult to diagnose and easily mistaken for other conditions?
4. How does treatment differ according to the etiology of the compression?
5. What cautions govern hands-on work in the thoracic outlet region?



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Answers

1. Upper extremity pain or compromised function resulting from compression of the neurovascular structures passing through the thoracic outlet. The three types are neurogenic (brachial plexus), venous and arterial, with the neurogenic form by far the most common.
2. The interscalene triangle between the anterior and middle scalenes; the costoclavicular space between the clavicle and first rib; and the subpectoral or subcoracoid space beneath pectoralis minor.
3. Its symptoms overlap with cervical radiculopathy, carpal tunnel syndrome, ulnar nerve compression at the elbow and rotator cuff pathology, and the provocative tests carry a high rate of false positives. Diagnosis rests on the whole clinical picture rather than any single test.
4. Work is directed at the structure causing the compression: scalene release and postural correction for the interscalene site, first rib and clavicular mechanics for the costoclavicular site, and pectoralis minor release for the subpectoral site. Treating the wrong site produces no change.
5. It is an endangerment zone containing the subclavian vessels and brachial plexus, so pressure is light and specific and sustained compression is avoided. Any reproduction of numbness, tingling, pallor, coldness or dizziness means stopping and reassessing, and arterial or venous forms require medical management rather than massage.