

T4 Syndrome

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Clinically Relevant Anatomy

A typical thoracic vertebra has a total of six joints with neighboring vertebrae: four synovial joints and two symphyses.

Although the movement between any two vertebrae is limited, the summation of movement among all vertebrae results in a large range of movement by the vertebral column. [6; LOE 5]

There are two major types of joints between the vertebrae [6; LOE 5]:

- Symphyses between vertebral bodies
- Synovial joints between articular processes

The synovial joint between superior and inferior articular processes on neighboring vertebrae are the zygapophysial joints. A Thin articular capsule attached to the margins of the articular facets covers each joint. In thoracic regions , the joints are oriented vertically and limit flexion and extension, but facilitate rotation [6; LOE 5].

In 1997 Evans described the basic science behind the origins of T4 syndrome[1; LOE 5]. Vasomotor nerve fibers descend in the spinal cord and emerge in the ventral horns and roots. These fibers pass the dorsal root ganglia as it sits in the intervertebral foramen. Next they emerge as part of a spinal segmental nerve. Sympathetic fibers leave the segmental nerve and join the sympathetic chain. Then it travels down the neck of the ribs with variable areas of the ganglia. Branches from the sympathetic chain pass over the costovertebral joints to supply the heart, esophagus, and abdominal viscera. It is not uncommon for these branches to become stretched or affected by neighboring osteophytes.

The sympathetic chain fibers ascend or descend a variable number of segments synapse in a ganglion, and leave the chain to join a peripheral nerve.

Sympathetic fibers can pass distally leaving the peripheral nerve to join an artery in the neurovascular bundle. Here they assist with the control of blood pressure via vasoconstriction. It is thought that the head and neck are provided with sympathetic outflow from T1 to T4. The upper trunk and extremities are thought to be supplied by T2 to T5. Symptoms in the neck, head, and upper extremities are common.

Epidemiology

Given the anatomical complexity of the thoracic and shoulder areas, the potential sources of pain in this region are numerous.[7; LOE 2B] [8; LOE 5] Some clinicians have found that long-standing visceral problems have been pushed into the background when treating spinal problems [1; LOE 5]. Those visceral sources, may indicate serious diseases such as cancer, cardiac/pulmonary or renal problems, renal, and gastroesophageal conditions [4; LOE 5][9; LOE 5]. Possibly extreme or persistent postures lead to relative ischaemia. This results in a kind of repetitive strain injury, but with sympathetic symptoms. So it is possible that in a T4 syndrome, not the joint who causes the problems, but the arteriole.

Arteriole ischaemia can produce repeated injury and recovery what leads to a mixture of scar development and attempted repair. They can lead to chronic damage, and are still active enough to be causing further damage [1; LOE 5].

This syndrome is more common in women than men (women 75% and men 25%) and usually occurs above the age of 35. [1; LOE 5]

Characteristics/Clinical Presentation

Symptom onset may coincide with a new job or hobby, especially those that require frequent stooping or bending (electricians, surgeons, and assembly-line worker's). Frequent posturing in front of computer has also been implicated. Symptoms are often diffuse and located in the neck, head, and upper extremities (unilateral or bilateral) [1; LOE 5][2; LOE 5][5; LOE 5][10; LOE 5].

Typical signs and symptoms include headaches, neck and arm pain and paresthesia. These signs and symptoms could be the result of thoracic dysfunction and its influence on the sympathetic nervous system. [11; LOE 5]

Other symptoms that can occur:

- paraesthesias to the upper limbs and hands [1; LOE]-> all five digits [5; LOE 5] [11; LOE 5],

- hand and forearm numbness [5; LOE 5][10; LOE 5]
- upper extremity coldness [5; LOE 5]
- Hands feel hot or cold[1; LOE 5]
- hand clumsiness[5; LOE 5]
- heaviness in upper extremities
- hands feel and may objectively be swollen[1; LOE 5]
- upper extremity pains associated with or without headaches and upper back stiffness[10; LOE 5]
- intermittent posterior pain or pain around the scapula
- refer pain
- pain often described as crushing or like a tight band[1; LOE 5]

sometimes these symptoms are present:

- pain and stiffness ->around chest wall with pain anterior and posterior[1; LOE 5]
- interscapular pain or stiffness[1; LOE 5]
- worse pain at night[1; LOE 5]

The pain can become sharp and stabbing and increased with quick trunk or upper-extremity movements, deep breathing, coughing or sneezing, and changing positions in bed [4; LOE 5]

Diagnostic Procedures

T4 syndrome is an exclusion diagnosis with no validated clinical criteria to assist the diagnosis. Radiographs are no aid in the diagnosis, but can help with ruling out other conditions. [10; LOE 5] For excluding we can use patient history, symptoms and physical examination too. To do this we need to rule out the differential diagnosis. There are no validated clinical criteria to assist in diagnosing T4 syndrome. Also, radiographs do not aid in the diagnosis, however they may help rule out other condition[3].

Outcome Measures

No self-report outcome measure has been validated for this specific condition. Any number of outcome measures would be appropriate for this patient population. This includes:

Patient Specific Functional Scale (PSFS) [12; LOE 2B]: This scale can determine the functional status of the individual patient. There is asked to report the most important activities that are unable to perform and score them on a 11-points scale (0 = not possible to carry out activity, 10 = possible to carry out activity). A higher score means a better function.

Neck Disability Index (NDI)[12; LOE 2B]: This questionnaire is a self-reported measurement that reports pain and limitations in performing daily work activities. This index can indicate how much the neck problems affect the daily activities.

Quick DASH [7; LOE 2B]:In comparison to the original 30 item DASH-outcome measure, this questionnaire contains 11 items. This questionnaire uses a 5-point Likert scale from which the patient can select an appropriate number corresponding to his/her severity in functioning.

Examination

There is no evidence about examinations that include T4 syndrome. Unfortunately, a great deal of literature exists on shoulder pain, yet little exists in the area of periscapular or rib pain.[4; LOE 5] But it is almost certain that the intervertebral joint around T4 is hypomobile in patients with T4 syndrome. We can test this by testing the active range of motion (AROM) of the cervical, shoulder, and trunk regions to determine pain-provoking movements.[1; LOE 5] [4; LOE 5] Furthermore we can examine the differential diagnosis to exclude. Also postural observation from the posterior, lateral, and anterior aspects can be useful, but the reliability of visual observation has not been reported. Deviations from an ideal posture were noted [4; LOE 5]

Manual muscle testing (MMT) and a gross sensory examination (to determine whether nerve root or peripheral nerve lesions were present) can also be helpful, but neither of them have been validated. Also palpation of the cervical, shoulder, and upper trunk regions were assessed [4; LOE 5].

Medical Management

- anti-inflammatory medication (reduce swelling and pain)
- intramuscular injections of 1 to 2 mL of 0.5% bupivacaine at the fourth thoracic paraspinal level [5; LOE 5]

Physical Therapy Management

Some possible treatments for T4 syndrome are:

- RICE (rest, ice, compression, elevation) → for the first 72 hours.
- a grade III postero-anterior mobilisation technique applied to T4 [14; LOE 1B].
- To date there have been no controlled studies that prove that sympathetic activity in the hands is influenceable by thoracic spinal manual therapy.
- TrP release [4; LOE 5]
- Flexibility [4; LOE 5]

In a recent randomised control trial of Pete Jowsey et al. 36 healthy subjects (18–35 years) were randomly assigned to two groups (validated placebo intervention on skin conductance or treatment intervention) and provided evidence that a grade III postero-anterior rotatory joint mobilisation technique (treatment intervention) applied to the T4 vertebra at a frequency of 0.5 Hz can produce sympathoexcitatory effects in the hands of the subjects [14; LOE 1B] [15; LOE 5].

The study of Defranca et al.[6; LOE 5] investigated the effect of joint manipulation [15; LOE 5], [17; LOE 5], stretching, and strengthening exercises directed at the upper thoracic dysfunctional segments as a treatment for the T4 syndrome [6; LOE 5]. Also Stacie J Fruth mentioned this sort of home exercises as a part of the treatment in her case report on T4 syndrome [4; LOE 5]:

- Passive stretch for middle trapezius and rhomboideus muscles [4; LOE 5]
- Alternate stretch for middle trapezius and rhomboideus muscles [4; LOE 5]
- Trunk rotation stretch in sitting position [4; LOE 5]
- Exercise for strengthening postural muscles. Patient presses arms into wall (arrows) while retracting scapulae.[4; LOE 5]
- Passive stretch for middle trapezius and rhomboideus muscles.

Differential Diagnosis

Symptoms of T4 Syndrome can be confused with :

- Thoracic Outlet Syndrome
- carpal tunnel syndrome [3; LOE 5]
- Ulnar nerve entrapment [3; LOE 5]
- myofascial pain syndromes
- Cervical disc disease [3; LOE 5]
- cervical spine degenerative conditions
- thoracic outlet syndrome [3; LOE 5]
- pain originating from the viscera [1; LOE], [2; LOE 5], [3; LOE 5], [5; LOE], [10; LOE 5]
- Neurological disease
- Visceral Disease [3; LOE 5]
- Fibromyalgia
- Myelopathy
- Complex Regional Pain Syndrome
- Discus hernia
- cardiac pain

Key Evidence

Several case studies have been reported in the literature [2; LOE 5], [5; LOE 5], [10; LOE 5] No validated diagnostic criteria have been established for T4 Syndrome. No randomized controlled trials have examined the most efficacious intervention strategies.

Resources

Richard L. Drake et al.; Gray's Anatomy for students, second edition; Churchill Livingstone Elsevier; 2010; p 70-80 [LOE 5]

César Fernández-de-las-Peñas, Joshua Cleland, Jan Dommerholt. Manual Therapy for Musculoskeletal Pain Syndromes: An Evidence- and Clinical-Informed Approach. Elsevier Health Sciences, 17 jun. 2015 - 848 pagina's. [LOE 5]

Clinical Bottom Line

T4 syndrome or upper thoracic syndrome was described as "a pattern that involves upper extremity paraesthesia". It can be caused by thoracic hypomobility but can also have a sympathetic origin.

Fibers pass the dorsal root ganglia as it sits in the intervertebral foramen. Next they emerge as part of a spinal segmental nerve. Sympathetic fibers leave the segmental nerve and join the sympathetic chain. Branches from the sympathetic chain pass over the costovertebral joints to supply the heart, esophagus, and abdominal viscera. There are two major types of joints between the vertebrae: symphyses between vertebral bodies and the synovial joints between articular processes. The synovial joint between superior and inferior articular processes on neighboring vertebrae are the zygapophysial joints, who are oriented vertically. Possibly extreme or persistent postures lead to relative ischaemia. This results in a kind of repetitive strain injury, but with sympathetic symptoms. So it is possible that in a T4 syndrome, not the joint who causes the problems, but the arteriole. Typical signs and symptoms include headaches, neck and arm pain and 'bilateral stocking glove' paresthesia. Symptoms of T4 Syndrome can be confused with: carpal tunnel syndrome, Ulnar nerve entrapment, myofascial pain syndrome, Cervical disc disease, etc. There is no evidence about examinations that include T4 syndrome. Some possible treatments for T4 syndrome are: RICE (for the first 72 hours), Joint mobilisation of the T4 vertebra, core stability training (only when the core stability is poor), TrP release, flexibility and postural exercises.

References

1. ↑ 1.0 1.1 1.2 1.3 1.4 1.5 1.6 1.7 1.8 Evans P. The T4: syndrome some basic science aspects. *Physiotherapy* 1997;83(4):186-189 (LOE 5)
2. ↑ 4.00 4.01 4.02 4.03 4.04 4.05 4.06 4.07 4.08 4.09 4.10 Conroy JL, Schneiders AG. The T4 syndrome. *Manual Therapy* 2005;10:292-296.(LOE 5)
3. Philip Librone et al.;Resolution of T4 Syndrome Following Chiropractic Care: A Case Report;A. Vertebral Subluxation Res. August 29, 2014 (LOE 5)
4. Vernon H, Mior S. The neck disability index: a study of reliability and validity. *Journal of manipulative and physiological therapeutics*. 1991 Sep;14(7):409-415 (LOE 2B)
5. ↑ 2.0 2.1 2.2 2.3 2.4 2.5 Mellick GA et al.,Mellick LB. Clinical presentation, quantitative sensory testing, and therapy of 2 patients with fourth thoracic syndrome. *J Manipulative Physiol Ther* 2006;29:403-408. (LOE 5)
6. Richard L. Drake et al.; Gray's Anatomy for students, second edition; churchill livingstone elsevier; 2010; p 70-80 (LOE 5)
7. Stacie J Fruth, Differential Diagnosis and Treatment in a Patient With Posterior Upper Thoracic Pain. February 2006. Case report. (LOE 5)
8. Christina Gummesson. The shortened disabilities of the arm, shoulder and hand questionnaire (Quick DASH): validity and reliability based on responses within the full-length DASH. *BMC Musculoskeletal Disorders*. 2006; 7(44): 1-7. (LOE 2B)
9. Edmondston SJ, Singer KP. Thoracic spine: anatomical and biomechanical considerations for manual therapy. *Man Ther* 1997;2 :132– 143 (LOE 5)
10. ↑ 3.00 3.01 3.02 3.03 3.04 3.05 3.06 3.07 3.08 3.09 3.10 3.11 3.12 DeFranca CG, Levine LJ. The T4 syndrome. *J Manipulative Physiol Ther* 1995;18(1):34–7 (LOE 5)
11. César Fernández-de-las-Peñas, Joshua Cleland, Jan Dommerholt. Manual Therapy for Musculoskeletal Pain Syndromes: An Evidence- and Clinical-Informed Approach. Elsevier Health Sciences, 17 jun. 2015 - 848 pagina's. (LOE 5)

12. Stratford P. Assessing disability and change on individual patients: a report of a patient specific measure. *Physiotherapy Canada*. 1995;47(4):258-263 (LOE 2B)
13. Mark Poray. Treatment of Upper Thoracic Syndrome (T4 Syndrome). Available from: <https://www.youtube.com/watch?v=MveaZfrxiiY> (<https://www.youtube.com/watch?v=MveaZfrxiiY>) [last accessed 15/3/15] (LOE 5)
14. Jowsey, P., and Perry, J. (2010) Sympathetic nervous system effects in the hands following a grade III poster-anterior rotatory mobilisation technique to T4: a randomised control trial. *Manual Therapy*, Vol. 15, pp. 248-253 (LOE: 1B)
15. Gerwin RD. Myofascial and visceral pain syndromes: visceral-somatic pain representations. *Journal of Musculoskeletal Pain* 2002;10 :165– 175. (LOE 5)
16. Scaringe JG, Ketner C. Manual methods for the treatment of rib dysfunctions and associated functional lesions. *Topics in Clinical Chiropractic* 1999;6 :20– 38. (LOE 5)
17. Bialosky, J. E., Bishop, M. D., Price, D. D., Robinson, M. E., and George, S. Z. (2009) The mechanisms of manual therapy in the treatment of musculoskeletal pain: a comprehensive model. *Manual Therapy*, Vol. 14, pp. 531-538 (LOE 5)
18. Rob Sillevs. Immediate effects of a thoracic spine thrust manipulation on the autonomic nervous system: a randomized clinical trial. *J Man Manip Ther*. 2010 Dec; 18(4): 181–190. (LOE 2B)
19. Concepts musculoskeletal group newsletter. Missed upper thoracic syndrome. The Apple Cart, 1 October 2010. (LOE: 5)
20. César Fernández-de-Las-Peñas. Development of a Clinical Prediction Rule for Identifying Women With Tension-Type Headache Who Are Likely to Achieve Short-Term Success With Joint Mobilization and Muscle Trigger Point Therapy. *The Journal of Head and Face Pain* 51(2):246-61 · November 2010. (LOE:3B)

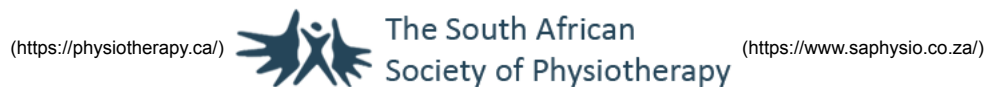
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