Case Study

Resolution of T4 Syndrome Following Chiropractic Care: A Case Report

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Abstract

Objective: The purpose of this case study was to describe a patient who presented with symptoms that closely resembled the T4 syndrome and to raise awareness in clinical practices.

Clinical Features: The patient typically presents with upper thoracic pain, bilateral paresthesia and numbness in the hands with no neurological signs present. The cause appears to be from upper thoracic segmental joint dysfunction referring symptoms to the upper limbs. Onset is insidious with no identifiable precipitating event. Characteristic symptoms of pain and/or paresthesia in a glove-like distribution of the hands can lead to misdiagnosis; therefore a thorough exam must be performed.

Intervention and Outcomes: Chiropractic adjustments to reduce subluxation consisted of a high velocity, low-amplitude thrust delivered by hand, accompanied by therapeutic modalities and muscle exercises. By the fifth visit, the patient reported complete remission of thoracic pain and hand numbness.

Conclusion: The T4 Syndrome is comprised of unilateral or bilateral upper extremity pain and paresthesia that originates from the upper thoracic spine. There are no neurological or vascular changes in the classic T4 syndrome upon examination. Case of a sixty-four year old female demonstrated resolution of upper thoracic pain and hand numbness and paresthesia in a case of T4 syndrome through chiropractic care.

Keywords: *T4 syndrome, chiropractic, thoracic pain, autonomic nervous system, vertebral subluxation complex, glove-like distribution, paresthesia*

Introduction

The T4 syndrome was introduced in the chiropractic literature in 1957 by Maitland and Burnell.[1,2] Any thoracic segment from T2 to T7 may be involved; however, T4 is most commonly affected;[3] hence "T4 syndrome." It may also be referred to as the "upper thoracic syndrome."[3,4] The mechanism of the condition is unknown but it is hypothesized that symptoms are of sympathetic origin.

Symptoms coming from the sympathetic nervous system provide a pathway for the expression of the T4 syndrome. The pain referral is from a proximal structure, thoracic spine, supplying innervation at one level to peripheral structures, head and upper extremities, supplied at the same level via the vascular system.[1-3,5] Studies have identified a relationship between chiropractic thoracic adjustments and sympathetic flow.[6,7]

Symptoms of T4 syndrome are widespread and may involve the neck, head, and upper extremity either unilaterally or bilaterally (Figure 1). Patients may experience paresthesia in

all digits of the hands, glove-like numbness of the hands and forearm, weakness (unable to open jars), hand clumsiness, upper extremity coldness, a sense of fullness, tightness, and deep aching pain.[2] The condition predominantly affects females more than males by a 4:1 ratio in patients between the ages of 30-50.[1,2,8] Classic T4 syndrome typically has no associated neurological exam findings.[3-5] However, there may be symptoms of headache.[1,8] Onset of symptoms may be due to an occupation or hobby, particularly those that require frequent stooping or bending, such as electricians, surgeons or seated factory assembly line workers. In addition, regular flexion posture in front of the computer has also been implicated.[3]

Conservative treatment has been found to be very effective and consists of mobilization and manipulation of the dysfunctional upper or mid-thoracic segments,[1,8] rib cage, and cervical spine.[3] Additionally, postural exercise, strengthening of the scapulothoracic musculature, and stretching tight pectoral muscles was found to be a beneficial physical therapy.[8] For non-manipulative therapeutic options, allopathic medicine has found anesthetic blockade or injections of anticonvulsant medication effective in treating the T4 syndrome.[2]

Pathophysiology

The exact mechanism of T4 syndrome is unknown; however, a proposed mechanism of T4 syndrome is a disturbance of autonomic nervous system homeostasis. Prolonged or extreme postures can cause relative ischemia within multiple tissues contributing to symptoms of sympathetic origin. The sympathetic nervous system provides pathways for referral of symptoms from the thoracic spine to the head and upper extremities.[1,3,5]

The autonomic nervous system controls involuntary actions and consists of two subsystems, parasympathetic and sympathetic**.** Both systems contain vasomotor nerve fibers that are essential in the regulation of blood circulation. The action of the sympathetic vasomotor nerve fiber is vasoconstriction. Vasomotor fibers are usually part of the sympathetic nervous system and innervate the blood vessels of the skin, mucous membranes, lungs, meninges, and abdominal organs.[3,9,10]

In 1997, Evans depicted the basic science behind the origins of T4 Syndrome. 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. Then they emerge as part of a spinal segmental nerve. Leaving the segmental nerve, the sympathetic fibers join the sympathetic chain and travel down the neck of the ribs with variable area of ganglia (Greek word "ganglion" meaning "lump").

Branches from the sympathetic chain pass over the costovertebral joints to supply the heart, esophagus, and the abdominal viscera. Here it is not unusual for these branches to be stretched or affected by osteophytes. Once the sympathetic chain fibers are in the sympathetic chain they ascend or descend a variable number of segments in a ganglion, and leave the chain to join a peripheral nerve. The sympathetic fibers pass distally and leave the peripheral nerve to join an artery in the neurovascular bundle where they assist with the control of blood pressure through vasoconstriction. Even though the sympathetic fibers contain afferent filaments which synapse in the dorsal root ganglion and enter the spinal cord with somatic afferents, they are motor.[3]

Sympathetic outflow illustrates the head and neck being supplied by levels T1-T4, and the upper trunk and upper extremities by T2-T5.[11] Symptoms in the neck, head, and upper extremities are believed to be due to any of the following:[3]

- Entrapment of segmental spinal nerves which carry sympathetic afferents
- Entrapment with ischemia of sympathetic nerves over rib necks or osteophytes
- Referred pain from the heart, esophagus, or abdominal viscera
- Referred pain from a thoracic spinal structure
- Referred pain in the neck from a dorsal spinal structure
- Referred pain from any structure in the upper quarter.

Hence, the sympathetic nervous system provides a pathway for the expression of the T4 syndrome, as seen in the pain referral from a proximal structure supplied at one level to a peripheral structure supplied at the same level.[3]

Bogduk proposed another mechanism where a presence of a hypomobile thoracic segment may indicate involvement of a synovial joint structure.[4] Grieve, stated mobilization of an upper thoracic segment reproduces or eliminates the symptoms of the T4 syndrome.[12]

The purpose of this case study is to describe a patient who presented with symptoms that closely resembled the T4 syndrome. The patient responded to cervical and upper thoracic mobilization and adjustment as well as therapeutic modalities and extensor muscle exercises to improve posture.

Case Report

History

The patient, a 62-year-old married, retired, female presented with a complaint of upper mid back pain and bilateral hand numbness and tingling, mostly involving the 4th and 5th digits (Figure 2). Her symptoms began insidiously approximately one week prior to her initial visit to the chiropractor without an identifiable precipitating event. The mid back pain was described as intermittent, achy, and sore. On a numerical pain scale of zero to ten, zero representing no pain and ten representing the worst pain the patient could imagine, the mid back pain carried an average rating of three. There were no palliative or provocative factors. The hand numbness was at its worst in the morning and did not upset sleep. The patient denied radiating arm pain or hand weakness. The patient had formerly sought relief through chiropractic care for low back pain that resolved.

Physical examination

During her initial chiropractic evaluation, the patient appeared

well nourished and groomed in no acute distress and responded appropriately to questions and instructions. A complete physical examination was performed on the patient including vital signs, inspection, vascular, neurological and orthopedic exams of the cervical and thoracic regions including ranges of motion and chiropractic spinal analysis.

The vital signs revealed blood pressure of 145/92, pulse rate of 80 beats per minute, height of 5'4", weight at 172 pounds and temperature of 98.6. Upon inspection there was no evidence of swelling, ecchymosis or dermis eruptions.

There was no history of seizures, loss of memory or consciousness. Cranial nerves II-XII were tested and found to be within normal limits. Eyes PERRLA. Extraoccular eye movements were full and without nystagmus. Romberg's test and Hoffman's sign were negative bilaterally. Fine motor was preserved through finger to nose and heel to shin. Biceps, triceps, brachioradialis, patella and achilles deep tendon reflexes were 2+ and bilateral symmetrical. Deltoid, biceps, triceps, common wrist flexors/extensors, common finger flexor/extensors and finger abductors and adductors grade 5/5**.** Allen's test demonstrated bilaterally patent radial and ulnar arteries. Roo's, Adson's, and Wright's test were negative, mitigating against Thoracic Outlet Syndrome. Tinnel's at the volar ligament and cubital tunnel, Phalen's and Prayer sign were also negative, mitigating against median and ulnar nerve involvement.

The musculoskeletal examination: cervical ranges of motion were within normal limits with a complaint of stiffness more than pain. Foraminal compression and cervical distraction were negative. Maximum cervical compression elicited localized cervical pain with both right and left rotation and hyperextension. Radiating arm pain was denied, thus mitigating against cervical radiculopathy. Thoracic ranges of motion were within normal limits as well, with a complaint of stiffness and soreness. Schepelmann's test was negative, however.

Clinical interpretation

Subjective palpatory findings revealed paraspinal muscle tone and tenderness +1 (mild). Spinal motion palpation elicited spinous process tenderness and demonstrated subluxations at C6, C7, T4, T5, and T7. Radiographs were deferred at this time based on clinical presentation and clinical exam findings. Thoracic radiographs dated 30 October 2009 were reviewed and revealed mild degenerative changes with mild anterior osteophytes. Given that there was thoracic pain with bilateral hand numbness in the absence of neurological or vascular findings, the default diagnosis was T4 Syndrome.

Intervention

Management consisted of chiropractic adjustments at C6, C7, T4, T5, T7 using Diversified Technique, which is the most commonly used of all chiropractic techniques. The Diversified adjustment entails a high velocity, low-amplitude thrust delivered by hand and possibly with assistance from a table with sections that have a drop mechanism. This can usually result in a cavitation of a joint.[13] At the beginning of each visit, spinal motion palpation was used to locate vertebral subluxation. Local tenderness, specifically over the spinous processes, was a common finding in the thoracic spine due to the location of the medial branch of the dorsal rami over the apex of these bony prominences.[14,15] Diversified Technique adjustments were then used at noted segments with the patient in the prone position to correct the subluxation.

Therapeutic modality consisted of interferential current, sweep mode, low to high frequency on 17 power intensity along with fomentation set on 125 degrees for 15 minutes, applied over the upper and mid paraspinal muscles to reduce tone and provide analgesia. The patient was given home extensor muscle exercises (rows and flies,) to improve extensor tone and posture. Pending patient response to therapeutic intervention, possible referral for MRI would be warranted. The plan consisted of chiropractic adjustments with therapeutic modalities until maximum therapeutic benefit was achieved.

Outcomes

The first visit consisted of chiropractic adjustments at segments C6, C7, T4, T5, T7. Three days after the first office visit, the patient reported that the numbness in her hands had resolved, but the mid back pain persisted. She returned to the office two days later for a follow-up visit where the same segments had been adjusted using the diversified technique. During her third visit, the patient stated she experienced a relapse of symptoms. She fell asleep on the couch while watching TV and the numbness in both hands had returned. On her fourth office visit, her mid-back pain had begun to improve and occasional hand numbness still presented. On her fifth and final visit, the patient reported her thoracic pain and hand numbness had fully resolved. The patient had achieved maximum therapeutic benefit and was released from care.

Subluxation responds positively to chiropractic adjustments. It is suggested that the patient will experience complete resolution of symptoms. It is noted, however, that the long-term effects of spinal degeneration can lead to chronic segmental dysfunction and a reoccurrence of symptoms, therefore requiring further management. A return of T4 syndrome would not be unexpected.

Discussion

Upper extremity pain and paresthesia of sympathetic origin is theorized to be attributed to neurological derangement secondary to misalignment of the vertebral column. This phenomenon is termed 'vertebral subluxation' or 'vertebral subluxation complex' (VSC). The vertebral subluxation develops when the normal bony juxtaposition of a vertebra is lost relative to another. This can be secondary to a myriad of factors including stress, poor posture, degeneration and trauma. Improperly functioning vertebrae within the spinal framework generate mechanical stress, which accelerates the wear and tear on the surrounding spinal muscles, ligaments, discs, joints and other spinal tissues.[16,17]

As a result, pain, tenderness, inflammation, edema, decreased spinal mobility, muscle spasm, and hypertonicity tend to develop. Additionally, and possibly most importantly, this abnormal juxtaposition can interfere with the function of the

central nervous system due to the intimate proximity and relationship of the spinal cord to the vertebrae.[18]

Since the symptoms experienced in T4 syndrome are systemic and vasomotor sympathetic in nature, it is only intuitive to look towards the spine where the sympathetic nervous system is located. Specific derangement of the sympathetic chain at the level of the upper and mid-thoracic is likely due to subluxations causing either dysafferentation or direct attenuation of sympathetic outflow secondary to compression via inflammatory process. Initially, as previously stated, the vertebral column may suffer a stress capable of altering bony juxtaposition and/or biomechanical patterns. This pathologic state is detected by local mechanoreceptive and proprioceptive fibers. Henceforth, distorted data regarding spatial locations of vertebrae and connecting tissue is relayed to the integrating center.

Subsequent efferent signal has decreased efficiency in the subluxated state. Due to the convergence of sympathetic fibers along thoracic spinal nerve roots, these fibers will also receive and relay signals in an abnormal fashion. As hypertonic sympathetic outflow reaches the precapillary sphincters, it causes systemic constriction and consequentially, ischemia. As such, ischemia manifests as pain and paresthesia in the T4 syndrome patient.[19]

Manual segmental adjustments aim to normalize central neural reflexes by establishing normal neurovertebral functions.[20] Mechanical force used during adjustment has a direct effect on the central nervous system, creating a positive neurophysiological response resulting in a reduced overall central sensitization.[21] If afferent input is compromised, efferent response may be qualitatively and quantitatively compromised. Correcting the specific vertebral subluxation cause is vital to restoring normal afferent input to the central nervous system, and allowing the body to correctly perceive itself and its environment.[18]

Differential diagnosis

Table 1 summarizes a variety of conditions comparable with symptoms of the T4 Syndrome. Thus, a differential diagnosis must be considered and more serious disease ruled out. The differential diagnosis should include Carpal Tunnel syndrome, Ulnar tunnel syndrome, Thoracic Outlet syndrome, cervical disc disease, visceral disease, vascular disease and neurologic disease.[8,22]

Carpal Tunnel syndrome classically presents with finger numbness or pain in wrist motion with possible weakness and sensory loss in the median nerve distribution affecting the thumb, index, middle and lateral half of ring fingers.[22,23] Symptoms usually occur at night and may wake the patient several times. To relieve the pain, the patient shakes the involved hand and fingers forcefully.

Sustained wrist flexion (Phalen's sign) and direct percussion over the median nerve will reproduce pain, often traveling along the median nerve distribution. Carpal tunnel syndrome usually occurs in adults over the age of 30 and an electrodiagnostic testing may confirm delayed median nerve conduction across the wrist.[8,23] In the T4 syndrome, patients experience a glove-like distribution, which is not consistent with the Carpal tunnel syndrome.

Ulnar tunnel, also known as Guyon's canal, syndrome is the entrapment of the ulnar nerve. Patients complain of finger numbness and pain in the ring finger and little finger along with muscle weakness. Symptoms may be worse at night and hand motions may be difficult. Similar to CTS, percussion of the ulnar nerve and Phalen's sign will often reproduce symptoms. As mentioned, the glove-like distribution of pain is a common finding of T4 syndrome, and is not a feature of ulnar tunnel syndrome. Electrodiagnostic testing may confirm delayed ulnar nerve conduction across the wrist.[22]

Thoracic outlet syndrome has a hallmark of nocturnal symptoms of arm pain, numbness, tingling and weakness as well as neck and shoulder pain. Signs of neurovascular compression are present. The cause is pressure in the neck against the nerves and blood vessels that go to the arm or a cervical rib or tight pectoral muscles that may be present.[24] Symptoms usually occur along the ulnar boarder of the upper limb, unlike the glove-like distribution.[8] Positive vascular tests, such as Adson's, Wrights, and Eden's, can help to guide the diagnosis.[8,24]

Intervertebral disc disease of the cervical spine may also be considered. Symptoms of arm and neck pain are present. Cervical ranges of motion might be restricted and painful. Neurological signs are present along the affected nerve root; however, symptoms were not glove-like in distribution. Neurological deficits will manifest as dermatogenous pain patterns in the patient. Magnetic resonance imaging studies can often confirm an anatomical lesion such as disc herniation.[8,10]

Since the patient demonstrated few or none of the expected signs and symptoms of cancer or cardiac disease, these conditions were considered unlikely.[10] Referred pain patterns for the lungs, gall bladder, liver and bile ducts, and esophagus are similar to this patient's complaint. She had no additional signs that would have indicated that these structures were involved, such as retrosternal pain or changes in pain with eating (esophageal), coughing or dyspnea (lung) or jaundice and nausea/vomiting (gallbladder and liver) or unexplained weight loss. In behavior, pain intensity was specific to active or passive motion and palpation, which is uncharacteristic of viscerally referred pain.[10,11,25]

Vascular lesions affecting the upper extremity, such as subclavian artery aneurysm or stenosis should be ruled out.[26,27] Neurological disease such as syringomyelia causes bilateral upper extremity symptoms present due to a pathological longitudinal cyst of the central canal of the spinal cord. Upon physical examination neurological loss exists with loss of pain and temperature sensation occurring at the level of the lesion while touch, vibration, and joint position sense are preserved. MRI aids in diagnosis.[8,11] Polyneuritis seen in diabetes can present as glove and stocking distribution of pain and paresthesia; however, signs of nerve involvement are usually present and it more commonly affects the lower extremity. It is commonly seen in a patient with diabetes mellitus.[11] The patient had no history of diabetes.

T4 syndrome referred to the upper limb can plausibly be of autonomic phenomena originating in the upper-and mid-thoracic spine. This is suggested by the nonspecific glove-like distribution of symptoms and the fact that sympathetic innervation to the upper extremities originates from as low as T7.[11]

Limitations

This case included a single subject study. No conclusions can be made on long-term effects since the study evaluated immediate or short-term responses. Follow-up studies should be performed to assess the long-term effects of repeated adjustments on the autonomic nervous system. Several case studies have been reported; however, no randomized controlled trials have examined the most efficacious intervention strategies.

Conclusion

The T4 Syndrome involves unilateral or bilateral upper extremity pain and paresthesia originating from the upper thoracic spine. Occasionally, headaches are experienced as well. The onset is usually gradual and non-traumatic. There are no neurological or vascular changes in the classic T4 syndrome upon examination. However, more serious conditions, such as thoracic outlet syndrome, must be ruled out.

This case included a presentation similar to that of the T4 syndrome where a manual segmental adjustment to the thoracic spine was the choice of management. After several visits, pain reduction and increase in spinal mobility was noted. This case is intended to aid in the decrease or resolution of upper limb symptoms experienced in the T4 syndrome through chiropractic adjustments along with therapeutic modalities and muscle exercises.

References

1. McGuckin N. The T4 syndrome. In: Grieve GP, editor. Modern manual therapy of the vertebral column. New York: Churchill Livingstone, 1986: 370-376.
2. Mellick G, Mellick Larry. Clinical presentation, quantitative sensory testing, and therapy of 2 patients with fourth thoracic syndrome. J Manipulative Physiol Ther. 2006; 29:403-408.
3. Evans P. The T4 syndrome: some basic science aspects. Physiotherapy. 1997; 83(4):186-189.
4. Bogduk N. Research design or what is T4 syndrome. N Z J Physiother. 1986;14(3):9-11.
5. Conroy Jl, Schneiders AG. The T4 syndrome. Manual Ther. 2005; 10:292-296.
6. Budgell B. Reflex effects of subluxation: the autonomic nervous system. J Manipulative Physiol Ther. 2000; 23:104-106.
7. Welch A, Boone R. Sympathetic and parasympathetic responses to specific diversified adjustments to chiropractic vertebral subluxations of the cervical and thoracic spine. J Chiropr Med. 2008; 7:86-93.
8. Defranca G, Levine L. The T4 syndrome. J Manipulative Physiol Ther. 1995; 18:34-37.
9. Moore K, Dalley A, Agur A. Nervous system. In: Clinically Oriented Anatomy. 7th ed. Philadelphia: Lippincott Williams & Wilkins, 2010: 46-70.
10. Fruth S. Differential Diagnosis and Treatment in a Patient with Posterior Upper Thoracic Pain. Physical Therapy. 2006; 86(2):254-268.
11. Souza T. Differential Diagnosis and management for the chiropractor. 4thed. Massachusetts: Jones and Bartlett Publishers, 2009: 101-115,297-303,498,506,792-806.
12. Grieve GP. The autonomic system in vertebral pain syndromes. In: Grieve GP, editor. Common Vertebral joint problems. 2nd ed. Edinburgh, Scotland: Churchill Livingstone, 1988: 319-329.
13. Gatterman M. Osseous manual thrust techniques. In: Foundations of Chiropractic subluxation. Missouri: Mosby-year book, Inc, 1995: 88-104.
14. Edmondston SJ, Singer KP. Thoracic spine: anatomical and biomechanical considerations for manual therapy. Manual ther. 1997; 2(3):132-143.
15. Maigne J-Y, Maigne R, Guerin-Surville H. Upper cervical dorsal rami: anatomic study of their medial cutaneous branches. Surgical and radiological anatomy. 1991; 13(2):109-112.
16. Owens Jr. E. Chiropractic subluxation assessment: what the research tells us. J Can Chiropr Assoc. 2002; 46(4): 215-220.
17. Hurwitz E, Coulter I, Adams A, Genovese B, Shekelle P. Use of chiropractic services from 1985 through 1991 in the United States and Canada. Am J Public Health. 1998; 88(5): 771-776.
18. Kent C. Models of vertebral subluxation: a review. J Vert Sublux Res. 1996; 1(1):1-7.
19. Haldeman S. Neurologic effects of the adjustment. J Manipulative Physiol Ther. 2000; 23:112-114.
20. Rome P. Neurovertebral influence on visceral and ANS function: some of the evidence to date-Part II: somatovisceral. Chiropr J Aust. 2010; 40:9-33.
21. Sillevis R, Cleland J, Hellman M, Beekhuizen K. Immediate effects of a thoracic spine thrust manipulation on the autonomic nervous system: a randomized clinical trial. J Manipulative Physiol Ther. 2010; 18(4):181-190.
22. Russell B. A suspected case of ulnar tunnel syndrome relieved by chiropractic extremity adjustment methods. J Manipulative Physiol Ther. 2003; 26:602-607. (peer-reviewed)
23. Hains G, Descarreaux M, Lamy AM, Hains F. A randomized controlled (intervention) trial of ischemic compression therapy for chronic carpal tunnel syndrome. J Can Chiropr Assoc. 2010; 54(3):155-163.
24. Laulan J, Fouquet B, Rodaix C, Jauffret P, Roquelaure Y, Descatha A. Thoracic outlet syndrome: definition, aetiological factors, diagnosis, management and occupational impact. J Occup Rehabil. 2012; 21(3):366-373.
25. Gray H. Arteries of the Trunk. In: Gray's anatomy. 15thed. New York: Barnes & Noble books, 1995: 522-549.

26. Osiro1 S, Zurada A, Gielecki J, Shoja M, Tubbs S, Loukas M. A review of subclavian steal syndrome with clinical correlation. Med Sci Monit. 2012; 18(5):57-63.
27. Urschel H, Razzuk M. Neurovascular Compression in the Thoracic Outlet Changing Management Over 50 Years. Ann Surg. 1998; 228(4):609-617.

Table 1. T4 Syndrome Differential Diagnosis

Condition/Disease Ruled during examination process	Signs and Symptoms	Diagnostic tests/ Criteria used to Rule In or Rule out conditions/diseases	Rationale for Ruling in or Ruling out Conditions/diseases.
Carpal Tunnel Syndrome	Finger numbness or pain in wrist motion with possible weakness and sensory loss in the median nerve distribution affecting the thumb, index, middle and lateral half of ring fingers;[22,23] usually occur at night and may wake the patient several times; shaking the hand and fingers forcefully relieves the pain; adults over the age of 30; clumsiness with precision gripping.[11,22,23]	An electrodiagnostic testing;[8] clinical findings and patient presentation	Low likelihood; sustained wrist flexion (Phalen's sign) and direct percussion over the median nerve will reproduce pain, often traveling along the median nerve distribution. In the T4 syndrome patients experience a glove-like distribution, which is not consistent with the Carpal tunnel syndrome.
Ulnar Tunnel Syndrome	Entrapment of the ulnar nerve either in the Tunnel of Guyon (wrist) producing finger numbness and pain in the ring finger and little finger along with muscle weakness; may be worse at night; hand motions may be difficult; unable to adduct all fingers.[11,22]	An electrodiagnostic testing; clinical findings and patient presentation	Low likelihood; Percussion of the ulnar nerve and Phalen's sign will often reproduce symptoms.[22] The glove-like distribution of pain is a common finding of T4 syndrome, and is not a feature of ulnar tunnel syndrome.
Thoracic Outlet Syndrome	Nocturnal arm symptoms of pain, numbness, tingling and weakness as well as neck and shoulder pain usually occur along the ulnar boarder of the upper limb; Signs of neurovascular compression most likely due to a cervical rib or tight pectoral muscles; chest pain or pseudo-angina may be present.[27]	Positive vascular tests, such as Adson's, Wrights, and Eden's;[8,24,27] Thoracic radiographs; Nerve Conduction velocity and Doppler Arteriography;[26] clinical findings and patient presentation	Low likelihood; Symptoms usually occur along the ulnar boarder of the upper limb, unlike the glove-like distribution.[8] Positive vascular tests, such as Adson's, Wrights, and Eden's, can help to guide the diagnosis.[24,27]
Cervical disc disease	Symptoms of arm and neck pain; Restricted cervical ranges of motion with possible pain; Neurological signs along the affected nerve root will manifest as dermatogenous pain patterns	Magnetic resonance imaging;[10] clinical findings and patient presentation	Low likelihood; Neurological signs are present; no dermatomal pain pattern; symptoms are not glove-like distribution.
Vascular disease: subclavian artery aneurysm.	Intermittent vertigo, drop attacks and/or arm weakness, claudication, paresthesia or coldness; an arm blood pressure greater than 20mmHg; no neurological signs; males 2:1 over the age of 50.[26]	CT or MRI;[26] clinical findings and patient presentation	Low likelihood; no absence of radial or ulnar pulse; no changes in arm blood pressure; pain and paresthesia is not relieved by rest in T4 syndrome.
Neurologic disease	bilateral upper extremity pain and temperature in a shawl-like distribution (Syringomyelia);[11] bilateral glove and stocking distribution of pain and paresthesia (Polyneuritis).[11]	MRI[11]	Low likelihood; neurological loss exists with loss of sense of pain and temperature occurring at the level of the lesion while touch, vibration, and joint position sense are preserved (Syringomyelia). With Polyneuriti signs of nerve involvement are usually present and it more commonly affects the lower extremity; commonly seen with Diabetes Mellitus.[11]
Visceral Disease	Weight loss, pain of unknown origin, constant pain not relieved by rest, night sweats (cancer); substernal pain, shortness of breath, increased pain with exertion, often left shoulder pain, medial arm and jaw pain (cardiac disease); changes in pain with eating, band-like pain around mid-thorax at level of lesion, referred pain to the mid-thorax region, heartburn or substernal pain (esophageal), coughing or dyspnea, deep often crushing chest pain (lung) or jaundice and nausea/vomiting, pain in the right mid-epigastric region, pain referred to the mid-back between the scapulae, right upper trapezius muscle, and right subscapular area (gallbladder).[10,11,25]	Radiographs, laboratory work, biopsy, ECG, esophagoscopy, radionuclide imaging, ultrasonography, CT scan;[11] clinical findings and patient presentation.	Low likelihood; In behavior, pain intensity was specific to active or passive motion and palpation, which is usually not the case with viscerally referred pain.

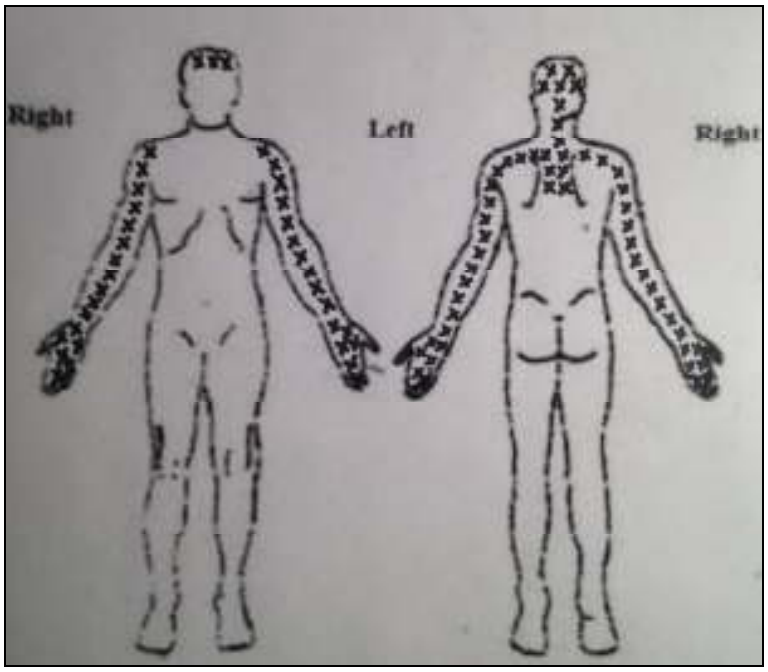

Figure 1. Features of the T4 Syndrome

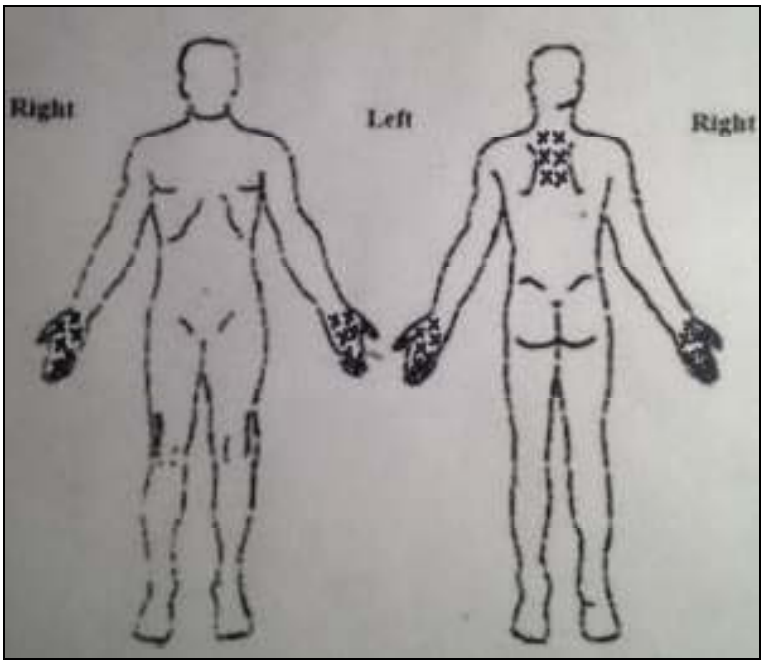

Figure 2. Case presentation