

## CASE SCENARIO: THORACIC SPINE

The patient is a 42-year-old female with a chief complaint of thoracic spine pain, headaches, and bilateral upper extremity paresthesia. She reports an insidious onset of these symptoms beginning 6 months ago. Her symptoms are aggravated by sustained postures such as sitting and driving for longer than 15 minutes, lifting or carrying objects such as a laundry basket or grocery bags, and sustained overhead activity such as when styling her hair. She denies night pain, weight loss, chest pain, shortness of breath, or a history of cancer. She had a thoracic MRI that revealed a disk bulge in the lower thoracic region T8-9. Her medical history and screening indicate a general anxiety disorder and irritable bowel syndrome. She reports that she is worried about her pain getting worse and that she has been limiting her activities because she is concerned about hurting herself. Upon further discussion, it seems that most of her concerns about injuring her back stem from the MRI findings of the disk bulge. Her active thoracic movements are guarded, reduced by about 50% range of motion, and reproduce her thoracic spine pain in all directions. During posterior to anterior spring testing applied to the upper to middle thoracic region T4-8 region, there is local pain, hypomobility, and her bilateral upper extremity paresthesia is reproduced. The slump test is positive for a reproduction of her thoracic spine pain and headache that eases with cervical extension. A thorough neurological examination including myotomes, dermatomes, deep tendon reflexes and the Hoffman's test were intact. Her Neck Disability Index is 38% and her average pain on the Numerical Pain Rating Scale is 6/10. The STarT Back Screening Tool designates her in the high-risk category for developing persistent pain.

1. Given the above presentation, which of the following diagnoses is most likely?
  - a. cervical myelopathy.
  - b. thoracic discogenic pain.
  - c. thoracic outlet syndrome.
  - d. T4 syndrome.

A screening examination including assessment of vital signs and an upper quarter neurological exam was normal, except allodynia was noted sporadically in the back and arms. On observation, she displays a reduced thoracic kyphosis in the T3-6 region and bilateral scapular winging. She displays an upper chest breathing pattern and hypertonicity of her accessory breathing muscles. Cervical range of motion is slightly limited in all directions, but this does not reproduce her pain. Bilateral shoulder elevation is limited to about 150° and reproduces her mid thoracic and her clinical examination indicates involvement of the upper to middle thoracic spine.

2. Given the above presentation, what is the likely *dominant* pain mechanism involved in this patient's presentation?
  - a. peripheral nociceptive.
  - b. peripheral neurogenic.

- c. central sensitization.
  - d. functional pain syndrome.
3. Given this patient's presentation and diagnosis, what should you recommend as the *initial* treatment intervention?
- a. cognitive intervention.
  - b. therapeutic exercise.
  - c. manual therapy.
  - d. electrotherapy.
4. Which of the following is theorized to cause the constellation of signs and symptoms associated with T4 syndrome?
- a. compression of the thoracic spine cord.
  - b. peripheral neuropathy of thoracic nerve roots.
  - c. referred mechanical thoracic pain.
  - d. sympathetic nervous system dysfunction.

## ANSWERS

1. The correct answer is **d. T4 syndrome**. The patient presents with the constellation of signs and symptoms consistent with this disorder including thoracic spine pain and stiffness, headaches, and bilateral upper extremity paresthesia with a normal neurological examination. Cervical myelopathy is a possibility but less likely due to the normal neurological examination and that cervical extension eases her symptoms during the slump test. With cervical myelopathy, symptoms are often worsened during cervical extension due to the narrowing of the cervical canal in this position. Thoracic outlet syndrome is another possibility; however, the distribution of symptoms with this syndrome is usually unilateral and located towards the ulnar region of the distal upper extremity. In addition, involvement of the thoracic spine is more likely to occur in the upper thoracic spine (T1-2) and first rib region as opposed to the upper to middle thoracic region. A thoracic disk bulge could potentially contribute to this patient's symptoms, but it is difficult to determine the relevance of the MRI findings for this patient given that high frequency of disk pathology found on MRI in individuals without symptoms. Furthermore, the disk bulge is located in the lower thoracic spine.
2. The correct answer is **c. central sensitization**. While peripheral pain mechanisms are also involved with this patient, she most closely fits the criteria for central sensitization. The pertinent features include a widespread region of symptoms without a discrete location and with less of a mechanically patterned behavior. Allodynia, or reported pain with a non-painful stimulus, is common with central sensitization as compared to other mechanisms. She also presents with associated cognitive and psychosocial factors including fear of movement, negative and unhelpful beliefs about her condition, and a history of an anxiety disorder. She reports irritable bowel syndrome, which also is common in individuals with chronic, widespread pain. It is important to note that there does appear to be local, movement-related impairments of the thoracic spine and addressing these as part of her program may be very useful. However, a multimodal, comprehensive intervention approach will likely be necessary due to the complexity of her presentation. Answer d. functional pain, is a related disorder but refers to abdominal pain of unknown origin and is thought to occur as a result of central sensitization.
3. The correct answer is **a. cognitive intervention**. The patient will require and benefit from an initial intensive cognitive intervention concerning the nature of her disorder, pain neurophysiology, accurate information and reassurance about her imaging findings, and how fear, worry, and anxiety could heighten her overall sensitivity. This intervention should be "front loaded" with the majority of the education and discussion taking place in the initial and perhaps second consultations. Ongoing discussion and reinforcement of these concepts at each follow-up session would likely also be useful. Once the patient understands the nature of her condition, she is likely to be more accepting of and better tolerate exercise and manual therapy targeting the patient's movement impairments. For example, manual interventions directed towards the movement impairments involving the T3-8 region could provide a temporary reduction in symptoms and

increase in mobility. Subsequently, the patient could be taught active mobility and postural awareness exercises. However, the therapist should carefully consider, in collaboration with the patient, whether the patient is open to and would tolerate these interventions and not experience an increase in symptoms. Patients with central sensitization can have impaired descending modulation.<sup>71</sup> Descending modulation is one of the mechanisms that normally leads to inhibition or modulation of nociceptive input and is a purported mechanism of the pain reduction associated with manual therapy and exercise. If descending modulation is impaired, manual therapy and other inputs that normally lead to a reduction in symptoms can be either ineffective or lead to an increase in symptoms.

4. The correct answer is **d. sympathetic nervous system dysfunction**. Due to the proximity of the sympathetic chain to the thoracic spine, it is thought that mechanical movement impairment of the thoracic spine could lead to altered sympathetic nervous system function. However, it should be recognized that the signs and symptoms associated with T4 syndrome likely represent enhanced sensitivity of and subsequent “output” from the central nervous system. This case is a good representation of this concept as there are multiple stressors or “inputs” involved in this patient’s case leading to sensitization of the peripheral and central nervous systems and altered sympathetic nervous system activity is one of many resulting outputs. Answer “b” is incorrect because thoracic spine peripheral neuropathy would present with pain or paresthesia along the sensory distribution of the thoracic nerve roots in the chest wall region. Answer “a” is incorrect because compression of the thoracic spine cord would lead to symptoms below the level of the compression and the patient would be more likely to present with neurological signs and symptoms in the lower quarter region. Answer “c” is incorrect because pain mapping studies have shown that the thoracic spine refers pain locally or within one segment above or below and does not typically create widespread symptoms in the upper extremities or headaches. However, it should be recognized that nociceptive input from the thoracic spine involving any of the structures such as the disks and facet joints could potentially lead to the central sensitization.