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CASE REVIEW

Upper extremity paraesthesia: Clinical assessment and reasoning

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Summary The art of clinical assessment involves an accurate determination of the cause(s) of a patient's symptoms. Given that a set of symptoms can be influenced by many contributing factors and features, assessment needs to differentially evaluate these. Accurate and appropriate treatment depends on differential assessment based on sound clinical reasoning. Many conditions derive from multiple causes demanding evaluation of as many etiological features as can be identified. The case review presented here involves a patient presenting with paraesthesia spreading into her right upper extremity. A complex history, involving her neck and contralateral upper extremity was assessed. The patient was found to have at least seven underlying, predisposing, and etiological, conditions capable of initiating, aggravating, or maintaining the presenting symptoms. Weighing the relative contributions of these often interacting features, and correlating this with the history, helped to identify a successful course of treatment.

Introduction

When a patient presents with a set of symptoms, the first responsibility of the practitioner (therapist/physician) is to determine the causative factor(s). Determining whether the patient is experiencing the effects of condition 'A' or condition 'B' demands differential assessment. When approaching differential assessment, it is important to remember that ''There is no law that a patient cannot have more than one condition.'' Those words, stated 25 years ago by an instructor of orthopedics at the author's chiropractic school, helped shape the author's approach to clinical assessment in professional practice.

In fact, the very premise of trying to determine whether a patient has condition A *or* condition B is not necessarily correct, and may distort the assessment process. All too often, a patient is experiencing the effects of more than one condition. When a person experiences the effects of a particular musculoskeletal condition, unless care is sought soon after the onset, it is likely that he or she will develop additional, symptom-inducing or

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symptom-aggravating, musculoskeletal, neurologic, or possibly stress-related, adaptive and compensatory changes.

Therefore, the art of assessing a patient's presenting symptoms often involves the need to assess the relationship(s) between multiple conditions. If this concept is kept in mind, assessment can be less confusing, particularly when positive findings emerge that do not all support each other, but rather point to multiple possible causes. Once all assessments have been made, it is then the task of the practitioner to prioritize the relative weight of the findings by correlating them with the patient's past history and recent activities, and to then choose a treatment plan that is best suited to the care of the individual.

The following case study illustrates this process:

An active middle-aged woman, presented with a complaint of tingling in the anterior aspect of her right thumb, index, and middle fingers. She also noted mild/moderate pain at the lateral side of the right elbow joint region, centered at the lateral epicondyle. As her previous history is significant, it is summarized below:

Previous history

This woman had been the author's patient for approximately 5 years when she presented with the symptoms as described above. She had previously been treated by the author for low back pain as well as a neck condition that referred down her left upper extremity.

Upon her initial evaluation, frontal plane postural assessment revealed bilateral over-pronation of the subtalar joints (loss of the arches of the feet) upon weight bearing, with the degree of over-pronation greater on the left than right side (this was assessed by visual examination of the height of the medial longitudinal arches from the anterior view). Her iliac crest and shoulder girdle were slightly low on the right side.[1] Sagittal plane postural assessment revealed a slight degree of head/upper cervical protraction. Transverse plane postural assessment was unremarkable.[2]

The neck condition had started after doing yard work one weekend. Upon examination, she was found to have cervical joint dysfunction and a left upper trapezius trigger point that, when compressed, reproduced the characteristic arm symptoms that she was experiencing.[3] Given the reproduction of her symptoms, it seemed clear that the trigger point related to her symptoms. However, when treatment aimed at deactivating the trigger point did not achieve satisfactory results, a cervical spine MRI was ordered. The results showed mild cervical spondylosis (degenerative joint disease/osteoarthritis) of the neck at the C3–C4 level and marked spondylosis at the C5–C6 and C6–C7 levels. Rest, icing, and anti-inflammatory medication (prescribed by her orthopedic physician) were recommended and the symptoms gradually resolved.

Four years later, her left side neck and upper extremity symptoms returned, with no precipitating trauma or event. A second MRI of the cervical spine was performed which showed that the cervical spondylosis found in the initial MRI had progressed to now include mild central canal stenosis at the C5–C6 and C6–C7 levels. Additionally, there was left-sided foraminal encroachment at the C4–C5 level. The patient was also experiencing chills and a feeling of pressure within the skull. After consulting with an orthopedist and hematologist, she was diagnosed with Lyme disease and a Parvo virus infection. She was prescribed prednisone and antibiotics and her symptoms were greatly reduced, but she remained with low grade, constant, neck pain, worse on the left but also somewhat present on the right.

By this time, she was also diagnosed as being clinically depressed and prescribed anti-depressant medication. She reported that her left neck pain was exacerbated whenever she experienced emotional stress. It was the patient's opinion that the

[1] It is of interest that the iliac crest was low on the side that exhibited less pronation. The usual pattern is for the side with greater pronation to be lower due to the loss of arch height (Muscolino, 2006b, p. 605). However, the patient exhibited hypertonicity of the right side hip joint abductor (pelvic depressor, i.e., lateral tilt) musculature, which would be consistent with the postural asymmetry as described.

[2] It should be added that in this case the patient's respiration and nutritional status were not evaluated. These are factors that may contribute to the conditions that occur within this case

(*footnote continued*)

study. Dysfunctional respiration may load the accessory breathing muscles, thereby affecting cervical/shoulder musculature. Dysfunctional breathing (and poor nutrition) may potentially alter pH, disturbing calcium/magnesium levels, thereby modifying neural function/motor control, as well as reducing pain threshold (with additional potential for encouraging the evolution of myofascial trigger points via ischemic influence) (Chaitow et al., 2002, p. 100). Further, nutritional imbalance may potentially encourage inflammatory processes and generally influence somatic function.

[3] This referral pattern into the upper extremity experienced by the patient is not typical for an upper trapezius trigger point (Travell and Simons, 1999, pp. 279–280). One possible explanation might be that her pain pathways were facilitated, accounting for their reproduction with pressure into the upper trapezius trigger point.

depression was secondary to the emotional stress of her chronic ongoing neck pain. Her neck pain was treated with physical therapy and acupuncture, with little further improvement.

Approximately 6 months later, the patient experienced left upper extremity tingling again; however, this time it extended all the way into her hand (again with no precipitating trauma to account for it). Searching for other possible factors, assessment procedures for thoracic outlet syndrome (TOS) were performed (see Figure 1). Eden's procedure was positive (diminishing the strength of the radial pulse and reproducing the symptoms into the left hand) indicating costoclavicular syndrome, a form of TOS; and Wright's procedure was positive (with a diminution in the strength of the radial pulse), indicating pectoralis minor syndrome, another form of TOS. Extension of the neck and head also reproduced the hand tingling. Beyond this, she certainly still had marked spondylosis of the cervical spine, and had multiple palpable trigger points in the neck and upper back musculature. Treatment was aimed primarily at the TOSs and her neck/upper back trigger points. This comprised ultrasound, electrical muscle stimulation, heat, and deep tissue massage; her condition gradually improved. The method of treatment used to treat the trigger points was deep stroking massage (Travell and Simons, 1999, p. 141). Deep stroking massage consists of approximately 30–60 short strokes performed upon the trigger point with moderate to deep pressure; further, these strokes are oriented along the direction of the taut band within which the trigger point is located, with the muscle passively stretched without pain.

Figure 1 illustrates the three orthopedic assessment procedures for the three forms of TOS.

Note: During each test, the pulse is assessed in order to see whether it is abolished or diminished, during adoption of the test position. If the pulse is so modified the test is positive for TOS.

Figure 1A depicts Adson's test in which the patient stretches the anterior and middle scalenes on the affected side by extending, contralaterally laterally flexing, and ipsilaterally rotating the head and neck at the spinal joints (Lowe, 2006, p. 189; Muscolino, 2006a, p. 173; Petty and Moore, 1998, p. 204).

Figure 1B depicts Eden's test (also known as the military brace test) in which the patient approximates the clavicle and first rib by sticking the chest out and retracting the

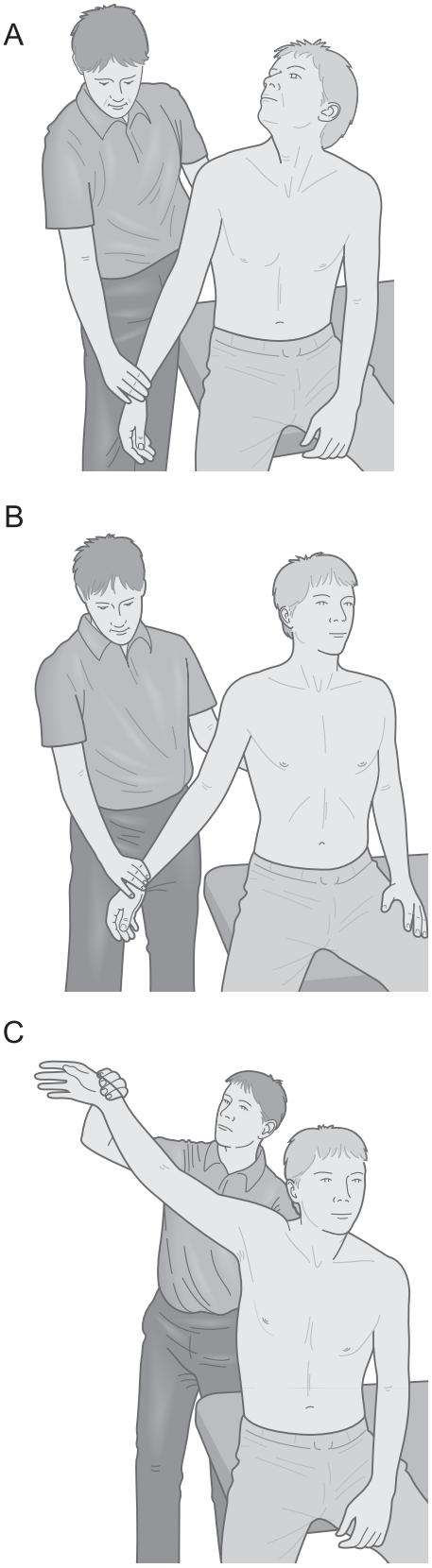

Figure 1 (A) Adson's test, (B) Eden's test, and (C) Wright's test.

shoulder girdle (Lowe, 2006, p. 190; Muscolino, 2006a, p. 173).

Figure 1C depicts Wright's test in which the patient approximates the pectoralis minor and the ribcage by having the arm brought back into extension and abduction (Muscolino, 2006a, p. 174). (*Note*: An alternative position for Wright's test is to have the arm held only in abduction; the purpose being to tether the neurovascular structures around the pectoralis minor [Lowe, 2006, p. 190].)

Outcomes: In all three cases, the test is considered to be positive if the client's ipsilateral radial pulse diminishes in strength. The rationale is that if the radial pulse decreases, then the subclavian artery in the affected region of the thoracic outlet has been impinged, showing the likelihood of compression upon the artery as well as the brachial plexus in that region (Muscolino, 2006a, p. 173).

Note: Reproduction of symptoms consistent with brachial plexus compression is also considered to be a positive finding.

Present complaints

Less than a month after her left sided neck and upper extremity symptoms had improved, the patient consulted the author again, this time reporting that the upper extremity symptoms were now being felt in the right hand. This was the first time that she had ever experienced right sided upper extremity symptoms. Her history revealed no trauma or remarkable events except that she had recently played tennis for the first time in 6 months 1 week prior to the onset of her symptoms; all else was unremarkable. There were no marked postural or lifestyle changes; the patient maintained a similarly active lifestyle. Further, the patient, now 48 years of age, had not yet begun experiencing menopausal changes. Examination revealed multiple cervical and upper thoracic myofascial trigger points, as well as bilateral cervical joint dysfunction. Certainly, the cervical spondylosis reported in the two MRI examinations was still present.

Given the cervical spondylosis, it would have been easy to ascribe her symptoms to these arthritic changes. Given her history of neck joint dysfunction and cervical and thoracic trigger points, it would also have been easy to blame her problems on these factors. However, given her complicated history, it was decided to check every possible cause that could account for the tingling into her right hand.

Because the tingling was located on the anterior aspect of the thumb, index, and middle fingers, it pointed to a median nerve compression. This narrowed down the possible conditions to: carpal tunnel syndrome (CTS), pronator teres syndrome, and pectoralis minor, costoclavicular, and anterior scalene syndromes (all forms of TOS). The symptomology could also be caused or aggravated by the bone spurs (spondylosis) in the neck, as well as muscular trigger points.

Assessment procedures for CTS were initiated including Phalen's and Tinel's tests (Figure 2). Phalen's test was positive; it reproduced tingling into her thumb and index finger. This result indicated that she had CTS. However, Tinel's test was negative, which suggested that her CTS was not severe in nature. Further investigation involved palpation of pronator teres. It was found to be very tight and application of deep pressure into it caused tingling into her hand. This confirmed pronator teres syndrome. However, when asked to

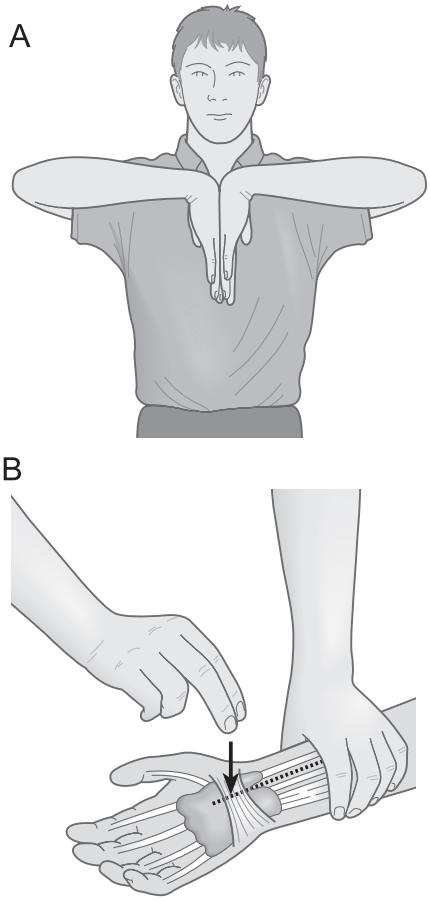

Figure 2 (A) Phalen's test and (B) Tinel's test.

contract the pronator teres against resistance, there was no reproduction of symptoms into her hand, which suggested that the pronator teres syndrome was not marked in severity. All three TOS test procedures, Adson's, Eden's, and Wright's procedures, were then performed. She was positive to both Eden's and Wright's procedures, as evidenced by a total loss of her radial pulse. These results indicated that two types of TOS were operating, both costoclavicular and pectoralis minor syndromes. In addition to all this, she also had marked cervical spondylosis, cervical joint dysfunction, and cervical and thoracic trigger points.

Figure 2 illustrates Phalen's and Tinel's test, both assessment procedures for CTS.

Figure 2A depicts Phalen's test in which the patient flexes both hands at the wrist joints, increasing compression within the carpal tunnel (Lowe, 2006, p. 271; Konin and Wiksten, 2002, pp. 105–106).

Figure 2B depicts Tinel's test performed upon the anterior surface of the wrist, over the course of the median nerve (Lowe, 2006, p. 272; Konin and Wiksten, 2002, pp. 107–108).

In both procedures, a positive finding is indicated by symptoms of median nerve compression such as pain or tingling into the median nerve distribution within the hand (the anterior aspects of the thumb, index, middle, and radial half of the ring fingers, as well as spilling over approximately 2–5 cm onto the posterior aspect of the same fingers) (Netter, 2003, p. 455).

The rationale is that if the median nerve is already irritated due to the compression of CTS, then it will be more sensitive to the compression caused by Phalen's or Tinel's test, thereby reproducing symptoms along the sensory distribution of the median nerve.

Assessment findings

The results of the orthopedic assessment examinations revealed the following—the patient was experiencing the effects of[4]:

(1) carpal tunnel syndrome,
(2) pronator teres syndrome,
(3) costoclavicular syndrome,
(4) pectoralis minor syndrome,
(5) cervical spondylosis,
(6) cervical joint dysfunction, and
(7) active myofascial trigger points.

In addition, she was now perimenopausal, displayed asymmetrical postural imbalances, and was reactively depressed.[5]

Treatment

With accurate orthopedic assessment, physical treatment is usually not difficult. However, when that assessment includes seven conditions, decisions regarding treatment choices become more complex and challenging. In this particular case, the history was informative as it indicated that the only remarkable event prior to the most recent onset of symptoms involved the patient having playing tennis shortly before (approximately 1 week before) the symptoms commenced. When questioned, she stated that she had not played tennis for over 6 months previous to this time. It was therefore decided to address the pronator teres and pectoralis minor syndromes, given they were probably most stressed when playing tennis after not having played for some time. Pronator teres and pectoralis minor were treated using ultrasound, electrical muscle stimulation, heat, and deep tissue massage. This treatment approach was chosen because these therapies are efficacious when treating conditions whose underlying pathophysiology involves hypertonic musculature, which is true of the two conditions of the patient being treated. Symptoms were occurring only occasionally after four treatments; and after two more treatments, had resolved completely.

Regarding self-care, it was recommended that she self-stretch the pectoral region as well as strengthening the scapular retractors of the interscapular region. The patient remained symptom

[4]While every orthopedic test carries with it the possibility of a false positive finding, the results obtained during the orthopedic testing of this patient were markedly positive, making the author quite confident of their validity.

[5]It should be acknowledged that in this particular case, alternative models of care might also have been considered, depending on the training of whoever she had consulted. For example, it is possible that acupuncture, movement therapy, and/or micro-current might have offered benefit. It is also possible that attention to her psychogenic/stress-management features could have reduced her perception of pain and other symptoms. In this instance a biomechanical/orthopedic/neuromuscular model of care was beneficially utilized.

free in her right upper extremity for the next 2 years without further treatment.

Conclusion

Patients rarely present with circumstances as simple as those described in textbooks. While this particular case review is more complicated than most, it does serve to illustrate an important point; the causes of a patient's symptoms are rarely ever due to just one factor. Rather, most of the time, causes are multifactorial.

When assessing a patient who presents with a set of symptoms, the first step toward achieving a differential assessment is to determine every possible condition that could cause those symptoms. The second step is to perform the orthopedic assessment procedures for each and every one of those conditions. Even if a positive finding is obtained with the first assessment procedure, it is important to keep assessing. A positive finding for one condition is like one piece of a jigsaw puzzle. One piece does not yield a clear and complete picture. It is necessary to have all pieces, or as many pieces of the puzzle as possible, to be confident of the patient's assessment. Only with a confident assessment is competent treatment possible.

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