Differential Diagnosis for the Painful Tingling Arm

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Abstract
The painful tingling arm is a common presenting complaint for the musculoskeletal physician. The differential diagnosis for upper-extremity pain associated with paresthesias will be the focus of this review. Symptoms are often neurologic in etiology, originating from the spinal cord, nerve root(s), brachial plexus, or peripheral nerve(s). Localizing the pathology starts with a comprehensive understanding of neuromuscular anatomy. It also is imperative to understand the function of these respective structures. The differential diagnosis can be narrowed with a thorough history, including an assessment of sport-specific risk factors, along with a comprehensive physical examination and functional assessment. It is important to determine the sensory distribution of the patient's symptoms. If weakness also is present, the affected muscles must be identified. While the diagnosis can often be made clinically, electrodiagnostics, magnetic resonance imaging, and ultrasound can be used as needed for confirmation and more specific localization. Nonneurologic structures also may be causative or contributory to the patient's symptoms and also should be considered.

Introduction

Pain associated with paresthesias in the upper extremity is a common presenting complaint for the musculoskeletal physician. A successful diagnosis requires an in-depth understanding of relevant anatomy and a complete history and physical examination serving as the basis for working through a comprehensive differential diagnosis. Upper-extremity pain associated with paresthesias originating from the spinal cord, nerve root(s), brachial plexus, or peripheral nerve(s) will be the focus of this review. However, it is important to understand that symptoms may arise from virtually anywhere along the sensory pathway from the peripheral nerve to the sensory cortex.

History and Physical Examination

In addition to obtaining a standard history including time course of injury, presence of inciting trauma, pain location and character, aggravating and alleviating factors, and so on, the musculoskeletal physician also must consider potential sport-specific and occupational hazards. For example, a cyclist presenting with dysesthesias in the little finger should prompt the provider to consider a repetitive compressive injury from the bicycle's handlebars. Key historical elements specific for individual diagnoses are discussed in the proceeding sections. Similarly, a thorough musculoskeletal and neurologic examination is critical and should include inspection, range of motion, palpation, neurovascular and special testing, and functional testing (1). Inspection may reveal muscle atrophy indicative of a neurologic lesion or skin discoloration suggestive of a vascular abnormality. Range of motion at the neck with pain reproduction may help differentiate cervical from peripheral pathology. Palpation with elicited point tenderness may suggest a musculoskeletal source of pain. On neurologic examination, the presence of upper motor neuron signs such as hyperreflexia, clonus, or a positive Hoffman's sign suggests a central cause and possible spinal cord involvement. Conversely, reflexes are classically depressed in mononeuropathies, polyneuropathies, brachial plexopathies, and radiculopathies. If sensory loss is present, time should be spent determining whether the distribution relates to a specific nerve root, area of the brachial plexus, or peripheral nerve. Special testing and other key physical examination findings for various pathologies are outlined in Table 1. While not covered in detail in this review, functional testing is the final component of the physical examination. This involves assessing the entire kinetic chain and observing the athlete in their sport. As an example, an astute sports medicine provider might observe poor trunk rotation in a rock climber, leading to repetitive overreaching as an underlying cause of chronic suprascapular nerve irritation (4). This type of functional observation should be routinely practiced by all sports medicine physicians.

Spinal Cord Compression

Compression of the spinal cord itself may occur secondary to cervical spondylotic myelopathy, the most common nontraumatic cause (2), or result from a variety of other structural abnormalities including neoplasm and epidural abscess.

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Table 1.
Neurologic injuries.

Diagnosis	Peripheral Nerve	Entrapment Site	Sensory Distribution	Muscles Affected	Common Physical Examination Findings
Spinal cord injury	N/A	Spinal canal	Variable but often spans multiple dermatomal and peripheral nerve root distributions	Variable but often spans multiple myotomal and peripheral nerve root distributions	Weakness and sensory impairments; hyperreflexia; Hoffman; Babinski
Cervical radiculopathy	N/A	Nerve root	Corresponds with affected dermatome based on nerve root level	Corresponds with affected myotome based on nerve root level	Weakness and sensory impairments; absent deep tendon reflexes associated with affected nerve root; Spurling's
Carpal tunnel syndrome	Median nerve	Carpal tunnel (wrist)	Palmar portion of the first three digits and radial half of the fourth digit as well as the distal dorsal aspects of these digits	Abductor pollicis brevis, opponens pollicis, superficial head of flexor pollicis brevis, lumbricals I/II	Weakness and sensory impairments; Phalen; Tinel at the wrist; manual carpal compression test
Pronator teres syndrome	Median nerve	Various locations at the elbow or proximal forearm, most commonly between the two heads of pronator teres	The same as in carpal tunnel syndrome, with the addition of the thenar eminence	The same as in carpal tunnel syndrome with the possible addition of pronator teres, flexor carpi radialis, palmaris longus, flexor digitorum superficialis, and the anterior interosseous nerve innervated muscles	Weakness and sensory impairments; Reproduction of symptoms with resisted forearm pronation
Anterior interosseous nerve syndrome	Anterior interosseous nerve	Same as in pronator teres syndrome	None, this is a pure motor palsy	Flexor pollicis longus, flexor digitorum profundus, pronator quadratus	Weakness; Difficulty making an "OK" sign with the thumb and the forefinger
Ulnar neuropathy at the elbow	Ulnar nerve	Elbow, most commonly within the cubital tunnel	Ulnar half of digit 4, entire digit 5	Frequently spares the ulnar innervated forearm muscles (flexor carpi ulnaris and flexor digitorum profundus to digits 4/5), while commonly affecting the ulnar innervated hand muscles, particularly the first dorsal interosseous muscle	Weakness and sensory impairments; Tinel sign at medial elbow; Wartenburg's sign; Froment's sign
Guyon's canal syndrome	Ulnar nerve	Guyon's canal (wrist)	The same as in ulnar neuropathy at the elbow	May involve all ulnar innervated hand muscles (interossei, lumbricals of digits 4/5, adductor pollicis, palmaris brevis, abductor digiti minimi, flexor digiti minimi, and opponens digiti minimi)	Weakness and sensory impairments
Saturday night palsy, radial neuropathy at the spiral groove	Radial nerve	Radial groove of the humerus	Dorsal aspect of lateral hand, part of the thumb, and proximal aspect of the dorsal phalanges of the index, middle, and ring fingers	Extensor indicis, extensor digitorum communis, extensor carpi ulnaris, long head of the extensor carpi radialis, supinator, brachioradialis; triceps are spared	Weakness and sensory impairments

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Diagnosis	Peripheral Nerve	Entrapment Site	Sensory Distribution	Muscles Affected	Common Physical Examination Findings
Posterior interosseous neuropathy	PIN (branch of radial nerve)	Forearm, most commonly within the Arcade of Frohse	No cutaneous sensory loss although pain may be present	The same as in radial neuropathy at the spiral groove except for sparing of brachioradialis, long and short heads of the extensor carpi radialis	Weakness
Radial nerve compression at the wrist	Superficial branch of the radial nerve	Wrist	The same as in radial neuropathy at the spiral groove	None, pure sensory palsy	Sensory impairments, tenderness at compression site
Lateral antebrachial cutaneous nerve entrapment	Lateral antebrachial cutaneous nerve	Between biceps tendon/ aponeurosis and the brachialis	Lateral forearm	None, pure sensory palsy (compression of the musculocutaneous nerve more proximally could have motor findings)	Sensory impairments, tenderness at compression site
Suprascapular nerve entrapment at suprascapular notch	Suprascapular nerve	Suprascapular notch	There is no cutaneous sensory distribution	Infraspinatus, supraspinatus	Weakness, atrophy
Suprascapular nerve entrapment at spinoglenoid notch	Suprascapular nerve	Spinoglenoid notch	There is no cutaneous sensory distribution	Infraspinatus	Weakness, atrophy
Long thoracic nerve palsy	Long thoracic nerve	Most commonly becomes entrapped where the nerve passes through the middle scalene muscle or angulates over the second rib; also may be involved in cervical traction injury	None, pure motor palsy	Serratus anterior	Weakness

References for information provided in Table 1 are from Bhattacharyya (2), Petron and Makovitch (1), Neal and Fields (Neal S, Fields KB. Peripheral nerve entrapment and injury in the upper extremity. *Am Fam Physician*. 2010 Jan 15;81 (2):147–55. PMID: 20082510), and Miller and Reinus (3).

It is important to rule out "red flag" symptoms that may indicate cord compression, malignancy, or infection. These symptoms may include bowel or bladder incontinence due to retention and overflow (5), gait abnormalities, severe motor weakness, fevers, and weight loss. Patients presenting with any of these symptoms should be referred directly to the emergency department. In the unresponsive athlete sustaining a possible concussion and/or neck injury, acute spinal cord injury should be assumed with appropriate on-field action taken until proven otherwise.

Cervical Radiculopathy

The most common cause of cervical radiculopathy is spondylosis, or adaptive changes in the spine that occur with age that may lead to diminished disc height, bony hypertrophy, and foraminal narrowing (6). Disc herniation causing direct compression or chemical irritation (a release of pro-inflammatory cytokines from the herniated disc material) of the nerve root also is common (7). Rarely, local infection, such as osteomyelitis or discitis and neoplasm, also may damage exiting nerve roots. The C7 nerve root is most commonly affected, followed by C6 (8).

Radiating unilateral upper extremity pain is the most common complaint followed by paresthesias (9), and neck pain is usually present. Symptoms may present suddenly and can be severe, especially in the case of an acute disc herniation, or may come on gradually, such as in spondylosis or neoplastic compression. Symptoms are typically exacerbated with neck movement. Pain and sensory loss do not necessarily coincide with a specific dermatome; in practice reported symptoms only correlate to the "classic" dermatomal patterns about half the time (10). Consequently, sensory loss is often less significant than in a peripheral nerve injury (11). The same is true for myotomes — muscles are typically innervated by multiple nerve roots, thus complete loss of motor strength in a single muscle is uncommon. In fact, subjective weakness is the least common complaint in patients with cervical radiculopathies, although motor weakness may be identified on examination

(8). Bilateral symptoms are suspicious for spinal cord pathology, although bilateral radiculopathies can occur.

Brachial Plexopathies

Brachial plexopathy most commonly results from trauma (12). A "burner" or "stinger" occurs in contact sport athletes via stretch, direct impact, or compression. Stretch across the upper trunk is common because of downward traction of the shoulder combined with contralateral lateral flexion of the neck. Alternatively, especially at the professional level, stingers are often caused by forced, rapid lateral flexion resulting in ipsilateral nerve root compression (13). A stinger typically results in transient symptoms but should be monitored for persistent neurologic loss. Critically, stingers are unilateral. Bilateral symptoms indicate transient quadriparesis or spinal cord injury.

A history of rapid onset of severe shoulder and arm pain followed by atrophy and weakness of muscles usually in the proximal upper extremity is suggestive of Parsonage-Turner syndrome, also known as brachial neuritis or neuralgic amyotrophy. This is an uncommon inflammatory plexitis of unclear etiology, although is most often associated with recent viral illness or vaccination (14). For example, this has recently been reported to occur in the setting of SARS-CoV2 infection (15). Motor axons are predominantly affected, and as a result, areas of the plexus and peripheral nerves carrying a larger proportion of motor axons are commonly involved (16). This includes the upper trunk and the suprascapular, long thoracic, musculocutaneous, radial, anterior interosseous, and axillary nerves (17).

Thoracic outlet syndrome, an umbrella term for signs and symptoms arising from compression of neurovascular structures within the thoracic outlet, can mimic cervical radiculopathy or peripheral nerve entrapment. Neurogenic thoracic outlet syndrome (nTOS) accounts for 95% to 98% of cases of thoracic outlet syndrome (18). Although often cited, nTOS is actually quite rare. Historically diagnosed more often, operations attempting to decompress the plexus were quite common. However, many patients diagnosed with nTOS were subsequently found to have entrapment neuropathies or cervical radiculopathy (19). When nTOS is genuinely present, sensory and motor disturbances in a lower trunk distribution may be present, especially weakness of the thenar muscles. Other etiologies of brachial plexopathies are listed in Table 2.

Median Nerve

The most common entrapment neuropathy is the median nerve at the wrist, also known as carpal tunnel syndrome. Risk factors include female sex, obesity, diabetes, rheumatologic diseases, arthritis, hypothyroidism, and occupational factors, namely repetitive wrist flexion and extension, working with vibrating tools, and sustained wrist or palm pressure (20). In athletes, carpal tunnel syndrome can be seen in sports requiring repetitive wrist flexion, including racket sports, rowing, baseball, or rock climbing. Patients often have pain and paresthesias in a median nerve distribution, which includes the palmar portion of the first three digits and radial half of the fourth digit, as well as the distal dorsal aspects of these digits. However, it is not uncommon for paresthesias to affect the entire hand or to have pain radiate proximally into the forearm. The pain is often bothersome at night and with persistent or repetitive hand flexion which compresses the carpal tunnel. In severe cases, patients may describe difficulty opening jars or dropping objects because of the weakness of the finger and thumb flexors. The median nerve also can become entrapped at various locations around the elbow, detailed further in Table 1 and illustrated in Figure 1.

Table 2.
Etiologies of pain and paresthesias in the upper extremity.

At the level of the brachial plexus
• Parsonage-Turner syndrome
• Neurogenic thoracic outlet syndrome
• Erb-Duchenne palsy
• Klumpke's palsy
• Burner or stinger
• Backpacker's palsy
• Traumatic nerve root avulsion
• Hereditary neuralgic amyotrophy
• Neoplasm (most commonly breast, lung cancer)
• Radiation-induced brachial plexopathy
• Iatrogenic plexopathies (*i.e.*, Medial brachial fascial compartment syndrome)
• Diabetic-related brachial plexopathy
Systemic
• Thalamic pain syndrome
• Hemiplegic migraine
• Focal sensory seizures
• Multiple sclerosis
• Axillary vein thrombosis or Paget-Schroetter disease
• Fibromyalgia or trigger points
• Herpes zoster (shingles)
• Mononeuritis multiplex
• Multifocal motor neuropathy

Ulnar Nerve

Ulnar neuropathy at the elbow is the next most common entrapment neuropathy after carpal tunnel syndrome (21). Proximal to the wrist, entrapment of the ulnar nerve most often occurs within the cubital tunnel. However, entrapment at the arcade of Struthers or between the heads of flexor carpi ulnaris also has been reported (Fig. 2A) (21). Patients may have a history of leaning on the elbow, as in a truck driver resting the elbow on the open window. Throwing athletes are at risk for ulnar nerve compression or traction at the elbow because of repetitive and excessive valgus stress that occurs at the medial elbow during throwing (22). Symptoms include pain involving the medial elbow and ulnar forearm with sensory deficits in the ulnar hand. Of note, paresthesias are more likely to be present in the digits than the palm because of the relative sparing of both the dorsal ulnar cutaneous nerve (DUC) and the palmar ulnar cutaneous nerve (PUC). This is because fascicles of the PUC and DUC are located in a deep dorsolateral location at the elbow (23). It also is important to note that sensory deficits proximal to the wrist suggest a lesion higher in the plexus or nerve roots (3).

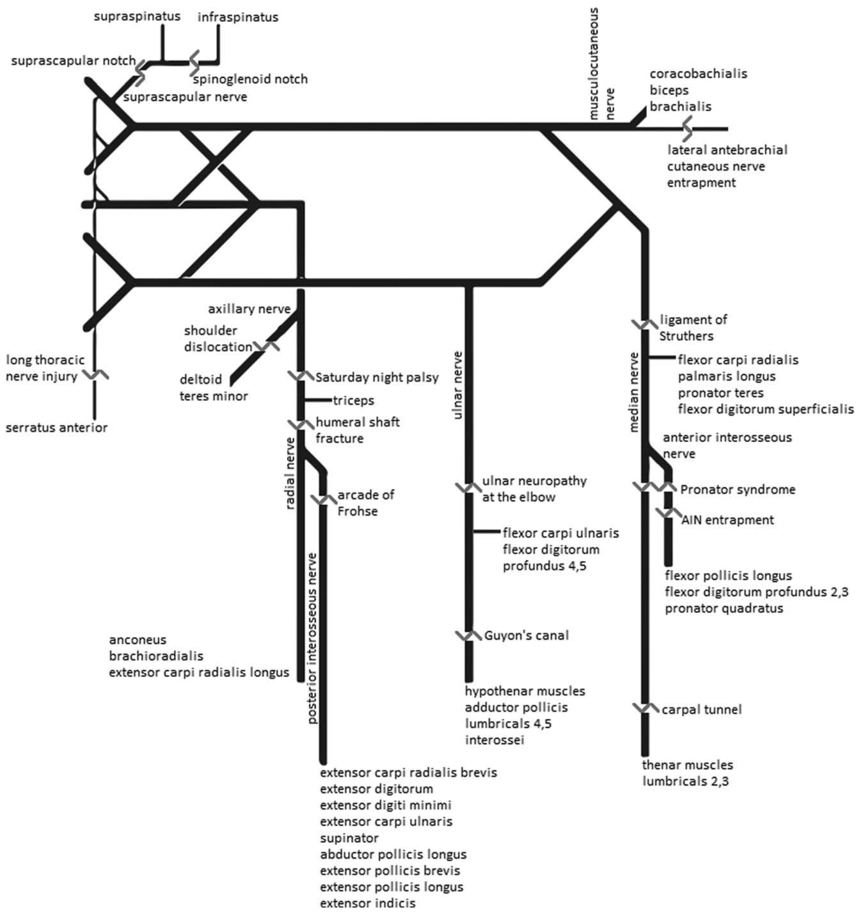

Figure 1: Schematic of upper extremity entrapment sites.

Compression of the ulnar nerve at the wrist is known as Guyon canal syndrome. The borders of the Guyon canal include the superficial volar carpal ligaments, the deep volar ligament, and the pisiform (24). The ulnar nerve is located at the medial aspect of this triangular canal and can be compressed internally by masses, such as ganglion cysts, or externally by repetitive activities, such as leaning on bicycle handlebars (the ulnar aspect of the hand within the corner of a bullhorn handlebar has been implicated) (25). Baseball players, especially catchers, also may be at risk because of the repetitive trauma involved with catching a ball (26). Patients may present with paresthesias in the ulnar half of the ring finger, as well as the little finger. Motor weakness of the hand is more pronounced in ulnar neuropathies than in carpal tunnel syndrome as most of the intrinsic muscles have ulnar innervation. In severe cases, wasting of the intrinsic muscles of the hand and clawing of the fourth and fifth digits may occur (3).

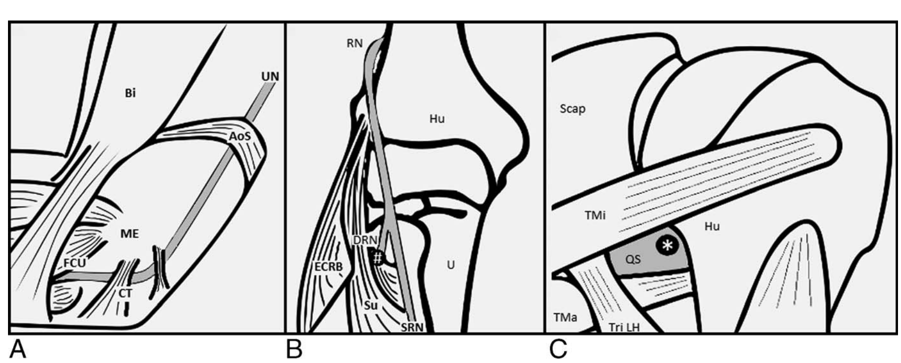

Figure 2: Upper extremity entrapment anatomy. (A) Medial elbow, (B) Anterior elbow. (C) Posterior shoulder. Bi, biceps; ME, medial epicondyle; UN, ulnar nerve; AoS, arcade of Struthers; CT, cubital tunnel; FCU, flexor carpi ulnaris; RN, radial nerve; Hu, humerus; ECRB, extensor carpi radialis brevis; DRN, deep radial nerve; U, ulna; Su, supinator; SRN, superficial radial nerve; Hash, Arcade of Frohse; Scap, scapula; TMi, teres minor; TMa, teres major; Tri LH, long head of triceps; QS, quadrilateral space; asterisks, axillary nerve.

Radial Nerve

At the axilla, compression of the radial nerve occurs classically in patients who use crutches incorrectly. Patients will have weakness in elbow and wrist extension and may have some weakness in supination and elbow flexion because of the involvement of the supinator and brachioradialis muscles. Impaired sensation occurs in the posterior arm, posterior forearm, dorsum of the thumb, and dorsum of the proximal aspect of the second, third, and fourth digits (27).

Just past the elbow, the radial nerve splits into the superficial branch and the deep branch, also known as the posterior interosseous nerve (PIN). The deep branch runs through the Arcade of Frohse, the most common location of its entrapment (27) (Fig. 2B), before penetrating the supinator muscle. In posterior interosseous neuropathy, wrist and finger drop are present, while elbow extension is preserved. Of note, this nerve is purely motor, thus while pain may be present, sensation remains intact. Radial tunnel syndrome refers to cases in which pain is present with intact motor function. This diagnosis should be considered in refractory lateral epicondylopathy and may present in the racket sport athlete (28). Other sites of radial nerve entrapment are detailed in Table 1 and illustrated in Figure 1.

Axillary Nerve

Axillary nerve injuries should be considered in the setting of shoulder dislocation or blunt trauma to the shoulder. In addition, the axillary nerve may be injured during rotator cuff surgery. Rarely, the nerve may be compressed outside of trauma in the quadrilateral space (Fig. 2C). Repetitive microtrauma due to throwing or a space-occupying lesion in this area is a potential cause (29). These patients may present with arm fatigue, particularly with overhead lifting, shoulder abduction weakness, and numbness in the area of the inferior deltoid (regimental badge area). As the axillary nerve innervates the teres minor, external rotation strength should be assessed for weakness as well. The branch to the teres minor is occasionally preserved in injuries that occur distal to the quadrilateral space, so careful assessment of this muscle during physical examination and via electromyography (EMG) is important.

Musculocutaneous Nerve

Entrapment of the musculocutaneous nerve or its peripheral sensory branch, the lateral antebrachial cutaneous nerve, is rare but has been reported in athletes. This seems to most commonly occur because of the compression of the nerve by the biceps tendon or because of the compression between the distal biceps and brachialis musculature. Repetitive pronation seems to be a risk for this type of dynamic compression and has been reported in the offensive lineman and the throwing athlete (30). The patient may present with aching pain lateral to the biceps with activity. In addition, they may describe dysesthesias through the radial forearm and, in some cases, through the thumb. Motor findings should not be present with distal compression; however, compression of the musculocutaneous nerve proximally may cause elbow flexion and supination weakness.

Suprascapular Nerve

About a quarter of suprascapular nerve injuries occur secondary to trauma and often present with axillary nerve injuries (31). The suprascapular nerve may become entrapped at one of two common locations, the suprascapular notch and the spinoglenoid notch. Suprascapular nerve injury is often associated with overhead repetitive trauma, such as in throwing athletes, swimmers, or volleyball players. Compression of the nerve in the spinoglenoid notch from a paralabral cyst secondary to superior glenoid labrum tears also have been commonly reported. Patients may describe deep, vague, posterolateral shoulder pain. Weakness depends on the location of entrapment. If the suprascapular nerve is entrapped at the suprascapular notch, both the infraspinatus and supraspinatus may demonstrate weakness. If the nerve is entrapped at the spinoglenoid notch, weakness may be limited to the infraspinatus. Entrapment at the spinoglenoid notch tends to be less severe; it is not uncommon for patients to present with atrophy of the infraspinatus but otherwise be symptom free (29).

Other Diagnoses to Consider

Vascular, systemic, and other less common etiologies for the painful tingling arm are listed in Table 2 and should be considered when the diagnosis is uncertain.

Diagnostic Testing

Electrodiagnostics

EMG is most useful in evaluating pathology of the peripheral nervous system and muscular system. Nerve conduction studies (NCS) are typically performed first in an electrodiagnostic evaluation and can evaluate for the presence of entrapment neuropathies such as carpal tunnel syndrome or ulnar neuropathy at the elbow. NCS also provide valuable information in the setting of brachial plexopathies. When abnormalities of a peripheral nerve are evidenced on NCS, EMG can rule out a mononeuropathy versus cervical radiculopathy by assessing muscles that are innervated by the same myotome but different peripheral nerves.

In addition, EMG can be useful in identifying radiculopathies caused by infection, infarction, or other nonstructural causes that may be missed on magnetic resonance imaging (MRI). There are limitations of EMG, however. During an EMG, a needle electrode is inserted into various muscles to record electrical signals from that muscle tissue. Therefore, EMG primarily assesses motor axon loss; sensory changes such as pain or tingling are not evaluated by an EMG. As a result, pathology is less likely to be identified when pain or tingling is the only presenting symptom. Further, even in the presence of pain, tingling, or diminished sensation, NCS in radiculopathy is generally normal. This is because mechanical compression or chemical irritation of the cervical nerve root generally occurs proximal to the dorsal root ganglion. This is in contrast to peripheral nerve entrapment where pathology occurs distal to the dorsal root ganglion. Thus, electrodiagnostic evidence of radiculopathy is more likely to be present when there is associated motor weakness (32). Similarly, EMG will not identify a demyelinating lesion without axonal loss which is sometimes the case in nerve root compression. EMG and NCS are useful in evaluating pathology of the peripheral nervous system but do not have utility in evaluating central nervous system pathology such as spinal cord injury. Importantly, electrodiagnostic studies must be interpreted within the clinical context and in isolation do not provide a definitive diagnosis.

X-ray and Computed Tomography

Outside of acute trauma, plain radiographs generally have lower diagnostic utility for evaluating nerve pathology, although in certain cases can be revealing. For example, in cervical spondylosis a vertebral osteophyte within a neural foramen might cause nerve root compression. Computed tomography (CT) is superior to X-ray (XR) in evaluating for cervical spine injuries in the setting of high-risk trauma and can be useful in surgical planning (33).

Magnetic Resonance Imaging

If cervical radiculopathy is high on the differential, MRI is an appropriate tool to use after reasonable treatment or in cases of severe pain/significant neurological findings with concern for underlying disease. MRI should be ordered if there is a reasonable chance that the results will change treatment. In the presence of a structural abnormality, such as neuroforaminal stenosis, MRI is typically more sensitive than EMG in detecting radiculopathies (34). MRI also is the study of choice for detecting spinal cord pathology in the setting of mechanical compression, such as cervical myelopathy. In addition, MR neurography can be used to visualize peripheral nerves to identify nerve thickening, perineural fluid, muscle denervation, and structural lesions such as nerve sheath tumors (35). Utility of this imaging modality is dependent on the strength of the MRI machine and institutional protocols.

Neuromuscular Ultrasound

Ultrasound has become a useful complement to electrodiagnostics in the evaluation of the peripheral nervous system. It is significantly less expensive than MRI, has less contraindications, and is often more accessible. Ultrasound also has higher spatial resolution than MRI, so there is better visualization superficial, peripheral nerves (36). In addition, live scanning allows for dynamic evaluation of nerve compression; for example, evaluation of the suprascapular nerve in the spinoglenoid notch with shoulder rotation. Ultrasound also can help localize a lesion in the setting of an equivocal electrodiagnostic study by looking at the entire length of a nerve from its origin at the brachial plexus down to its distal branches (37). Ultrasound has been shown to accurately diagnose carpal tunnel syndrome severity through nerve cross-sectional area measurements (38). This information not only assists in making a diagnosis but may guide management, especially when planning surgical interventions.

Conclusions

The painful tingling arm is a common presenting complaint with a broad differential diagnosis. A thorough understanding of upper extremity neuroanatomy allows for differentiating pain and weakness in a dermatomal and myotomal distribution from a peripheral nerve distribution. A detailed functional history is critical to identify risk factors specific to certain diagnoses. In the athlete, the entire kinetic chain should be addressed. This requires identifying inflexibilities, strength loss, imbalances, proprioceptive changes, and motor control deficits (39–43). A comprehensive physical examination will often further narrow the differential diagnosis. Lastly, electrodiagnostics and imaging may help confirm and further localize the pathology, although the results of these studies should always be interpreted within the clinical context. Even so, in many cases, the exact cause and/or location of injury cannot always be identified. While this article addresses some of the most prevalent etiologies of this chief complaint, it does not explore in detail the less common nonneurologic causes. Furthermore, additional research is needed to better understand the presentation, epidemiology, and pathophysiology of peripheral nerve injuries, particularly those that are less common.

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