CLINICAL VIGNETTE

Carpal Tunnel Syndrome in the Setting of Weight Gain: A Clinical Vignette

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Case Report

The patient is a 52-year-old male of Italian decent with a history of hypoandrogenism, osteoporosis, and vertebral compression fractures, who presents with pain and paresthesias in both of hands and forearms right greater than left. He had gained 15 pounds over the past several years attributed to poor dietary habits.

Past medical history also includes spinal stenosis, asthma, and degenerative disc disease. Medications include testosterone 5 grams applied topically daily, alendronate 70 mg weekly, montelukast 10 mg daily, and buproprion XL 150 mg daily. Supplements include calcium 600 mg bid and vitamin D 1000 IU daily. He has no medication allergies.

Social history includes being a non-smoker who drinks socially averaging about 1 per day. He has at most one cup of coffee each morning. Because of his work responsibilities, he spends a minimum of 4-6 hours each day on his computer. He exercises consistently using an elliptical trainer 30 minutes five times per week and with light weights twice weekly. He has been travelling often for work and has been making poor nutritional choices. Family history reveals a sister with early osteoporosis, his father died at age 84 with lung cancer, and his mother died at age 45 with a fatal arrhythmia.

His physical examination revealed a BMI of 27, blood pressure 128/84, pulse 68 and regular, and temperature 98.6 F. Physical exam revealed a loss of sensations in the median nerve distributions of both hands, right greater than left. Phalen's maneuver and Tinel's sign were positive. Exam was otherwise unremarkable with a normal cardiac and pulmonary exam with no edema.

Laboratory evaluation revealed a normal CBC, chemistries, thyroid function, and lipid panel.

General Discussion and Epidemiology

Carpal tunnel syndrome is a very common compressive focal mononeuropathy that results from the compression of the median nerve as it traverses the carpal tunnel resulting in symptoms that can include numbness, paresethesias, and loss of strength[1]. Carpal tunnel syndrome is very common with an incidence in men of about 200 per 100,000 and an incidence in women of about 400 per 100,000[2]. The prevalence of the disorder is approximately 3% with women being much more likely than men to be diagnosed[3]. The incidence of carpal tunnel syndrome appears to be greater in workplace environments providing evidence that repetitive overuse injuries plays a part in the pathophysiology of this disorder[4]. Obesity appears to also significantly increase the risk of developing carpal tunnel syndrome[5]. Pregnancy, diabetes, genetics, hypothyroidism, and connective tissue diseases also increase the risk[6]. One plausible theory for why women have a predisposition to developing carpal tunnel syndrome is that women on average have a smaller carpal tunnel space than men[7]. Genetics clearly also plays a role (especially in bilateral cases) perhaps related to congenital differences in the size of the carpal tunnel[8]. Some medications (most notably aromatase inhibitors) have been associated with an increased risk of CTS perhaps related to changes in tendon thickness[9]. Although CTS appears to be more common in the workplace, a clear causal relationship being workplace factors (such as keyboard time, repetitive hand use, heavy lifing, etc.) isn't consistently supported by the literature[10]. Thus, which specific elements of the workplace contribute to CTS remains controversial and elusive.

Etiology and Pathophysiology

The median nerve is comprised of nerve fibers from C6, C7, C8, and T1 nerve roots with C6 and C7 providing the sensory fibers and C8 and T1 providing the motor fibers[7]. The median nerve accompanies nine flexor tendons through the carpal tunnel of the wrist where compression can result in ischemia

and/or direct injury to the contents affecting the functioning of the hand, wrist, and forearm[11]. Although the exact pathophysiology of carpal tunnel syndrome is not yet completely elucidated, it is believed that direct compression and inflammation are the two most likely mechanisms[12]. Such injuries can disrupt axonal function, compress blood flow, and cause nerve ischemia[13]. Swelling from inflammatory conditions, congenital differences in the size of the carpal tunnel, and lesions such as cysts can contribute to the disorder's pathophysiology[14]. Vascular proliferation and fibrosis related to increased expression of prostaglandin E2 and various growth factors can also play a role[1].

Clinical Features

The symptoms of carpal tunnel syndrome usually involved paresethesias and numbness in the distribution of the median nerve. Thus, the first three digits and the radial half of the fourth digit are usually affected with symptoms sometimes radiating into the wrist or forearm[15]. Dullness and achiness are common complaints. Symptoms tend to worsen with flexion, extension and especially during sleeping which commonly results in the disruption of proper sleep patterns. Driving, telephone usage, and computer usage are other common sustained, repetitive activities that can elicit symptoms[16]. Waxing and waning symptoms are the norm with fixed sensory loss and motor loss only occurring late in the progression of the disorder. Clumsiness and weakness in the hand tend to occur late in the course of the disorder.

Diagnosis and Testing

Diagnosis is made based on the combination of characteristic signs and symptoms supported by confirmatory nerve conductive testing. Findings on examination correspond to the sensory and motor innervations of the median nerve. However, the absence of findings on examination does not rule CTS. Classically, sensory deficits occur before motor deficits in the course of the disorder. Sensory loss in the thenar eminence does not occur with CTS. Thus, such a finding would indicate a lesion proximal to the wrist. Motor weakness in both thumb abduction and opposition can occur in the thenar eminence late in the course of the disorder[18]. Muscle atrophy can also sometimes be seen[17].

In addition to a full examination, provocative testing can be helpful in diagnosing CTS. Such tests include the Phalen maneuver, Tinel test, manual carpal compression, and hand elevation tests. The sensitivity and specificity of all of these tests are very limited. The Phalen maneuver involves the patient fully extending the elbow and flexing the wrist[18]. A positive sign occurs when pain and/or paresethesias occur in the median nerve distribution within one minute. The Tinel maneuver involves firm percussion over the median nerve just proximal to or on top of the carpal tunnel resulting in pain and/or paresethesias[19]. The manual carpal compression test is performed by applying pressure over the transverse carpal ligament resulting in paresethesias within 30 seconds[19]. The hand elevation test involves CTS symptoms occurring while raising the hands over the head for one minute[20].

Nerve conduction studies and electromyography are also standard parts of the evaluation of carpal tunnel syndrome. Such testing is positive if it shows impaired median nerve conduction with unremarkable conduction elsewhere. The results of NCV/EMG testing must be assessed in conjunction with the history and physical examination findings to put the findings in proper clinical context. These findings can also be useful to rule out other abnormalities that can present similarly to CTS.

Treatment

Treatment options for carpal tunnel syndrome include conservative measures (non-surgical) and surgical options. The choice of whether to pursue surgical or non-surgical options typically depends on the severity of symptoms with mild to moderate cases being handled conservatively and more severe cases (or those unresponsive to non-surgical measures) being handled surgically[21]. Factors that predict which patients will do well with conservative measures include duration of symptoms (>1 year), age (>50 years), constant symptoms, and a positive Phalen's sign[22]. A combination of therapies tend to be more successful that focusing on any one therapy[23]. Enlisting the aid of a physical therapy or occupational therapist can also be helpful[24].

1. Splinting

Splinting (either during the day or at night) helps to maintain the wrist in neutral position preventing further overuse and injury and is believed to be effective in reducing symptoms in those with mild to moderate symptoms[25]. Splints can be purchased over the counter or custom made by a certified physical or occupational therapist. There is a paucity of studies comparing surgery to splinting although the studies that have been done to date favor surgery[26].

2. Steroids

Steroids can be used effectively for carpal tunnel syndrome either orally or injected into the carpal tunnel (either proximal or distal) to reduce inflammation and speed recovery. Some studies have shown short-term improvement with corticosteroid injections although cases of nerve injury have also been reported[27]. Although steroid injections may confer better short-term results than surgery, results after six months tend to favor surgery[28]. Similarly, oral corticosteroids typically provide short-term improvement in symptoms although long-term outcomes are less impressive[29].

3. Nerve Gliding

The use of nerve gliding therapy by an occupational therapist is unsupported by the literature. Other unproven therapies include sonography, magnetic therapy, laser therapy, electrical stimulation therapy, NSAIDS, myofascial massage, and contrast baths[29].

4. Yoga/Stretching
Some preliminary evidence suggests that yoga and stretching may have a role in the treatment of CTS[30].

Treatment Summary: Patients with mild to moderate symptoms typically do well with conservative therapies such as splinting and steroids. Yoga and carpal bone mobilization may also be beneficial. Combining therapies appear to provide more relief than individual therapies. Lifestyle measures including practicing proper ergonomics and reaching a healthy weight may be helpful component in the treatment plan. Surgical options are considered if conservative measures fail. Enlisting the help of an occupational therapist also appears to help. Surgery is considered for those with moderate to severe CTS symptoms or those who fail conservative measures.

Clinical Course and Follow-Up

My 52-year old patient was referred to an orthopedist who established the diagnosis of carpal tunnel syndrome possibly exacerbated by his osteoporosis. He was subsequently referred to an occupational therapist and nocturnal splinting was initiated. He also pursued a healthier diet, lost 10 pounds, practiced proper ergonomics at work, and had a dramatic improvement in symptoms over the ensuing 6 months. He also practiced proper stretching and yoga exercises as recommended by his occupational therapist and avoided overuse strain during the day and at night. Fortunately, his outcome was quite good.

Teaching Pearls:

1. Carpal tunnel syndrome is a common disorder seen in the primary care setting.
2. An increased BMI is an independent risk factor for CTS.
3. Treatment may include splinting, steroids, stretching, yoga, proper ergonomics, and reaching a healthy weight. Surgery is usually reserved for refractory or severe cases.

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