



Investigating the causes of hand paresthesia in the patients admitted to the electrodiagnostic center of martyr Sadoughi Hospital in Yazd

Causes of hand paresthesia

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Abstract

Aim: Paresthesia is an abnormal sensation in the hands characterized by tingling and numbness of the hands. Neuropathy is the most common neurological condition that causes peripheral nervous system involvement and creates tingling and numbness. Carpal tunnel syndrome is the most common neuropathy in the upper organs. Medical history and physical examination are the basic methods for the detection of neuropathies, and electrodiagnostic studies make a decisive diagnosis. The aim of this study was to investigate the causes of paresthesia in patients admitted to Martyr Sadoughi Hospital in Yazd. **Material and Method:** This is a cross-sectional descriptive study. Sampling in this study was as a census of all patients admitted during the study. A total of 660 patients (512 females and 148 males) were enrolled in the study based on the inclusion criteria from April 2014 to June 2015. After the history and physical examination, x-rays and electrodiagnostic tests were performed for the patients. Afterward, required questionnaires for the patients were completed and analyzed by SPSS software using chi-square test. All probabilities less than 0.05 were considered as statistically significant. **Results:** Most patients were housewives (69.1%) in the age group of 40-49years (33.3%) who had referred while complaining paresthesia in both hands (54.6%). Median nerve sensory disorder was common and had happened typically in 26.1% of patients. Women with carpal tunnel syndrome comprised 66.4% of the cases. One-sided and two-sided carpal tunnel syndrome, respectively, were recorded in 15.2% and 43.6% of patients. The second cause of paresthesia was cervical spondylosis occurring in 25.5% of patients being more common in the age group of 60-80 years. **Discussion:** Carpal tunnel syndrome was the most common cause of paresthesia in the patients of our study.

Keywords

Carpal Tunnel Syndrome; Paresthesia; Electrodiagnostic Studies

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Introduction

Paresthesia is an abnormal sensation in the hands characterized by tingling and numbness of the hands. This impairment is caused by the discharge of large sensory fibers that can be created by compression, hypokalemia, and a variety of nervous diseases. In addition, nerve root lesions or isolated peripheral nerves may be the cause of paresthesia [1]. The healing ability of nerves is lost with aging, which leads to the occurrence of progressive destruction of sensory perception [1]. Physical examination is sufficient to determine the cause of paresthesia in most cases. However, the use of electrodiagnostic testing such as Electromyography (EMG) and Nerve Conduction Velocity (NCV) raise the accuracy of diagnosis and reduce plausible differential diagnoses [1]. Compressive neuropathy occurs in certain predictable regions of the upper organs, and the different types can be evaluated with the same methods of likely similar pathophysiology. Neuropathy and localization of nerve compression are detected by the use of clinical examination, electrodiagnostic tests, and according to common places of pressure on the nerve [2]. Carpal tunnel syndrome, which involves the median nerve in the wrist is the most common compressive neuropathy in humans. This disease was first introduced by Foix Marie (1913) as a clinical disease in patients with two-sided thenar atrophy. The incidence of carpal tunnel syndrome is estimated to be 125/100,000. It occurs in women 1.52-2 times more than men. It is observed in people who use their hands frequently in their daily activities; the dominant hand is often involved being two-sided in at least 10% of patients [3].

Any person who has paresthesia and muscle atrophy within a peripheral nerve should suspect the entrapment of peripheral nerve. The involvement mechanism changes in accordance with the relationship between the nerve anatomy and the incoming mechanical force [13]. Intense and annoying paresthesia is often caused by polyneuropathy [4]. Cervical spondylosis (as a cause of hand paresthesia) is the destructive disease of the cervical vertebra that is extremely common in adults and becomes more prevalent with aging. The most common surface of cervical destruction is between the spaces C6-C7, C5-C6, which lead to radiculopathy of C7 and C6 nerve roots.

In spite of physical strength, many patients are incapable of doing things due to the involvement of the one of the most important organ, i.e., the hands. Some patients are not even able to perform everyday tasks, and a group suffers from psychological complications. A faster diagnosis can be reached through the knowledge of age, gender, and common cause. Early diagnosis and proper treatment can solve a lot of problems with patients. Due to these reasons, this study investigated the causes of hand paresthesia in patients admitted to martyr Sadoughi Hospital in the city of Yazd.

Paresthesias

Paresthesias are abnormal sensations experienced in the absence of specific stimuli [5]. These sensations are usually described as burning, tingling or numb feelings, although they may be described as feelings of cold, warmth, prickling, pins and needles, skin crawling or itching. The most common locations of paresthesias are the hands, arms, legs, and feet, although paresthesias can be present anywhere on the body.

Paresthesias are contrasted with dysesthesias, which are abnormal interpretations of appropriate stimuli [6]. Paresthesias are common presenting complaints, and diagnosis is usually assisted by knowing the specific clinical presentations associated with various paresthetic syndromes.

The basic pathophysiology of paresthesias is an altered nerve or nerve pathway function. Paresthesias are thought to represent abnormal showers of impulses generated from an ectopic focus [7] and can arise from an abnormality anywhere along the sensory pathway, from the peripheral nerves to the sensory cortex [8]. Paresthesias can be caused by central nervous system or peripheral nervous system abnormalities. Central nervous system causes include ischemia, obstruction, compression, infection, inflammation, and degenerative conditions.

Diagnostic approach

Paraesthesias can be caused by a wide range of conditions affecting the nervous system at any level. Most patients have peripheral neuropathy, but all causes should be considered. The clinical history and physical examination narrow the differential diagnosis and guide the need for further investigations. The aim of the examination is to determine whether the pathology is likely to be affecting the peripheral nerves, plexuses, dorsal spinal roots, spinal cord, or brain, and to identify additional signs of the underlying cause.

Diabetic neuropathy, hypocalcemia, vitamin deficiencies, drug toxicity, and minor infections such as shingles or HSV can usually be diagnosed clinically or with laboratory testing. All other peripheral neuropathies require EMG with nerve conduction studies to confirm and characterize the neuropathy. If the history and examination suggest a plexopathy, a radiculopathy, or a lesion affecting the spinal cord, brainstem, or brain, imaging is required [9].

Characteristics of the paraesthesias

Description: It is important to characterize the paraesthesias being experienced by the patients. The patients should be encouraged to describe their symptoms in detail in their own words. Common descriptions include burning, stabbing, pins and needles, prickling, stinging, and sharp shooting pains. It is important to establish if there is an associated loss of sensation and if it is in the same area as the paraesthesias. Painful paraesthesias suggest an inflammatory or ischemic process such as vasculitis. Shooting pains are characteristic of nerve entrapment. Burning pains are characteristic of paraesthesias affecting small unmyelinated fibers. Paraesthesias may occur as part of a migraine aura or have an onset at the same time as the headache, and they typically last <1 hour from the onset of the headache.

Onset: It is important to reveal if the symptoms had a sudden onset or if they evolved over seconds, minutes, hours, days, or weeks. A sudden onset suggests stroke or trauma. Symptoms that evolve over several seconds suggest epilepsy. Symptoms that evolve over minutes suggest a migraine, panic attack, or fish poisoning (if the patient has ingested fish within the previous 8 hours). An insidious onset is characteristic of inherited neuropathies.

Duration and severity: The patient should be asked whether the symptoms are constant or relapsing and remitting and whether there has been any symptom progression. A history of similar previous symptoms should be sought. Muscle pain, atrophy, or weakness in the same anatomical distribution as the paraesthesias indicates a sensorimotor peripheral neuropathy (often a sign of more advanced disease).

Localization: The location of the symptoms indicates the level of the lesion. Localized symptoms indicate a peripheral mononeuropathy or a plexopathy if in the distribution of one or more peripheral nerves, or a radiculopathy if in the distribution of a dermatome. If symptoms suggest a peripheral mononeuropathy, a more detailed history should be taken to assess for focal nerve entrapment syndromes. Paraesthesias affecting the first 3 digits of the affected hand suggest carpal tunnel syndrome. Symptoms are usually worse at night (awakening patient from sleep) and exacerbated by prolonged wrist extension such as driving, typing on a keyboard, or reading a newspaper. Patients may also have pain in the wrist or hand possibly extending into the forearm, elbow, or shoulder.

Paraesthesias affecting the fourth and fifth digits suggest ulnar neuropathy, which may be induced by prolonged or repetitive flexion of the elbow or repetitive leaning on the elbow. Paraesthesias in the lateral leg or dorsal foot may indicate fibular (peroneal) neuropathy. Patients may also have a foot drop. The nerve compression is usually due to the repetitive crossing of the knees or prolonged kneeling, crouching, or squatting, but a history of trauma or previous knee surgery may also be present. Paraesthesias in the medial aspect of the foot suggest tibial neuropathy, which is relatively rare. Burning paraesthesias with increased sensitivity to touch or pressure in the anterolateral thigh region suggest meralgia paraesthetica, produced by compression of the lateral cutaneous nerve of the thigh. Paraesthesias characterized by persistent itching, localized unilaterally on the upper back, are called notalgia-paraesthetica. Symptoms may also include pain, tingling, numbness, or increased sensitivity to light touch in the affected area. Notalgiaparaesthetica is thought to be due to compression of the dorsal or sensory branches of the spinal nerves, from dermatomes T2 to T6, by paraspinal muscle spasm or by bony degenerative changes in the spine at these levels [9].

Material and Method

This study was a descriptive study conducted through case series method. The population in this study were all patients complaining hand paresthesia referred to the neurology clinic and electrodiagnostic center of Martyr Sadoughi Hospital in Yazd during the study period (April 2014 to June 2015). Samples were selected by census from the population based on clinical observations (signs and symptoms), clinical measures (electrodiagnostic tests of EMG, NCV) and cervical radiography during the fifteen-month period of the study, in which 660 patients were examined.

First, detailed histories were taken from the patients by questioning about the presence of complaints such as numbness, tingling, numbness, and tingling of the hands and weaknesses in everyday tasks, which was followed by a necessary physical examination. Then NCV, EMG, and radiography was performed

for all patients and questionnaires were completed containing information such as age, gender, occupation, involved hand, nerve inspections (sensory and motor impairments), neck radiologic findings, EMG and NCV. The results of the questionnaire were analyzed using chi-square test. All probabilities less than 0.05 were considered as significant.

Results

In this study, a total of 660 patients (512 females and 148 males) participated who complained about hand paresthesia and referred to the neurology clinic and electrodiagnostic center of Martyr Sadoughi Hospital in Yazd during the study period (April 2014 to June 2015). They were divided into four groups of 19-39, 40-49, 50-59, and 60-80 years. The age group of 40-49 years was of greatest abundance (33.3%) among the patients. Among the patients, 456 (69.1%), 80 (18.8%), and 80 (12.1%) individuals, respectively, were housewives, self-employed, and employees. The numbers of patients complaining about paresthesia in the right, left, and both hands were 180 (27.2%), 120 (18.2%), and 360 (54.6%) individuals, respectively. Groups of 18 (27.2%), 120 (18.2%), and 360 (54.6%) patients, respectively, complained about paresthesia in the right, left, and both hands. Most of the patients (89.8%) with hand paresthesia were not affected by hand movement disorder. In the inspection of totaling 420 patients (63.7%), none of them showed hand sensory disorder; the majority of these patients were women in the age group of 50-59 years. From a population of 512 female patients, 132 (25.8%) and 32 (6/2%) individuals, respectively, displayed median and ulnar nerve sensory impairments with the former being more common in the age group of 19-39 years. Sensory abnormality in the radial nerve pathway was observed in none of the patients, and 0.6% of patients exhibited sensory dysfunction in the pathway of all three nerves (median, ulnar, and radial).

A total of 388 (58.8%) patients had carpal tunnel syndrome in the electrodiagnostic test examinations with the highest prevalence in the age group of 50-59 years (72.2%). One hundred (15.2%) of our patients with an average age of 45.6 years experienced one-sided carpal tunnel syndrome and 288 (43.6%) of the samples with an average age of 50.3 years endured two-sided carpal tunnel syndrome. The numbers of females and males with carpal tunnel syndrome equaled 340 (66.4%) and 48 (32.4%), respectively. No significant differences were found between the mean ages of patients ($p = 0.267$) nor between the duration of symptoms in the patients ($p = 0.467$) based on the results of electrodiagnostic tests.

According to the neck cleavage and profile, the prevalence of cervical spondylosis increased with aging, so that the majority of patients with cervical spondylosis were in the age group of 60-80 years. The electrodiagnostic tests revealed radiculopathy in 44 patients. The numbers of patients with C6, C7, and C8 nerve root radiculopathy, respectively, were 28 (4.2%), 12 (1.8%), and 4 (0.6%) individuals with average ages of 44.8, 48.6, and 46 years. The radiculopathy of C6 nerve root was the most common type of radiculopathy, and this disorder was more frequent in men than in women, most of which lied in the age group of 40-49 years. Polyneuropathy was detected in 12 (1.8%) of patients studied. Six percent of the patients had ulnar

nerve compression with the elbow as the most common place of compression (cubital tunnel syndrome), which was more prevalent in the males of 40-49 age group. There were no relationships between the duration of symptoms and the results of electrodiagnostic tests.

Discussion

The most common cause of hand paresthesia in the studied patients was carpal tunnel syndrome (58.8%). Most of our patients were housewives (69.1%). The patients aged between 19-80 years. Similarly, Kouyoundjian reported patients' ages of 17-83 years [10]. The highest prevalence of carpal tunnel syndrome was found in the age group of 50-59 years (72.2%). Nakasalto et al. (2003) also reported similar results [11]. The prevalence of carpal tunnel syndrome was greater in the population of women than in that of men. Likewise, of 388 patients with carpal tunnel syndrome in our study, 340 (87.6%) individuals were females. In a study by Kouyoundjian on 668 patients with carpal tunnel syndrome, 91.3% of patients were females [10].

Bekkeund et al. (2001) reported the prevalence of carpal tunnel syndrome in a public population to be around 3%, which was more prevailing in women and people who performed hand-work. The job difference between men and women can explain the increased prevalence of carpal tunnel syndrome in women [12]. In most of the patients studied (54.6%), both hands were involved with the right hand more impaired than the left one. These results are similar to those of Kouyoundjian, in which 72% of patients complained about two-sided impairments [10]. Moreover, Stevens et al. (1988) concluded that 75% of patients with carpal tunnel syndrome showed more severe symptoms in their dominant hand and a half of them had two-sided impairments [13]. The duration of symptoms in the patients was 1-120 months, which is similar to that reported by Kouyoundjian [10].

Ulnar nerve compression was more prevalent in our male samples as was also recorded by Richardson et al. (2001). The results of neck radiography indicated a direct relationship of cervical spondylosis with aging such that it was recorded in 108 (90%) out of 120 patients in the age group of 60-80; this finding corroborates those noted in literature in which the prevalence of cervical spondylosis was reported to be 5-10%, 50%, and over 90%, respectively, in a population aged 20-30, up to 45, and over 60 years [14].

Conclusion

The most common cause of hand paresthesia was the involvement of median nerve in the form of carpal tunnel syndrome, which mainly occurred in the housewives. It is, therefore, recommended that women work with both hands as far as possible and avoid folding and keeping the hands in flexion for a long time in order to prevent the disease. Any patient with paresthesia of both hands, especially in the age group 50-59 years and also females, should first be provided with clinical measures in order to verify the confirmation or rejection of carpal tunnel syndrome and, in case it was disapproved, other paresthesia causes should be looked for. Cervical spondylosis in old age should also be considered as one of the common reasons of

paresthesia and neck radiography (cleavage profile) has to be accomplished for the diagnosis.

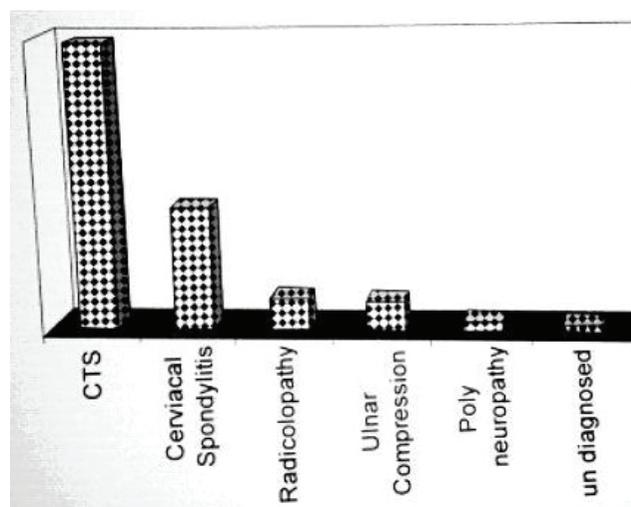


Figure 1. Distribution of factors causing hand paresthesia in the studied patients

Table 1. Distribution of hand disorder by age in the studied patients

Disorder	No sensory impairment		Median sensory impairment		Ulna sensory impairment		Involvement of three nerves		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Age group										
19-39	92	52.3	64	36.3	20	11.4	0	0	176	100
40-49	140	63.6	52	23.6	24	10.9	4	0.6	220	100
50-59	112	77.8	24	16.7	8	5.6	0	0	144	100
60-80	76	36.3	172	26.6	12	10	0	0	120	100
Total	420	63.6	172	26.1	64	9.7	4	0.6	660	100

Table 2. Distribution of average ages in the studied patients based on the results of electrodiagnostic tests

Patients' age	Number	Average	Standard deviation
Results of electrodiagnostic tests			
Normal	176	44.7	12.8
One-sided carpal tunnel syndrome	100	54.6	11.19
Two-sided carpal tunnel syndrome	288	50.3	13.21
Radiculopathy of Root C6	28	44.8	14.57
Radiculopathy of Root C7	12	48.6	14.57
Radiculopathy of Root C8	4	46	-
Cubital tunnel syndrome	16	33.7	10.04
Ulna compression in the shoulder	4	40	-
Polyneuropathy	12	52.6	15.94
Ulna compression in the arm	12	45.6	6.02
Ulna compression in the forearm	4	43	-
Ulna compression in the wrist	4	59	-
Total	660	47.3	12.62

Competing interests

The authors declare that they have no competing interests.

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