

CARPAL TUNNEL SYNDROME : A REVIEW

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Abstract

Carpal Tunnel Syndrome (CTS) is an entrapment of the median nerve beneath the flexor retinaculum in the wrist. It is the most frequently encountered peripheral compressive neuropathy. Although the diagnosis was rare 50 years ago, it continues to be made with increasing frequency, not only because of better diagnostic test, but also because of wide spread public awareness of the condition. Recently a distinct population of CTS patients have been recognized.

Workers engaged in repetitive tasks that involve flexion and extension of the wrist, strong grip or exposure to vibration are at risk. However the incidence of CTS is increasing gradually and it is anticipated that soon it will be the second only to low back pain for work related claimed disabilities in the developing countries.

As the disease is not so common in our country and available information about the disease in many textbooks are inadequate as a result, despite of great enthusiasm, many physicals failed to acquire knowledge about this disease. So in this review attempt has been taken to high light the etiology, pathogenesis, presentation and 'recent advancement in the management of carpal tunnel syndrome with good patient compliance and effectiveness.

Key words: carpal tunnel syndrome; management; review.

Introduction

Carpal tunnel syndrome (CTS), caused by compression of the median nerve at the wrist¹, beneath the flexor retinaculum causing neural symptomatology into the hand and upper extremity. It is a common problem in daily rheumatology

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practice². The syndrome affects an estimated percent of adults American and is approximately three times more common in women than in men³. Patient complains of paresthesia in the hand along the distribution of the median nerve and often pain radiates to the arm. The symptoms intensified at night and the patient tries to get relief by shaking the hand in the air, this is referred to as flick test and is considered the most valued and reliable sign of CTS²⁻⁵.

Synonyms

Carpal tunnel syndrome, have some special synonyms. These are:

- Tardy median nerve palsy⁴
- Acroparesthesia⁵
- Median neuritis
- Median thenar neuritis
- Professional or occupational median neuritis
- Thenar neural atrophy

Historical background

- Sir James paget⁶ first described the symptoms of carpal tunnel syndrome in 1854
- In 1911 Ramsey Hunt described this neuropathy¹
- In 1950 Phalen wrote the first several articles on CTS⁷
- In 1913 autopsy findings by Marie and Foix⁸ described grossly and histologically the compressed appearance of the median nerve in the carpal canal

Incidence and epidemiology

- Carpal tunnel syndrome recognized and diagnosed with increasing frequency over the past several decades
- A recent study showed that CTS occurs at a rate of 3.46 cases per thousand person²⁻¹⁰
- Workers at risk for CTS due to repetitive task function include garment workers, butchers, grocery checkers, packers, electronics assemblers, carpenters, typist, musician, cooks, line changers¹⁻⁴
- It is commonly seen in patients of 30-60 yrs old and two five times more common in female than male¹⁻²

Dynamic anatomy of the carpal tunnel studies evaluating normal carpal interstitial pressure show that

- i) When the wrist is in a neutral position, normal carpal tunnel interstitial pressure is 2.5 mm of Hg
- ii) With normal wrist flexion carpal tunnel pressure increases to 31 mm of Hg and with maximal extension this increases to 30 mm of Hg¹¹
- iii) Even in normal subjects the pressure in the carpal tunnel is 13 mm of Hg, which may be increased up to 90 mm of Hg during wrist flexion and extension¹²

Pathophysiology of CTS

The pathophysiology is not clearly understood but it is assumed that the initial insult is a reduction in epineurial blood flow, which occurs with 20 to 30 mm Hg of compression. Intra carpal canal pressure in patients with CTS roughly measures at 33 mm of Hg and often up to 110 of Hg with extension. Eventually epineurial fluid pressure increases four fold and block axonal transport¹³. In Sunderland's view, the ischemic environment within the nerve impeding axonal transport of the normal nerve function. Finally limitation of median nerve motion beneath the flexor retinaculum may play a part in the development of carpal tunnel syndrome¹⁴.

Etiology

The most common causes is non-specific flexor tenosynovitis followed by diabetes (47%), pregnancy (21-45%), arthritis of the hand¹⁵ hypothyroidism and acromegaly (30%). Contraceptives, amyloidosis and paraplegia¹⁶ are the other important causes of CTS. CTS associated with pregnancy first reported in 1957 and incidence of CTS in pregnancy is (21-45%)¹⁶.

Clinical features

1. Fullness of the wrist
2. Poor dexterity of the fingers and dropping of items
3. Paresthesia and numbness of the fingers and nocturnal dysesthesia
4. Pain worsening at night and relieved by shaking the hand in the air¹⁷

Physical examination

Tinel's Sign- Percussion of the median nerve at the level of the carpal creases, frequently is positive to the long fingers alone, not to the entire median nerve distribution. Tinel's sign has a sensitivity of 30% and specificity 88%¹⁸

Phalen's sign- Phalen's sign or Phalen's wrist flexion test has a sensitive of 22.2% and specificity 94.6%¹⁸

Vibratory test- Paresthesia is found along the distribution of median nerve area in the hand¹⁹

Diagnosis

The diagnosis of CTS is based on the history and physical examination. Tinel's sign, positive wrist flexion test and standard nerve conduction studies are recognized as the diagnostic standard for CTS²⁰.

Electrophysiologic studies- NCV studies considered positive when the median nerve sensory latency exceeds the standard radial and ulnar nerve sensory latency by more than 0.4 millisecond.

MRI- Proved to be sensitive and specific in detecting CTS².

Ultrasonography- Ultrasonography is a quick and relatively inexpensive technique that can provide important information in CTS.

Differential diagnoses i) C6 - C7 radiculopathy ii) Thoracic outlet syndrom (TOS) iii) Trigger finger vi) De Quervain's disease

Management

Once diagnosis is established a trial of conservative therapy can be used the patients with mild to moderate symptoms¹⁹⁻²¹.

a) Drug treatment : i) NSAIDs have little effect in relieving the symptoms and night pain but are recommended as a first treatment by some²². Kaplans et al,²³ in their study showed that patients treated with splint and NSAIDs are considered cure if remain symptoms free for more than 6 months.

ii) Diuretics: Chang et al²⁴ found that diuretics, trichlorthiazide 2mg daily for 4 weeks is less effective than NSAIDs and prednisolone.

iii) Vitamin B6 : Franzblar et al.²⁵ reviewed that vitamin B6 is effective in selected cases of CTS and help in relieving symptoms earlier.

iv) Oral steroid : A significant effect infavour of oral steroid, either using prednisolone or prednisone, in a dose of 25 mg /day was demonstrated on symptom improvement with two and four weeks of treatment ^{24,26,27}

v) Steroid injection : Weiss et al.²⁸ in their study proved that a single steroid injection into the carpal canal causes relief of symptoms earlier but long term

effect is uncertain. Culick et al.²⁹ reported a mean relief of 27 weeks after corticosteroid injection and splinting. Weiss et al.²⁸ reported an average of 11 months symptoms free after a steroid injection. Green³⁰ noted that a good response to steroid injection with immediate pain relief from the local anaesthetic co-related with an excellent response. Still 65-95% patients may have recurrence of symptoms after 2-4 months but 11% patients remain symptoms free for up to 45 months.

b) Ultrasound therapy (UST) : is the most widely used treatment modality in physical medicine in the management of CTS. Hong and colleague³¹ found that low dose of ultrasound may facilitate recovery of acute compression neuropathy. Szumski³¹ has shown that application of UST at 0.5-2.0 watts/cm² on a peripheral nerve may increase the conduction velocity due to a thermal effect.

Ozlas et al.³² observed that patients with CTS showed statistically significant symptomatic improvement after 2 weeks of treatment.

Ebenbichler et al.³³ conducted a randomized double blind "sham" controlled trial with assessment at baseline after 23 and 7 weeks treatment at a frequency of 1 MHz and intensity of 1.0 watt/ cm² satisfactory improvement and complete remission of symptoms were observed in 68 percent patients of the treatment group.

c) Therapeutic splinting : splinting of the wrist in neutral position helps reduction of carpal canal pressure and may completely relieve CTS symptoms. Length of is about 3 to 4 weeks followed by part time is recommended. Preferably night time splinting for four weeks is also helpful in CTS³⁴.

d) Exercise : muscle strengthening extension such as barbell or tubing exercise, wrist flexion and extension exercise, adduction and abduction, gripping exercise with putty are also helpful³³.

e) Activities of daily living (ADL) : changing the design of tools or workstation to eliminate or reduce stimuli for cumulative trauma can be both preventive and curative.

f) Job modification: decrease the incidence of CTS³⁵.

g) Surgical treatment

Indication of surgery

i) Thenar atrophy ii) Tactile sensory loss iii) Failure of non- operative treatment

vi) Recurrence of symptoms after steroid injection in less than 2 weeks v) Post traumatic CTS.

By using specific indication of surgery a 95% improvement rate can be expected and it is important to note that surgery may be effective even it has normal nerve conduction studies.³⁶⁻⁴⁰

Conclusion

Though no absolute satisfactory conservative treatment is available at present but trial suggest that conservative treatment seems to offer clear advantage over surgical treatment of CTS. In physical medicine UST therapy seems to be a effective conservative treatment approach. Improvement persisting for at least 6 months in most patients might even suggest the potential superiority of ultrasound treatment. Further research is required to evaluate optimal treatment schedule with this method. Studies are also warranted to compare short term and long term effects of ultrasound treatment or one of the non surgical treatment approach alone or in combination with that of the decompression.

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