

Carpal Tunnel Release

Surgical Indications and Considerations

Description: A compression neuropathy of the median nerve at the level of the carpal tunnel, commonly associated with pain, numbness, weakness and/or tingling that frequently disturb sleep. The numbness and tingling is in median nerve distribution of the thumb, index finger, long finger, and radial half of the ring finger. The weakness may result in difficulty with grasping objects or dropping of objects. Symptoms worsen with repetitive flexion or extension of the wrist, sustained wrist flexion, and continued gripping or pinching activities and may be relieved by shaking hands or dangling hand and working the fingers.

Etiology: The etiology is presumed to be increased volume in the carpal tunnel caused by edema or tenosynovitis of the flexor tendons or by an alternation in the osseous margins of the carpus, secondary to fractures, dislocations, or arthritis or by thickening of the transverse carpal ligament.

Non-operative versus Operative Management: Most patients with CTS improve with conservative treatment and medications. The two main indications for surgical management of CTS are the failure, or expected failure, of nonsurgical treatment and evidence of denervation in the hand as evident in EMG/NCV testing, and/or by a loss of two-point discrimination, and/or thenar muscle atrophy. It has been shown that surgical treatment is 95% effective and results in faster return to work times than nonoperative management. The main reason for surgical failure is an incorrect diagnosis of CTS, meaning the CTS symptoms were a manifestation of a different underlying pathology, which the release surgery did not treat. Thus, nonoperative management should be followed for patients with underlying conditions until they are medically stable. Contraindications for surgery include concomitant ulnar nerved entrapment in Guyon's canal, and advanced tenosynovitis. Risks of surgery include infection, injury to the median nerve or its branches, failure of the surgery to improve symptoms, and injury to another nerve or vascular structure.

Surgical Procedure: Decompression of the nerve is accomplished by severing the TCL. This can be done in two ways:

1. Open technique: a volar incision extending from the mid-palm to about one half inch proximal to the wrist. The skin, subcutaneous tissue, palmar fascia, and palmaris brevis have to be transected to reach the TCL.
2. Endoscopic procedure: release of the TCL by inserting a metal tube through the carpal tunnel via one or two small incisions
 - a. single portal: proximal incision
 - b. two-portal: proximal and distal incision

Preoperative (and Non-operative) Rehabilitation:

- Patient Education: The nature of CTS including relevant anatomy and pathology
- Modification/cessation of causative activity with emphasis on decreasing repetitive wrist motions
- Splint immobilization with the wrist positioned in neutral for 6 weeks continuous
- Tendon and nerve gliding exercises
- NSAIDs as prescribed by the MD
- MD may do steroid injection for temporary relief (6-9) months
- CTS associated with pregnancy will usually resolve post-partum

Acute Stage / Severe Condition: Physical Examinations Findings (Key Impairments)

ICF Body Functions code: b7101.3 SEVERE impairment of mobility of several joints

- Sensory deficits and/or pain in the median nerve distribution of the thumb, index finger, long finger, and radial half of the ring finger
- Diminished grip and pinch strength
- Weakness of thumb opposition thumb abduction pollicis brevis.
- Symptoms are reproduced with provocation of carpal tunnel
- Positive median nerve tension test
- Positive Phalen's test
- Positive Tinel's sign
- Positive carpal compression test
- Atrophy of thenar muscle group

Sub Acute Stage / Moderate Condition: Physical Examinations Findings (Key Impairments)

ICF Body Functions code: b7101.2 MODERATE impairment of mobility of several joints

As above with less severe sensory and motor deficits and less signs of nerve irritation without visible thenar muscle group atrophy. For example, the patient may experience intermittent or constant symptoms, which are commonly exacerbated with repetitive gripping or flexion activities of the hand.

Settled Stage / Mild Condition: Physical Examinations Findings (Key Impairments)

ICF Body Functions code: b7101.1 MILD impairment of mobility of several joints

As above with less severe sensory, motor deficits, and less signs of nerve irritation such as without thenar muscle group atrophy, weakness, or sensory deficits. For example, the patient may experience only intermittent symptoms which are commonly exacerbated with repetitive gripping or flexion activities of the hand.

Intervention Approaches / Strategies

Non-operative Rehabilitation

Acute Stage / Severe Condition:

Goals: Decrease inflammation in the carpal tunnel
Reduce pain
Improve mobility of the wrist and hand

- Physical Agents
 - Iontophoresis
 - Ultrasound
- Therapeutic Exercises
 - Tendon and nerve gliding mobility exercises performed within the patient's pain-free ROM, using high repetition and low resistance motions.
- External Devices (Taping/Splinting/Orthotics)
 - Wrist splint to maintain the wrist in the neutral position. Should be worn continuously for at least 6 weeks to reduce inflammation and pain. Can be taken off for exercises.
- Re-injury Prevention Instruction
 - Temporarily limit activities by resting the involved wrist
 - Reduce aggravating factors by, for example, avoiding sustained hand and wrist flexion or extension postures, gripping or pinching, and repetitive activities
 - Counseling patient to avoid traumatic injuries secondary to diminished sensation

Sub Acute Stage / Moderate Condition:

Goals: Avoidance of continued irritation and repetitive trauma
Restore normal strength and mobility of the involved extremity

- Approaches / Strategies listed above
- Therapeutic Exercises
 - Midrange wrist strengthening exercises
- Manual Therapy
 - Soft tissue mobilization to potential median nerve entrapment sites, such as near the pronator teres or wrist flexor myofascia
 - Joint mobilization to restore normal accessory motions of the intercarpal and radiocarpal articulations

- **Prevention and wellness Instruction**
Provide body mechanics instructions and modify work area as indicated to prevent symptoms. For example, proper use of adjustable chairs for optimal upper quarter alignment, wrist support for data processing, ergonomically designed hand tools, and use of musculoskeletal rest periods during prolonged recreational/occupational tasks requiring sustained wrist use.

Settled Stage / Mild Condition:

Goals: Progress activity tolerance

- Approaches / Strategies listed above
- **Therapeutic Exercises**
Progress mobility exercises to full ROM with overpressure as tolerated
Progress resistance with strengthening exercises
Maximize muscle performance of the relevant trunk, scapulae, shoulder girdle and
upper extremity muscles required to perform the desired occupational or recreational activities – including hand fine motor/dexterity exercises

Intervention for High Performance/High Demand Functioning in Workers or Athletes:

Goals: Return to desired occupational or leisure time activities

- Approaches/ Strategies listed above
- **Prevention and wellness Instruction**
Progress job/sport specific training depending on the needs and desires and impairments of the worker or athlete

Post-Operative Rehabilitation

Acute Stage / Severe Condition: 0-3 Weeks (PT usually begins at 5-7 days postop)

Goals: Control edema
Pain control
Decrease stiffness

- **Patient Education**
Elevation/Compression wrap
AROM of entire involved extremity

Scar mobilization
Progress with ADLs as able

- External Devices
Remove bulky dressing and replace with a lightweight removable splint prn
- Therapeutic Exercises
Nerve mobility exercises in pain free ranges
Differential tendon gliding exercises
- Manual Therapy
Soft tissue mobilization – especially focus on potential median nerve entrapment sites in the involved extremity
Joint mobilization – especially focus on intercarpal articulations that are hypomobile

Sub Acute Stage / Moderate Condition: Weeks 3-6

Goals: Continue edema control
Increase tissue mobility
Improve grip strength

- Approaches / Strategies listed above
- AROM exercises to include wrist motions
- Initiate gentle grip and pinch strengthening exercises
- Progress in to light resistance if painfree.

Settled Stage / Mild Condition: Weeks 4-8

Goals: Return to work
Normal strength and mobility

- Approaches / Strategies listed above
- Advance as tolerated to progressive resistive exercises (PREs) for all joints
- May use splint for protection for all activities

Selected References

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