



Clinical Case Report Competition

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Carpal tunnel syndrome: myofascial release to decrease neurological symptoms in the median nerve distribution of the hand

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Abstract

Background

Carpal Tunnel Syndrome is a condition caused by narrowing of the carpal tunnel or enlargement of the structures that pass through it; the resultant compression of the median nerve affects sensory and motor distribution in the hand.

Objective

To decrease symptoms of numbness and tingling in the median nerve distribution through the application of myofascial release therapy to areas of compression or restriction within the torso and right arm.

Methods

Ten 90-minute treatments over the course of eight weeks. Myofascial release techniques applied bilaterally to the torso and neck, and unilaterally to the right shoulder, arm, forearm, wrist, and hand. Where indicated, alternate techniques such as joint mobilizations, stretching, and Swedish massage were applied. Homecare suggestions were self-stretching and thermal hydrotherapy.

Results

At the end of the 10 treatments the patient had a decrease in the intensity and occurrence of numbness and tingling in the right hand, and improved ROM in the c-spine and right gleno-humeral joint. The primary, secondary and tertiary goals were reached.

Conclusion

The results support the application of myofascial release to influence postural and musculoskeletal imbalances that contribute to CTS symptoms.

Keywords

massage therapy, myofascial release therapy, carpal tunnel syndrome, manual therapy

Carpal Tunnel Syndrome: Myofascial Release to Decrease Neurological Symptoms in the Median Nerve Distribution of the Hand

Overview of Chronic Carpal Tunnel Syndrome

Prevalence and Impact

Carpal Tunnel Syndrome is the most commonly occurring and recognized of the peripheral entrapment neuropathies. According to the National Institute of Neurological Disorders and Stroke, it was estimated that in 1998, 3 out of every 10,000 workers lost time from work. Half of these lost more than 10 days of work with the estimated lifetime cost of this syndrome, estimated total includes medical bills and absenteeism from work, for one worker coming in at \$30,000.

(Carpal Tunnel Syndrome Fact Sheet: 2002)

Etiology

This syndrome may be present bilaterally but is most common in the dominant hand. Most commonly affected are women between the ages of 40 and 60, and also occurs in younger populations whose wrists are involved in frequent repetitive movements, manual labor, or repeated use of vibrating hand tools.

Causes of median nerve compression are multifactorial; trauma such as lunate dislocation or a Colles fracture, osteoarthritis, rheumatoid arthritis, flexor tendon paratendonitis, fluid retention during menopause or pregnancy, diabetes mellitus or other metabolic disorders, or a collagen disease can all influence median nerve compression or demyelination. The median nerve can be affected anywhere from the nerve roots of C5-T1 to its destination in the hand through the carpal tunnel.

Symptoms of numbness, tingling, burning, and/or pins and needles typically occur distal to the wrist in the median nerve sensory distribution of the hand and usually worsen at night. If the condition is chronic there may be atrophy and weakness to thenar muscle group; flexor pollicis brevis, abductor pollicis brevis, opponens pollicis; and the lateral two lumbricals. (Magee 2006: 406)

Common Medical Intervention

Physical examination of the neck, shoulders, arms and hands are necessary to locate sites of compression or rule out other conditions that have a similar manifestation, for example Thoracic Outlet Syndrome. Orthopedic tests and/or neurological tests are used to elicit a recreation of symptoms. Sensory testing in the median nerve distribution of the hand and manual muscle testing of the muscles at the base of the thumb can narrow down where the nerve is being affected. The wrist is examined for signs of warmth, swelling, tenderness and discoloration as well as muscle atrophy. X-ray and laboratory tests may show the presence of fractures, rheumatoid arthritis, and diabetes mellitus. Magee states "Tests for neurological dysfunction are highly suggestive of a particular nerve lesion if they are positive, but they do not

rule out the problem if they are negative. In fact, they may be negative 50% of the time, or more, when the condition actually exists. Electrodiagnostic tests are more conclusive.” (Magee 2006: 396)

Common medical intervention practice falls under the categories of non-surgical and surgical. Non-surgical treatment methods are as follows; prescription drugs such as NSAID’s and diuretics; injections of corticosteroids or lidocaine directly into the wrist; supplementation with B6 (pyridoxine) is thought to benefit nerves in general; wrist braces worn at night can keep the wrists in a neutral position; and specific strengthening and stretching exercises. Alternative manual therapies, such as chiropractic and acupuncture have been beneficial for some. Surgical intervention, for example ‘open release surgery’ or ‘endoscopic surgery’ to cut the transverse carpal ligament, is suggested when the symptoms are constant for a period of 6 months or more. Symptoms may decrease immediately post-surgery or may take more time. It is recommended to restore wrist strength lost through cutting the carpal ligament with physical therapy. (Carpal Tunnel Syndrome Fact Sheet: 2002)

Research for Massage Therapy Treatment of CTS

A practiced based clinical trial was conducted in 2010 by a team of Chiropractic doctors in Quebec. The study used ischemic compression therapy on trigger points in the axilla, biceps, and cubital fossa to decrease CTS symptoms. The patients had a perceived improvement in functional capacities for 6 months post-study.

Thomas W. Myers speaks of fascia and it’s role in the body as “These sheets and lines follow the warp and weft of the body’s connective tissue fabric, forming traceable ‘meridians’ of myofascia. Stability, strain, tension, fixation, resilience, and postural compensation are all distributed along these lines.” (Anatomy Trains 2009: 1) There are meridians at various depths throughout the body that travel anteriorly, posteriorly, laterally, and obliquely. Some meridians spiral around connecting, for example, the anterior hip to the opposite posterior shoulder and skull. Another connects the fascia of pectoralis minor to the thenar muscles of the hand. Imbalances in these meridians can lead to changes in posture and the way the body functions both statically and dynamically.

In 1993 a study, conducted by Dr. B. M. Sucher at the Center for Carpal Tunnel Studies in Arizona, used magnetic resonance imaging on patients with mild to moderate CTS to document the results gained through self-stretching and myofascial release of the carpal tunnel. The patients had EMG tests to confirm abnormal distal motor and sensory latency. The results of the study showed a decrease in symptoms, but if the CTS were severe surgery would be a better option, as these techniques would temporarily increase the pressure in the tunnel.

Hypothesis

The research has shown that specific application of myofascial therapy, in the case of ischemic compression of trigger points in the axilla and arm as well as applied

directly to the transverse carpal ligament, to be effect treatments of this condition. However, this author did not find research that looked at more than just one or two compression sites as the cause of the condition. The hypothesis of this study was that in the assessment and treatment of CTS addressing all the structures related to and surrounding the median nerve, from origin to termination, could achieve a decrease in symptoms.

The expected outcomes of the case study were; primarily to decreased numbness and tingling in the right hand, secondarily to decreased hypertonicity or fascial restriction of the right middle scalene and right pronator teres muscles, and lastly to increased range of motion in both the c-spine and the right gleno-humeral joint.

Assessment Overview

Patient History

This case study is based on a right hand dominant 38-year-old male, whose work history shows heavy use of upper extremities in repetitive daily tasks. At 19 years of age there was trauma, 2-3 inches proximal to the carpals of the right wrist, in the form of compression between two metal poles. Possible limb loss was a concern but the compression was able to be removed without any broken skin, vessels or bones, no surgical intervention was required and he was discharged from the hospital later that day. Later, he became trained as a graphic designer and worked professionally in this field for 5 years

There was not an immediate onset of symptoms following the initial wrist trauma; these began intermittently in the late 1990s. The symptoms of numbness and tingling have been present bilaterally, in digits 1-3 and half of 4 on the palmer aspect only. At this time a doctor was visited for an exam and it was established that there was median nerve involvement, wrist braces for sleep were suggested, an off the shelf version were procured and worn on and off. Roughly 5 years ago the symptoms became constant in the right hand prompting another doctor visit. This time an EMG was performed bilaterally confirming decreased rate of conduction in the median nerve, slightly decreased in the left and notably in the right, at this time surgical intervention was recommended. Custom wrist braces were prescribed and patient compliance has been moderate.

A FOOSH injury, from a downhill mountain bike accident, was sustained to the right shoulder in the mid 2000's. After approximately one year post-injury, the patient reported that he was unable to use this shoulder to pull start a snowmobile and had trouble throwing a baseball, the wind up was normal but the spin and release was painful. At the onset of this study abduction is still painful and weak.

This same shoulder was re-injured in January 2012 resulting initially in a spasm from the top of the shoulder up through the neck on the R-side that night and the following few days. Afterwards the range of motion increased but the shoulder in

general was weaker. At the onset of this study no specific rehab for this shoulder has been done and full strength has not returned.

Assessment

A HOPMNRs model of assessment was used in this case; history, observation, palpation, movement, neurological, referral, and special testing. A thorough patient history was taken and the 'Carpal Tunnel Syndrome – Median Nerve Function Disability Form' (Magee2006: 385, 386) was completed. Assessment began at the most proximal point of the likely origin of this condition and moved distally through the respective articulations and associated structures. Active, passive, and resisted ranges of motion were performed to the c-spine, gleno-humeral, elbow, and wrist joints. Orthopedic testing was used to confirm or rule out possible compression sites that may have compromised the brachial plexus and associated vasculature. Sensory testing was used to determine if individual nerve branches were involved and therefore more information to locate the possible compression site(s). Manual muscle tests were able to determine which, if any, muscles showed a decrease in strength.

Assessment records consist of paper copies of the patient charts, treatment notes, and range of motion assessments. Digital images were recorded of functional testing, and postural assessments.

Treatment Overview

Treatment Goals

The primary goal for the conclusion of 10 subsequent treatments was a decrease, or absence, of numbness and tingling in the right hand. A secondary goal was the decrease of compression of the median nerve due to the right middle scalene and right pronator teres. Lastly, the tertiary goal was to increase the range of motion, both actively and passively, of the right gleno-humeral joint in all the movements.

Management Plan

The treatments were set at 90 minute sessions, one day per week, for a total of 10 sessions. In addition to this are 3 assessments, the initial one before commencement of the study, the second at the time of the fifth session, and the last at the end of the tenth and final session.

Treatment Protocol

This study was meant to look at the body as a whole, take note of concurrent musculoskeletal imbalances and/or dysfunctions, and resolve those that, through assessment, had a role in the presenting symptoms. Many of the techniques were adopted from course notes supplied as part of Utopia Academy Level 500 Myofascial Release (Sleeper, Ann: 2012).

Treatments 1 through 5 focused on adhesions between the superficial and deep investing fascial layers of the torso, neck, shoulder, and upper arm, with minimal time spent on the forearm, wrist, and hand. Treatments 6 through 10 addressed the superficial and deep investing fascial layers of the forearm, wrist, and hand, with minimal time spent maintaining the results from treatments 1 through 5. The use of alternate treatment modalities such as stretching, joint mobilizations, and Swedish massage were included where indicated to enhance the effects of myofascial release therapy.

Please note that the protocols listed below have been developed to both thoroughly treat each area and to provide a record of said treatment in a clear and concise manner. Any additional modalities that did not adhere to the specific protocol for that particular area of the body are listed under 'Treatment Additions'. This allowed the treatments to adapt to the physical presentation of the patient at the time of each session. All treatment sessions end with Swedish massage, to clear the affected limb and bilateral neck, in the direction of venous flow.

Protocol 1: Torso

(Bilateral)

- Thoraco-lumbar Fascia; contra-lateral cross-hands fascial release, one hand just distal to inferior costals, other hand just superior to posterior iliac crest.
- Midback; contra-lateral cross-hands fascial release.
- Erector Spinae Group; ulnar border or forearm between spinous processes and muscle bellies, therapist slowly applies body weight, bow in a lateral direction and wait for muscles to soften.
- Abdominals in general; contra-lateral cross-hands fascial release, one hand just distal to inferior costals, and other hand just superior to anterior iliac crest.
- Rectus Abdominis; stand at 90 degrees to muscle group in line with umbilicus, therapist's hands are next to each other with thenars along medial border and digits 2-4 along lateral border of muscle, pick up, stack and load, bow muscle belly, address all restrictions along length of muscle from origin to insertion.

Protocol 2: Posterior Neck

(Bilateral)

- Semispinalis Capitis; picking up, bowing, and after 3 releases, drawing inferiorly away from nuchal line
- Upper Trapezius; 'unrolling' technique, grasping posterior aspect with palm and thenar and hypothenar eminences, curling the fingers around the anterior aspect with the points of contact being the finger pads and middle phalanges, stack and load.
- Semispinalis capitis; at the level of C3-C4 within the laminar space, trigger point release with ischemic compression.
- Posterior neck stretch

Protocol 3: Antero-lateral Neck

(Bilateral & Unilateral)

- Mastoid process (Bilateral); unwinding technique using both hands, finger pads on mastoid processes, apply even moderate pressure towards midline.
- Sternocleidomastoid (Bilateral); address one SCM at a time, GTO release of origin and insertion, bowing along the muscle belly making sure to address both the sternal and clavicular heads.
- Anterior and Middle Scalenes (Ipsilateral); with digit of one hand hold first rib down at insertion site of muscle, rotate head contra-laterally, digits of other hand hold muscle tightly along anterior and posterior TVP attachments, gently strain muscle superiorly, wait for release. Start at inferior origins and move superiorly.
- Posterior Scalene (Ipsilateral); with digit of one hand hold second rib down at insertion site of muscle, rotate head contra-laterally, digits of other hand hold muscle tightly along posterior TVP attachments, gently strain muscle superiorly, wait for release. Start at inferior origins and move superiorly.
- Subclavius (Ipsilateral)- address any restrictions or trigger points
- Antero-lateral neck stretch (Bilateral)

Protocol 4: Chest and Right Arm

(Ipsilateral)

- Pectoralis Minor; bowing of tendon just inferior and medial to it's insertion onto coracoid process of scapula, wait for release; then place other hand under the scapula (palmer contact) use both hands to draw scapula superior and lateral at an oblique angle, hold this stretch for 30-60 seconds
- Deltoids; intermuscular MFR to decrease adhesions between deltoids and surrounding musculature (pectoralis major, biceps, triceps), intermuscular MFR between biceps, triceps and coracobrachialis
- Coracobrachialis; patient is supine with arm at 45 degrees, therapist makes a loose fist and places it in the axilla, apply force towards the humerus with the dorsal surface of the middle and distal phalanges, ask patient to abduct arm slightly so you can correctly landmark the muscle, 'scoop' into the muscle and draw it inferiorly and slightly anteriorly, wait for it to soften (your fist will move), repeat along the lengthen of the muscle until the insertion is reached.
- Biceps Brachii; grasp muscle belly with one hand, start with forearm in flexion and supination, move forearm into extension and pronation.
- Brachialis; intermuscular and extramuscular myofascial release.
- Triceps; intermuscular and extramuscular myofascial release.
- Intermuscular myofascial release of all muscle groups from each other.

Protocol 5: Forearm

(Ipsilateral)

- Wrist Extensors and Flexors; unwinding technique, therapist grasps forearm with both hands sinking into superficial fascia, draw both hands together until the first line of resistance is met, twist hands in opposite directions. Wait for the superficial fascia to 'right itself' and for the therapist's hands to be back in the starting position.
- Wad of 3; intermuscular and extramuscular myofascial release from origin to insertions.

- Pronator Teres; intermuscular and extramuscular myofascial release, addressing both the humeral and ulnar heads, from origin to insertion.
- Wrist Flexors (muscle bellies and tendons); patient starts with hand in a loose fist and flexed forward at the wrist, the therapist's thenar and hypothenar eminences are on the extensor surface and finger pads on flexor surface of the forearm. Starting proximally, therapist applies pressure with fingerpads and patient slowly opens hand and extends wrist. This process is repeated along forearm, proximal to distal, until the wrist is reached.
- Flexor Digitorum Superficialis and Profundus; extramuscular myofascial release along ulnar and radial borders.
- Forearm Flexors and Extensors stretch

Protocol 6: Wrist

(Ipsilateral)

- Distraction; therapist wraps one hand around the patient's distal ulna and radius, the other hand is around the distal row of carpals, draw hands apart, hold for 5-10 seconds.
- Transverse carpal ligament; (medial border attaches at the hook of the hamate and the pisiform, lateral border attaches at the scaphoid tubercle and trapezium) therapist landmarks medial border with one hand and lateral border with the other, one hand stabilizes while the other draws away, wait for release, address both borders of ligament.

Protocol 7: Hand

(Ipsilateral)

- Palmar fascia; using both hands, therapist grasps thenar eminence and hypothenar eminence, stretch palmar fascia gently apart, hold for release, repeat with different lines of pull.
- Thenar group; grasp with one hand and metacarpals with the other hand, draw hands apart, wait for release, address trigger points if present.
- Hypothenar group; grasp with one hand and metacarpals with the other hand, draw hands apart, wait for release, address trigger points if present.
- Metacarpals; mobilize each one individually

Homecare 1:

- Stretch for wrist flexors, extensors, and individual digits
(1 x day, hold 60 seconds (3x), continue until subsequent treatment session)
- Hydrotherapy; heat to forearm and hand
(Applied before stretch, to the temperature of a hot bath)

Homecare 2:

- Stretch for shoulder complex, cross body
(2 x day, hold 60 seconds (3x), continue until subsequent treatment session)
- Hydrotherapy; contrast washes to right shoulder complex
(3:1 ratio of warm:cool, 10 degree difference, 1x/day)

Treatment Summary			
Date	Goals	Details	Remex and Comments
Treatment 1: May 26, 2012 (90 min)	Assessment 1 Decrease adhesions, release compression sites, increase circulation to above areas	Protocols 1, 3, and 4 Treatment Additions: clavicular release; fascial leg pull (not effective); skin rolling to ventral forearm and wrist; pronator teres from O to I; passive stretch of flexors, extensors, palm.	Homecare 1 Areas found to be most restricted were general back, posterolateral neck bilaterally, shoulder complex, forearm, hand with the superficial fascia of the back and forearm very restricted Ongoing treatment plan: See how fascia responds to this treatment, address deeper structures.
Treatment 2: May 31, 2012 (90 min)	Decrease adhesions, release compression sites, increase circulation to above areas	Protocols 1-3, 4 (Pectoralis Minor was omitted) Treatment Additions: Clavicular release; forearm protocol not used, only Wad of 3, pronator teres, and some flexor and extensor adhesions were decreased.	Homecare 1 Superficial fascia of back, upper trapezius, and abdomen had increased mobility after treatment 1. Ongoing treatment plan: Focus on right shoulder complex and arm with pin and stretch to rotator cuff and release of subscapularis.
Treatment 3: June 7, 2012		Protocols 2,4,5 (superficial fascia	Homecare 2

(90 min)		<p>unwinding omitted)</p> <p>Treatment Additions: Pin and stretch to latissimus dorsi, teres minor, teres major; ischemic compression of trigger points in teres minor, teres major, and subscapularis; transverse carpal ligament; stretches for flexors, extensors, and hand.</p>	<p>Ongoing treatment plan: See response to shoulder complex treatment, continue with subscapularis release, and focus on forearm.</p>
Treatment 4: June 11, 2012 (90 min)	<p>Include torso integration, increase circulation and clear shoulder to decrease DOMS, decrease adhesions in forearm</p>	<p>Protocols 1-4 (3 is all bilateral this time, pectoralis minor stretch omitted)</p> <p>Treatment Additions: Clavicular release, warm thermal therapy to distal arm and full forearm, bilateral subscapularis release, transverse carpal ligament and palmar fascia addressed, joint mobilizations to radial head and carpals, ischemic compressions to common extensor tendon and flexor carpi ulnaris + stretch; GH, elbow and wrist PROM.</p>	<p>Homecare 2</p> <p>Ongoing treatment plan: See response to shoulder complex treatment, focus on forearm, wrist, and hand.</p>
Treatment 5: June 19, 2012 (90 min)	<p>Assessment 2</p> <p>Include torso</p>	<p>Protocols 1-4</p> <p>Treatment</p>	<p>Homecare 1</p> <p>Ongoing treatment</p>

	integration, increase circulation and clear shoulder to decrease DOMS, decrease adhesions in forearm	Additions: Extra time decreasing adhesion between anterior deltoid and pectoralis major and between biceps and triceps.	plan: Continue trigger point release and decreasing adhesions in right shoulder complex and subscapularis with pin and stretch and ischemic compressions. Focus on forearm.
Treatment 6: July 28, 2012 (90 min)	Include torso integration, increase circulation and clear shoulder to decrease DOMS, decrease adhesions in forearm	Protocols 2-5 Treatment Additions: Warm thermal therapy to lumbar area, right shoulder, and distal arm and full forearm; TL fascia and midback addressed; pin and stretch latissimus dorsi, teres minor, teres major; ischemic compression to subscapularis; scapulothoracic mobilization; flexor carpi ulnaris muscle stripping.	Homecare 1 Ongoing treatment plan: Assessment # 2 showed Halstead (+) on left so apply protocol 3 bilaterally from now on. Focus on forearm, wrist, and hand.
Treatment 7: July 5, 2012 (90 min)	Address compression of bilateral middle scalenes, decrease adhesions in right forearm, decrease wrist compression due to transverse carpal ligament and plantar fascia	Protocols 2-7 Treatment Additions: Platysma muscle release, and warm thermal therapy to the forearm and hand.	Homecare 1 Ongoing treatment plan: repeat treatment 7
Treatment 8: July 11, 2012	Address hypertonicity of	Protocols 2-7	Homecare 1

(90 min)	bilateral middle scalenes, decrease adhesions in right forearm, decrease wrist compression due to transverse carpal ligament and plantar fascia	Treatment Additions: Platysma muscle release, and warm thermal therapy to the forearm and hand.	
Treatment 9: July 18, 2012 (90 min)	Integrate upper body with right upper limb, address bilateral middle scalene hypertonicity, decrease wrist compression due to transverse carpal ligament	Protocols 1-4, 6 Treatment Additions: Warm thermal therapy to the forearm and hand, wrist flexor and extensor stretches.	Homecare 1 Ongoing treatment plan: Integrate protocols 1-7
Treatment 10: July 23, 2012 (90 min)	Assessment 3	Protocols 1-7 Treatment Additions: Warm thermal therapy to the forearm and hand.	Homecare 1

Remedial Exercise and Hydrotherapy

Remedial exercise and hydrotherapy homecare suggestions were kept to a minimum to encourage patient compliance. Remedial exercise was focused on stretching the wrist flexors and extensors as well as individual digits to increase extensibility of muscles and decrease compressive forces on the median nerve. A shoulder complex stretch was included for treatments 3 and 4 after chronic adhesions from a previous injury were addressed. All stretches were to be done 1-2 times a day, held for 30 to 60 seconds, and repeated so that each was performed a total of 3 times. The hydrotherapy suggestions were to preheat the forearm to encourage extensibility of the muscles prior to stretching. In the case of the right shoulder complex, contrast washes were recommended to encourage circulatory exchange and accelerate healing in the area.

Modifications to Treatments

Treatments 3 and 4 addressed the patient's long-term right shoulder injury and the homecare was adjusted to take that into account. The following few treatments were modified with the modalities for the right shoulder being swedish circulatory petrissage and passive range of motion.

Results

Self-Reported Health Questionnaires

The patient completed the 'Carpal Tunnel Syndrome/Median Nerve Function Disability Form' (Magee 2006: 385) in a series of 3, one at each assessment point. The hand and wrist symptoms of pain and tingling have decreased in severity and frequency at night.

Symptom Severity Scale

The following questions refer to your symptoms for a typical twenty-four hour period during the last two weeks (please bold only one answer to each question)

Q. How severe is the hand or wrist pain that you have at night?

1. I do not have hand or wrist pain at night
- 2. Mild pain**
3. Moderate pain
4. Severe pain
5. Very severe pain

Q. How often did hand or wrist pain wake you up during a typical night in the last 2 weeks?

1. Never
- 2. Once (Assessment #2 and #3)**
- 3. Two or three times (Assessment #1)**
4. Four or five times
5. more than five times

Q. Do you typically have pain in your hand or wrist during the daytime?

- 1. I never have pain during the day**
2. I have mild pain during the day
3. I have moderate pain during the day
4. I have severe pain during the day
5. I have very severe pain during the day

Q. How often do you have hand or wrist pain during the daytime?

- 1. Never**
2. Once or twice a day
3. Three to five times a day
4. More than five times a day
5. The pain is constant

Q. How long, on average, does an episode of pain last during the daytime?

- 1. I never get pain during the day**
2. Less than 10 minutes
3. 10 to 60 minutes

4. Greater than 60 minutes
5. The pain is constant throughout the day

Q. Do you have numbness (loss of sensation) in your hand?

1. No
2. **I have mild numbness (Assessment #3)**
3. **I have moderate numbness (Assessment #1 and #2)**
4. I have severe numbness
5. I have very severe numbness

Q. Do you have weakness in your hand or wrist?

1. **No weakness**
2. Mild weakness
3. Moderate weakness
4. Severe weakness
5. Very severe weakness

Q. Do you have tingling sensations in your hand?

1. No tingling
2. **Mild tingling (Assessment #3)**
3. **Moderate tingling (Assessment #1 and #2)**
4. Severe tingling
5. Very severe tingling

Q. How severe is numbness (loss of sensation) or tingling at night?

1. I have no numbness or tingling at night?
2. **Mild (Assessment #3)**
3. **Moderate (Assessment #1 and #2)**
4. Severe
5. Very severe

Q. How often did hand numbness or tingling wake you up during a typical night during the last two weeks?

1. Never
2. **Once (Assessment #2 and #3)**
3. **Two or three times (Assessment #1)**
4. Four or five times
5. More than five times

Q. Do you have difficulty with the grasping and use of small objects such as keys or pens?

1. **No difficulty**
2. Mild difficulty
3. Moderate difficulty
4. Severe difficulty
5. Very severe difficulty

Postural Observation

At the time of the first assessment there was head forward posture, the torso was twisted to the left, the inferior angle of the right scapula was lower and slightly winged, and both forearms were fully pronated. The final assessment no longer showed head forward posture, and the inferior angles of the scapula were level with each other and no winging was present.

Range of Motion and Functional Tests

Ranges of motion for the c-spine, gleno-humeral, elbow, and wrist joints were taken at each of the three assessment checkpoints. Only the c-spine and gleno-humeral joints presented with limitations in movement.

All ranges, except flexion, were decreased with active range of motion of the c-spine at the time of the first assessment. The final assessment showed no decrease in any range during AROM.

The gleno-humeral joints showed AROM limitations in all ranges bilaterally, except extension, at the initial assessment. In the right gleno-humeral joint abduction was markedly reduced with moderate reduction in adduction, flexion, and internal and external rotation. The final assessment showed a slight decrease in AROM in abduction with all other ranges showing no limitations. Resisted range of motion elicits discomfort between 75 and 110 degrees of abduction of the right shoulder complex, this indicates that further treatment is warranted past the time frame of this study.

Treatment was focused on the torso and right upper limb, exclusive of the left gleno-humeral joint. It is worth noting that by the end of the 10 treatment sessions the left gleno-humeral joint was full in all ranges.

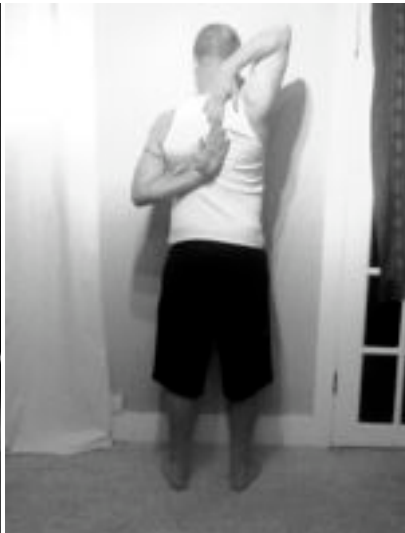
The images of Apley's Scratch Test taken at all three assessment checkpoints showed improvements in AROM, and as the study progressed, less compensation from the torso and lower body were noted.



Assessment 1: May 26, 2012



Assessment 2: June 19, 2012



Assessment 3: July 23, 2012



Assessment 2: 7"

Assessment 3: 4"

Special Tests

A summary of the special tests follows. Only the tests with positive results in the initial assessment are reassessed in the midpoint and final assessments.

Region	Special Test	Result		
		Assessment 1	Assessment 2	Assessment 3
Neck	Spurling's	- Bilaterally		
Neck	Tinel's	- Bilaterally		
Arm	ULTT 1	- Bilaterally		
Trunk	Breathing	- Bilaterally		
Shoulder	Drop Arm	- Bilaterally		
Shoulder	Empty Can	+ R	+ R	- Bilaterally
Shoulder	Neer Impingment	- Bilaterally		
Shoulder	Hawkins Kennedy	- Bilaterally		
Shoulder	Lift-off sign	+ R Marked weakness	+ R	+ R Slight weakness
Shoulder	Adson's	- Bilaterally		
Shoulder	Halstead's	+ R	+ R at 5 secs + L at 20 secs	- Bilaterally
Shoulder	Military Brace	- Bilaterally		
Shoulder	Wright's Hyperabduction	- Bilaterally		
Shoulder	Pectoralis major Length	- Bilaterally		
Forearm	Pronator Teres	+ R	- Bilaterally	
Wrist	Phalen's	- Bilaterally		
Wrist	Reverse Phalen's	- Bilaterally		

Wrist	Wrist Extension Ligamentous Stress	- Bilaterally		
Wrist	Wrist Flexion Ligamentous Stress	- Bilaterally		
Wrist	Tinel's	+Bilaterally	+ Bilaterally	+ Bilaterally
Hand	Pinch	- Bilaterally		
Hand	Sensory	- Bilaterally		

Manual muscle testing of flexor pollicis brevis, abductor pollicis brevis, opponens pollicis, and the lateral two lumbricals showed no decrease in strength functional loss (Kendall 2005: 262-265, 275). Also noted were no losses in sensation over the dorsal and palmar digits 1-3 and lateral half of 4, or atrophy of the thenar muscle group.

Conclusion

The outcome of this study supports the hypothesis of assessment and treatment of all the structures related to and surrounding the median nerve, from origin to termination, would result in decreased numbness and tingling in the median nerve distribution of the hand. The three self-reported health questionnaires showed a decrease in the severity and frequency of symptoms even though, by the patient's admission, the wrist braces were no longer being worn regularly at night and repetitive stress on the hands, wrists, and arms was increased due to extended hours at work.

It is impossible to say how long these results will last, especially if the patient continues to be non-compliant with self-stretching and the nightly use of wrist braces. The patient has a follow up appointment, one month post-study, with the neurologist to discuss surgical intervention. It is of interest to know if participation in this study will result in improved performance with EMG testing and if surgery is still recommended as the best treatment option in this case.

To improve the validity and efficacy of further studies suggestions are; goniometry to record ranges of motion; assessment from the feet up to, and including, the pelvis to ascertain if the lower body is involved in a complaint in the upper body; the use of contrast hydrotherapy of the hand, wrist, and forearm; and increased patient compliance with homecare.

This author feels that further study is warranted in the treatment of CTS, with focused assessment and treatment based on the patient's individual presentation rather than a specific regional approach to the area thought to be causing the condition.

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