Review Article

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Exercise Therapy for Carpal Tunnel Syndrome: An Overview of Evidence to Inform Current Practice

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Abstract

Carpal tunnel syndrome (CTS) is the clinical manifestation of compression of median nerve in the volar aspect of wrist leading to sensory, motor and autonomic dysfunction in the hands. This review article outlined the evidence for exercise therapy in CTS to identify the type, dosage and prescription in this population. The presented evidence includes many studies on splinting versus nerve/ tendon gliding exercises, one study on nerve slider techniques, one study on aerobic exercises, one study on carpal tunnel decompression exercises and one study on upper extremity flexibility, strength, and circulatory exercises for people with CTS. Insufficient evidence and inconsistent findings limit our conclusions and provision of definitive recommendations in this population.

Keywords: Carpal Tunnel Syndrome; Entrapment Neuropathy; Hand Rehabilitation; Orthopaedic Rehabilitation.

Carpal tunnel syndrome (CTS) is the clinical manifestation of compression of median nerve in the volar aspect of wrist leading to sensory, motor and autonomic dysfunction in the hands. This review article outlined the evidence for exercise therapy in CTS to identify the type, dosage and prescription in this population.

Nerve Gliding Exercises

Pinar et al [1] investigated the effectiveness of nerve gliding exercises used in combination with conservative treatment approaches in 26 patients (35 hands) with carpal tunnel syndrome. Static volar wrist splints and functional modification (16 hands in the control group), and nerve gliding exercises (19 hands in the experimental group) were the interventions. The nerve gliding exercises group demonstrated more rapid pain reduction and greater functional improvement, especially in grip strength.

Nerve & Tendon Gliding Exercises

Rozmarynet al [2] studied 197 patients (240 hands) with CTS who were divided into two groups: conservative treatment with or without nerve and tendon gliding exercises. Lesser patients in experimental group underwent surgery and of them, 70.2% reported good or excellent results, 19.2% remained symptomatic, and 10.6% were non-compliant.

Schmid et al [3] compared splinting versus nerve and tendon gliding exercises on 20 patients with mild to moderate CTS Following 1 week of intervention, signal intensity of the median nerve was reduced by 11% at the radioulnar level for both interventions. This was accompanied by a mild improvement in symptoms and function.

Hornget al [4] investigated the effectiveness of tendon and nerve gliding exercises as a part of combined treatments for 53 patients with carpal tunnel syndrome. Group 1 received standard care

and tendon gliding exercises; Group 2 received standard care and nerve gliding exercises; and, Group 3 received standard care alone (splint and paraffin therapy). The combination of tendon gliding exercises with conventional treatments may be more effective for improving functional status in CTS than that of nerve gliding exercises with conventional treatments.

Akalinet al [5] studied 28 patients with CTS in 36 hands who were randomly assigned to two groups-wear a custom made neutral volar wrist splint or perform a series of nerve and tendon gliding exercises in addition to splinting.Both groups improved on all outcomes (pain severity, function and treatment satisfaction), but the exercise group performed better than the splinting group.

Briningeret al [6]compared the effects of a neutral wrist and metacarpophalangeal (MCP) splint with a wrist cock-up splint, with and without exercises, for the treatment of carpal tunnel syndrome (CTS) in 51 subjects. "There were 4 groups: the neutral wrist and MCP group and the neutral wrist and MCP-exercise group received fabricated customized splints that supported the wrist and MCP joints; the wrist cock-up group and the wrist cock-up-exercise group received wrist cock-up splints." Splinting with wrist in neutral had beneficial effect on symptoms and functional status than the wrist cock-up splint.

Wrist Flexion/Extension Exercise

Clifford and Israels [7] examined the influence of a provocative dynamic exercise maneuver on nerve conduction studies (NCS) in three study groups: 10 healthy controls (Group A); 10 patients with clinical CTS, but normal NCS (Group B); and 10 patients with clinical CTS and abnormal NCS (Group C). A provocative4-min wrist flexion-extension exercise protocol was found to evoke symptom exacerbation in 50% of the patients. Prolonged sensory distal latency (median) for digit IV was found which was not clinically significant inasmuch as the change in latency was insufficient to meet the a priori criteria for NCS abnormality required for the electrodiagnosis of median nerve abnormality.

Nerve Sliding Exercises

Coppieters and Alshami [8] evaluatedthe effects of nerve sliding techniqueswhere an increase in nerve strain due to nerve bed elongation at one joint (e.g., wrist extension) is simultaneously counterbalanced by a decrease in nerve bed length at an adjacent joint (e.g., elbow flexion) on median nerve excursion and strain at the wrist in six human cadavers during six mobilization techniques. The sliding technique resulted in 30% increased excursion of 12.4 mm, with minimal peak strain values.

Aerobic Exercise

'Nathan et al [9]determined the effect of aerobic exercise on median nerve conduction and symptoms suggestive of carpal tunnel syndrome, in 30 symptomatic volunteers with abnormal median nerve conduction studies who participated in a 10-month program of supervised aerobic exercise. The study found the following findings; A decrease in 14-cm sensory median latency correlated with a decrease in percentage of body fat and was predicted by an increase in peak oxygen utilization and a decrease in body mass index. There was also a tendency for a set of symptoms sometimes associated with carpal tunnel syndrome (pain, tightness, and clumsiness) to be relieved by the exercise program.

Exercise and Mobilisation Interventions

Page et al [10] reviewed the efficacy and safety of exercise and mobilisation interventions compared with no treatment, a placebo or another non-surgical intervention in people with CTS by searching the Cochrane Neuromuscular Disease Group Specialised Register, CENTRAL, MEDLINE, EMBASE, CINAHL Plus, and AMED. The review included 16 studies randomising 741 participants: Two compared a mobilisation regimen to a no treatment control, three compared one mobilisation intervention (for example carpal bone mobilisation) to another (for example soft tissue mobilisation), nine compared nerve mobilisation delivered as part of a multi-component intervention to another non-surgical intervention (for example splint or therapeutic ultrasound), and three compared a mobilisation intervention other than nerve mobilisation (for example yoga or chiropractic treatment) to another non-surgical intervention. There was limited and very low quality evidence of benefit for all of a diverse collection of exercise and mobilisation interventions for CTS. The authors thus suggested that the decision to provide this type of non-surgical intervention to people with CTS should be based on the clinician's expertise in being able to deliver these treatments and patient's preferences.

Carpal Tunnel Decompression Exercise

Seradgeet al [11] evaluated the effect of a new non-surgical protocol (Carpal Tunnel Decompression

Exercise Program) for treating 28 patients (33 hands) with CTS. 80% of the hands in the mild category and 71% in the moderate category were successfully treated without surgery. All patients in the severe category required surgery. The average success rate of their non-surgical treatment protocol was 67%.

Upper Extremity Flexibility, Strength, and Circulation Exercise

Thomas et al [12] studied the effects of an exercise programme for increasing upper extremity on symptoms of CTS intwo groups (exercise and control) of seven participants each who did repetitive hand motion tasks. The exercise group participated in daily arm, hand, and other upper-extremity exercises for 8 weeks. The control group did not participate in the exercise programme.The grip strengths had improved over time, which suggested that the exercise group had physiological benefits from the exercise programme.

The presented evidence includes many studies on splinting versus nerve/tendon gliding exercises, one study on nerve slider techniques, one study on aerobic exercises, one study on carpal tunnel decompression exercises and one study onupper extremity flexibility, strength, and circulatory exercises for people with CTS. Insufficient evidence and inconsistent findings limit our conclusions and provision of definitive recommendations in this population.

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