

INFLUENCE OF SELECTED PHYSICAL EXERCISES TO IMPROVE OUTCOMES IN PATIENTS OPERATED FOR CARPAL TUNNEL SYNDROME IN OWN MATERIAL

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Abstract. The purpose of this study was to evaluate the influence of selected physical exercises on the improved results of treatment of patients operated for carpal tunnel syndrome. Hands were examined in 112 patients treated for carpal tunnel syndrome, aged 33 to 80 years. All individuals underwent open surgery procedure. Patients were divided into group I, in which the exercise was carried out under the supervision of the authors of this study and group II, in which exercises were not performed. Measurements were performed on all patients before surgery (initial) and 6 weeks after (final). Symptoms were studied according to Whitley and Mc Donnell, and they included night pain, sensory disturbance, thenar muscle weakness, Tinel's sign and Phalen's maneuver, the bottle syndrome and the opponens pollicis muscle activity. In the treatment of enhancing gliding exercise (automobilization) and neuromobilization. Stabilizing exercises included automobilization (nerve gliding) and neuromobilization. Wrist and hand stabilizing exercises were used and the correct settings in the carpo-metacarpal joints during work and physical activity were taught. The results were statistically analyzed using Chi-squared test. It was found that in patients with carpal tunnel syndrome the best way to eliminate or reduce symptoms of hands mobility disorders comes primarily with surgical treatment, followed by rehabilitation treatment using gliding and neuromobilization exercises.

Key words: nerve gliding exercise, neuromobilization, surgical treatment of carpal tunnel syndrome

Introduction

Carpal tunnel syndrome is the most common disorder of the peripheral upper limb. The number of patients is steadily increasing (Tuppin et al. 2011). Withdrawal symptoms are caused by increased pressure in the canal and the pressure on the median nerve. The syndrome may be caused, inter alia, by traumatic changes in the peripheral forearm and wrist, degenerative diseases, proliferative changes, inflammation, and overload following an intensive and prolonged work or exercise (Kostopoulos 2004; Szczechowicz et al. 2004; Tiffert 2010).

The assessment of the severity of carpal tunnel syndrome can be made based on the clinical picture of the very widespread classification by Whitley and Mc Donnell (Whitley and Mc Donnell 2002). The syndrome can be divided into three stages. In the early, mild stage, we can observe symptoms such as tingling, numbness, and pain at night. In the intermediate, moderate period, there are constant pain, weakened feeling and grip strength, and muscle atrophy. While in the advanced stage, we can witness thenar atrophy, deficit in hand movements precision, and loss of a two-point sensation.

Carpal tunnel syndrome is more common in women, usually aged from 40 to 60 years, and it usually refers to the dominant hand (Szczechowicz et al. 2001; Tiffert 2010). To achieve good treatment results importance should be put on early diagnosis, determined on the basis of not only clinical symptoms but also electromyographic guidance (EMG), ultrasound (USG) and magnetic resonance imaging (MRI). The extension of nerve conduction in EMG and the thickening of the median nerve above 9 mm in imaging tests allows to suspect the existence of carpal tunnel syndrome (Tiffert 2010).

In carpal tunnel syndrome, except for the preventive action in the early stage, non-invasive treatment with the use of physiotherapy is also implemented. When the symptoms persist, surgical procedure is recommended. It allows for a rapid reduction or elimination of symptoms. The surgical treatment involves open and endoscopic method, where the open technique is more frequently used in the idiopathic form of the syndrome as it allows for a thorough recognition of the causes behind the pressure on the median nerve and its elimination. Endoscopic method has not been clearly concluded to be a better one (Bartkowiak 2010). In the postoperative period it is important to conduct rehabilitation treatment in the form of gliding exercises and neuromobilization with improved mobility of the brachial plexus and the median nerve in the carpal tunnel of the wrist (Butler 1991; Szczechowicz et al. 2001; Tiffert 2010). This procedure allows to restore the normal ability of nerve mobility in relation to surrounding tissues, reduce pain, numbness, swelling, contractures, improve sensation and muscle strength (Keilani et al. 2012; Szczechowicz et al. 2004). The aim of the study was to evaluate the effect of selected exercises conducted in the postoperative period on the results of the hands treatment in patients with carpal tunnel syndrome.

Materials and methods

The study included 112 patients with carpal tunnel syndrome, including 72 females and 48 males, aged 33 to 80 years (Table 1). Treatment and research was carried out in SP Regional Hospital in Nowogard. Patients were treated by the authors of the article. For surgical treatment, patients were qualified on the basis of clinical symptoms and EMG. The open method was used in the surgical treatment and in the postoperative period primarily nerve gliding exercises and neuromobilization. The exercises were used to treat the hands of 67 patients in group I, however a further 45 patients in group II did not perform these exercises.

Hands rehabilitation started the next day after surgery, initially adjusted so as not to cause any pain. The treatment consisted of nerve gliding exercises and neuromobilization. Patients performed gliding exercises (automobilization) every 1 to 2 hours a day for 5 to 10 repetitions of 2–5 second-long maintained extended position of the limb's nerve (Bartkowiak 2010; Szczechowicz et al. 2004).

Neuromobilization was performed by the therapist, and the treatment was conducted individually, depending on the extent of the changes and the time post surgery (Szczechowicz et al. 2004; Tiffert 2010). The exercise program included stabilizing exercises of the wrist and the proper hand position for the radial-wrist joint during physical activity and work (Tiffert 2010).

Table 1. Number of patients with carpal tunnel syndrome by gender and age

The age of patients in years	Number of patients by gender				Together	
	women		men		n	%
	n	%	n	%		
31–40	5	4.5	3	2.7	8	7.1
41–50	13	11.6	7	6.3	20	17.9
51–60	30	26.8	17	15.2	47	42.0
61–70	15	13.4	9	8.0	24	21.4
71–80	9	8.0	4	3.6	13	11.6
Together	72	64.3	40	35.7	112	100.0

All patients underwent a preliminary examination prior to surgery and the final examination 6 weeks after surgery. Clinical symptoms were investigated according to Whitley and Mc Donnell (Whitley and Mc Donnell 2002), and they included: the severity of night pain based on a 10-point VAS scale (Visual Analog Scale), feeling disorder using Semmes-Weinstein monofilament test, thenar muscle weakness according to the 6-point Lovett scale, Tinel and Phalen’s tests, Luthy’s bottle syndrome and the opponens pollicis muscle activity.

Statistical analysis

The results were statistically analyzed using the chi-square test (Ciężczyk and Boichanke 2008).

Results

We studied 112 hands of patients with carpal tunnel syndrome who were treated surgically. Patients were divided into 2 groups based on the exercise type performed in the postoperative period. Group I – 67 people – included patients who performed gliding exercises and mobilization, and group II – 45 patients – who did not perform these exercises (Table 2).

Table 2. Comparison of the number of hands with different disorder symptoms in patients in group I (67) and II (45) at the preliminary and final stages of the examination

Hand function disorder symptoms	Patients group: I–67 and II–45 hands	The number of hands with various dysfunctions in the examinations			
		preliminary		final	
		n	%	n	%
1	2	3	4	5	6
Night pain	I	55	82.0	2	3.0
	II	36	80.0	8	17.8
Sensory dysfunction	I	47	70.1	8	11.9
	II	30	68.0	9	20.0
Thenar muscle weakness	I	46	68.6	18	26.8
	II	30	67.0	17	37.8
Positive Phalen’s Test	I	35	52.2	9	13.4
	II	23	51.1	10	22.2

1	2	3	4	5	6
Positive Tinel-Hoffman Test	I	33	49.2	5	7.5
	II	34	50.7	7	15.6
Positive Bottle Test	I	10	14.9	4	5.9
	II	7	15.5	5	11.1
The opponens pollicis muscle activity impairment	I	19	28.3	8	11.9
	II	13	28.9	9	20.0

In this study, in both group I and II, there was a substantial reduction in the number of hands with various disorder symptoms in a final study compared to the initial examination. In group I the reduced number of treated hands was more evident than in group II.

Analyzing the number of hands of patients in group I and II with various symptoms of dysfunction at initial and final stages, there was a statistically significant relationship of night pain occurrence ($p = 0.0144$) and the patients adherence to group I or II. A significant beneficial effect of exercise was noted on improving the occurrence of night pain in patients of group I compared with group II. The results of treatment of the hands of the other symptoms of dysfunction in group I were also better than in group II, but not so significantly. They included sensory dysfunction ($p = 0.290$), thenar muscle weakness ($p = 0.367$), positive Phalen's test ($p = 0.321$), positive Tinel-Hoffman test ($p = 0.628$), the positive bottle syndrome ($p = 0.484$) and the opponens pollicis muscle activity impairment ($p = 0.409$).

Discussion

In the studies performed, in all patients a reduction in the number of symptoms of hands function disorders in the final study compared with the preliminary examination was observed. Symptoms of hands dysfunction more often occurred in patients performing exercise in the postoperative period than in those who did not perform these kind of exercises. This difference was particularly marked in patients suffering from night pain, but was also observed in people with sensory dysfunction and other symptoms. Neuromobilization and gliding exercises improve the mobility of nerves, blood circulation, reduce swelling and pain. Ultrasound studies confirm these findings (Bartkowiak 2010; Szczechowicz et al. 2004). We are convinced that in the long term performance of these exercises you can achieve even better results of hands function restoration. The results are consistent with the findings of other authors (Bartkowiak 2010; Dakowicz and Latosiewicz 2004; Szczechowicz et al. 2004).

Conclusions

1. Carpal tunnel syndrome is most common in women over 40 years of age.
2. In patients at risk of carpal tunnel syndrome, it is important to implement prophylactic and conservative management.
3. The best method of eliminating hands dysfunction in carpal tunnel syndrome is a surgical and improving treatment with the use of gliding exercise and neuromobilization.
4. Gliding exercise and neuromobilization carried out in the postoperative period by a specialized therapeutic team improve the treatment of carpal tunnel syndrome.

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