

# EFFECTS OF PHYSICAL EXERCISE ON THE MOTILITY OF HANDS IN PATIENTS OPERATED BECAUSE OF DUPUYTREN'S CONTRACTURE IN OWN MATERIAL

Zbigniew Deskur,<sup>1, A, C, D</sup> Anna Deskur,<sup>2, A, B</sup> Maciej Zawadzki<sup>1, A, B</sup>

<sup>1</sup> Szczecin University, Faculty of Physical Culture and Health Promotion, Poland

<sup>2</sup> Pomeranian Medical University, Szczecin, Poland

<sup>A</sup> Study Design; <sup>B</sup> Data Collection; <sup>C</sup> Statistical Analysis; <sup>D</sup> Manuscript Preparation; <sup>E</sup> Funds Collection

## Address for correspondence:

Zbigniew Deskur

Al. Piastów 40b/6, 71-065 Szczecin, Poland

E-mail: zdeskur@onet.pl

**Abstract.** The purpose of this study was to evaluate the effect of physical exercise on limited locomotion in the hands of patients who underwent surgery to correct Dupuytren's contracture. We studied the hands of 84 patients with Dupuytren's contracture aged from 30 to 84 years. In all patients, the contracture was removed by performing a partial fasciectomy. Physical exercises were carried out a week prior to surgery and during the postoperative period. 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 performed sporadically and without professional supervision. Measurements were performed on all patients one week before surgery (A), 1 week after surgery (B) and 6 weeks after (C). The range of movement of fingers was measured using a goniometer. The average total loss of finger extension was evaluated, taking due account of the extension loss in the MCP, PIP and DIP joints of all fingers of the treated hand. Rehabilitation treatment included active and passive exercises; in more severe cases the treatment of choice was massage and special equipment to help bear flexion contracture. Test results were statistically analyzed. In all patients, there was an increase in mobility of the fingers. Patients taking part in physical exercise had significantly greater range of finger movement.

**Key words:** exercise, surgery, Dupuytren's contracture

## Introduction

Dupuytren's contracture is a common disease of the hands. Dupuytren was first described in 1831 (Green et al 2011). It is a contracture of the palmar fascia with flexion contracture of the metacarpophalangeal joints of the fingers in phalangeal (MCP) and interphalangeal region (PIP, DIP). Most believed that the formation of the changes was associated with immunology, genetics, the nervous system or microtrauma. Contracture usually occurs at about 50 years of age, more often in men than in women. The results of treatment are still unsatisfactory. The most effective way to restore the motor function of both the fingers and hands is a correct and careful surgical treatment. Complication and failure are common, prolonging motor function rehabilitation. The surgery most often used involves partial or nearly complete excision of palmar fascia and streamlining treatment to extend contracture

ligaments stretch skin, clean joint capsules and strengthen surrounding tissues. (Dias et al. 2013; Karabek et al. 2012; Larocerie-Salgate et al. 2012). The treatment does not typically include an appropriate measure of rehabilitation treatment despite the fact that the procedure often significantly increases the limited mobility of the fingers and improves hand dexterity (Kuźdzał 2009; Warrell 2012). Therefore, the aim of this study was to evaluate the effect of physical exercise to improve motility hands of patients operated for Dupuytren's contracture.

**Materials and methods.** The study included 84 patients with Dupuytren's contracture aged 30 to 84 years. There were 16 women and 66 men (Table 1). Treatment and research was carried out in SP Regional Hospital in Nowogard between 2007 and 2011. During the surgery almost a complete or partial fasciectomy was performed, with dermato-fasciotomy performed on 2 people. Physical exercise was carried out a week before the surgery and the next day after surgery. The exercise program was gradually expanded or increased periodically evaluated and adjusted to the program. The program consisted of active exercises, active assisted, passive with progressive stretching of joint contractures and scarring. After twisting their hands, patients performed flexion and extension exercises 10–15 times with a 30-second pause 6 times a day. Elevation of the limb was recommended (Kuźdzał 2009). The major change was applied massage and cameras to help eliminate flexion contracture. Patients were divided into group I, comprised of individuals performing exercises under the supervision of the authors and group II, comprised of individuals exercising on their own. The tests were performed a week prior to surgery (A) and in the postoperative period after 7 days (B) and 6 weeks (C). The range of movement of fingers was measured using a goniometer. The average total loss of finger extension was evaluated, taking due account of the extension loss in the MCP, PIP and DIP joints of all fingers of the treated hand.

## Statistical analysis

Test results were statistically analyzed. According to/B clinical variables, age of the patients had a normal distribution, hence the use of Student's test ( $p = 0.2349$ ). In the calculation of the average value loss of extension of the fingers in patients from group I and II prior to surgery (Table 2) and in groups I and II after 1 and 6 weeks (Table 4) variables did not have a normal distribution using a nonparametric Mann-Whitney U test. Compared to the average value of the loss of extension of the fingers of patients in groups I and II, 1 and 6 weeks after surgery (Table 3), variables did not have a normal distribution using a non-parametric Wilcoxon matched pairs test.

## Results

We treated 84 patients with Dupuytren contracture, aged 30 to 84 years, including 16 females (19%), 68 males (80.9%). Most were aged 51–70 years (65%) – Table 1.

**Table 1.** Number of patients with Dupuytren's contracture by gender and age

The age of patients in years	Number of patients by gender				Together	
	women		men		n	%
	n	%	n	%		
30–50	4	4.8	15	17.9	19	22.6
51–70	8	9.5	47	56.0	55	65.0
71–84	4	4.8	6	7.1	10	11.9
Together	16	19.0	68	80.9	84	100.0

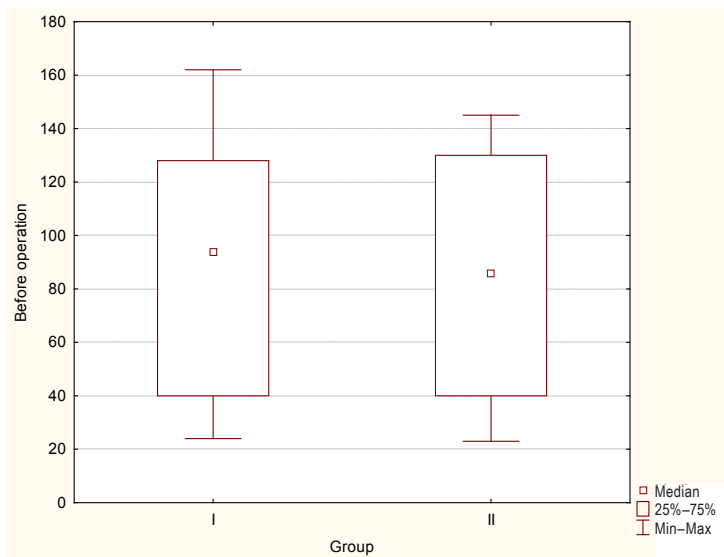
The mean age of the patients in group I was 55.9 in group II – 58.69 years without significant statistical differences.

Average values in degree of finger extension loss among patients before surgery to treat Dupuytren's contracture were 85.52 in group I and 85.19 in group II. The results were similar, there were no significant statistical differences (Table 2, Figure 1).

**Table 2.** Average values (degrees) extension defects of the fingers in patients from group I and II before surgery of Dupuytren's contracture

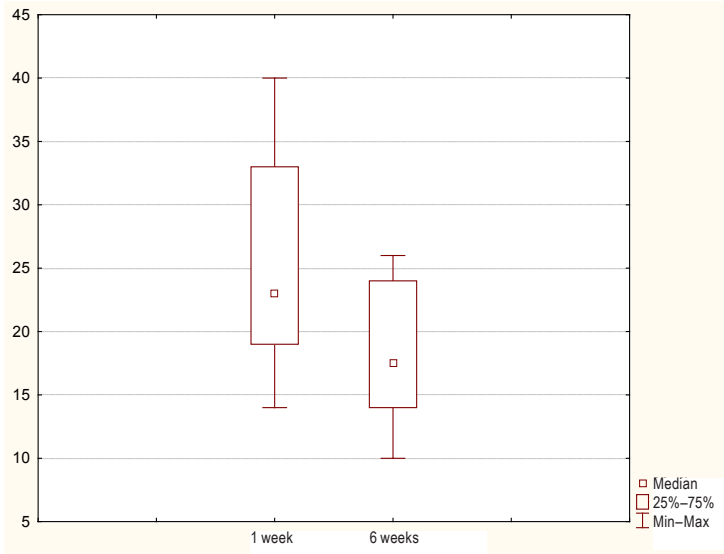
Group	n	x	SD	min	max	p
I	42	85.52	44.91	24	162	0.872071
II	42	85.19	44.86	23	145	

There was no statistically significant difference.

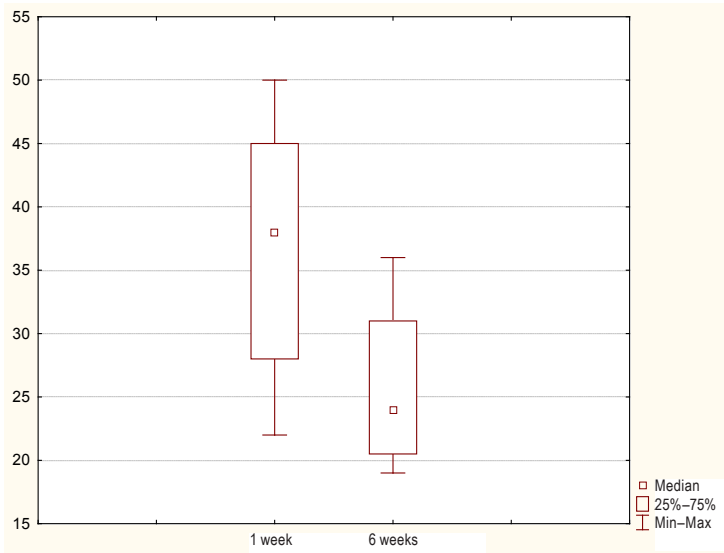


**Figure 1.** Comparison of average values (degrees) of finger extension defects among patients in group I and II before operation Dupuytren's contracture

Average value of finger extension loss of patients in groups I and II after 6 weeks were significantly lower than the corresponding values in patients after 1 week (Table 3, Figures 2, 3).



**Figure 2.** Comparison of the mean values of the loss of extension of the fingers of patients in group I after 1 and 6 weeks after surgery of Dupuytren's contracture



**Figure 3.** Comparison of the mean values of the finger extension loss of patients in group II, 1 and 6 weeks after surgery of Dupuytren's contracture

**Table 3.** Comparison of the mean values of cavity extension fingers of patients in group I and II at 1 and 6 weeks after surgery Dupuytren's contracture

Group	Study after the operation	n	x	SD	min	max	p
I	1 week (B)	22	25.91	8.22	14	40	0.027709*
	6 weeks (C)	6	18.17	6.21	10	26	
II	1 week (B)	23	36.91	9.06	22	50	0.002218*
	6 weeks (C)	12	25.83	6.01	19	36	

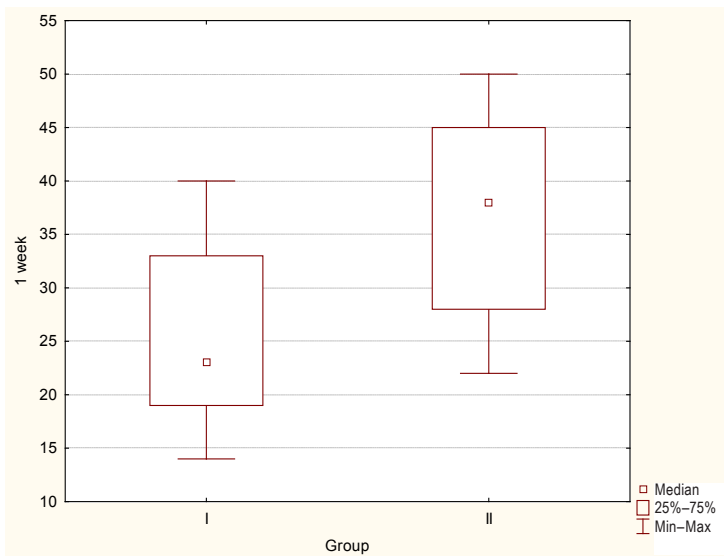
\* Statistically significant differences ( $p \leq 0.05$ ).

Mean values of finger extension loss of patients in Group I were significantly lower both 1 and 6 weeks after surgery than the corresponding values of patients in Group II (Table 4, Figures 4 and 5).

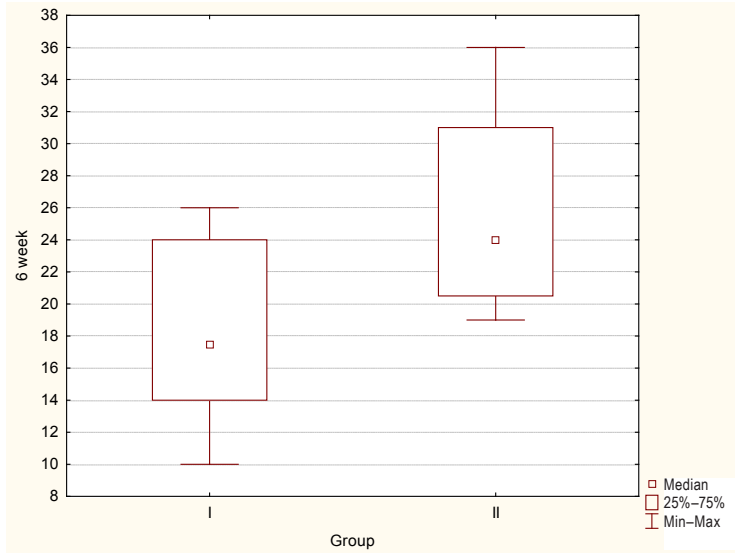
**Table 4.** Comparison of the mean values of finger extension loss in patients in group I and II, 1 and 6 weeks after surgery

Study after the operation	Group	n	x	SD	min	max	p
1 week (B)	I	22	25.91	8.22	14	40	0.000320*
	II	23	36.91	9.06	22	50	
6 weeks (C)	I	6	18.17	6.21	10	26	0.049204*
	II	12	25.83	6.01	19	36	

\* Statistically significant differences ( $p \leq 0.05$ ).



**Figure 4.** Comparison of the mean finger extension loss between groups I and II after 1 week after surgery



**Figure 5.** Comparison of average values of finger extension loss in patients in group I and II, 6 weeks after surgery

## Discussion

Patients with Dupuytren's contracture can achieve significant improvement in both range of motion of the fingers and hand efficiency if there is an early diagnosis of the disease, timely surgical treatment and professional rehabilitation (Van Dijk et al. 2013; Sobierajska-Rek et al. 2010). The results of treatment vary and are often unsatisfactory. It depends on the choice of an appropriate method of operation, reliable performance, and skillfully conducted rehabilitation treatment under the supervision of a specialist team (Dias et al. 2013; Nagay et al. 1998; Worrell 2012).

All treated patients with Dupuytren's contracture after surgery and facilitated reahabilitation experienced improved mobility and hand efficiency. Loss of finger extension was significantly lower both 1 week and 6 weeks after the operation compared with the results of similar studies in the preoperative period. The results were significantly better in patients from group I, who performed systematic physical exercises, as compared to group II, who occasionally exercised on their own. Systematic exercise beyond surgery is the primary method of enhancing the treatment of Dupuytren's contracture, in accordance with other studies (Kobus 2007; Kużdżał 2009; Manikowski 2006; Worrell 2012). Early diagnosis of contracture also contributed to the achievement of good results – a lack of complications and good wound healing in the postoperative period. Fasciotomy, leaving the affected tissue, was not used. Due to the short period of observation, there was no recurrence. Two patients experienced only an overgrowth of scar tissue. Most authors reported a 30% to 80% return to full range of motion after treatment of Dupuytren's contracture (Creon et al. 2011; Karabek et al. 2012).

## Conclusions

1. Maintaining an exercise regimen in patients operated on because of Dupuytren's contracture has a significant impact on the increase in motor function and manual dexterity of fingers.
2. In restoring finger mobility of patients treated surgically for Dupuytren's contracture, conducting skillful and intensive rehabilitation treatment under the supervision of a specialist team is important.

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