

Hand Function Deficiency in Patients with Dupuytren's Disease and Course of Recovery after Palmar Fasciectomy

Deficit funkce ruky u pacientů s Dupuytrenovou kontrakturou a průběh rekonvalescence po palmární fasciotomii

M. TRYBUS¹, M. KOZIEJ², M. BEDNAREK¹, J. BRUDNICKI¹, W. POKROWIECKI¹

¹ 2nd Department of General Surgery, Jagiellonian University Medical College, Kraków, Poland

² Department of Anatomy, Jagiellonian University Medical College, Kraków, Poland

ABSTRACT

PURPOSE OF THE STUDY

To evaluate hand function deficiency in patients with Dupuytren's disease (DD) in addition to assessing the improvement of function after palmar fasciectomy by using different hand-related questionnaires.

MATERIAL AND METHODS

A total of 121 hands (95 patients) underwent surgery. Disease severity was designated using Tubiana's Staging System. The Tendency of changes of Disabilities of the Arm, Shoulder, and Hand questionnaire (DASH), Patient Evaluation Measure (PEM), and Hand Function Score (HFS) scores of patients with DD undergoing palmar fasciectomy were assessed prior to, 3 months after, and 1 year after the operation. Moreover, total loss of extension (TLoE) was evaluated using a goniometer in the same time intervals. Repeated measure ANOVA Friedman's test were used. Responsiveness to clinical change was calculated by using standardized response means (SRMs).

RESULTS

The results showed statistically significant improvement of the originally obtained questionnaire results after 3 months for DASH and HFS and 12 months for all forms; only the PEM and DASH score significantly changed between 3 and 12 months. TLoE before surgery was $144.1^\circ \pm 99.6^\circ$; 3-month and 1-year after surgery: $14.3^\circ \pm 58.0^\circ$ and $19.3^\circ \pm 34.7^\circ$ respectively. SRMs for 1 year after surgery was large for PEM (1.11) and medium for DASH (0.7) and HFS (0.79).

CONCLUSIONS

DASH, PEM, and HFS are valuable tools to monitor the hand function of patients with DD after surgery.

Key words: hand function, Dupuytren's disease, palmar fasciectomy.

INTRODUCTION

Dupuytren's disease (DD) is progressive excess myofibroblast proliferation and contracture of the aponeurosis, which over time leads to palmar contraction of fingers (2, 20, 27, 28, 29). The disease can include a single or more bands of the palmar aponeurosis (10, 17). It often occurs in both hands but usually does not appear at the same time, thus the severity of symptoms is different. It most frequently affects the ulnar aspect of hand (digits V and IV) (4, 21). The disease is chronic and progressive and allows some adaptation to changing conditions caused by deficiency of hand/hand functions; a significant increase of fingers contracture impedes and sometimes even make impossible, to perform daily tasks or professional activities.

The primary aims of this study were: 1) to assess the improvement of hand function after palmar fasciectomy

by using different hand-related questionnaires and an assessment of total loss of finger extension; 2) to show which of these questionnaires was the most appropriate for assessing DD.

MATERIAL AND METHODS

Study sample

Consecutive patients were recruited prospectively to participate in this study, and 95 people were enrolled into cohort (Fig. 1). The study was conducted in the 2nd Department of General Surgery in Jagiellonian University Medical College between 2006 and 2011. A total of 121 hands underwent surgery. The severity of the disease was designated using the Tubiana's Staging System (7, 14, 30):

- 1) I (global extension deficit between 0–45°);
- 2) II (46–90°);
- 3) III (91–135°) and
- 4) IV (> 135°).

The global extension deficit is calculated by adding together the extensor deficit at the metacarpophalangeal (MCP), proximal (PIP), and distal interphalangeal joints (DIP).

In cases when contracture concerns more than one finger, it was assumed that the severity is designated by a finger with the highest contracture grade.

Jagiellonian University Medical College Ethical Committee approved the study protocol, and written informed consent was obtained from all patients prior to surgery (KBET/313/B/2012). The methods were carried out in accordance with the approved guidelines.

Inclusion criteria were as follows:

- 1) patients with the diagnosis of DD and qualified to surgery;
- 2) >18 years old;
- 3) without previous surgery or treatment with collagenase on the same hand;
- 4) no concomitant hand disorders such as carpal tunnel syndrome, ulnar nerve entrapment, rheumatoid arthritis, connective tissue disorders, tenosynovitis, or another condition that could confound the assessment of patient-related outcomes;
- 5) obtained written informed consent and
- 6) ability to fill questionnaires in Polish language.

Data collection and patient-reported questionnaires outcomes

Patients were evaluated using three different hand questionnaires and the total loss of extension by goniometer prior to the surgical procedure, and three months and one year later. Measurements of extension were evaluated, taking due account of the extension loss in the MCP, PIP and DIP joints of all fingers of the treated hand were performed three times and the average score was then taken (1). All the questionnaire outcomes and the goniometer measurements were scored, and statistical analyses were performed. The final analysis contained only results from questionnaire outcomes with no missing data.

Disabilities of the Arm, Shoulder, and Hand questionnaire (DASH) is composed of 30 questions and is divided into two parts (<http://www.dash.iwh.on.ca/>). The first 20 questions refer to performance in the most frequent activities of everyday life with the upper extremities and the resulting specific difficulties. The remaining 10 questions assess problems and difficulties in life caused by dysfunction of the hand. Questions were evaluated with a five-point scale, whereby the higher the number of the scale, the higher dysfunction

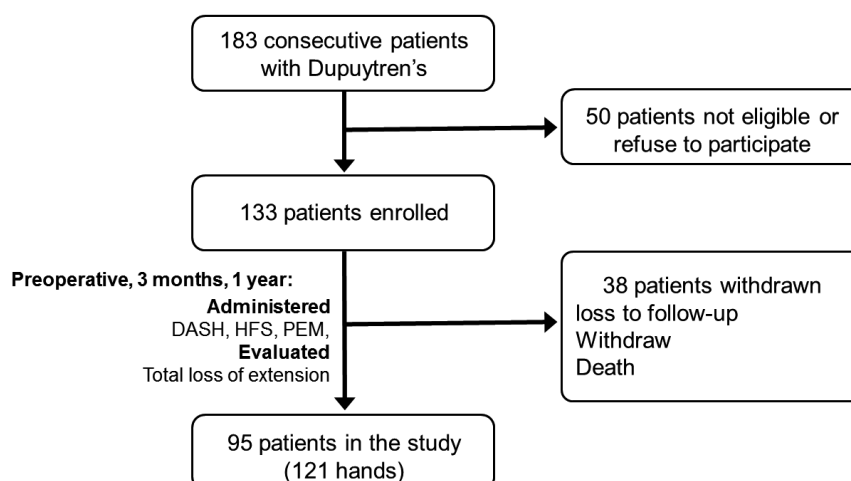


Fig. 1. Flow-chart of subject enrollment.

of the hand that causes more difficulties in performing the activity or has a greater negative impact on daily life. The minimum point value for the DASH questionnaire is 0 and the maximum is 100 points. DD has a smaller impact on the daily life of the patient when the value of the sum of individual points of the questionnaire is lower (15).

Hand Function Score (HFS) was developed to assess the outcome of rehabilitation following trauma. It was originally aimed at planning, monitoring, and possible modification of the treatment. It contains 25 questions covering the most common everyday activities performed with hand. Each question is evaluated on a 4-point scale. The minimum number of points is 25 for normal hand function, and the maximum is 100 for its severe impairment (31).

The Patient Evaluation Measure (PEM) is composed of three parts. In this analysis, the second part “How your hand is now” was used. It consisted of 10 questions, each of which addresses different aspects of hand symptoms and functions. Each question is scored using a seven-point scale (1–7), where 1 indicates normal state, and 7 is severe pathology. The range of rating is between 10 and 70 points, but the final result was expressed as a percentage. The smaller the numerical value of the sum of points obtained from the answers to all the questions in the questionnaire shows less impact on quality of life (22, 33).

Statistical analysis

Statistical analysis was performed using StatSoft STATISTICA 12.5 software for Windows. A P-value <0.05 was deemed to be statistically significant. The distributions of the datasets were checked for normality using Shapiro-Wilk tests. Quantile-quantile plots and histograms were evaluated as well if eventually outlier/extreme cases occurred. The data are presented as means, standard deviations (SD), and percentages to facilitate illustration of the presented change parameters. Graphs

of each variable for analyzed measuring tools were presented as means with 95% confidence intervals (95% CI) and median with quantiles. Responsiveness was calculated as the standard response mean (SRM), of which >0.8 is considered large, >0.5 is medium, and >0.3 is considered small (5). ANOVA with repeated measures and Friedman's non-parametric test were used to assess whether a certain scores changed statistically significantly over time. If the aforementioned test results were statistically significant, a post hoc analysis was performed in order to check the differences in parameter values between preoperation, 3-month, and 1-year time points.

RESULTS

The study sample consisted of 82 men with a mean age 61.2 ± 10.0 years and 13 women with average age of 66.8 ± 10.2 . Study group characteristics are presented in Table 1. The mean time of disease duration was 8.5 ± 8.1 years and was 6.9 ± 6.0 years in women and 8.7 ± 8.8 years in men. Almost half of the patients of study group were occupationally active (43 cases; 45.3%). A similar number (40 cases; 42.1%) of patients were of retirement age. Some of them were still employed in the current or other place of work. The remaining 12 patients (12.6%) were retired due to other illness.

The most numerous group of patients consisted of physical workers (35 cases; 36.8%). Another group in terms of numbers were white-collar workers with higher education (31 patients; 32.6%). The remaining group of 29 people (30.5%) consisted of patients with secondary technical education.

In 37 cases (38.9%), the process included the dominant hand and in 32 patients (33.6%) the non-dominant hand

Table 1. Study group characteristic

	Total
	n = 95, 121 hands
Men	n = 82, 105 hands
Women	n = 13, 16 hands
Age [years]	61.8 ± 10.2
Duration of disease [years]	8.5 ± 8.1
Work status	
occupationally active	n = 43 (45.3%)
retirement age	n = 40 (42.1%)
retire due to other illness	n = 12 (12.6%)

Table 2. Clinical grade of Dupuytren's contracture in patients before surgery

Clinical grade	Women (n = 16 hands)		Men (n = 105 hands)		Total (n = 121 hands)	
	R	L	R	L	R	L
I (0–45°)	3	2	11	11	14	13
	5		22		27	
II (46–90°)	1	2	14	15	15	17
	3		29		32	
III (91–135°)	0	3	20	15	20	18
	3		35		38	
IV (>135°)	2	3	13	6	15	9
	5		19		24	

was involved. In 26 individuals both hands were affected by DD. The most common finger affected by contracture was ring finger (93 cases; 97.9%) followed by the 5th finger (76 cases; 80.0%). In 65 patients, the disease process affected more than one part of the finger. Among these groups, the most often influenced by contracture were the 4th and 5th fingers (31 cases; 32.6%) and the 3rd, 4th and 5th fingers (17 cases; 17.9%). Clinical grade distributions of patients are presented in Table 2, and the most frequent was III.

The mean value of the total loss of finger extension before surgery was $144.1^\circ \pm 99.6^\circ$; At three months after surgery it had decreased to $14.3^\circ \pm 58.0^\circ$ and after one year it was $19.3^\circ \pm 34.7^\circ$ (Fig. 2). The results of pre- and postoperative outcomes of hand-used questionnaires are presented in Table 3 and Fig. 3.

Follow-up evaluations showed statistically significant improvements in the original results after three months for HFS and DASH

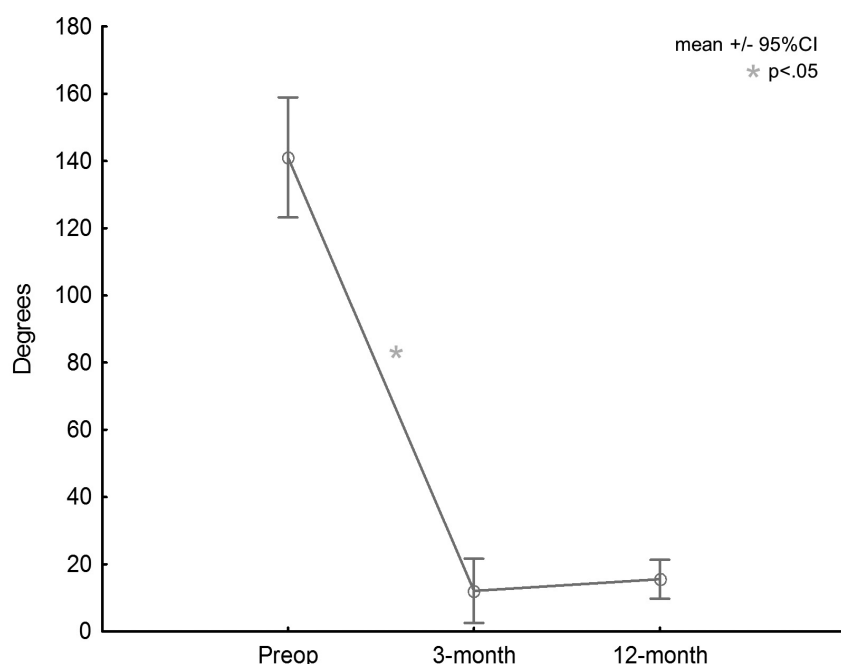


Fig. 2. Changes of the total loss of extension of patients with Dupuytren's contracture undergoing palmar fasciectomy.

Table 3. Outcomes for all questionnaires of patients with Dupuytren's disease undergoing palmar fasciectomy

	Preoperative	3-month	12-month
PEM	28.1 (10.0–45.0)	15.0 (8.3–31.7)	7.5 (0.0–5.0)±*
SRM		0.32	1.11
HFS	30.0 (25.0–34.0)	25.0 (25.0–28.0)†	25.0 (25.0–26.0)*
SRM		0.73	0.79
DASH	6.7 (2.5–11.7)	1.7 (0.0–5.0)†	0.8 (0.0–3.3)±*
SRM		0.61	0.7
Goniometer [degrees]	141.1° (99.2)	12.1° (53.2)†	15.5° (32.2)*

DASH – Disabilities of the Arm, Shoulder, and Hand questionnaire;
PEM – Patient Evaluation Measure;

HFS – Hand Function Score;

SRM – standard response mean, where of .2 is considered mild, 0.5 is medium, and 0.8 is strong

† Repeated-measures analysis of variance evaluating the 3-month time point score compared with the preoperative score, $P < 0.05$

* Repeated-measures analysis of variance evaluating the 12-month time point score compared with the preoperative score, $P < 0.05$.

± Repeated-measures analysis of variance evaluating the 12-month time point score compared with the 3-month score postoperatively, $P < 0.05$

Table 4. Results of preoperative questionnaires outcomes depending on clinical grade of Dupuytren's contracture

Clinical grade	I (0–45°)	II (46–90°)	III (9–135°)	IV (>135°)
PEM*	11.7 (5.0–51.7)	40.8 (20.8–55.0)	25.8 (13.3–38.3)	18.3 (6.7–32.5)
HFS†	25.0 (25.0–30.0)	31.0 (27.0–33.0)	33.0 (28.0–36.0)	30.5 (27.0–36.5)
DASH	2.5 (0.0–10.0)	6.7 (3.3–12.5)	7.5 (5.0–11.7)	7.5 (3.3–15.0)

DASH – Disabilities of the Arm, Shoulder, and Hand questionnaire;

PEM – Patient Evaluation Measure; HFS – Hand Function Score

† multiple comparison - $P < 0.05$ between grades: I–III

± multiple comparison - $P < 0.05$ between grades: I–III, I–IV

* multiple comparison - $P < 0.05$ between grades: I–II, II–IV;

and for all forms after twelve months. Only the DASH score significantly changed between three and 12 months. Effect size, calculated as SRM, was used to compare questionnaires after palmar fasciectomy (Table 3). PEM responsiveness was considered small and strong for three and 12 months, respectively. However, responsiveness for HFS and DASH were considered medium for each interval.

Results of preoperative questionnaires outcomes depending on clinical grade of DD disease were significantly different in the PEM questionnaire between grades I–II and II–IV; HFS between grades I–III and DASH between grades I–III and I–IV (Table 4).

DISCUSSION

The present study demonstrated that DASH, HFS, and PEM are valuable tools for assessing recovery after palmar fasciectomy for patients with DD. Moreover, SRM was considered the highest for PEM. Only DASH could indicate differences between disease severity.

DD etiology is not yet known (21, 27, 29). It is believed that a genetic factor in the form of an autosomal dominant gene plays a large role in its development of different penetration, which would explain the frequent occurrence in the family, and it appears to be statistically more likely to occur in patients with diabetes, smokers, and in people who abuse alcohol (3, 7, 12, 13). It usually involves middle-aged and older men. Women are affected by the disease 3–15 times less than men (5, 19, 21, 27, 29). In our study sample, the most frequently contractures involved fingers IV and V, which is consistent with reports of other authors (4, 19).

It draws attention to the significant degree of severity of the disease in the study group. Of the 121 hands that

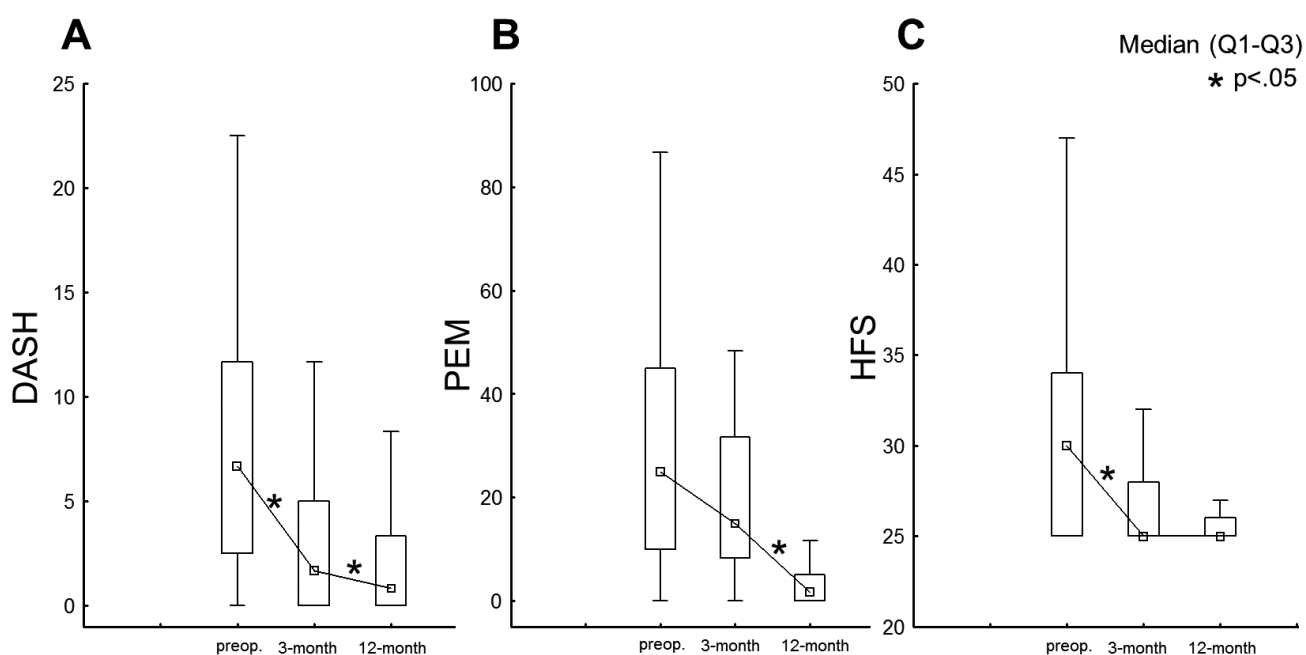


Fig. 3. Changes of (A) Disabilities of the Arm, Shoulder, and Hand questionnaire (DASH), (B) Patient Evaluation Measure (PEM), (C) Hand Function Score (HFS) of patients with Dupuytren's contracture undergoing palmar fasciectomy.

underwent surgery, 62 were covered by the contraction of grade III or IV (51%). Given the fact that in patients with bilateral DD, the first hand that underwent surgery had a contraction of greater advancement, while the other 26 operated hands showed less contracture level. Not all patients decided to have surgery on the other hand. Only in the Karabeg's study patients reported for treatment in the early stages of the disease (18). Similar to other authors' studies, the average time from the appearance of the first symptoms to the time of receiving treatment was 6–10 years (13, 21, 24). Such a long period of time is due to the fact that the escalating contracture lasts for years and allows for some adaptation of patients to the different circumstances of hand function. Moreover, the absence of any hand pain and apprehension about surgical treatment leads patients to delay this decision for years (13, 21). Hence, when patients decide to undergo surgery a considerable degree of contracture of the fingers clearly makes it difficult for them to perform certain daily activities such as washing, wearing gloves or inserting a hand into their pockets in addition to professional activities that require the implementation of a strong full palmar grip when moving large, heavy objects or the use of certain tools (style shovel, pick, ax, as well as various handles) with full use of IV and V of the parts of the hand. It draws attention to the fact that some patients reported to performing their duties without the use of mandatory protective gloves. After inserting gloves, fingers IV and/or V sockets remained "empty", which made it difficult to manipulate the hand during work and increased the risk of glove's being caught in the gears of the machine or the blade of the saw. When a disease process affects IV finger it practically ruled out a gripping action of finger V, because while embracing larger and heavier items finger IV became a disturbed finger.

Much less common contracture concerned the thumb (two patients), which was caused by hypertrophy and shrinking band palmar fascia in the I interdigital space decreased ability to perform a full, strong spherical grip due to the limited range of motion in I metacarpal joint (adduction and opposition of thumb) (23).

In our view, disabling of the function of the "disturbing" finger IV and/or V during full palmar grip, significantly reduced the strength of the grip and also forced the patient into a ulnar-direction in the radial-wrist joint, which that changed the vector of the applied force. IV and V parts of hand are the III hand grip zone (ulnar). The movement in the carpometacarpal joint at this zone along with the movements of the metacarpophalangeal joints and interphalangeal joints of fingers IV and V appears to make it possible to significantly increase the force used in performing full palmar grips (17).

Unfortunately, we had not evaluated patients' grip strength before surgery, making it impossible to assess the possible loss of power due to lack of use of finger IV and/or V for advanced DD.

To evaluate the function of the hand before and after surgical treatment of DD questionnaires were used: 1) DASH, 2) HFS, and 3) PEM. The most commonly used questionnaire for this purpose is the DASH questionnaire. The median result of our study was 6.7 points (2.5–11.7), which is slightly lower in comparison with the observations of other authors (10, 11, 33). It shows the impact of contracture on the function of the hand. In our opinion, it is not the best available tool to evaluate function of the hand. It concerns the entire upper limb along with a shoulder that may affect the assessment function of the hand. Similar conclusions were made by other authors (16, 25). Our study did not demonstrate a clear statistical relationship between the severity of DD and the result of the HFS and PEM questionnaire before surgery. Such dependence demonstrated while research using questionnaire DASH. The average value of points obtained with PEM was 30.7 points, which is comparable to the result given by Dias' and Braybrooke's (8).

All three questionnaires showed a significant improvement of subjective assessment of hand function and quality of life of patients undergoing surgery. This is consistent with findings of other authors (9, 26, 28). Wehri et al. has shown that the briefMHQ is an accurate and time-saving tool to evaluate patients with Dupuytren contracture and the effect of a corresponding treatment with the standard response mean equals 0.9 (injection 1.1; surgery 0.5) (32). In the assessment of the study aims, using a goniometer demonstrated a significant reduction in the deficit extension of the fingers and thereby increase the scope of their active motion (Total Active Motion). After a period of necessary rehabilitation, patients were able to grasp large items with all of their fingers, and grip strength, in their opinion, gradually returned to force of the hand before the operation. On the other hand, two professional musicians (keyboards and violin) confirmed significant postoperative improvement in hand function, which in their case testified to both improved range of motion in the fingers and improvement in the precise movements.

CONCLUSIONS

Reducing the range of motion of the fingers in the disease DD cause deterioration of the function of hands. In our opinion, the doctors examining patients at certain work positions during the physical examination should pay closer attention to patients' hands, and after finding advanced contracture of the fingers, should refer them to a specialist for consultation. DASH, PEM and HFS are valuable tools to monitor the hand function of patients with DD after surgery. PEM was the most responsive after one year; however, the DASH and HFS scores significantly changed after three months. Used questionnaires have revealed preoperative hand function deficiency and significant increase of this function in follow-up examinations.

References

1. American Society of Hand Therapists. Clinical assessment recommendations. 2nd ed., The Society, Chicago, 1992.
2. Ball C, Pratt AL, Nanchahal J. Optimal functional outcome measures for assessing treatment for Dupuytren's disease: a systematic review and recommendations for future practice. *BMC Musculoskelet Disord*. 2013;14:131.
3. Benson LS, Williams CS, Kahle M. Dupuytren's contracture. *J Am Acad Orthop Surg*. 1998;6:24–35.
4. Brenner P, Krause-Bergmann A, Van VH. [Dupuytren contracture in North Germany. Epidemiological study of 500 cases]. *Unfallchirurg*. 2001;104:303–311.
5. Citron N, Hearnden A. Skin tension in the aetiology of Dupuytren's disease; a prospective trial. *J Hand Surg Br*. 2003;28:528–530.
6. Cohen J. Statistical power analysis for the behavioral sciences. L. Erlbaum Associates, New York, 1988.
7. Corrado A, Cantatore FP. Dupuytren's disease. State of the art and therapeutic perspectives. *Reumatismo*. 2011;59:118–128.
8. Dias J, Braybrooke J. Dupuytren's contracture: an audit of the outcomes of surgery. *J Hand Surg J Br*. 2006;31:514–521.
9. Draviraj KP, Chakrabarti I. Functional outcome after surgery for Dupuytren's contracture: a prospective study. *J Hand Surg Am*. 2004;29:804–808.
10. Engstrand C, Krevers B, Kvist J. Factors affecting functional recovery after surgery and hand therapy in patients with Dupuytren's disease. *J Hand Ther* 2015;28:255–259.
11. Forget NJ, Jerosch-Herold C, Shepstone L, Higgins J. Psychometric evaluation of the Disabilities of the Arm, Shoulder and Hand (DASH) with Dupuytren's contracture: validity evidence using Rasch modeling. *BMC Musculoskelet Disord*. 2014;15:361.
12. Geoghegan JM, Forbes J, Clark DI, Smith C, Hubbard R. Dupuytren's disease risk factors. *J Hand Surg Br*. 2004;29:423–426.
13. Gudmundsson KG, Arngrímsson R, Jónsson T. Dupuytren's disease, alcohol consumption and alcoholism. *Scand J Prim Health Care*. 2001;19:186–190.
14. Hindocha S, Stanley JK, Watson JS, Bayat A. Revised Tubiana's staging system for assessment of disease severity in Dupuytren's disease—preliminary clinical findings. *Hand (N Y)* 2008;3:80–86.
15. Hudak PL, Amadio PC, Bombardier C. Development of an upper extremity outcome measure: the DASH (disabilities of the arm, shoulder and hand) [corrected]. The Upper Extremity Collaborative Group (UECG). *Am J Ind Med*. 1996;29:602–608.
16. Jerosch-Herold C, Shepstone L, Chojnowski A, Larson D. Severity of contracture and self-reported disability in patients with Dupuytren's contracture referred for surgery. *J Hand Ther*. 2011;24:6–11.
17. Kapandji AI, Tubiana R. Physiologie articulaire. 1, Epaule, coude, prono-supination, poignet, main schemas commentés de mécanique humaine : 805 dessins originaux de l'auteur. Maloine, Paris, 2005.
18. Karabeg R, Jakirlic M, Arslanagic S, Dujso V, Obradovic G, Zeco A. Results of surgery treatment of Dupuytren's contracture in 115 patients. *Med Arch*. 2012;66:329–331.
19. Kobus K, Wójcicki P, Dydymski T, Wegrzyn M, Hamlawi F. Evaluation of treatment results of patients with Dupuytren's contracture—our clinical experience. *Ortop Traumatol Rehabil*. 2007;9:134–140.
20. Larson D, Jerosch-Herold C. Clinical effectiveness of post-operative splinting after surgical release of Dupuytren's contracture: a systematic review. *BMC Musculoskelet Disord*. 2008;9:104.
21. Loos B, Puschkin V, Horch RE. 50 years experience with Dupuytren's contracture in the Erlangen University Hospital—a retrospective analysis of 2919 operated hands from 1956 to 2006. *BMC Musculoskelet Disord*. 2007;8:60.
22. Macey AC, Burke FD, Abbott K, Barton NJ, Bradbury E, Bradley A, Bradley MJ, Brady O, Burt A, Brown P. Outcomes of hand surgery. British Society for Surgery of the Hand. *J Hand Surg Br*. 1995;20:841–855.
23. Marcuzzi A, Ruggiero L, Chirila L, Gilardi R, Landi A. Dupuytren's disease of the radial side of the hand. *Eur J Plast Surg*. 2009;32:275–281.
24. Reilly RM, Stern PJ, Goldfarb CA. A retrospective review of the management of Dupuytren's nodules. *J Hand Surg Am*. 2005;30:1014–1018.
25. Rodrigues J, Zhang W, Scammell B, Russell P, Chakrabarti I, Fulilove S, Davidson D, Davis T. Validity of the Disabilities of the Arm, Shoulder and Hand patient-reported outcome measure (DASH) and the Quickdash when used in Dupuytren's disease. *J Hand Surg Eur Vol* 2016;41:589–599.
26. Sinha R, Cresswell TR, Mason R, Chakrabarti I. Functional benefit of Dupuytren's surgery. *J Hand Surg Br*. 2002;27:378–381.
27. Slattery D. Review: Dupuytren's disease in Asia and the migration theory of Dupuytren's disease. *ANZ J Surg*. 2010;80:495–499.
28. Thoma A, Kaur MN, Ignacy TA, Levis C, Martin S, Duku E, Haines T. Health-related quality of life in patients undergoing palmar fasciectomy for Dupuytren's disease. *Plast Reconstr Surg*. 2014;133:1411–1419.
29. Thomas A, Bayat A. The emerging role of Clostridium histolyticum collagenase in the treatment of Dupuytren disease. *Ther Clin Risk Manag*. 2010;6:557–572.
30. Tubiana R. Dupuytren's disease of the radial side of the hand. *Hand Clin*. 1999;15:149–159.
31. Watts A, Greenstock M, Cole R. Outcome following the rehabilitation of hand trauma patients. The importance of a subjective functional assessment. *J Hand Surg J Br*. 1998;23:485–489.
32. Wehrli M, Hensler S, Schindele S, Herren DB, Marks M. Measurement properties of the Brief Michigan Hand Outcomes Questionnaire in patients with Dupuytren contracture. *J Hand Surg Am*. 2016;41:896–902.
33. Zyluk A, Piotuch B. [Use of questionnaires in outcome measurement in hand surgery]. *Chir Narządów Ruchu Ortop Pol*. 2009;74:193–201.

Corresponding author:

Mateusz Koziej, MD, PhD
Department of Anatomy
Jagiellonian University Medical College
Kopernika 12
31-034 Kraków, Poland
E-mail: mateusz.koziej@gmail.com