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Severity of Contracture and Self-reported Disability in Patients with Dupuytren's Contracture Referred for Surgery

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ABSTRACT: The purpose of the study was to explore the relationship between preoperative flexion contracture (FC) and self-reported disability in patients undergoing surgical release by fasciectomy or dermofasciectomy. The study design used was a prospective observational study: Dupuytren's disease (DD) is a fibroproliferative disorder of the palmar fascia and may lead to functional deficits requiring surgical intervention. Outcomes are usually reported using digital range of motion although recent studies have also included patient-rated outcome measures with the extensively validated Disabilities of the Arm, Shoulder, and Hand (DASH) Questionnaire commonly used. One hundred fifty-four patients consecutively enrolled in a prospective randomized trial were assessed before surgery for active range of movement using goniometry and self-reported functioning using DASH questionnaire. The small finger was affected in 69% of patients with a mean FC of 77.8 degrees (standard deviation = 43.5°). The mean DASH score was 16 points (range, 0–62). The correlation between severity of FC in all four fingers and DASH was weak ($r = 0.264$, $p = 0.001$). At individual digital level, the correlation between FC and DASH was weak in the index ($r = 0.26$), middle ($r = 0.28$), and ring ($r = 0.21$) fingers but almost absent in the small finger ($r = 0.07$). These results show that the relationship between severity of FC and functional disability measured by the DASH questionnaire appear to be very weak or even absent. Level of evidence: Level III prospective cohort study.

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Dupuytren's disease (DD) is a fibroproliferative disorder resulting in the formation of nodules and cords in the palmar fascia of hand. These nodules and cords are contractile and often result in one or more fingers becoming flexed into the palm with associated psychosocial and functional deficits for the patient.[1] It is a common disease with a recent review of prevalence rates reporting a mean of 7% and 14% for women and men, respectively, at the age of 45–54 years increasing to 23% and 34% over the age of 75 years.[2] The standard intervention for DD is surgical excision of the diseased tissue to release the contracted finger[3]; however, there is debate regarding whether tissue excision should be minimal to ensure a quick recovery[4] or radical to reduce the risk of recurrence.[5] The high prevalence of DD together with the impact of surgical treatment on the patient and society warrant a greater understanding of the functional consequences of DD.

The increasing trend in using patient-rated outcome measures is reflected in recently published studies investigating DD. They have included patient-rated activity and participation questionnaires with the Disabilities of the Arm, Shoulder, and Hand (DASH) Outcome Measure[6] being most commonly used.[7–13] The DASH is a region-specific functional outcome measure that has been extensively investigated for validity and reliability with patients with upper limb conditions[14] and has demonstrated acceptable responsiveness with a wide range of hand conditions including patients undergoing Dupuytren's surgery.[15] In an attempt to understand the relationship between DD and function, several studies have examined the correlation between DASH score and either total active motion

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(TAM) or flexion contracture (FC) of the affected digits.[7–9,13]

Herweijer et al.[7] studied postoperative hand therapy referral patterns in 46 patients with DD. Outcome measures included range of motion and DASH collected preoperatively and after surgery. Over half of the patients were being operated for recurrent disease and had a mean age of 62 years. They report outcome as TAM, calculated as the sum of active metacarpophalangeal (MCP), proximal interphalangeal (PIP), and distal interphalangeal (DIP) joint flexion minus lack of active extension in the same joints. Mean preoperative TAM was 184 degrees (standard deviation [SD] = 49) and the mean preoperative DASH score was 12.1 (SD = 12.9) indicating a low level of disability.

Three further studies have examined the relationship between range of motion and DASH preoperatively. Engstrand et al.[8] assessed 60 patients undergoing surgery. The mean DASH score was 17 points (range, 7–28). The degree of FC was measured by adding MCP, PIP, and DIP extension. Sixty patients (81 digits) were included with a mean FC of 105 degrees (SD = 37). They reported no significant correlation between DASH and FC. Degreef et al.[9] assessed 80 patients before surgery (mean age 60 years). The mean DASH score was 15 points and mean FC in the MCP joint was 53 degrees and in the PIP joint 60 degrees. The authors do not report the actual correlation coefficient but state that no significant correlation was found between DASH and FC.

Zyluk and Jagielski[13] assessed 74 patients undergoing fasciectomy. Median FC preoperatively was 80 degrees (range, 0–370) and median DASH score was 54 points (range, 30–103). They found a weak correlation between total active extension (TAE) and DASH score, which was not statistically significant (Spearman correlation $r = 0.26$, $p > 0.05$).

In this article, we describe the level of impairment and patient-rated disability in a large cohort of patients undergoing surgery who were enrolled in a multicenter randomized controlled trial. The aim was to examine the relationship between contracture severity of individual digits, and the whole hand and self-reported disability.

PATIENTS AND METHODS

The preoperative data in this cohort of 154 patients undergoing surgical release of Dupuytren's contracture were collected as part of a multicenter, pragmatic, randomized controlled trial of postoperative night splinting.[16] The trial received multicenter Ethics Committee approval and Research Governance approval at each of the five participating sites. A total of 16 surgeons at five centers in East Anglia were involved in identifying eligible patients. Patients who presented to an operating surgeon with a Dupuytren's contracture affecting one or more digits of the hand and requiring fasciectomy or dermofasciectomy were informed about the study and the trial coordinator notified of their name and address. Two hundred eighteen patients were referred as eligible and invited by mail to take part in the trial. One hundred seventy-two (79%) patients returned written informed consent forms. Eighteen patients were excluded from the trial before randomization for a variety of reasons, including death (1), delayed or canceled surgery (8), unable to contact (1), already had surgery (6), not referred to hand therapy/not randomized (1), and one patient withdrew.

A total of 154 patients were thus enrolled into the trial, had surgery and were subsequently randomized. The baseline data for 154 patients are presented here. Assessments of range of motion were taken by two research associates who visited patients in their own homes. This included active range of individual finger joint flexion and extension assessed with a Rolyan (Homecraft, Sutton-in-Ashfield, UK) finger goniometer and following a standardized protocol. Both researchers were not qualified hand therapists but received extensive training in the use of goniometry by a qualified occupational therapist before the study including undertaking comparative assessments. For the purpose of this study, FC was defined as the summed active extension deficit of DIP, PIP, and MCP joints. TAM was defined as the sum of MCP, PIP, and DIP flexion minus extension deficit. Patients were instructed to straighten out each joint as far as they could and the goniometer placed dorsally before reading the degrees of motion to the nearest 2 degrees. Any hyperextension values were set to zero. Patients were sent the DASH questionnaire by mail to be completed before the researchers' visit. The DASH is a standardized, patient-rated, region-specific measure of symptoms and disability (scores 0–100 with higher score indicating greater disability).

Data were entered into an Access database. Statistical analysis was carried out using SAS (SAS v9.1, SAS Institute Inc., Cary, NC). The relationship between the DASH score and range of motion was quantified using Pearson's correlation coefficient and a test of zero correlation carried out.

RESULTS

Demographic and baseline outcome variables for the cohort are presented in Tables 1 and 2. The most common presentation was contracture of the MCP and PIP joints of the small finger, followed by the ring finger. The mean FC for each digit was greatest in the small finger with an ulnar to radial decrease. TAM was greatest in the radial digits and decreased in a radial to ulnar direction.

TABLE 1. **Demographic Characteristics of Sample (Based on $n = 154$ Unless Otherwise Stated)**

Number of patients	154
Mean age (standard deviation [SD]/range) in years	67.4 (9.6/36 to 89)
Ratio of male to female	120 (78%): 34 (22%)
Ratio of patients working or seeking work to retired	53 (34.4%): 101 (65.6%)
Number of patients being operated on dominant hand	84 (55%)
Number of patients right handed	133 (86.4%)
Number of patients who had previous surgery for DC	23 (15%)
Operated digit	
Index	7 (4.5%)
Middle	24 (15.6%)
Ring	61 (39.6%)
Small	106 (68.8%)
Ratio of single to multiple fingers (two or more) operated ($n = 153$)*	116 (76%): 37 (34%)
Mean Disabilities of the Arm, Shoulder, and Hand score (SD/range)	15.87 (14.2/0 to 62.1)

DC = Dupuytren's contracture.
*Missing data for one patient who withdrew.

The correlation coefficients between self-reported disability (DASH score) and active range of motion measured by goniometry are presented for each digit and the whole hand in Table 3. There was a weak, statistically significant correlation between FC for the whole hand (adding all digits together irrespective of how many or which are affected) and DASH score ($r = 0.264$, $p < 0.001$). When examining the correlation between FC and DASH at the single digit level, the strength remained similarly weak in index, middle, and ring fingers but become almost absent in the small finger ($r = 0.07$, $p = 0.41$).

When examining the correlation between DASH score and TAM (a higher TAM indicates greater mobility), a statistically significant weak negative correlation ($r = -0.370$, $p < 0.0001$) was found for the whole hand. At single digit level, the strength of the correlation decreased from a radial to ulnar direction.

DISCUSSION

Dupuytren's disease often progresses to a stage where one or more digits in both hands are affected by severe contractures, which in turn interfere with everyday activities and result in functional disability.[17] Although patients with the disease may adapt to these functional limitations initially, eventually patients seek medical advice with surgery being the only effective intervention for restoring function.[18]

In this cohort of patients referred for surgery, the typical presentation was a male patient, aged 60 years or over with a contracture of the MCP and PIP of the small and ring fingers. Mean FC at the PIP joint of the ring and small fingers was 17.6 and 37.4 degrees, respectively, and the mean DASH score was 15 points indicating low disability. However, the range in the preoperative demographic and outcome variables also highlights that although some patients sought surgical treatment with much milder contracture and self-reported disability others waited until contractures and functional deficits were severe. The decision to proceed to surgery is often made on a case-by-case basis[17] and an individual patient's decision to have surgery depends on many factors, such as the appearance of the hand or social embarrassment (shaking hands) and which are not be captured by current outcome measures.

If increasing functional disability is an important factor in patients seeking a surgical opinion, it seems reasonable also to hypothesize that there would be moderate correlation between the severity of the contracture and self-reported disability as assessed by the DASH score. Several other studies have explored this with only one study[13] finding a weak but statistically significant correlation between preoperative TAE and DASH score ($r = 0.26$, $p = 0.01$), whereas Degreef et al.[9] and Engstrand et al.[8] state that no significant correlations could be found, although the actual coefficients and p-values were

TABLE 2. **Mean and Standard Deviation of Flexion Contracture (FC), Total Active Flexion (TAF), and Total Active Motion (TAM) by Digit Measured with Goniometry**

Digit	*FC*	*PIP Joint Contracture*	*MCP Joint Contracture*	*TAF*	*TAM*
Index ($n = 154$)	35.5 (20.9)	11.3 (13.9)	21.6 (14.6)	219.5 (20.4)	184 (29.2)
Middle ($n = 153$)*	39.1 (22.8)	10.2 (13.8)	27.4 (16.6)	234 (20.3)	194.9 (31.2)
Ring ($n = 153$)*	51 (37.2)	17.6 (23.6)	30.4 (19.0)	224.2 (22)	173.3 (42.5)
Small ($n = 152$)*	77.8 (43.5)	37.4 (29.5)	32.1 (27.8)	222.2 (20.7)	144.4 (49.4)

FC = DIP, PIP, and MCP extension loss (full extension = 0); TAF = DIP, PIP, and MCP flexion added; TAM = TAF minus TAE.
*Missing values due to one patient with a pre-existing traumatic amputation proximal to the DIP joint of his long and ring fingers and two patients with an amputation of the small finger.

TABLE 3. **Pearson Correlation Coefficients (p-Value) between Flexion Contracture (FC), Total Active Flexion (TAF), Total Active Motion (TAM), and Disabilities of the Arm, Shoulder, and Hand (DASH) Score**

Digit	*DASH with FC*	*DASH with TAF*	*DASH with TAM*
Index	0.26 ($p = 0.013$)	−0.27 ($p < 0.001$)	−0.373 ($p < 0.0001$)
Middle	0.28 ($p < 0.001$)	−0.14 ($p = 0.093$)	−0.291 ($p < 0.001$)
Ring	0.21 ($p = 0.010$)	−0.24 ($p = 0.003$)	−0.308 ($p < 0.0001$)
Small	0.07 ($p = 0.410$)	−0.24 ($p = 0.003$)	−0.161 ($p = 0.048$)
Hand (all four digits)	0.264 ($p = 0.001$)	−0.26 ($p = 0.001$)	−0.370 ($p < 0.0001$)

not reported in their papers. It is of note that in Zyluk's study, patients also had a much higher median DASH score of 54 points compared with the other studies where mean or median values were ≤17 points including our study. Zyluk and Jagielski,[13] Engstrand et al.,[8] and Degreef et al.[9] report that they based their correlation coefficients on the affected digits only, whereas in our study we measured all four fingers irrespective of which was operated on or affected. When taking the summed FC for all digits, the correlation coefficient is weak and statistically significant ($r = 0.264$); however, when examining the correlation at individual digit level it is surprising that in the small finger, which was the affected digit in 69% of patients and had the worst degree of contracture, any correlation with DASH score is almost absent. One possible explanation is that the intention of the DASH is to determine how well a patient can perform functional activities regardless of how these are carried out, for example, assistive devices or compensatory strategies are not taken into account. Therefore, the DASH score may underestimate the actual functional impact of DD. Furthermore, it is a region-specific measure and not disease specific and difficulties commonly reported by patients with DD such as shaking hands, putting on gloves, applying face cream, and appearance-related concerns are not included in the DASH questionnaire. A further possible explanation of the much weaker correlation between the ulnar digits and the DASH score is that many tasks in the DASH questionnaire rely on tripod grip involving thumb and first two digits only (e.g., writing, turning a key) and that only when the radial digits are affected by contractures is this also reflected in a higher DASH score.

Our study concurs with previously published studies that have shown that the relationship between digital contracture and functional disability appears to be very weak or even absent. This is perhaps not surprising given that range of motion is a measure of body structure, whereas DASH and similar patient-rated questionnaires capture the domains of activity limitation and participation restrictions according to the International Classification of Functioning, Disability and Health.[19] We would argue therefore that measures of impairment such as severity of contracture and self-reported disability need to be included in the assessment of outcome of patients undergoing surgical treatment for DD. The question of whether the DASH is the most sensitive and relevant patient-rated outcome measure in this patient group remains unanswered and further work is needed to compare it to other existing patient-rated outcome measures or to develop a new disease-specific measure.

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REFERENCES

1. Pratt A, Byrne G. The lived experience of Dupuytren's disease of the hand. J Clin Nurs. 2009;18:1793–802.
2. HIndocha S, McGrougther D, Bayat A. Epidemiological evaluation of Dupuytren's disease: incidence and prevalence rates in relation to etiology. Hand. 2009;4:256–69.
3. Hurst L, Badalamente M. Non-operative treatment of Dupuytren's disease. Hand Clin. 1999;15:97–107.
4. Van Rijssen A, Werker P. Percutaneous needle fasciotomy in Dupuytren's disease. J Hand Surg [Br]. 2006;31B:498–501.
5. Hall PN, Fitzgerald A, Sterne GD, Logan AM. Skin replacement in Dupuytren's disease. J Hand Surg [Br]. 1997;22(2): 193–7.
6. Hudak P, Amadio P, Bombardier C, (UECG) TUECG. Development of an upper extremity outcome measure: the DASH (Disabilities of the Arm, Shoulder, and Hand). Am J Ind Med. 1996; 29:602–8.
7. Herweijer H, Dijkstra PU, Nicolai JP, Van der Sluis CK. Postoperative hand therapy in Dupuytren's disease. Disabil Rehabil. 2007;29(22):1736–41.
8. Engstrand C, Boren L, Liedberg GM. Evaluation of activity limitation and digital extension in Dupuytren's contracture three months after fasciectomy and hand therapy interventions. J Hand Ther. 2009;22(1):21–7.
9. Degreef I, Vererfve P-B, De Smet L. Effect of severity of Dupuytren contracture on disability. Scand J Plast Reconstr Surg Hand Surg. 2009;43(1):41–2.
10. Glassey N. A study of the effect of night extension splintage on post-fasciectomy Dupuytren's patients. Br J Hand Ther. 2001;6 (3):89–94.
11. Skoff HD. The surgical treatment of Dupuytren's contracture: a synthesis of techniques. Plast Reconstr Surg. 2004;113:540–4.

12. van Rijssen AL, Gerbrandy FSJ, Ter Linden H, Klip H, Werker PMN. A comparison of the direct outcomes of percutaneous needle fasciotomy and limited fasciectomy for Dupuytren's disease: a 6-week follow-up study. J Hand Surg [Am]. 2006; 31:717–25.
13. Zyluk A, Jagielski W. The effect of the severity of the Dupuytren's contracture on the function of the hand before and after surgery. J Hand Surg [Br]. 2007;32E:326–9.
14. Beaton DE, Katz JN, Fossel AH, Wright JG, Tarasuk V, Bombardier C. Measuring the whole or the parts? Validity, reliability, and responsiveness of the Disabilities of the Arm, Shoulder and Hand outcome measure in different regions of the upper extremity. J Hand Ther. 2001;14(2):128–46.
15. Gummesson C, Atroshi I, Ekdahl C. The Disabilities of the Arm, Shoulder and Hand (DASH) outcome questionnaire: longitudinal construct validity and measuring self-rated health change after surgery. BMC Musculoskelet Disord. 2003;4(11): 1–6.
16. Jerosch-Herold C, Shepstone L, Chojnowski AJ, Larson D. Splinting after contracture release for Dupuytren's contracture (SCoRD): protocol of a pragmatic, multi-centre, randomized controlled trial. BMC Musculoskelet Disord. 2008;9(6):1–5.
17. Bayat A, McGrouther DA. Management of Dupuytren's disease-clear advice for an elusive condition. Ann R Coll Surg Engl. 2006;88(1):3–8.
18. Sinha R, Cresswell TR, Mason R, Chakrabarti I. Functional benefit of Dupuytren's surgery. J Hand Surg [Br]. 2002;27(4): 378–81.
19. WHO. International Classification of Functioning, Disability and Health. Geneva: World Health Organisation, 2002.

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#1. This cohort study is based on
   a. a before and after study
   b. retrospective case reviews
   c. post treatment interviews of patients
   d. baseline data from randomized controlled trials

#2. The worst flexion contractures were seen in the
   a. ring finger
   b. middle finger
   c. little finger
   d. index finger

#3. Regarding the relationship between the DASH and flexion contractures, there was a
   a. weak correlation which was statistically significant
   b. strong correlation which was statistically significant
   c. strong correlation which was not statistically significant
   d. negative correlation which was statistically significant

#4. The authors concluded that patient outcomes in Dupuytrens should be assessed using
   a. severity of the flexion contractures only
   b. a patient-rated measure as well as severity of the flexion contractures
   c. the DASH and another patient-rated outcome measure
   d. ROM and grip strength testing

#5. All subjects underwent a surgical procedure
   a. false
   b. true

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