

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

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40.1 Introduction

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 (Pratt and Byrne 2009). 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 age 45–54 increasing to 23% and 34% over the age of 75 (Hindocha et al. 2009). The standard intervention for DD is surgical excision of the diseased tissue to release the contracted finger (Hurst and Badalamente 1999); however, there is debate regarding whether tissue excision should be minimal to ensure a quick recovery (van Rijssen and Werker 2006) or radical to reduce the risk of recurrence (Hall et al. 1997). The high prevalence of DD together with the impact of surgical treatment on the patient and society warrants 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 (Hudak et al. 1996) being most commonly used (Herweijer et al. 2007; Engstrand et al. 2009; Degreef et al. 2009; Glassey 2001; Skoff 2004; van Rijssen et al. 2006;

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Zyluk and Jagielski 2007). The DASH is a region-specific functional outcome measure that has been extensively investigated for validity and reliability with patients with upper limb conditions (Beaton et al. 2001) and has demonstrated acceptable responsiveness with a wide range of hand conditions including patients undergoing Dupuytren's surgery (Gummesson et al. 2003). In an attempt to understand the relationship between DD and function, several studies have examined the correlation between DASH score and either total active range of motion (TAM) or flexion contracture of the affected digits (Zyluk and Jagielski 2007; Herweijer et al. 2007; Engstrand et al. 2009; Degreef et al. 2009).

Herweijer et al. (2007) studied post-operative hand therapy referral patterns in 46 patients with DD. Outcome measures included range of motion and DASH collected pre-operatively 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 total active motion (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 pre-operative TAM was 184° ($SD=49$), and the mean pre-operative 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 pre-operatively. Engstrand et al. (2009) assessed 60 patients undergoing surgery. The mean DASH score was 17 points (range 7–28). The degree of flexion contracture was measured by adding MCP, PIP and DIP extension. Sixty patients (81 digits) were included with a mean flexion contracture of 105° ($SD=37$). They reported no significant correlation between DASH and flexion contracture. Degreef et al. (2009) assessed 80 patients before surgery (mean age 60 years). The mean DASH score was 15 points, and mean flexion contracture in the MCP joint was 53° and in the PIP joint 60° . The authors do not report the actual correlation coefficient but state that no significant correlation was found between DASH and flexion contracture.

Zyluk and Jagielski (2007) assessed 74 patients undergoing fasciectomy. Median flexion contracture pre-operatively was 80° (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 chapter, we describe the level of impairment and patient-rated disability in a large cohort of patients undergoing surgery who were enrolled in a multi-centre randomised controlled trial. The aim was to examine the relationship between contracture severity of individual digits as well as the whole hand and self-reported disability.

40.2 Patients and Methods

The pre-operative data in this cohort of 154 patients undergoing surgical release of Dupuytren's contracture were collected as part of a multi-centre, pragmatic, randomised controlled trial of post-operative night splinting (Jerosch-Herold et al. 2008). The trial received multi-centre Ethics Committee approval and Research Governance approval at each of the five participating sites. A total of 16 surgeons at 5 centres 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 prior to randomisation for a variety of reasons, including death (1), delayed or cancelled surgery (8), unable to contact (1), already had surgery (6) and not referred to hand therapy/not randomised (1), and one patient withdrew.

A total of 154 patients were thus enrolled into the trial, had surgery and were subsequently randomised. 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 standardised protocol. Both researchers were not qualified hand therapists but received extensive training in the use of goniometry by a qualified occupational therapist prior to the study including undertaking comparative assessments. For the purpose of this study, flexion contracture (FC) was defined as the summed active extension deficit of DIP, PIP and MCP joints. Total active motion (TAM) was defined as the sum of MCP, PIP and DIP flexion minus

Table 40.1 Demographic characteristics of sample (based on $n = 154$ unless otherwise stated)

Number of patients	154
Mean age (SD/range) in years	67.4 (9.6/36–89)
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 ($n = 153$) ^a	116 (76%):37 (34%)
Mean DASH score (SD/range)	15.87 (14.2/0–62.1)

^aMissing data for one patient who withdrew

Table 40.2 Mean and standard deviation of flexion contracture (FC), total active flexion (TAF) and total active motion (TAM) by digit measured with goniometry

	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 ($n = 153$) ^a	39.1 (22.8)	10.2 (13.8)	27.4 (16.6)	234 (20.3)	194.9 (31.2)
Ring ($n = 153$) ^a	51 (37.2)	17.6 (23.6)	30.4 (19.0)	224.2 (22)	173.3 (42.5)
Small ($n = 152$) ^a	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

^aMissing 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

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°. Any hyperextension values were set to zero. Patients were sent the Disabilities of the Arm, Shoulder and Hand (DASH) questionnaire by mail to be completed prior to the researchers' visit. The DASH is a standardised, 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, USA). 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.

40.3 Results

Demographic and baseline outcome variables for the cohort are presented in Tables 40.1 and 40.2. The most common presentation was contracture of the MCP and

PIP joints of the small finger, followed by the ring finger. The mean flexion contracture for each digit was greatest in the small finger with an ulnar to radial decrease. Total active motion (TAM) was greatest in the radial digits and decreased in a radial to ulnar direction.

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 40.3. There was a weak, statistically significant correlation between flexion contracture 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 flexion contracture and DASH at the single digit level, the strength remained similarly weak in index, middle and ring fingers but became 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.

Table 40.3 Pearson correlation coefficients (*p*-value) between flexion contracture (FC), total active flexion (TAF), total active motion (TAM) and DASH score

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

40.4 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 (Bayat and McGrouther 2006). Whilst 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 (Sinha et al. 2002).

In this cohort of patients referred for surgery, the typical presentation was a male patient, aged 60 or over with a contracture of the MCP and PIP of the small and ring fingers. Mean flexion contracture at the PIP joint of the ring and small fingers were 17.6° and 37.4°, respectively, and the mean DASH score was 15 points, indicating low disability. However, the range in the pre-operative demographic and outcome variables also highlights that whilst 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 (Bayat and McGrouther 2006), 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 hypothesise 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 (Zyluk and Jagielski 2007) finding a weak but statistically significant correlation between pre-operative total active extension and DASH score ($r=0.26$, $p=0.01$), whilst Degreef et al. (2009) and

Engstrand et al. (2009) state that no significant correlations could be found, although the actual coefficients and *p*-values were 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 to the other studies where mean or median values were ≤ 17 points including our study. Zyluk and Jagielski (2007), Engstrand et al. (2009) and Degreef et al. (2009) 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 flexion contracture 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, e.g. 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 like shaking hands, putting on gloves, applying face cream as well as 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 which 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 (ICF) (WHO 2002). We would argue therefore that measures of impairment such as severity of contracture as well as 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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