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The QuickDASH Score: A Patient-reported Outcome Measure for Dupuytren's Surgery

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ABSTRACT:
Study Design: Retrospective Cohort.
Introduction: There is currently no validated patient reported outcome measure (PROM) for Dupuytren's disease. We have performed a retrospective analysis of QuickDASH scores taken before and after surgery for Dupuytren's disease to assess the validity and responsiveness of the QuickDASH and evaluate its suitability to being a PROM for this condition.
Purpose of the Study: To determine the eligibility of the QuickDASH score as a Patient Reported Outcome Measure for Dupuytren's disease.
Methods: Patients were identified from the hand therapy database that had surgery performed between January 2006 and April 2008 who had documented pre- and post-operative QuickDASH scores.
Results: 69 patients were identified with complete datasets with a mean change in QuickDASH score of −7.14 ($p < 0.001$) and an improvement of extension deficit by 68.1 degrees ($p < 0.001$) at a mean 110 day follow-up. **The change in QuickDASH score did not correlate with the change in extension deficit**. The effect size was 0.545 and the standardised response mean was 0.580.
Conclusion: The QuickDASH is an acceptable PROM for Dupuytren's surgery with limitations. Further research is needed examining PROMs with this common condition.
Level of Evidence: n/a.
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Dupuytren's disease is a fibro-proliferative disorder of the palmar fascial complex causing nodular hypertrophy and contracture of the superficial palmer fascia resulting in extension deficit of the involved digits.[1] The results of corrective surgery can be assessed objectively by an observer in terms of the measured change in digit movement, including total active and passive range of movement, extension deficit and grip strength, and subjectively with patient-reported functional scores and outcome measures. These outcome measures need to be able to reflect a change in the disease state and health status of the patient after surgery due to improvements in anatomical or physiological function and participation in daily activities.[2] Such tools must be supported by robust data validating the responsiveness of the tool to clinical change in Dupuytren's disease.[3]

There is no disease-specific functional outcome score for Dupuytren's disease, therefore previous authors have used several other generic upper limb functional scores to quantify outcome. Because these outcome measures have not been designed specifically for Dupuytren's disease, the content validity of each must be questioned, because the components of the score may not adequately reflect the health status of this patient group who have unique functional problems in the absence of pain.[4] The scores previously used to assess pre- and postoperative hand function include the Disabilities of the Arm, Shoulder, and Hand score (DASH), Michigan Hand Outcomes questionnaire, and the Sollerman test. The DASH score was described by Hudak et al.[5] in 1996 as a generic evaluative outcome measure for patients with upper limb musculoskeletal conditions and subsequently the shorter QuickDASH has been published demonstrating comparable psychometric properties to the DASH score.[6] The DASH score examines multiple aspects of hand function and includes the patient's ability to perform multiple dextrous tasks,

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the interference with social and working activities, and sleep disturbance providing a global assessment of hand function in the context of disease.

PURPOSE OF STUDY

We aimed to investigate the validity and responsiveness of the QuickDASH as a patient-reported outcome measure (PROM) for Dupuytren's surgery. The correlation between presurgery QuickDASH score and presurgery total active range of motion was investigated to elicit the construct validity of the QuickDASH as a valid indicator of self-reported functional impairment in Dupuytren's disease. The responsiveness of the QuickDASH as an indicator of clinical change after Dupuytren's surgery was investigated by evaluating the significance of change in score from preoperative to postoperative timepoints and by calculating the effect size (ES) and the standardized response mean (SRM).

METHODS

We retrospectively identified 182 patients that had a fasciectomy or dermofascietomy performed between January 2006 and April 2008 from the hand therapy database. Of these patients, 113 did not have complete records of pre- and postoperative QuickDASH scores and range of movement data for the distal interphalangeal joint (DIPJ), proximal interphalangeal joint (PIPJ), and metacarpalphalangeal joint (MCPJ) and were therefore excluded leaving 69 patients. Range of movement measurements for each joint were made in clinic by an experienced hand therapist using a goniometer. These were then used to calculate the extension deficit, which was measured from 0 degrees. The total active range of movement was calculated by summing the range movement from extension to flexion of the MCPJ, PIPJ, and DIPJ of the middle, ring, and little fingers. Data were also collected for patient age, sex, handedness, grip strength, and time to discharge from hand therapy. These measurements and the QuickDASH scores were recorded at the final postoperative hand therapy attendance when hand function was assessed to be stable and the patient discharged.

Description of Surgical Technique and Rehabilitation Postoperatively

Fasciectomy was performed by one of four consultant orthopedic upper limb surgeons using a comparable surgical technique. Postoperatively patients were held in tension free extension using a custom-made static night splint prescribed until it was established that the digit was not contracting due to scarring. They were seen routinely 10 days after surgery for suture removal, mobilization, and application of the splint. Subsequent hand therapy visits were arranged to mobilize digits and observe for recurrence as necessary. Patients were discharged once hand function was stable and postoperative pain and swelling had settled.

ANALYSIS

Extension deficit, total range of movement, grip strength, and the QuickDASH scores were assumed to follow a Normal distribution. Between-group comparisons of mean scores were compared using a two-sample t-test, and the difference between the pre- and postoperative scores was compared using a paired t-test. The time to discharge was very right skewed and between-group comparisons of the median value were made using the two-sample Wilcoxon test. The strength of correlation between different measures was quantified using Pearson's correlation coefficient. The ES was calculated by dividing the difference in the means by the baseline standard deviation and the SRM was calculated by dividing the mean change in DASH score by standard deviation of the DASH change.[7]

RESULTS

Sixty-nine patients (57 male and 12 female) were included in the final analysis. The mean age of the patient population was 69.9 years (standard deviation [SD] 10.5 years) and 65 patients were right handed (94.2%). Fifty-eight patients had a primary fasciectomy, eight patients had primary dermofasciectomy, two patients had a revision fasciectomy, and one patient had a combination of procedures with fasciectomy performed on the little finger contracture and dermofasciecomy on the ring finger. Forty-six patients had single digit involvement, whereas 23 patients had multiple digit involvement (21 patients with two digits involved and two patients with three digits involved). The median time to discharge from hand therapy was 81 days (range, 14−313 days) (Tables 1(A) and 1(B)).

There was a statistically significant correlation between the preoperative QuickDASH score and the mean total range of movement ($r = -0.329$; $p = 0.006$) and a weak correlation of borderline significance with extension deficit ($r = 0.233$; $p < 0.054$) (Table 2).

The extension deficit improved, on average, by 68.1 degrees (SD 40.1 degrees, $p < 0.001$, paired t-test) after surgery from 109.4 degrees preoperatively to 41.3 degrees, and the mean QuickDASH score was 15.1 (SD 13.1) preoperatively improving by a mean of 7.1 points ($p < 0.001$, paired t-test) to 8.0 after surgery. The ES was 0.545 and the SRM was 0.580 (Tables 3(A) and 3(B)).

TABLE 1(A). **Patient Characteristics and Presurgery Information—DASH and Range of Movement**

Patient Group	*Sub-Group*	*Number*	*Extension Deficit in Degrees (SD*)*	*p-Value*	*Total ROM (SD)*	*p-Value*
All patients		69	109.4 (56.6)	—	633.4 (71.8)	—
Surgery	DF	8	117.3 (31.0)		633.6 (77.2)	
	F	58	105.2 (56.4)	0.559	637.2 (89.9)	0.893
	Unknown	3				
Dominant side	Yes	35	108.1 (50.1)		630.8 (94.5)	
	No	16	99.4 (60.5)	0.596	639.3 (120.9)	0.706
	Unknown	18				
Digits affected	Single	46	88.0 (34.4)		664.0 (45.6)	
	Multiple	23	152.2 (67.8)	<0.001	572.2 (76.2)	<0.001
Joint involvement	Lone MCP	7	63.1 (37.8)		703.0 (55.6)	
	Other	62	114.7 (56.2)	0.021	625.6 (69.4)	0.001

DF = Dermofasciectomy; F = Fasciectomy.
*The values displayed means and (in brackets) standard deviations (SD).

DISCUSSION

Patient outcome measures are increasingly important performance indicators allowing health service providers to quantify the effect of potentially costly treatments on health status and health-related quality of life.[8] They have the potential to influence the allocation of health care resources to treatments that are proven to improve health status, but such tools must be carefully selected to justify their selection ensuring they are valid and responsive for a specific disease.[9] Although clinical data, such as an improvement in joint range of motion, can be used to assess the outcome of surgery for Dupuytren's disease, health care policy emphasizes the need to assess the patient's perception of a disease intervention in terms of both improved quality of life and participation in society.[2]

A large number of PROMs have been developed in recent years including the Oxford Hip Score and the Oxford Knee Score, which are well established in orthopedic practice.[10,11] Multiple generic upper limb outcome measures have been used in previous studies to evaluate the outcome of surgical interventions for Dupuytren's disease but none of these have been validated for this purpose. There are several selection criteria that an outcome measure must satisfy to be accepted as an appropriate instrument for a specific disease, most importantly the tool should be responsive to change, reliable with internal consistency, and validated for that purpose.[4]

The DASH and QuickDASH have not previously been evaluated specifically for Dupuytren's disease. The QuickDASH was selected for evaluation because it is more acceptable to patients and more feasible to use in the clinical setting than the longer DASH.[12] Previous studies have used several other generic upper limb scores, including the Sollerman test and Michigan Hand Questionnaire. Although the Michigan Hand Questionnaire is a potential-proven alternative to the DASH or QuickDASH scores, it is long and cumbersome to use in a busy clinical setting.[13] The Sollerman test, described by Sollerman and Ejeskar in 1995, requires the patient to undertake 20 subtests or tasks,

TABLE 1(B). **Patient Characteristics and Presurgery Information—DASH and Grip Strength**

Patient Group	*Sub-Group*	*Number of Patients*	*QuickDASH (SD*)*	*p-Value*	*Grip Strength in Kilograms (SD)*	*p-Value*
All patients		69	15.1 (13.1)		35.6 (13.6) $n = 49$	
Surgery	DF	8	15.9 (10.8)		32.0 (16.2) $n = 4$	
	F	58	14.4 (13.5)	0.765	36.7 (13.4) $n = 42$	0.515
	Unknown	3	—	—	—	—
Dominant side affected	Yes	35	12.3 (12.4)		35.2 (15.2) $n = 29$	
	No	16	15.0 (11.4)	0.454	35.2 (12.6) $n = 13$	0.99
	Unknown	18	—	—	—	—

DF = Dermofasciectomy; F = Fasciectomy.
n = number of patients with grip strength data.
*The values displayed means and (in brackets) standard deviations (SD).

TABLE 2. **Correlations Presurgery—Pearson's Correlation Coefficient**

	QuickDASH Score	*Extension Deficit*	*Total ROM*
Extension deficit	$r = 0.233$	—	—
	$p = 0.054$	—	—
	$N = 69$	—	—
Total ROM	$r = -0.329$	$r = -0.882$	—
	$p = 0.006$	$p < 0.001$	—
	$N = 69$	$N = 69$	—
Grip strength	$r = -0.228$	$r = -0.163$	$r = 0.184$
	$p = 0.115$	$p = 0.262$	$p = 0.206$
	$N = 49$	$N = 49$	$N = 49$

r = Pearson's correlation coefficient; p = p-value; N = Number of patients.

which are each graded out of four according to whether the task is completed, the time to completion, and whether the patient uses the prescribed hand grip.[14,15] Six of the 20 subtests rely on pulp pinch, which are unlikely to relate to a disease predominantly affecting the ulnar hand-like Dupuytren's and indeed this is a clinician-rated, and not a patient-reported, outcome measure. Although a significant change in the Sollermans score was reported by Draviaraj 12 months after surgery, the absolute mean improvement in the score was only 5.5 points.[16] Sinha et al.[17] reported a correlation between preoperative total extension deficit and the Sollerman score in addition to a six-point increase in the mean Sollerman score from 71 to 76 postsurgery. The DASH score has been used previously by Zyluk and Jaglieski[18] to represent changes in upper limb function after subtotal fasciectomy for Dupuytren's disease. They demonstrated a statistically significant improvement in the DASH score from 54 to 32 after subtotal fasciectomy, but were unable to correlate preoperative extension deficit with DASH score and did not comment on the ES or the SRM-limiting comparisons that can be made to other studies investigating responsiveness.

Crucially, an outcome measure must be responsive to a change in health status. There are several ways of assessing the responsiveness of an outcome measure to change but there is no single agreed method for doing so. These should be able to demonstrate a statistically significant change of score between measurements made at different times and there should be a satisfactory reason to conclude that these changes are important to patients. The statistically significant correlation between the outcome measure and a measurable external criterion that reflects clinical change important to patients can be used to demonstrate responsiveness but other statistical techniques have been described. These include the ES, which measures the magnitude of health-status changes by dividing the mean change by the standard deviation of the mean, and the SRM, which takes into account the baseline variability of the change and is arguably more informative.[7]

In this study, we found a statistically significant change in the QuickDASH score from 15.1 before surgery to 8.0 afterward at a mean of 110 days follow-up, whereas the extension deficit improved significantly by 68.1 degrees (SD 40.1 degrees, $p < 0.001$). We did not look specifically at which joints contributed most to this clinical improvement though previous work by Coert et al.[19] emphasized that the PIPJ was the ''tricky'' joint, and severe PIPJ contracture was associated with reduced percentage gain of extension with corrective surgery.

The validity of the QuickDASH is supported by the significant correlation between preoperative QuickDASH score and the preoperative total range of movement. The responsiveness is supported through a statistically significant change in QuickDASH score and an acceptable SRM. The ES of 0.545 and the SRM of 0.580 suggest a medium-sized change and an acceptable responsiveness for a PROM in line with the SRM of 0.55 previously reported by Herweijer and collegues.[3,14] A key criticism of such instruments is however that they directly refer to the magnitude of the size of health-status change and hence a minor intervention will by definition have a smaller ES and SRM regardless of the measured effect on patients' health status and the instrument used to quantify it. ES and SRM

TABLE 3(A). **Changes Presurgery to Postsurgery Information—Range of Movement**

Patient Group	*Sub-Group*	*Number of Patients*	*Extension Deficit (SD*)*	*p-Value*	*Total ROM (SD*)*	*p-Value*
All patients		69	−68.1 (40.1)	<0.001*	64.5 (46.2)	<0.001*
Surgery	DF	8	−84.3 (40.9)		85.8 (58.6)	
	F	58	−64.6 (38.9)	0.186†	61.1 (44.7)	0.164†
	Unknown	3	—	—	—	—
Dominant side	Yes	35	−58.3 (44.0)		66.7 (46.2)	
	No	16	−68.3 (36.8)	0.400†	56.7 (37.3)	0.453†
	Unknown	18	—	—	—	—

DF = Dermofasciectomy; F = Fasciectomy.
*Based on a paired t-test.
†Based on a two-sample t-test.

TABLE 3(B). **Changes Presurgery to Postsurgery Information—DASH and Grip Strength**

Patient Group	*Sub-Group*	*Number of Patients*	*Change in QuickDASH*	*p-Value*	*Change in Grip Strength (kg)*	*p-Value*
All patients		69	−7.14 (12.3)	<0.001*	−1.26 (7.22) $n = 46$	0.242*
Surgery	DF	8	−6.85 (10.8)	—	2.25 (7.97)	—
	F	58	−6.90 (12.8)	0.991†	−1.85 (6.98)	0.274†
	Unknown	3	—	—	—	
Dominant side	Yes	35	−6.51 (9.90)	—	−2.00 (7.49)	—
	No	16	−2.06 (11.8)	0.167†	−1.33 (7.88)	0.801†
	Unknown	18	—	—	—	

DF = Dermofasciectomy; F = Fasciectomy.
*Based on a one-sample t-test.
†Based on a two-sample t-test.

do however have value comparing instruments over the same intervention and preferably within the same group of patients. Of criticism is the low ES for our results and a mean change in QuickDASH score of less than 15 points, which has been previously been shown to be suggestive of indicating a minimal clinically improved difference (MCID) in function.[14] However, this definition of MCID has been determined with conditions other than Dupuytren's disease. It is also important to highlight that the significant change in QuickDASH did not correlate with the significant change in extension deficit, which would have supported the QuickDASH as a measure responsive to clinical change. This suggests that while there was a statistically significant change in the QuickDASH score after surgery and an acceptable ES and SRM, no statistically significant correlation was found between it and the measurable external criterion most important to patients, suggesting that the QuickDASH score may not ultimately prove the most suitable PROM for Dupuytren's disease.

Although this study is limited by its small sample size of 69 patients, a consequence of the retrospective design, this number is in keeping with other recent studies using functional outcome measures to assess the effect of Dupuytren's surgery. The postoperative measurements were made after a median of 81 days after surgery. This is a relatively short follow-up period, however, because it corresponds with the time at discharge from the hand therapist, it is a key landmark for patients and represents a point in time when the patient's condition has stabilized, tenderness has settled, and no significant clinical recurrence of contracture due to scarring has been observed enabling them to resume normal activities.

CONCLUSION

This study has found the QuickDASH to be an acceptable, valid, and responsive outcome measure after surgery for Dupuytren's disease. We acknowledge that there are inadequacies highlighted in the study but in the absence of other larger methodological studies investigating the validity and responsiveness of PROMs with Dupuytren's surgery, the findings are sufficient to justify the current use of the QuickDASH score as a PROM after treatment of this common condition.

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#1. The DASH score
   a. was described as an assessment of the severity of Dupuytrens disease
   b. should only be used to assess conditions affecting the hand
   c. incorporates the interference of upper extremity conditions on work activities
   d. has a maximum score of 60

#2. Patient Reported Outcome Measures
   a. must be responsive to change
   b. do not require formal validation
   c. have only been established for the upper extremity
   d. have previously been described for Dupuytrens disease

#3. Which is not recommended for evaluation of Dupuytrens patients
   a. DASH
   b. Sollerman test
   c. Hueston test
   d. Outerbridge classification

#4. The responsiveness of a tool
   a. does not require correlation with patient function
   b. is not reflected by the effect size or standardized response mean
   c. assesses the change in clinically important health status
   d. requires measurement of an internal criterion reflecting measurable disease change

#5. The results suggest
   a. the QuickDASH is not appropriate in evaluating outcomes in Dupuytrens patients
   b. the QuickDASH score is an acceptable, valid tool in evaluating outcomes in Dupuytrens patients
   c. the QuickDASH demonstrated a minimally clinically improved difference (MCID) post op
   d. the QuickDASH cannot be used in cases of bilateral fasciotomy

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