

Usefulness of the Quick Disabilities of the Arm, Shoulder and Hand (QuickDASH) Questionnaire in Dupuytren's Disease: A Prospective Cohort Study

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Abstract

Background: Dupuytren's Disease (DD) is a fibroproliferative disease which affects the hands and can produce progressive and irreversible flexion contractures. Collagenase *Clostridium histolyticum* (CCH) is a minimally-invasive treatment option for it. Hand function and patient's satisfaction were commonly measured by the Disabilities of the Arm, Shoulder and Hand (QuickDASH) questionnaire. The Spanish QuickDASH is the only validated Spanish region-specific questionnaire can be employed for the clinical assessment of patients with pathologies of the hand, such as Dupuytren's Disease. The aim of the study was to determine the usefulness of the abbreviated Spanish version of the QuickDASH, as an effective tool for evaluation of Dupuytren's disease treatment outcomes and their correlation with objective outcomes measuring improvement in residual contracture following treatment.

Methods: We conducted a prospective cohort study from April 2016 to June 2017 involving the selection of patients from three different hospitals. The measurement of the clinical results was made by calculating the difference between prior and post-treatment degrees of contraction (Thomine's coefficient) and QuickDASH questionnaire was self-administered by patients pre- and post-treatment.

Results: 46 patients (66.1 ± 1.1 years) completed the study. The mean correction for the metacarpophalangeal joint was -26.67 degrees ($p < 0.001$) and -23.39 degrees for the proximal interphalangeal joint. The mean change in QuickDASH score was 8.88 ($p < 0.001$) at a mean 34.6-day follow-up. The study showed a low correlation between the QuickDASH scores and the improvement in mobility, showing a weak relation between the scores ($r < 0.2$).

Conclusion: In our study, QuickDASH questionnaire scores for the treatment of Dupuytren's disease did not correlate with clinical outcomes.

Keywords: Dupuytren's disease; Health related quality life; Patient reported outcome measures; QuickDASH; Evaluation questionnaire

Introduction

Dupuytren's disease (DD) is a fibroproliferative disease which affects the hands and can produce progressive and irreversible flexion contractures. DD is prevalent in Caucasian men older than 50 years of age, affects 1% of the population of the US and between 2 and 42% of the European population [1], with a much higher incidence in Scandinavian countries. This deformity results in considerable patient disability, limiting their routine daily activities and ability to practice sports, thereby significantly reducing their quality of life [2].

The treatment options are fasciotomy, fasciectomy, dermo fasciectomy and pharmacological treatment with Collagenase *Clostridium histolyticum* (CCH) [3-5]. Objectively, we can evaluate treatment results in terms of the measured change in the movement of the fingers in terms of ranges of active and passive movement, extension deficit, and grip strength, and subjectively by using the scores obtained from the quality of life and patient satisfaction measurement scales, the so-called patient-reported outcome measures (PROMs). The change in hand function should be evaluated using a combination of physical measurements and questionnaires used to measure patient quality of life [6]. Among the questionnaires most commonly used for measurement of these results in DD is the PROM known as "Disabilities of the Arm, Shoulder and Hand" (DASH), and its abbreviated version, QuickDASH [7,8].

The objective of this study consists in evaluating the use of QuickDASH as a tool for evaluation of CCH treatment outcomes and their correlation with objective outcomes measuring improvement in residual contracture following treatment.

Methods

Study design and eligibility criteria

We conducted a prospective cohort study from April 2016 to June 2017 involving the selection of patients from three different Orthopedic and Trauma Surgery hospital units. Symptomatic indication for treatment with CCH injection consisted of the presence of a palpable cord and the involvement of DD with a contracture $\pm 20^\circ$ in the Metacarpophalangeal joint (MCP) and/or the proximal interphalangeal joint (PIP).

The exclusion criteria for the study were: hypersensitivity to CCH, the presence of an acute disease, or a chronic or psychiatric medical condition.

All the patients included in the study signed the corresponding informed consent, both for treatment and for inclusion in the study, previously approved by both the hospital's Ethics Committees and by the Spanish Agency of Medicines and Medical Devices (AEMPS) under the JPJ-COL-2015-01 protocol. All the CCH injections administered over the study's period of analysis were included consecutively. Demographic data, medical history related to DD, current diagnosis, symptoms and severity of the disease were collected.

Treatment

The procedures for both injection and extension of the finger were performed in conformity with the protocol [9]. All surgical procedures were performed by a single orthopedic surgeon. The total dose administered amounted to 0.58 mg of CCH. The extension procedure was performed between 24-48 hours after injection.

Measurements

A digital goniometer was used to measure digital extension deficit at MCP and PIP in each patient prior to and following treatment (Passive Extension Deficit or PED). Joints with hyperextension were considered to have full extension measured as 0° . The results of the PIP joint were not assessed. The thumb was excluded from the study in line with pharmaceutical instructions for use.

Before and after administration, all patients completed the QuickDASH questionnaire to measure patient quality of life. Each item can be scored on a Likert five-point scale, ranging from "without difficulty" to "cannot do it". At least 10 of the 11 items must be completed in order for a total score to be tallied. The responses to the items were added to form a first raw score, then normalized to a scale of 0 to 100. Higher scores denote greater disability. The choice of this questionnaire was determined by the local availability of a validated and reliable PROM for upper limb pathology [10]. QuickDASH was the questionnaire validated by Rodrigues et al. [8] in 759 DD patients.

Statistical analysis

The clinical data were entered into a restricted-access normalized Access® database (Microsoft®, Redmond, Washington, USA). Descriptive statistics were derived from measures and proportions, as well as Student t-test for paired data when tracking the variables of interest.

For the model, a logistic regression of all the variables involved was applied with predictive purpose for which all the possible hierarchical models that include all the variables were tested to seek minimization of the Akaike index. A difference in absolute value greater than 10% in the QuickDASH score was defined as the dependent variable (success). The independent variables included were the variation in the degree of mobility of the MCP joint, the variation in PIP, age, gender, educational level, sick leave from work, the hand involved, affected finger, presence of family history, diabetes, hypertension, epilepsy, psoriasis, rheumatoid arthritis, and prior surgical interventions. All the analyzes were carried out using STATA 15 (StataCorp, 2017. Stata Statistical software: Release 15. College Station, TX: StataCorp LLC).

Results

Demographic characteristics

A total of 48 patients with DD (51 hands) were included during the study period. Three patients were treated bilaterally. A total of 46 patients (49 hands) completed the study, two patients did not participate in the final follow-up and were excluded (one died due to a neoplasia unrelated to treatment, and another did not show up for the appointment). The average age of the patients was 66.1 (± 1.1), 83.7% of

them men. All the demographic characteristics are listed in **Table 1**.

Table 1 Demographics and baseline characteristics of the patients.

Parameters		Mean/Proportion (%)	SD/SE	95% CI
Age (years)		66.12	1.08 (SD)	63.94 – 68.29
Gender	Male	83.67	5.33	70.03 – 91.83
Marital status	Married	71.43	6.52	56.80 – 82.62
Education	Primary	77.55	6.02	63.28 – 87.38
	Secondary	12.24	4.73	5.44 – 25.27
	University	10.2	4.37	4.17 – 22.86
Time off work	No	97.96	2.04	86.04 – 99.73
	Yes	2.04		0.27 – 13.96
Hand	Right	53.06	7.2	38.72 – 66.91
	Left	46.94		33.09 – 61.28
Finger	Other	28.57	6.52	17.38 – 43.20
	Second	59.18	7.09	44.55 – 72.35
	Third	12.24	4.73	5.44 – 25.27
Family history	No	75.51	6.21	61.09 – 85.83
	Yes	24.49		14.17 – 38.91
Pain	No	73.47	6.37	58.93 – 84.24
	Yes	26.53		15.76 – 41.07
Diabetes	No	67.35	6.77	52.62 – 79.29
	Yes	32.65		20.71 – 47.38
Epilepsy	No	97.96	2.04	86.04 – 99.73
	Yes	2.04		0.27 – 13.96
Hypertension	No	73.47	6.37	58.93 – 84.24
	Yes	26.53		15.76 – 41.07
Rheumatoid Arthritis	No	97.96	2.04	86.04 – 99.73
	Yes	2.04		0.27 – 13.96
Previous surgery	No	81.63	5.59	67.75 – 90.39
	Yes	18.37		9.61 – 32.25

SD= Standard deviation; SE= Standard Error; CI= Confidence interval.

Joint contracture

The initial average contracture of the MCP joint for all cases included in the study was 27.49 degrees (\pm 22.15), and that of the PIP joint was 29.53 degrees (\pm 25.63). After over four weeks following injection with CCH, the mean correction for the MCP joint was -26.67 degrees (95% CI: -32.70 to -20.65,

$p < 0.001$), and -23.39 degrees (95% CI: -29.60 to -17.18; $p < 0.001$) for the PIP. The measurement of clinical results was made by calculating the difference between final and initial degrees of contracture per articulation accordingly to basis of CCH treatment (**Table 2**). The mean time elapsed between treatment and the objective assessment point was 34.6 days (\pm 8.8).

Table 2 Active extension deficit in the treated joints and QuickDASH results immediately before collagenase injection (baseline) and after injection follow-up visit (final).

Variables	Baseline (n=49)	Final (n=49)	Mean difference (95% CI); p-value	
MCP	27.49 (22.15)	0.82 (3.44)	-26.67 (-32.70, -20.65);	p<0.001
PIP	29.53 (25.63)	6.14 (11.80)	-23.39 (-29.60, -17.18);	p<0.001
QD	26.80 (21.71)	17.92 (18.05)	8.88 (2.59, -15.18);	p<0.001

Values are mean (SD) unless specified otherwise.

MCP=Metacarpophalangeal Joint; PIP=Proximal Interphalangeal Joint. QD=QuickDASH.

For the patient's assessment of outcome, 49 QuickDASH questionnaires were collected and analyzed, both prior to (baseline) and after treatment (final). All of them completed the 11 items in all the questionnaires with no missing data. In every case, the QuickDASH score was lower after treatment. The mean QuickDASH score dropped significantly, from 26.80 (\pm 21.71) prior to treatment, to 17.92 (\pm 18.05) four weeks later (**Table 2**). With the data obtained, a correlation analysis was conducted between the magnitude of the difference between the prior and post-treatment QuickDASH scores and the various variables that were integrated posteriori in the regression model, obtaining values lower than 0.20 in every case. This was particularly true in case of improvement in

mobility of the MCP joint, 0.1943, and of the PIP joint, 0.1298, showing a low relationship between the scores.

Logistic regression

A total of 79 hierarchical models were tested using the 14 variables involved, evaluated using an iterative process for minimization of the Akaike index. The resulting models oscillated between 33.30 and 43.71 on the Akaike index, together with an Area under the Curve (AUC) of between 0.617 and 0.928. The model finally selected included four variables, taking the second finger as the standard of reference.

Table 3 Best model characteristics, logistic regression.

Variables	OR	Std. Err.	z	P> z	(95% Conf. Interval)	
MCP	0.965	0.034	-1.020	0.309	0.902	1.033
PIP	1.008	0.029	0.280	0.776	0.953	1.066
Education	0.113	0.092	-2.670	0.008	0.023	0.560
Finger	0.161	0.155	-1.900	0.057	0.025	1.056
Constant	8.09.779	19.74.289	2.750	0.006	6.809	96304.290

Number of obs= 49; Log likelihood = -11.514.456; LR (χ^2) = 13.41; Prob> χ^2 = 0.0095; PseudoR2= 0.3679.

MCP=Variation in the metacarpophalangeal joint; PIP=Variation in the proximal interphalangeal joint; Education=Education level; Finger=Finger involved taking as reference the second one.

The model had an Akaike index of 33.30, with an area under the curve of 0.89 and an R^2 of 0.37. The complete results obtained can be viewed in **Table 3**, in which ORs between 0.113 and 1.008 for the observed values can be seen. Our model yields a correct classification of 93.88% with a sensitivity of 97.67% and a specificity of 66.67%, with positive predictive values of 95.45% and negative predictive value of 80.0%. The goodness of fit is high, with χ^2 at 31.49 and $p>0.8575$.

Discussion

Our results show that it was not possible to demonstrate a correlation between clinical improvement and questionnaire scores. Even though the QuickDASH questionnaire scores improve after injection with CCH, the differences are not

clinically relevant. This lack of correlation leads us to question the use of QuickDASH as a useful tool in the follow-up assessment of DD patients treated with CCH.

The effectiveness of the treatment in our study, measured as the decrease in the degree of contracture of the fingers before and after treatment with CCH, was 26.67 for MCP and 23.39 for PIP, significant decreases that replicate the results obtained previously by other authors [11-13]. However, this effectiveness only indicates a correct administration of the medication and the consequent destruction of DD cord to a greater or lesser extent, the real effectiveness of the treatment being valued over time and measured in the form of relapse rates [13].

An improvement in patient quality of life was shown positively in our study, since in all cases, the QuickDASH scores

obtained at the end of treatment were lower than those obtained for the baseline. The mean QuickDASH scores before treatment in our study was similar to the score of 28.0 (24.0-32.0) obtained in the study by Rodrigues et al [8] with 114 patients, and also that of 22.0 (\pm 27.0) obtained in the study by Gummeson et al. [14] with 13 patients. One controversial issue involves minimal clinically important differences (MCID), which focus on the change within the person over time and represent the smallest improvement in score needed to indicate a change that is clinically meaningful to the patient, which has been defined for the QuickDASH score as 15 to 20 points [15]. With a statistically significant difference in our study of 8.88 points between the average QuickDASH scores before and after treatment, this value is insufficient to establish a MCID, even though the MCID was not designed for DD, but rather for other diagnostic uses.

Assessment via logistic regression allows us to interpret that an improvement in finger contracture is what patients most value subjectively in their treatment. The model, referring to the level of categorized studies, can be interpreted according to the majority population in our area: retired blue-collar workers with low education levels and a relative absence of functional demands with respect to jobs that require precision. Indeed, the requirements for people with high educational levels who perform precision work, who might be surgeons or musicians, are not the same as those of people such as construction workers or farm laborers, who frequently show signs of Arthritis affecting their hands and other joints of the body to a greater or lesser extent. Factors such as age, work activity or level of education play a role in both the subjective satisfaction of patients and occasionally limit the potential for a complete correction of the finger.

The same relationship can be found regarding the finger affected. Involvement of the 5th finger in manual workers is of less importance than it would be for workers who perform precision work [16].

Although the QuickDASH has been used in the measurement of DD outcomes with significant results with respect to the MCID [16,17], not all studies show this difference [13,18]. More and more authors indicate that the DASH or its abbreviated variant are not sensitive enough to measure DD outcomes [6,19-21]. Our results serve to show that QuickDASH is not the most effective tool for assessment of DD outcomes. Several authors [17,21] advocate the use of disease-specific questionnaires, such as the Southampton Dupuytren's Scoring System (SDSS) [22] or the Unité Rhumatologique des Affections de la Main (URAM) [23,24], moving away from employing more widely used questionnaires for the measurement of DD outcomes, such as DASH or Michigan Hand Outcomes, since pain is among the parameters the latter assess, which is rare in DD, and they also do not show proper correlation with improvement in the range of finger movement.

Limitations

As limiting factors of the study, we could cite the use of QuickDASH as the PROM tool, as it is a region-specific rather than a disease-specific questionnaire. Similarly, the use of an abbreviated questionnaire (QuickDASH) instead of its complete form (DASH) could partially condition the results. However, in the absence of a disease-specific questionnaire validated for DD, we prioritized the use of QuickDASH because it has been validated in Spanish language [10] and been used in previous studies with DD patients [5,6,8,14].

Conclusion

Regarding the statistical technique used, although the use of logistic regression employing an index such as Akaike does allow for obtaining models using few variables by penalizing the excessive complexity of the model in relation to the goodness of fit, it does not allow for effective discrimination of the overall absolute quality of fit of the model, regardless of whether the included variables have greater or lesser explanatory power. In an effort to minimize this limitation, we performed an analysis of each of the models, applying complementary criteria and evaluating the R^2 of each of the final candidates. The sample size could also be a limiting factor, yet although this study is limited by its small sample size; it is in line with other recent studies that use measures of functional outcomes to evaluate the effect of surgical or pharmacological treatment on DD. The period of outcome measurement, 30 days, could also be a limiting factor, although in the studies conducted over longer durations, the variation between the different post-treatment QuickDASH scores has hardly changed, considering for this analysis only the score that shows the greatest difference between observations, that is, the prior and post-treatment measurements. In our study the QuickDASH questionnaire scores for the treatment of DD with CCH do not correlate with clinical outcomes.

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Disclosure of Interest

The authors hereby declare to have no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Author's Contributions

Francisco Javier Carrera-Hueso conceived the study and Diego Gómez-Herrero designed the study and drafted the manuscript. Rafael Sanjuan-Cerveró, Daniel Montaner-Alonso and Luis Aguilera-Fernandez collected the data and Pedro Vazquez-Ferreiro analyzed the data. Rocío Vila-Miralles and Emilio Garcia-Jimenez put forward the concept of the study and reviewed the manuscript. All authors read and approved the final manuscript.

References

- Verstreken F, Degreef I, Decramer A, Libberecht K, Vanhove W, et al. (2016) Effectiveness and safety of collagenase *Clostridium histolyticum* in Dupuytren's disease: An observational study in Belgium. *Acta Orthop Belg* 82: 397-404.
- Thomas A, Bayat A (2010) The emerging role of *Clostridium histolyticum* collagenase in the treatment of Dupuytren's disease. *Ther Clin Risk Manag* 6: 557-572.
- Hurst LC, Badalamente MA, Hentz VR, Hotchkiss RN, Kaplan FT, et al. (2009) Injectable collagenase *Clostridium histolyticum* for Dupuytren's contracture. *N Eng J Med* 361: 968-979.
- Denkler KA, Vaughn CJ, Dolan EL, Hansen SL (2017) Evidence-based medicine: options for Dupuytren's contracture. *Plast Reconstr Surg* 139: 240e-255e.
- Lauritzson A, Atroshi I (2017) Collagenase injections for Dupuytren's disease: prospective cohort study assessing 2-year treatment effect durability. *BMJ Open* 7: e012943.
- Pratt AL, Ball C (2016) What are we measuring? A critique of range of motion methods currently in use for Dupuytren's disease and recommendations for practice. *BMC Musculoskelet Disord* 17: 20.
- Budd HR, Larson D, Chojnowski A, Shepstone L (2011) The QuickDASH score: A patient-reported outcome measure for Dupuytren's surgery. *J Hand Ther* 24: 15-20.
- Rodrigues J, Zhang W, Scammell B, Russell P, Chakrabarti I, et al. (2016) 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* 41: 589-599.
- Sanjuan-Cerveró R, Franco-Ferrando N, Poquet-Jornet J (2013) Use of resources and costs associated with the treatment of Dupuytren's contracture at an orthopedics and traumatology surgery department in Denia (Spain): Collagenase *Clostridium histolyticum* versus subtotal fasciectomy. *BMC Musculoskelet Disord* 14: 293.
- http://www.dash.iwh.on.ca/sites/dash/public/translations/QuickDASH_Spanish_Spain_2018.pdf
- Poelstra R, Selles RW, Slijper HP, Van der Oest MJW, Feitz R, et al. (2018) Better patients' treatment experiences are associated with better postoperative results in Dupuytren's disease. *J Hand Surg Eur* 43: 848-854.
- Kus S, Van de Ven-Stevens LA, Coenen M, Berno S, Kollerits B, et al. (2011) What is our knowledge of functioning and disability in hand conditions based on?. *Arch Phys Med Rehabil* 92: 1326-1332.
- Sanjuán-Cerveró R, Vazquez-Ferreiro P, Gómez-Herrero D, Carrera-Hueso FJ, Fikri-Banbrahim N (2018) One-year follow-up after treatment with CCH for Dupuytren's disease: a prospective view. *Rev Espanola Cirugia Ortop Traumatol* 62: 448-457.
- Gummeson C, Atroshi I, Ekdahl C (2003) 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* 4:11.
- Franchignoni F, Vercelli S, Giordano A, Sartorio F, Bravini E, et al. (2014) Minimal clinically important difference of the disabilities of the arm, shoulder and hand outcome measure (DASH) and its shortened version (QuickDASH). *J Orthop Sports Phys Ther* 44: 30-39.
- Bradley J, Warwick D (2016) Patient satisfaction with collagenase. *J Hand Surg* 41:689-697.
- Warwick D (2017) Correlation of function with deformity in Dupuytren's disease: The condition-specific Southampton scoring scheme outperforms the generic QuickDASH. In: Werker PMN, Dias J, Eaton C, Reichert B, Wach W (eds.), *Dupuytren's Disease and Related Diseases - The Cutting Edge*. Cham, Switzerland: Springer International Publishing, pp: 199-203.
- Hansen KL, Werlinrud JC, Larsen S, Ipsen T, Lauritsen J (2017) Difference in success treating proximal interphalangeal and metacarpophalangeal joints with collagenase: Results of 208 treatments. *Plastic Reconstr Surg Glob Open* 5: e1275.
- Forget NJ, Jerosch-Herold C, Shepstone L, Higgins J (2014) Psychometric evaluation of the disabilities of the arm, shoulder and hand (DASH) with Dupuytren's contracture: validity evidence using Rasch modeling. *BMC Musculoskelet Disord* 15: 361.
- Degreef I, Vererfve PB, De Smet L (2009) Effect of severity of Dupuytren contracture on disability. *Scand J Plast Reconstr Surg Hand Surg* 43:41-42.
- Eaton C (2014) Evidence-based medicine: Dupuytren contracture. *Plast Reconstr Surg* 133:1241-1251.
- Mohan A, Vadher J, Ismail H, Warwick D (2014) The Southampton Dupuytren's scoring scheme. *J Plast Surg Hand Surg* 48: 28-33.
- Bernabé B, Lasbleiz S, Gerber RA, Cappelleri JC, Yelnik A, et al. (2014) URAM scale for functional assessment in Dupuytren's disease: A comparative study of its properties. *Joint Bone Spine* 81: 441-444.
- Warwick D (2017) Dupuytren's disease: My personal view. *J Hand Surg Eur* 42: 665-672.