

Sensitiveness of the Constant-Murley's Shoulder and Quick DASH as an Outcome Measure for Midshaft Clavicle Fracture

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ABSTRACT

Background: Quick DASH and Constant-Murley's Shoulder are two valid measuring tools for health status and are useful for patients with a wide variety of upper-extremity complaints; it is sufficiently sensitive to reveal even small changes in function. **Objective:** To evaluate the sensitivity of Quick DASH and Constant-Murley's Shoulder as an outcome measurement for midshaft clavicle fracture. **Method:** The study population consisted of 64 patients with a diagnosis of midshaft clavicle fracture based on clinical and radiological criteria. Study design was that of a classic prospective cohort study with measurements at 3 and 6 months following the injury. Evaluation was based on effect size (ES) and standardized response means (SRM). **Result:** Both Quick DASH and Constant-Murley's Shoulder showed high sensitivity (ES: 0.711; SRM: 1.46 and ES: 0.628; SRM: 1.45, respectively). **Conclusion:** Quick DASH was more sensitive than Constant-Murley's Shoulder in detecting clinical changes on midshaft clavicle fractures at 3 and 6 month following treatment.

Key Words:

Quick DASH, Constant-Murley's Shoulder, Clavicle, responsiveness

INTRODUCTION

Clavicle fracture represents 2.6-5% of all fractures, and occurs mostly in the active and productive young population. Approximately 69-82% of all clavicle fracture are midshaft clavicle fracture¹. The midshaft is the weakest part of the clavicle because the area is thin and not covered by ligament or muscles². Moreover, most of this type of fracture are treated non-operatively even when displaced³. Research in Edinburgh show the incidence of clavicle fracture in patients over the age of 13y was 29.14 per 1000 population per year with the mean age of 33.6y, ratio of men to women of 2.6:1 and the ratio of left to right clavicle fracture of 1.28:1⁴.

Several methods have been introduced to evaluate shoulder function. Most were designed to evaluate arthroplasty procedures of the shoulder. The Constant-Murley's and

Murley tools involve evaluation that can be used for all abnormalities of the shoulder joint, irrespective of the underlying diagnosis⁵. With a 100-point maximum score, 35% of the evaluation involves subjective variables while the second part consists of 65% objective variable evaluation. Subjective variables include those assessing pain and daily living capability (e.g., sleep, work, sports, etc), with a maximum of 35 points. The objective variables consist of shoulder range of motion and motor capability with a maximum score of 65 points⁶.

The Disabilities of the Arm, Shoulder, and Hand (DASH) and its shorter form, the Quick DASH is the best option to clinically assess the shoulder joint and upper extremity. DASH has been adapted for use in many languages such as German, Italian, Swedish, French, Dutch, Japanese and Indonesian with the same reliability and validity compared to the original version^{7,8,9,10}. The score range for Quick DASH is zero to 100 with higher values indicative of more disability¹¹.

Sensitivity is the ability of an instrument to detect changes, and to measure important clinical changes^{3,7,12}. Sensitivity is best proven by two statistical values: Standardized Response Mean (SRM) and Effect Size (ES)⁷. Significant levels on the hypothesis study explains the size of the mistaken risk regarding a decision interpretation to reject H0 hypothesis and but doesn't explain the size of the parameter effect that is tested. The possible values of parameter effect are small size, moderate and large. This effect size should be reported as part of the hypothesis trial results. The American Psychological Association recommends that the effect size should be reported for hypothesis trials¹³.

There exist studies that assess the reliability and validity of Constant-Murley's Shoulder and Quick DASH. However, there is no study that specifically assesses the sensitivity of both instrument on midshaft clavicle fractures¹⁴. Thus, the objective of this study is to assess the sensitivity of Quick DASH and Constant-Murley's Shoulder evaluation tools on a sample of the same patients, each with clavicle fracture. The results of this study may be used to evaluate which instrument is best for use in the clinic.

MATERIALS AND METHODS

This was a cohort prospective study, conducted in Sardjito Hospital Gadjah Mada University, Yogyakarta, Indonesia between January 2007 and December 2008. All patient presenting with clavicle fracture during that time period were enrolled on this study. Outcome measurements consisted of results from administration of the Quick DASH and the Constant-Murley's Shoulder tools, representing both the patient and surgeon point of view respectively. The hypothesis is both Quick DASH and Constant-Murley's Shoulder have high sensitivity.

Inclusion and exclusion criteria

Inclusion criteria were: 1) patient with fracture of the mid-third clavicle; 2) aged 16-65y; and, 3) clavicle fracture type 2B1 or 2B2 according to Robinson classification. Exclusion criteria were: 1) patient refusal to participate in the study; 2) open clavicle fracture; 3) bilateral clavicle fracture; 4) pathologic clavicle fracture; 5) recurrent clavicle fracture; 6) fractured clavicle comorbid with neurovascular disturbances; 7) comorbid diabetes mellitus or any other metabolic disease; 8) drug consumption that could disturb fracture healing; and, 9) comorbid anaemia or electrolyte imbalance.

A total of 81 patients presented to the hospital with clavicle fracture during the study period. Seventy-one patients met the inclusion criteria while ten patients were excluded due to meeting exclusion criteria. Seven patients were lost to follow up, leaving a total of 64 patients enrolled in the study.

Assessment

Following enrollment in the study, the patients received follow up assessment on the third and sixth months post-injury. Assessment includes completion of Constant-Murley's Shoulder and Quick DASH by two observers. The authors were not involved in patient assessment. A preliminary study to assess inter-observer variability for Quick DASH administration was previously completed and resulted in a low level disagreement ($Kappa = 0.783$). Validity testing of the Indonesian version of Quick Dash was previously conducted by Sagiran with good results (α Cronbach = 0.7792)⁸.

Statistical Analysis

Statistical analysis was performed utilizing SPSS software (version 16.0; SPSS, Chicago, Illinois). The effect size (ES) was measured with Pearson correlation and the standardized response means (SRM) were measured by dividing the difference in means with difference in standard deviation.

RESULTS

The sociodemographic distribution as well as information about fracture types is provided for the 64 included patients in Table I. The percentage of patients that underwent operative treatment was 53.125 %, meaning that the

percentage of those who received nonoperative treatment was 46.875 %. The average age of study participants was 39.48y and the ratio of left to right side fractures was 1:1. Of study participants, 40.625% completed junior high school or below and 22% of study subjects were unemployed. A majority of study patients were male (75%), a statistic that may be related to the fact that traffic accident was the most common mechanism of injury (78.125%).

Table I: Severity of osteoarthritis based on radiographs before initiating treatment

Parameter	Total
Age (Year)	
Mean	39.48 ($\pm 14,2$)
Range	17-65 years old
Sex	
Male	75%
Female	65%
Education	
Elementary School	18.75%
Junior High School	18.75%
Senior High School	35.94%
Undergraduate	23.4%
No formal education	3.125%
Occupation	
Unemployed	22%
Government employee	15.625%
Housewife	4.7%
Entrepreneur	35.94%
Labourer/Farmer	7.8%
Student	10.94%
Other	3.125%
Mechanism of injury	
Traffic accident	78.125%
Sport related	6.25%
Fall	15.625%
Management	
Operative	53.125%
Conservative	46.875%
Side of fracture	
Right	50%
Left	50%

Table II: Constant-Murley's Shoulder and Quick DASH result

Parameter	Total
Constant-Murley's Shoulder (at 3 month follow-up)	
Mean	81.64 (± 6.8)
Range	67-92
Constant-Murley's Shoulder (at 6 month follow-up)	
Mean	89.89 (± 6.32)
Range	76-100
Quick DASH (at 3 month follow-up)	
Mean	33.5 (± 21.6)
Range	4.55-79.55
Quick DASH (at 6 month follow-up)	
Mean	9.2 (± 8.5)
Range	0-34.1

Table III: Standardized response means and effect size value

Parameter	Range of difference	Mean of difference	SRM	ES
Constant-Murley's Shoulder	0-20	8.25 (±5.68)	1.45	0.628 (P<0.001)
Quick DASH	2.27-68.18	24.29 (±16.64)	1.46	0.711 (P <0.001)

All participants demonstrated improved outcome on the 6 month follow-up compared to the 3 month follow-up visit, based on Quick DASH results; however, some patient does not have an improvement of outcome if evaluation was based on the Constant-Murley's Shoulder tool. On average though, the outcome of the 6 month follow-up was better than the 3 month, based on Quick DASH or Constant-Murley's Shoulder.

SRM and ES for Constant-Murley's Shoulder and Quick DASH

Statistical analysis revealed only a slight difference in SRM results when comparing Constant-Murley's Shoulder to Quick DASH (Table III). Both resulted in high sensitivity based on SRM and also high ES ($r > 0.5$), although Quick DASH had a slightly higher result on ES and SRM than Constant-Murley's Shoulder.

DISCUSSION

The Constant-Murley's Shoulder evaluation tool measures the outcome of shoulder function, based on clinical examination whereas Quick DASH is an instrument to measure the outcome of shoulder-arm-hand function, fully based on patient's (subjective) point of view¹⁵. Question arise as to which of these two tools is the best used for measuring the outcome of patients treated for midshaft clavicle fracture, especially in a population where the education level is not high. For example, in the current study, 37.5 % of patients completed education only Junior High School or lower and two of our respondents were illiterate. When Quick DASH was administered for this study, the test was translated and adapted to Indonesian version⁸. With the addition of using an interviewer for Quick DASH, one may assume that effects of educational differences were somewhat diminished.

In the present study, there were very little disagreement between the two observers who explain the questions to the patients and those who conducted the clinical examination. At the first administration of Quick DASH, the patients were read the question on the evaluation sheet, and if they had

difficulties understanding the question or instructions, the interviewer would explain the question or instruction in simple and clear terms using the local language so the patient could understand the question clearly and supply accurate answers.

Cohen determined that ES of >0.1 means that there was a small effect; >0.3 , a moderate effect; and, >0.5 a large effect. Moreover, a SRM value of more than one signifies high sensitivity¹⁶. In the present study, both Quick DASH and Constant-Murley's Shoulder showed high ES and SRM, although Quick DASH resulted in a slightly higher ES and SRM. These results indicate that both scoring systems were sensitive enough to detect even a small difference in outcome, with Quick DASH being slightly more sensitive than Constant-Murley's shoulder.

We were not able to measure the impact of specific rehabilitation regimes or the results of variable timing due to lack of the rehabilitation data. Moreover, data of time return to work or activity would be needed, as it could affect the patient satisfaction to their condition. Need more studies that include the evaluation of those variables, as it could be a bias to the result.

CONCLUSION

Both Quick DASH and Constant-Murley's Shoulder evaluations showed a high sensitivity, although Quick DASH had a slightly higher result. Quick DASH and Constant-Murley's Shoulder evaluation instruments are commonly used to assess the outcome of shoulder pathology; however t the author recommends using Quick DASH rather than Constant-Murley's to asses the outcome of clavicle fracture for regular outpatient clinic visits. First, Constant-Murley has a lower sensitivity. Second it can be more time consuming because the physician must conduct the examination himself whereas Quick DASH may be self administered or administered with the aid of ancillary staff. This study could be used as a basis for deciding whether these scoring systems will be used to evaluate the outcome of therapy for midshaft clavicle fracture in clinics or in a further study, but further studies may be needed.

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