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Validity of self-report measures of pain and disability for persons who have undergone arthroplasty for osteoarthritis of the carpometacarpal joint of the hand[1]

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Summary

Objective: To establish the validity of three self-report scales used to measure function following arthroplasty for osteoarthritis (OA) of the carpometacarpal joint.

Method: Persons with OA of the carpometacarpal joint ($n = 122$) were assessed on one occasion 9–117 months following tendon interposition arthroplasty. They completed three self-report measures of hand/upper limb disability: the Australian/Canadian Osteoarthritis Hand Index (AUSCAN), the Patient-Rated Wrist Hand Evaluation (PRWHE), and the Disabilities of Arm, Shoulder and Hand (DASH). They also completed the Short Form 36 (SF-36) and performed tests of strength, range of motion (ROM), and dexterity. Factor analysis and correlations were used to determine the association among the scales and subscales considered to measure similar constructs (e.g., pain and physical disability). Correlations between the scales and measures of impairment were also conducted to examine construct validity of the disability measures. *t*-Tests evaluated the hypotheses that subjects with isolated hand OA would have lower scores than those with additional joint involvement.

Results: All three scales or their subscales loaded on one factor. Convergent validity of the disability measures was demonstrated by high correlations between similar subscales ($r > 0.75$), and divergent validity by a lack of correlation between the measures and self-report hand appearance. As expected, correlations between disability and strength, dexterity, or a global measure of ROM were higher than with ROM of individual joints. The AUSCAN and the DASH were better able to discriminate those with localized hand OA from those with involvement of other joints.

Conclusions: The AUSCAN, PRWHE, and DASH are valid assessments of pain and/or disability of hand OA, and provide information distinct from impairment measures.

Key words: Hand osteoarthritis, Disability, Self-report measure.

Introduction

Osteoarthritis (OA) is a cause of pain, stiffness, and disability that has a broad impact on quality of life[1]. A study of more than 10,000 patients with OA determined that 74% of those with hand OA experienced difficulties with their tasks of daily life[2] suggesting that measures that focus on this disability are needed.

A recent systematic review[3] identified 18 measurement tools that might potentially be used to evaluate hand disability resulting from OA. Only five instruments met inclusion criteria: the disability index of the Stanford Health Assessment Questionnaire (HAQ)[4], the Arthritis Impact Measurement Scale (AIMS2)[5], the Australian/Canadian Osteoarthritis Hand Index (AUSCAN)[6,7], the Cochin Scale[8], and the Algofunctional Index (FIHOA)[9,10]. Considering conceptual framework, reliability, validity, and administrative burden, the AIMS2 and AUSCAN were rated slightly higher than the remaining three scales. This review highlighted that the psychometric properties of the scales had not been tested sufficiently to make any definitive conclusions.

Since the noted systematic review, Angst *et al.*[11] examined methodological properties of different scales as used to evaluate the long-term follow-up of a resection interposition arthroplasty of the carpometacarpal (CMC) joint. The self-reported Disabilities of Arm, Shoulder and Hand (DASH), Short Form 36 (SF-36), and Patient-Rated Wrist Hand Evaluation (PRWHE), and performance-based Hand Functional Index (HFI) of the Kietel Function Test were evaluated. The authors found that the self-report measures of physical function loaded on one factor and accounted for

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over 50% of the variance. Each of the HFI, the Custom Form, and the mental component of the SF-36 loaded on separate factors. Another study supported the validity of the Norwegian version of the AUSCAN[12]. Most recently, Allen *et al.*[13] supported the factor and criterion validity of the AUSCAN in 700 patients with familial OA of both hands. While the evidence around a number of scales is promising, it is insufficient to support a single measure, to identify the relative discriminative vs evaluative properties, or to provide the scope of comparative data needed for clinical decision-making.

The purpose of this study was to examine the validity of three self-report scales (disease-specific, wrist/hand-specific, and regional) for evaluating disability associated with OA of the CMC joint of the hand managed by (tendon interpositional) arthroplasty.

Methods

STUDY DESIGN

This study was cross-sectional in design. Subjects who had undergone CMC joint surgery for OA were evaluated on one occasion. Physical assessments [grip strength, pinch strength, dexterity, and range of motion (ROM)] were performed, and the subjects completed the AUSCAN, PRWHE, DASH, and SF-36.

PARTICIPANTS

Study participants included 121 patients who were included in an outcomes study of tendon interposition arthroplasty of the CMC joint of the thumb, and who had returned for follow-up appointments. The surgical procedure involved interposition of the flexor carpi radialis tendon (either half or whole tendon) as a spacer following removal of the trapezium. Subject characteristics are given in Table I.

SELF-REPORT MEASURES

The AUSCAN[6,7] is a 15-item scale which addresses pain, stiffness, and functional disability in patients with OA of the hand. It was developed using a clinimetric process similar to that used by the same developer when designing the WOMAC OA Index for measuring function in persons with lower extremity arthritis[14]. Item responses are scored on a 5-point Likert scale (0–4). The scores are computed as the mean of items across the three subscales addressing pain (five items), stiffness (one item), and function (eight items). A higher score indicates greater pain, stiffness, or disability.

Table I
Subject characteristics

		Mean (SD)	
Age	Years	65.4	(8.1)
Time since surgery	Months	54.2	(23.1)
		Frequency (%)	
Gender	Male	22	(18.3)
	Female	98	(81.7)
OA involvement	CMC only	15	(12.5)
	CMC + hand	12	(10.0)
	CMC + other	89	(74.2)
	Data missing	4	(3.3)
Tendon interposition arthroplasty technique	½ FCR	38	(31.7)
	Full FCR	78	(65.0)
	Both	4	(3.3)

FCR: Flexor carpi radialis.

Table II
Scores on self-report measures

	Minimum	Maximum	Mean	SD
AUSCAN pain (/4)	0	3.8	1.6	1.02
AUSCAN stiffness (/4)	0	4	1.4	1.14
AUSCAN function (/4)	0	3.8	1.8	1.08
PRWHE (/100)	0	92	41.5	28.33
DASH (/100)	0	90.8	36.7	24.03
SF-36 Mental Component Summary	21.9	66.7	47.9	11.67
SF-36 Physical Component Summary	12.0	61.5	34.6	11.38

The PRWHE[15] is a 15-item scale that addresses pain and disability related to wrist and hand disorders. It was originally validated in patients with distal radius or scaphoid fractures and, subsequently, has been used to assess a variety of wrist and hand conditions[16–18]. The score ranges from 0 to 100 points; 50 points are allocated to five pain items and 50 points to 10 functional items. These functional items include six specific activities that are known to be difficult with wrist and hand impairment and four items that ask patients to rate their ability compared to their usual activity in four domains (personal care, household work, occupation, and recreation). One supplemental question on appearance of the affected hand is scored separately. All items are scored 0–10 with 10 indicating poorer status.

The DASH[19,20] is a 30-item questionnaire that was designed to measure disability of the upper limb. The DASH was developed as a joint effort between the Institute for Work and Health in Canada and the American Association of Orthopaedic Surgeons. It has been validated in a number of upper extremity conditions. The majority of items (21) address functional tasks, five relate to symptoms, and one item is dedicated to each of the four remaining concepts: social, work, sleep, and capability. The DASH is presented as a uni-dimensional scale. A higher score indicates greater disability.

The SF-36 is a 36-item scale that addresses general health. Subscales measure Physical Function, Physical Role, Bodily Pain, General Health, Vitality, Social Function, Emotional Role, and Mental Health. These subscales can be summarized into Physical and Mental Component Summary Scores. While a number of studies have demonstrated that the SF-36 is less responsive than specific scales in measuring upper extremity disability[18,21], it has been shown to be more responsive than other generic health instruments in musculoskeletal disorders[22]. The SF-36 is commonly used to represent broad aspects of health in questionnaire validation. A higher score represents better health.

PHYSICAL IMPAIRMENT MEASURES

The NK Hand Assessment System was used to measure ROM, grip, and pinch strength and dexterity. The device is calibrated prior to each test and scores are stored and averaged in NK software. Standardized test protocols[23] for grip and pinch (tripod and key) strength and dexterity were followed as they have been found to be reliable and