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Validation of Duruöz Hand Index in patients with tetraplegia

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ABSTRACT

Study design: Cross-sectional, clinical measurement.
Purpose: To investigate the validity of the Duruöz Hand Index (DHI) in the assessment of hand function in patients with tetraplegia.
Methods: A total of 40 patients with tetraplegia participated. Patients' upper extremities were assessed on the level of 'body function and structure' [The American Spinal Cord Injury Association (ASIA) Impairment Scale (AIS) 2000 revised criteria, upper extremity motor score (UEMS), neurologic level of injury and visual analogue scale of hand function (VAS-HF)], 'activity' [DHI and Quadriplegia index of function-short form (QIF-SF)] and 'body function and structure, activity and participation' [Health Survey Short Form-36 (SF-36)] according to International Classification of Function.
Results: The DHI showed significant correlations with UEMS, AIS, QIF-SF, VAS-HF, physical functioning and physical compound summary scores of SF-36.
Conclusions: The DHI was found a valid method in the assessment of hand functions in patients with tetraplegia.
Level of evidence: Diagnostic III.

Introduction

Impaired motor and sensory functions in arms and hands is one of the most debilitating results of the cervical spinal cord injury (SCI).[1] Restoration of hand and arm function during rehabilitation is of crucial importance considering their key role in the activities of daily living (ADL) and the level of independence.[2] Evaluation of the efficacy of rehabilitation and experimental interventions can be achieved by standardized tests that assess upper extremity function validly.[3] Numerous tests and/or outcome measures have been designed to evaluate upper extremity function in humans; however, only a few of them have been proved to be valid and reliable for assessment of individuals with tetraplegia and none has gained sufficient international acceptance to become a gold standard.[3,4] Many of the existing tests that evaluate outcome of the upper extremity in individuals with tetraplegia can be categorized according to the three levels of the International Classification of Functioning Disability and Health (ICF), namely 'body function and structure,' 'activity,' and 'participation.'[5,6] Among these, tests that evaluate the performance of arm and hand at the 'activity' level by assessing ADL tasks are continuously being recommended as standard outcome measures, since they are believed to reflect patients' real performance.[3,7] Besides, self-reported questionnaires that are structured to evaluate hand-related activity level with regard to ADL have gained sufficient acceptance in rehabilitation settings.[8]

The Duruöz Hand Index (DHI) is a self-report questionnaire, which was developed primarily to assess hand-related activity limitation in patients with rheumatoid arthritis (RA).[9] As an inexpensive, easy to administer tool that requires no special equipment or training, the DHI shows promise as an outcome measure of hand-related activity. Its reliability, validity and responsiveness have been studied in many diseases and conditions such as RA,[9,10] osteoarthritis,[11,12] systemic sclerosis,[13] hemiplegia,[14] diabetes,[15] traumatic hand flexor tendon injuries,[16] hemodialysis patients[17] and following hand surgery in patients with RA.[18]

This material was presented as a poster in 51st Annual Scientific Meeting of the International Spinal Cord Society, London, 2012.

Abbreviations: ADL, Activities of Daily Living; AIS, The American Spinal Cord Injury Association Impairment Scale; ASIA, The American Spinal Cord Injury Association; DHI, Duruöz Hand Index; ICF, International Classification of Function; PCS, Physical Compound Summary; PF, Physical Functioning; QIF-SF, the Quadriplegia Index of Function-Short Form; RA, Rheumatoid Arthritis; SCI, Spinal Cord Injury; SF-36, the Health Survey Short Form-36; UEMS, Upper Extremity Motor Score; VAS-HF, the Visual Analogue Scale of Hand Function.

Conflict of interest: The authors declare no conflict of interest.

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Purpose of the study

After a detailed current literature review, no study with the DHI in patients with tetraplegia was found. The purpose of the present study was to investigate the validity of the DHI in the assessment of arm-hand related activity limitation in patients with tetraplegia.

Methods

Participants

Forty-five ($n = 45$) patients with traumatic cervical SCI were recruited consecutively into the present prospective study with the approval of the Medical Ethics Committee prior to the study. The inclusion criteria were: having a traumatic cervical SCI with a disease duration of at least 1 year, being acknowledged through informed consent, being at least 18 and not more than 65 years of age. The exclusion criteria were: having a history of arm and/or hand surgery; a concomitant pathology that could affect the function of the arm and/or hand; a trauma, head injury or psychiatric disease that may lead to cognitive deficits precluding the performance of standard physical/neurologic examination.

Of the 45 consecutive recruited patients with tetraplegia, three patients who had undergone operation and two patients whose American Spinal Cord Injury Association (ASIA) Impairment Scale (AIS) grades were undeterminable according to AIS 2000 revised criteria were excluded. Remaining 40 patients who met the inclusion criteria completed the study.

Assessments

Patients' upper extremities were assessed on the level of 'body function and structure' [AIS grade, upper extremity motor score (UEMS), neurologic level of injury and visual analogue scale of hand function (VAS-HF)], 'activity' [DHI and Quadriplegia index of function-short form (QIF-SF)] and 'body function and structure, activity and participation' [Health Survey Short Form-36 (SF-36)] according to ICF. All the examinations and assessments were performed by the same physiatrist with 5 years of experience in SCI medicine in the aforementioned order.

All the patients were assessed according to the AIS 2000 revised criteria, which has been endorsed by the International Standards for Neurological Classification of SCI as a standardized neurological examination that documents impairment in a person with an SCI in the most accurate way.[19] The sensory and motor neurologic levels of injury and AIS grade of the patients as well as the UEMS were assessed according to this examination. UEMS is the sum score (0–50) of the key muscle groups of the upper extremity (elbow flexors, wrist extensors, elbow extensors, finger flexors, and finger abductors), which are scored between 0 and 5.

Duruöz Hand Index

The DHI, which was developed as a self-report questionnaire to measure functional ability of the hand in RA,[9,10] has also been found adequately valid in patients with osteoarthritis,[11,12] systemic sclerosis,[13] hemiplegia,[14] diabetes,[15] traumatic hand flexor injuries[16] and in patients receiving hemodialysis.[17] It contains 18 items related to ability of the hand during performing kitchen tasks (8 items), dressing (2 items), maintaining personal hygiene (2 items), performing office tasks (2 items) and other general items (4 items) (Appendix). Patients rate their ability from '0' (no difficulty) to '5' (impossible to do), and these 6 levels of answers allow a highly sensitive grading of hand-related activity limitation. The total score of the questionnaire, ranging from 0 to 90, indicates greater impairment or more difficulty with higher scores whereas less impairment or difficulty with lower scores. No training is required prior to administration and it takes less than 3 min to administer the whole questionnaire.[9]

In the present study, we administered the DHI by interview. The patients were asked to assess their abilities without any hand preferences after each question was read by the examiner.

Quadriplegia Index of Function-Short Form

Among the tests specifically designed for individuals with tetraplegia, the most commonly used test at the complex activity level is the QIF,[20] which has a well-documented validity, reliability and responsiveness.[21] The short form version of the QIF was found to have a high correlation with the original version,[22] which was specifically developed to document functional gains in patients with tetraplegia during medical rehabilitation.[21] The QIF-SF, which can be administered by interview and/or observation, consists of six tasks (wash/dry hair, turn supine to side in bed, put on lower body clothing, open carton/jar, transfer from bed to chair, and lock wheelchair) that were found to be the best predictors of the total score through regression analysis. The total QIF-SF score (0–24) is a simple sum of the six tasks; each scored between 0 and 4 and takes only a few minutes to administer.[22]

The QIF has been used in various countries including Turkey.[23] However, it is not clear if the QIF actually was translated into Turkish language or that the observers used the English version. Therefore, in the present study the QIF-SF was administered by observation.

Visual Analogue Scale of Hand Function

Following the administration of the QIF-SF, we requested the patients to evaluate their hand functions using VAS. A horizontal 100-mm VAS, numbered at every 10 mm, was used in our study. Subjects were instructed to express their limitation of hand function by considering '0' as 'normal hand function' and '100' as 'loss of all hand functions.' The question with VAS-HF was; 'During the last month and considering your needs for daily living, what is your limitation level due to hand involvement?'

Health Survey Short Form-36

The Health Survey SF-36 is a well-known and widely used generic index of health-related quality of life. Its applicability for assessing health-related quality of life among persons with SCI has also been shown.[24,25] SF-36 provides an efficient way to measure status from the patient's point of view by scoring standardized questions. The questionnaire is composed of 36 items, 8 subscales that aggregate 2–10 items each, and 2 summary measures that aggregate the scales. The scales are physical functioning (PF), role limitations due to physical problems (role-physical; RP), bodily pain (BP), general health (GH), vitality (VT), social functioning (SF), role limitations due to emotional problems (role-emotional; RE), and mental health (MH). The summary measures are physical compound summary (PCS) and mental compound summary (MCS). Scores for subscales range from 0 to 100, with higher scores indicating a better health status.

The Turkish version of the SF-36, which was approved by the Medical Outcome Study-Trust, the originator of the SF-36, was validated in a study in Turkey and was found to be valid and reliable.[26,27]

Statistical analysis

Pearson correlation was used to determine the construct validity of the DHI by analyzing the relationship between the DHI and UEMS, AIS grade, QIF-SF, VAS-HF and SF-36 ($p < 0.01$). One-way