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ORIGINAL ARTICLE

Validity and internal consistency of the Helsinki Serratus Palsy Index for patients with serratus palsy

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Background: To our knowledge, no validated scales exist as yet for measuring quality of life and functioning level in patients with serratus palsy. This cross-sectional survey study examined whether a broadly validated Western Ontario Rotator Cuff Index (WORC) could be partially adapted for patients with serratus palsy.
Methods: The relevancy of WORC, 21 items, along with 4 additional new items, was tested by 95 patients with serratus palsy and a panel of 9 medical experts. Its content validity was measured by a content validity index (CVI), a content validity ratio (CVR), and a modified κ. The internal consistency of 11 retained items was assessed with the Cronbach α. Its construct validity was assessed by exploratory factor analysis.
Results: Of the 25 items, 11 were considered relevant (CVI ≥0.78) for serratus palsy by the panelists, with overall test CVI (S-CVI) of 0.86. The internal consistency of these 11 items was excellent, with a Cronbach α of 0.94. The exploratory factor analysis accompanied by a parallel analysis confirmed the unidimensionality of a new test. All except 2 items of WORC that were considered relevant by the panelists were also marked with scores of >5 by the patients on an 11-point scale of relevancy.
Conclusions: Adapted from the WORC, the new 11-item Helsinki Serratus Palsy Index scale was internally consistent and face and content valid for serratus palsy patients.
Level of evidence: Basic Science Study; Development or Validation of Outcome Instrument

Keywords: Quality of life; serratus palsy; winging scapula; Western Ontario Rotator Cuff Index; validity; consistency; factor analysis; Helsinki Serratus Palsy Index

Isolated serratus palsy is a rare condition resulting from different pathologies, most commonly from injury to the long thoracic nerve after trauma or strenuous exertion. In patients with serratus palsy, fixation of the scapula against the rib cage during active flexion and abduction is inadequate, causing weakness and change in these movements.[13-17] Patients with serratus palsy may have problems in daily living and sports activities and often complain of a major negative effect on their quality of life (QOL).[5,9,11,14,16]

The University Hospital District Ethical Committee approved the study (16.11.2016, HUS/2037/2016 and No. 311/13/03/02/2008). The authors' institutions approved the human protocol for this investigation, and all investigations were concluded in conformity with ethical principles of research.

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A number of instruments allow measurement of QOL in patients with shoulder pain,[2,3] but there is no validated measurement scale for serratus palsy. Patient-reported outcomes, such as symptoms, health-related QOL or perceived health status, are, however, good tools to describe morbidity and patient suffering.[1] The patient's perception of changes in health status has even been considered to be the most important indicator of a treatment's success.

In 1998, Kirkley et al[8] published a disease-specific QOL measurement tool for patients with unstable shoulders, the Western Ontario Shoulder Instability Index. Another emerged in 2003 for patients with rotator cuff symptoms, the Western Ontario Rotator Cuff (WORC) Index, which has become a primary outcome measure in clinical trials evaluating treatments of rotator cuff degeneration.[7] The WORC is a condition-specific self-reported instrument to assess QOL with 21 visual analog scale (VAS) items organized in 5 subscales: physical symptoms (items 1-6), sports/recreation (items 7-10), work (items 11-14), lifestyle (items 15-18), and emotions (items 19-21).

The first, just recently published study concerning content validity of the WORC Index for serratus palsy patients,[5,12] indicated that only half the 21 items in the WORC Index were of good or excellent content validity and that further studies are needed to find a suitable validated QOL measurement tool for patients with serratus palsy. The objective of this study was to examine whether the WORC Index could partially be adapted and validated among patients with serratus palsy.

Materials and methods

This study involved a cross-sectional survey among patients with isolated serratus palsy and included a panel of 9 medical experts in orthopedics, hand surgery, and physical and rehabilitation medicine (Table I). The survey was conducted in May 2017. The participants provided informed consent for participation in the study.

Each expert evaluated independently the relevance of all separate WORC Index items, along with 4 additional items potentially relevant for patients with winged scapula. These additional items were:

1. How much does serratus palsy restrict your social relations?
2. How much does shoulder pain related to serratus palsy bother you?
3. How extensive do you estimate is your scapular winging during use of your arm in shoulder flexion?
4. How much does the limited shoulder motion bother you?

The panelists expressed their opinions on the validity of all 25 items on a 4-point scale: 1, not relevant, 2, somewhat relevant, 3, quite relevant, and 4, highly relevant.

The first author (M.V.) treated 212 patients with isolated serratus palsy between 1981 and 2008. Of these, 170 patients alive and with available address received the questionnaire in 2017, and 95 patients replied and evaluated the same 25 items as the experts did. The diagnosis of isolated serratus palsy was confirmed with electromyography in all patients. The study excluded other cases with winging scapula, such as Parsonage-Turner syndrome, neurologic disorders, such as facioscapulohumeral syndrome, and functional palsies caused by shoulder problems causing scapular winging.

An 11-point numerical rating scale assessed the perceived relevancy of the items, with 0 denoting not relevant, and 10 denoting highly relevant. Patients were a mean age of 31 years at symptom onset, and the questionnaire follow-up was 9 to 35 years after that.

Table I Characteristics of the expert panel

Experts	Value
	(n = 9)
Sex, No.	
Women	2
Men	7
Medical education, No.	
Hand surgeon and orthopedic surgeon	5
Hand surgeon	3
Physiatrist	1
Medical/academic degree, No.	
MD, PhD	5
MD	4
Clinical experience with serratus palsy patients, mean (range), y	26 (11-37)
Treated serratus palsy patients, mean (median), No.	50 (25)

Statistical analysis

Content validity

The content validity ratio (CVR) for individual scale items was calculated as $CVR = (N_e - N/2)/(N/2)$, where N_e was the proportion of experts who rated the item as a 3 or 4 on a 4-point scale, and N was the total number of experts.[4] For the 9 panelists, the cutoff point for excellent CVR was set at ≥0.78.[10] The content validity index (CVI) for each individual scale item (I-CVI) was calculated as $I\text{-}CVI = N_e/N$.[4] To compute a modified κ (κ^m), the probability of chance agreement was computed first as $P_c = (N/N_e) \times (N - N_e) \times 0.5^N$.[5] Then, κ^m was calculated as $\kappa^m = (I\text{-}CVI - P_c)/(1 - P_c)$. The CVI for the entire scale (S-CVI) was calculated as a proportion of the number of items deemed content valid.[4] The I-CVI ≥0.78 and S-CVI ≥0.90 were considered excellent. A $\kappa^m < 0.40$ was considered poor, ≥0.40 fair, ≥0.60 good, and >0.74 excellent.

Face validity

The patients expressed their opinions on the relevancy of items on a 10-point numerical rating scale described above. Their opinions were reported as means and standard deviations (SDs).

Internal consistency

The internal consistency of the set of retained items was examined with the Cronbach α. An $\alpha \geq 0.9$ was considered