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Study on the correlation between the brief ICF scale and Barthel index scale in the evaluation of patients with spinal cord injury

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Abstract: objective*: To analyze the correlation between ICF scale and Barthel index in acute stage spinal cord injury.* ***Methods****: 14 patients with subacute spinal cord injury were evaluated with brief core set ICF scale and Barthel index.* ***Results:*** *Body function, body structure, activity and participation in spinal cord injury of ICF and the Barthel index are negatively correlated (R<0), and the difference was significant (P<0.05).* ***Conclusion:*** *The brief core set of ICF is more comprehensive in the evaluation of patients with subacute spinal cord injury.*

Keywords: *Spinal cord injury; Brief core set of ICF; Barthel index*

1. Introduction

Spinal cord injury (SCI) is a kind of damage to the structure and function of the spinal cord caused by various reasons, and ultimately leads to functional impairment below the level of spinal cord injury.

SCI can be roughly divided into the traumatic spinal cord injury (TSCI) and non-traumatic spinal cord injury (NTSCI). And TSCI is the most common cause of the adult spinal cord injury, which is commonly caused by traffic accidents (40.4%), falls (27.9%), sports accidents (8.0%), mining accidents, natural disasters and injuries in life, etc., and traffic accidents are the leading cause of TSCI.

NTSCI is usually caused by a disease or infection, including spinal vascular dysfunction, spinal cord tumors, spinal abscesses, neurological diseases such as multiple sclerosis and amyotrophic lateral sclerosis, which accounts for approximately 39% of spinal cord injuries [1].

A reasonable, effective and targeted rehabilitation assessment plays a significant guiding role in making a rehabilitation plan, in this way, it can make the greatest development of the potential of patients with spinal cord injury, so as to achieve the ideal prognosis of patients.

Currently, International Standards for Neurological Classification of Spinal Cord Injury (ISNCSCI) is used to make the assessment of the serious of the patient's spinal cord injury in the clinical, which is made by the International Neuroclassification of Spinal Cord Injury (Asia), this can make a standardized record of motor and sensory impairment of patients with spinal cord injury.

The nerve level is the lowest level of the spinal cord that retains normal sensory and motor function on the left and right sides of the body. The motor lever is the lowest level of the spinal cord that preserves normal motor function on the left and right sides of the body, which is assessed by the strength of 10 key muscles on both sides of the body. Sensory level refers to the lowest spinal cord plane that retains normal sensory functions on the left and right sides of the body, which is judged by the sensitivity of acupuncture sensation and light touch at 28 sensory key sites.

International Classification of Functioning, Disability and Health(ICF) is to provide a knowledge framework for the detailed analysis and summary of the health status, obstacles, activity limitations and participation limitations of the human body, and to further explain and distinguish the health status and patients' problems. ICF consists of four components: body function, body structure, activity and participation, and environmental factors, with a total of 1424 taxa levels [2,3].ICF is an international communication tool that provides a description of function, disability and health status to make it easier to communicate about a disease internationally, and to compare the changes before and after the disease. Therefore, the theory and methods of ICF are particularly important in rehabilitation medicine. It can run through the whole rehabilitation procedure and be used for functional assessment, formulation of rehabilitation goals for specific conditions, selection of treatment methods and evaluation of

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rehabilitation effect [5].In recent years, rehabilitation scholars have called for this tool that should be widely used in clinical practice [3.4], and the reliability and validity of the application of ICF in various diseases has been tested [6]. Therefore, in recent years, ICF has been gradually applied in the evaluation of various diseases [7,8].

ICF evaluation scales are divided into Comprehensive Core set and Brief Core set. The comprehensive Core set is to select as few ICF items as possible that are related to functional disability and health for specific diseases and circumstances. The Brief Core Set is selected from the core set which are the most commonly used and the best reflect the condition of dysfunction in the clinical application. Comprehensive Core set and Brief Core set.are the key methods of ICF applicated in clinical practice. At present, the core set that have been certified by research include: skeletal muscular system ,ankylosing spondylitis, low back pain, osteoarthritis, cardiopulmonary disease, diabetes, obesity, stroke, nervous system disease, brain injury, spinal cord injury, multiple sclerosis and other diseases in the acute and subacute phase of ICF core set(check the website https://www.icf-core-sets.org).

At present, both the comprehensive version and the simplified version of ICF have been validated in the subacute and chronic spinal cord injury, and their reliability and validity have been verified.

The brief version of ICF in the subacute spinal cord injury includes four sections: body function, body structure, activity and participation, and environmental factors. The body function includes 8 items: emotional function, pain sensation, respiratory function, defecation function, urination function, muscle strength function, muscle tension function, and skin protection function. Body institutions including the spinal cord and the structure, the structure of the respiratory system, urinary system injury degree, nature and position of the structure, activity and participation involves changing the body's basic posture, movement itself, the use of hand and arm, walk, wash one's hands and itself, lavatory, dress, eat, drink, each and every activity and participate in the performance of the (P) and (C),Environmental factors include items and technologies for the daily life of the individual, items and technologies for the indoor and outdoor mobility and transportation of the individual, immediate family members, personal care providers and personal assistants, and health professionals.

2. Research objects and methods

2.1 Subjects

2.1.1 Inclusion criteria of subjects

① Subacute spinal cord injury;

② The patient was in good health without other trauma before injury;

③After MRI examination, professional rehabilitation appraiser evaluated the nerve level and injury degree of spinal cord injury.

2.1.2 Basic information of subjects

After screening, 14 inpatients with subacute spinal cord injury in Xi 'an Hospital of Traditional Chinese Medicine for Encephalopathy were finally identified as research subjects. Among them, 12 cases were male and 2 cases were female, aged 30-55 years, 6-12 months after injury. Causes of spinal cord injury: 11 cases of falling injury, 1 case of car accident injury, 1 case of falling injury, 1 case of postoperative spinal canal space occupation. All the patients had injuries above the sacral pulp, including 4 cases of cervical pulp, 5 cases of thoracic pulp and 5 cases of lumbar pulp.3 cases were complete SCI, and 11 cases were incomplete SCI. According to the international classification standard of Asia 2000, 3 cases of grade A, 1 case of grade B, 6 cases of grade C, and 4 cases of grade D were classified.

2.2 Research Methods

2.2.1 Evaluation method

The simplified ICF assessment scale and Barthel index scale were used to evaluate the 14 patients with spinal cord injury. Assessment information was obtained from patient medical history, questionnaire, clinical examination, standardized assessment tools (Asia rating, Barthel index, modified Ashworth scale, Lovett grading method), medical examination (spinal MRI, pleural effusion

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B-ultrasound), interview, etc. Finally, quantitative assessment was performed using ICF of subacute spinal cord injury.

In the process of evaluation, some ICF projects are evaluated quantitatively according to the quantitative standard of the simplified ICF limit value, such as muscle strength, muscle tone; For some items that cannot be evaluated by standard quantitative indicators, such as pain perception, 0,2 and 4 were used, in which 0 represented no injury,4 represented complete injury, and 2 represented injury between 0 and 4.

2.2.2 Statistical methods

SPSS 22.0 statistical software was used to conduct statistical processing on the data, and the correlation between the items in the concise ICF evaluation scale and the scores of Barthel Index Scale was analyzed.

3. Research Results

3.1 Correlation between physical function items and Barthel Index in ICF of patients with subacute spinal cord injury

In the simplified ICF of 14 patients with subacute spinal cord injury, emotional function, pain, defecation function, urination function, muscle strength function, muscle tension function, skin protection function were negatively correlated with Barthel index (R<0) and positively correlated with each item (R>0), but the item of respiratory function could not be correlated with Barthel index and other items and was not statistically significant (as shown in Table 1).

Table 1 Correlation between physical function items and Barthel Index (R)

	emotional function	pain	defecation function	urination function	muscle strength	muscle tension	skin protection	Barthel index
emotional function	1	0.317	0.415	0.415	0.451	0.076	0.790**	-0.699**
pain	0.317	1	0.329	00.329	0.703**	0.394	0.289	-0.649*
defecation function	0.415	0.329	1	1.000**	0.160	-0.020	0.525	-0.637*
urination function	0.415	0.329	1.000**	1	0.160	-0.020	0.525	-0.637*
muscle strength	0.451	0.703**	0.160	0.160	1	0.070	0.517	-0.755**
muscle tension	0.076	0.394	-.020	-0.020	0.070	1	-0.038	-0.221
skin protection	0.790**	0.289	0.525	0.525	0.517	-0.038	1	-0.779**
Barthel index	-0.699**	-0.649*	-0.637*	-0.637*	-.755**	-0.221	-0.779**	1

Note: * P<0.05,* * P<0.01

3.2 Correlation between various items of body structure in ICF of patients with subacute spinal cord injury and Barthel index

In the simplified ICF of 14 patients with subacute spinal cord injury, the structure of spinal cord and related structures, the structure of respiratory system, and the structure of urinary system were negatively correlated with Barthel index (R<0) and positively correlated with each item (R>0). However, the statistical results showed that the correlation between respiratory system structure and Barthel index and other items could not be analyzed and was not statistically significant (as shown in Table 2).

Table 2 Correlation between Body Structure Items and Barthel Index (R)

	structure of SC and related structures	structure of respiratory system	Barthel index
structure of SC and related structures	1	0.221	-0.405
structure of respiratory system	0.221	1	-0.666**
Barthel index	-0.405	-0.666**	1

Note: * P<0.05,* * P<0.01

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3.3 Correlation between Barthel Index and ICF activities and participation in patients with subacute spinal cord injury

In the simplified ICF of 14 patients with subacute spinal cord injury, changes in basic body posture, self movement, use of hands and arms, walking, self-washing, toilet, dressing, eating and drinking were negatively correlated with Barthel index (R<0), and positively correlated with each item (R>0) (as shown in Table 3).

Table 3 Correlation between activities and participation items and Barthel Index (R)

	changes in basic body posture,	self movement	use of hands and arms	walking	self-washing	toilet	dressing	eating	drinking	Barthel index
changes in basic body posture,	1	0.9**	0.76**	0.58*	0.64*	0.55*	0.66*	0.65*	0.65*	-0.83**
self movement	0.9**	1	0.74**	0.59*	0.78**	0.67**	0.68**	0.72**	0.72**	-0.84**
use of hands and arms	0.76**	0.74**	1	0.51	0.73**	0.48	0.59*	0.91**	0.91**	-0.63*
walking	0.58*	0.59*	0.51	1	0.56*	0.67**	0.39	0.43	0.43	-0.74**
self-washing	0.64*	0.79**	0.73**	0.56*	1	0.79**	0.77**	0.87**	0.86**	-0.75**
toilet	0.55*	0.67**	0.48	0.67**	0.79**	1	0.79**	0.60*	0.60*	-0.78**
dressing	0.66*	0.68**	0.59*	0.39	0.77**	0.79**	1	0.76**	0.76**	-0.78**
eating	0.65*	0.72**	0.91**	0.43	0.87**	0.60*	0.76**	1	1.00**	-0.62*
drinking	0.65*	0.72**	0.91**	0.43	0.86**	0.60*	0.76**	1.00**	1	-0.62*
Barthel index	-0.83**	-0.84**	-0.63*	-0.74**	-0.75**	-0.78**	-0.78**	-0.62*	-0.62*	1

Note: * P<0.05 ,* * P<0.01

4. Research Conclusions

4.1 Correlation analysis between physical function items in ICF of patients with subacute spinal cord injury and Barthel index

This study showed that there was a negative correlation between emotional function, pain sensation, defecation function, urination function, muscle strength function, muscle tension function, skin protection function and Barthel index in ICF of patients with subacute spinal cord injury (R<0), with a high significance (P<0.05). so, the higher the Barthel Index, the lower the scores of various physical functions. In other words, it has the lower degree of injury of spinal cord injury. Respiratory function could not be correlated with Barthel index and other items, and it was not statistically significant. For specific reasons, further data analysis is needed.

4.2 Correlation analysis between various items of body structure in ICF of patients with subacute spinal cord injury and Barthel index

In this study, the simplified version of ICF for patients with subacute spinal cord injury showed a negative correlation (R<0) between the structure of spinal cord and related structures, the structure of respiratory system, the structure of urinary system and Barthel index with high significance (P<0.05), and there was a positive correlation (R>) among various items, that is to say,the higher the Barthel index, the lower the scores of body structure in ICF, in other words, the patient has the lower degree of spinal cord injury, and the various items of body structure are complementary and closely related, but the correlation analysis between the respiratory system structure and Barthel index and other items cannot be conducted, which is not statistically significant, the specific reasons still need further data analysis.

4.3 Correlation analysis between activities and participation items in ICF of patients with subacute spinal cord injury and Barthel index

This study showed that in ICF simplified version of patients with spinal cord injury in subacute stage, changes in basic body posture, self movement, use of hands and arms, walking, washing oneself, going to the toilet, dressing, eating and drinking were in negative correlation with Barthel index (R<0), and had significant differences (P<0.05), that is, The higher the Barthel Index, the lower the scores of

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ICF activities and participation. In other words, the better the performance and ability of patients with spinal cord injury to complete the activity project, the lower the difficulty has.

Compared with other spinal cord injury assessment scales, ICF assessment has the following advantages: (1) meticulous: The assessment of spinal cord injury by ICF can be divided into subacute and chronic stages, which is more representative and practical according to the clinical time of spinal cord injury. (2)Good comprehensiveness: it can evaluate both the physical function and structure and the activity performance and ability of patients with spinal cord injury. In addition, it can also evaluate the surrounding environmental factors of patients with spinal cord injury [9].

Among them, Barthel Index can only be used to evaluate the activities of daily living of patients with spinal cord injury, while ICF includes the ability of patients with spinal cord injury to participate in social activities, which is more in line with the ultimate goal of rehabilitation therapy and the return to family and society.

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