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Research Status and Progress of Chronic Pruritus Evaluation Tools

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Abstract: ***Itching is the most common main symptom of skin diseases, and patients may cause skin breakage by scratching, which can aggravate itching and even infection, forming a vicious circle of "itching-scratching-itching", which seriously affects the quality of life and mental health of patients. In recent years, with the deepening of the research on the mechanism of pruritus, a variety of tools have been developed to evaluate pruritus. This article systematically reviews the research status and progress of chronic pruritus evaluation tools, and focuses on the application and limitations of subjective evaluation tools and objective evaluation methods.***

Keywords: Chronic pruritus, Degree of itching, Evaluation tools**.**

1. Introduction

Itch is an unpleasant sensation that provokes the desire to scratch [1], itch lasting more than 6 weeks or longer is termed chronic itch. The assessment methods for itch primarily rely on the itch itself and the behavioural responses it elicits [2]. Various tools for evaluating itch have been developed both domestically and internationally. This article categorises and summarises the advantages and disadvantages of existing itch evaluation tools from both subjective and objective perspectives, aiming to provide some foundational basis for the development and application of clinical evaluation tools for chronic itch.

2. Subjective Evaluation Tool

2.1 Scale Evaluation Method

The current itching assessment tools still mainly use scale evaluation as the primary assessment method, and the common scale assessment tools are mainly divided into the following types.

(1) Visual Analogue Acale (VAS) [3]

VAS is currently the most commonly used and simplest tool for assessing itch. It represents the severity of itching with a straight line 10 centimetres long, where the beginning of the line (0 points) indicates no itch and the end of the line (10 points) represents the most severe itch that the patient can imagine (some scales also use a 100-point system). The subjects can illustrate their perceived level of itchiness by marking on the line. This method is simple and convenient, but it may require a physician's guidance to help patients understand the meaning of their markings, as it is influenced by their own level of awareness.

(2) Numerical Rating Scale (NRS) [4]

The NRS is also a 10-point rating scale, but the NRS method categorises the degree of itching: '0<NRS<4' represents mild itching, '4≤NRS<7' represents moderate itching, '7≤NRS<9' represents severe itching, and 'NRS≥9' represents very severe itching.

(3) Verbal Rating Scale (VRS) [5]

The intensity of itching is mainly described by gradually increasing itch rating adjectives, with scores from 0 to 4 representing no itch, mild, moderate, severe, and extreme itching respectively.

(4) Xie-Kawashima Itch Scale [6]

The Xie-Chuan Island Itch Assessment evaluates itch status through three dimensions: severity of itching, scratching behaviour, and its impact on patient sleep. It independently assesses daytime and nighttime itching, rating the severity of itching from 0 to 4, where 0 represents no itching and 4 indicates unimaginably maximum itching severity. It is a reliable multidimensional itch assessment tool.

(5) The 5-D itch scale [7]

The 5-D refers to Degree, Duration, Direction, Disability, and Distribution, among which Disability includes four aspects: sleep, social interaction, household chores, and work. Patients choose the answers that best reflect their situation. The 5-D itch scale can evaluate multiple dimensions of chronic itch, including changes in symptoms over a certain period and the degree of those changes [8]. The 5-D itch scale has good reliability and sensitivity to the severity of itch.

(6) Four-item Itch Questionnaire-validation

The four-item itch questionnaire evaluation method includes four dimensions: itch location, severity, frequency, and sleep disturbances. Respondents choose the corresponding scores based on the items, with the scores being directly proportional to the severity of the itch. This questionnaire is simple and easy to understand, has high feasibility, and evaluates itch from multiple dimensions, making it widely applicable in clinical settings.

(7) 12-Item Pruritus Severity Scale (12-PSS) [9]

In 2017, Adam and others proposed the 12-PSS method, and

in 2022, Xu Lin and others localised it into Chinese and verified its reliability [10]. The scale includes 12 questions, and patients select answers corresponding to scores based on their actual situation. Although there is a drawback of a longer completion time, the Chinese version of the 12-PSS still has a high level of reliability.

2.2 Skin Symptom Evaluation Method

Itching-induced scratching behaviour can leave marks on the skin's surface, which can indirectly reflect the severity of itching, mainly assessed through the following symptom evaluation methods.

(1) Skin Picking Scale (SPS) [11]

The SPS evaluation system includes six questions, which are the frequency of scratching impulses, the duration of scratching, the impact of scratching behaviour on the patient's life, the distress caused by scratching behaviour, and whether social avoidance occurs due to scratching behaviour. A score of 7 or above strongly suggests the presence of skin scratching behaviour.

(2) Investigator Global Assessment (IGA)

It is commonly used to assess the overall changes in lesions before and after treatment in patients with severe chronic pruritic skin diseases. Doctors provide an impression score based on the severity of the patient's lesion changes, where 1 to 5 represents no symptoms to very severe symptoms. This scoring method is applicable to various skin diseases with different lesion presentations.

(3) Dynamic Pruritus Score (DPS)

DPS indirectly reflects the severity of itching by comparing the level of itching at the time of consultation with the level of itching during the previous consultation. The assessment of itching is represented by a straight line where 0% at the centre indicates no change, with increments of 25%, 50%, and 75% on the left side reflecting a worsening of itching; conversely, the percentage increments on the right side indicate a reduction in itching severity, with a maximum increment of 100%. The further away from the centre, the greater the change in itching severity. DPS has a high level of credibility and can effectively reflect changes in patients' itching severity before and after treatment [12].

(4) Patient Benefit Index (PBI-P)

PBI-P is an evaluation tool used to assess the benefits patients gain from treatment and their overall satisfaction with the treatment, consisting of 27 standardised treatment efficacy questions. Respondents reflect on the improvement of itching symptoms by rating from 0, 'not important at all', to 4, 'very important'.

2.3 Quality of Life, Sleep, Mental and Psychological Assessment Methods

The Dermatology Life Quality Index (DLQI) and the ItchyQol scale [13-15] are currently widely used in the assessment of skin diseases, which can indirectly reflect the impact of itch on the quality of life of patients with skin-related itching [16]. There is currently no research to support the applicability of these tools for itch caused by visceral or other reasons.

Chronic itching can easily affect sleep and mental health, therefore, many studies have incorporated sleep quality and mental health scales into the evaluation of itching diseases. For example, the Athens Insomnia Scale (AIS) [17] and the Stanford Sleepiness Scale (SSS) [18] are used as references to assess the extent of itching. The Hospital Anxiety and Depression Scale (HADS), the Beck Anxiety Inventory (BAI), and the Beck Depression Inventory (BDI) [19] indirectly reflect the course and severity of the itching through the anxiety, depression, and somatic symptoms caused by prolonged itching.

3. Objective Evaluation Tools

Although itchiness is a subjective feeling, with the development of technology, there are now more objective evaluation tools for itchiness that have become increasingly mature. Measuring itch threshold, monitoring scratching behaviour, detecting itch-related indicators, and imaging of itch-related brain areas can also be used to evaluate the severity of itch.

3.1 Itch Threshold Measurement

The measurement of the itching threshold uses a bone-conducting wearable device to detect the friction produced by bone conduction during activity to record scratching behaviour. After recording, the system will use specific software to process and evaluate the data to detect scratching activity. This device is simple and portable, suitable for home and various environments; however, it is significantly affected by individual differences and lacks clinical validation.

3.2 Monitoring of Scratching Behaviour

Monitoring scratching behaviour mainly involves video methods, near-infrared imaging methods, and wrist activity monitors. The first two methods allow for direct observation of daytime and nighttime scratching activities in chronic itch [20], as well as the duration of scratching to reflect the severity of itching. The wrist activity monitor [21] tracks the duration of scratching actions by the patient's hands to indicate the severity of itch. Behavioural monitoring is time-consuming, heavily influenced by environmental factors, can easily invade privacy in clinical settings, and is prone to confusion with other movements, thus significantly limiting its use in clinical itch assessment.

3.3 Detection of Pruritus-related Indicators

The CK skin physiological function detection instrument reflects the impact of scratching behaviour caused by itching on skin physiological functions and skin barrier through detection indicators including epidermal moisture content (Capacitance, CAP), epidermal lipids (Sebum, SEB), and erythema index (Erythema Index, EI) among others [22].

Secondly, clinical laboratory tests for interleukin-6, eosinophils, IgE [23] and other indicators can also be used to evaluate the degree of itching, but all have certain limitations.

3.4 Imaging of the Itchy Brain Area and Application of Electroencephalography

Functional Magnetic Resonance Imaging (fMRI) technology can be used to observe the activation of different brain regions in the state of itching [24], marking a new beginning for the objective assessment of itch. However, due to differences in MRI equipment and individual patient variability, there are significant discrepancies in many MRI imaging studies on itch [25]. Existing research has used Electroencephalography (EEG) monitoring technology to observe the responses of different brain centres during itching [26, 27], but clinical research evidence is still lackin.

4. Conclusion

Currently, subjective evaluation methods are constrained by patients' levels of awareness, cultural background, and expression abilities. Objective evaluation tools, due to their immaturity and susceptibility to environmental factors, have not been established as reliable tools for assessing pruritus in clinical settings. Therefore, there is currently no standardized method for objectively evaluating pruritus. The strong subjectivity of pruritic symptom evaluation makes it difficult for clinicians to accurately use antihistamines and sedatives for itch relief in tiered diagnosis and treatment. Thus, the development and application of objective evaluation tools for pruritus remain a research necessity in clinical demand.

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