

Original Article

The pruritus severity scale-a novel tool to assess itch in burns patients

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Abstract: Background: Pruritus assessment is difficult due to the varying subjective nature of the experience. There have been several validated tools described to quantify the severity of itch, however these tools fail to provide a comprehensive assessment or are too cumbersome and therefore lack usability. Our novel burn assessment tool, "The Pruritus Severity Scale" (PSS) allows for accurate quantification of itch components. The aim of this study was to assess its use in the burns population. Methods: A prospective observational study was conducted on all patients over five years of age with a burn injury over a six month period. Patients underwent subjective evaluation of their itch as determined by two validated scores, the Visual Analogue Scale (VAS) and the Itch Man scale (IMS) and in addition to the PSS. The pruritus severity scale was correlated with the previously validated scoring methods using bi-variate correlations. Results: Twenty-two patients were included in the study. The most common cause of injury was due to flame burn. The mean total body surface area was 6.5% (range: 1-26%). Both the IMS and the VAS positively correlated well with the PSS. The Spearman Coefficient for the PSS vs IMS was 0.81, $R^2 = 0.65$ ($P < 0.05$). The Spearman Coefficient for the PSS vs VAS was 0.87 ($R^2 = 0.76$ ($P < 0.01$)). There is a positive linear relationship between our novel scoring methods and the currently validated methods, indicating its validity as a burn assessment tool. Conclusion: The Pruritus Severity Scale was shown to be an accurate, objective tool that was able to effectively record the patient's experience of itch. We believe that this novel score is quick, easy to use and allows for more comprehensive assessment than other short assessment tools.

Keywords: Burn, itch, pruritus, scoring tool, severity scale

Introduction

Pruritus following a burn injury is a common symptom reported by patients with burns, with a prevalence of as much as 87% of adults and 72% of children [1, 2]. It can be a disabling feature, complicating recovery and affecting the patients quality of life [3]. Not only does itch cause distress for patients, but it can also have clinical implications. Patients can cause local trauma to their wounds by uncontrolled scratching, which can lead to damage and delayed wound healing. It can also potentially introduce infection [3]. Pruritus can result in significant morbidity and can be present even years after the original injury, with an incidence of up to 79% at 4 years post injury and 44% at 12 years post injury [4]. It can be a difficult symptom to manage in the post-operative and rehabilitation periods. Whilst pain is often managed

quite effectively with multiple modalities, itch is often not at the forefront of treatment [5].

It has been suggested that pruritus should be one of the top priorities of burn management due to its distressing and persistent nature [3]. Therefore, in order to appropriately manage it, itch should be accurately assessed and quantified. Pruritus assessment is difficult due to the varying subjective nature of the experience. There have been several validated tools described that can be of use in the burns population including the Visual Analogue scale (VAS) and Itch Man Scale (IMS) [6, 7]. These scoring systems can be useful, but in general fail to provide information on the more detailed components of the itch sensation. There are more detailed pruritus assessment measures such as 5-D, Leuven Itch Scale, 12 item pruritus severity scale and ItchyQuant available [8-11].

The pruritus severity scale

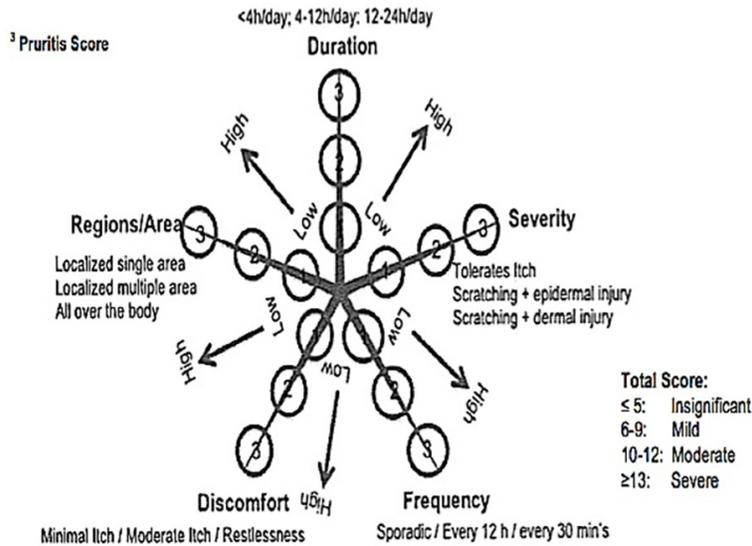


Figure 1. Pruritus severity scale.

These measures however are onerous to complete, which significantly limits their use in day-to-day practice. The ideal assessment tool would be quick, easy to use and objective, allowing for standardised assessment across all demographics.

As the burn itch assessment tools to date have been either incomprehensive or too onerous, we propose a novel burn assessment tool, “*The Pruritus Severity Scale*” (PSS, **Figure 1**) that allows for comprehensive assessment of itch components, whilst remaining short and concise. We wish to highlight its usefulness in the burns population.

Methods

Study design

The study was carried out at the Department of Plastic and Reconstructive Surgery, Cork University Hospital from September 2016 to March 2017. The study was designed as an observational prospective study. A power test was carried out to determine the minimum sample size that we would require for generous correlation targets. With a significance of 0.05, a power of 0.8 and a target correlation coefficient of 0.5, we determined that we would need to analyse at least 23 scores to deem our results significant. We included all patients who sustained a burn and were managed by the plastic surgery team during the study period. Patients under the age of 5 were excluded due to the inability

to complete a formal assessment. Consent was obtained from all patients for participation in the study. For patients under the age of 18, consent was obtained from the legal guardian. Ethical approval was obtained from the Clinical Research and Ethics Committee in Cork University Hospital.

Patient assessment

All patients were assessed using the Patient Assessment Form (PAF, **Appendix 1**). Itch scores were routinely analysed in order to guide treatment. Treatment was based on the St. Andrew’s anti-itch ladder [12]. All patients underwent

subjective evaluation of their itch as determined by two validated scores, the Visual Analogue Scale (VAS) and the Itch Man scale (IMS) and also using our novel Pruritus Severity Scale (PSS).

Statistical analysis

Statistical analysis was carried out using SPSS v24. The pruritus severity scale was correlated with the previously validated scoring methods using bi-variate correlations. Convergent validity was investigated using Spearman’s rank correlation efficient to measure the strength of the association between the assessment methods. We hypothesised that the PSS would correlate with the previously validated VAS & IMS scores. A *p* value of less than 0.05 was deemed significant.

Results

Fifty consecutive patients with burns were assessed during the study period. 23 patients were assessed using the Pruritus in Burns PAF. 27 patients were excluded, as they were children under 5 years of age who could not undergo formal pruritus assessment. One patient did not undergo itch assessment. This produced 49 readings over a four-month period.

Patient demographics

Of the 23 patients, 16 (70%) patients were male and 7 (30%) patients were female. The

The pruritus severity scale

Table 1. Patient demographics

Burn aetiology	Total (N)	Male (N)	Female (N)	Mean Age (range)	Mean TBSA (range)
Scald	6	2	4	23 (5-38)	2,3 (1-5)
Flame	10	8	2	39 (14-68)	9.4 (3-26)
Hot oil	2	1	1	35 (33-37)	3 (3)
Chemical	3	3	0	44 (42-47)	2.75 (1.5-4)
Contact	1	1	0	84	1

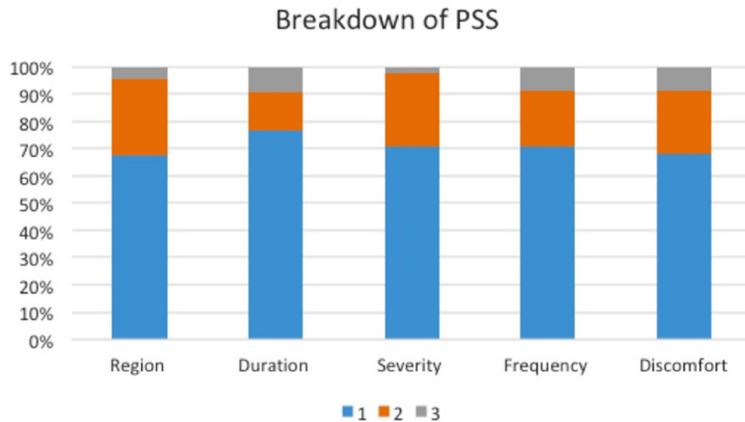


Figure 2. Allocation of PSS scores.

mean patient age was 37 years (range: 5-84 years). Six patients sustained scalds and ten patients sustained a flame burn. Two burns were due to hot oil, three were chemical burns and there was one contact burn. The size of burn ranged from 1% to 26%, with an average 6.5% total body surface area (TBSA). Ten of the 23 patients underwent debridement and split skin graft reconstruction, whereas the 13 healed with the aid of dressings alone. **Table 1** details the patient demographics.

Itch scores

Overall, the levels of itch were low. The average IMS score was 1 (Range 0 to 3) and the average VAS score was 2.9 (Range 0 to 9). The average PSS score was 7.41 (Range 5 to 13). There was variation across the scores for the PSS, identifying that the region and severity were more affected than duration (**Figure 2**). **Figure 2** details the breakdown of scores for extent of symptoms by location, duration, severity, frequency and discomfort.

Statistical analysis

We carried out bi-variate correlations between the PSS and the VAS and the IMS to compare

our score against current validated assessment tools (**Figure 3**). The data is provided as a supplementary file (**Appendix 2**). As expected, there was a good correlation between the VAS and Itchman scale (**Figure 3A**). Both the IMS and the VAS positively correlated well with the PSS. The Spearman Coefficient for the PSS Vs IMS was 0.81, $R^2 = 0.65$ ($P < 0.05$) (**Figure 3B**). The Spearman Coefficient for the PSS Vs VAS was 0.87 ($R^2 = 0.76$) ($P < 0.01$) (**Figure 3C**). Therefore we can say with 95% confidence that there is a positive linear relationship between our novel scoring methods and the currently validated methods, indicating its validity as a burn assessment tool.

Discussion

In this study we have demonstrated that the PSS is a novel burn itch assessment tool that compares well to other previously validated tools, yet gives more information to the clinician to guide treatment. The PSS gives information on the extent of area of itch, the duration of symptoms and the severity of symptoms. It also provides information on the frequency of symptoms and how much discomfort it causes for the patient. These components are all lacking in the VAS & IMS scores.

Pruritus or Itch is defined as the unpleasant sensation that provokes the desire to scratch [13]. It is thought to be mediated by the C nerve fibres which transmits itch, pain and temperature via the dorsal horn of the nerve root. In burns, tissue injury results in the release of pro-inflammatory mediators which can bind to and activate C fibres, whilst also causing an increase in density and sensitivity of certain fibres in the time following the burn injury [3]. It is a complex mechanism and is not yet fully understood. There may be a neuropathic component to itch [14]. There may also be a genetic component to the post-burn pruritus [15]. The multitude of components to itch can lead to difficulty when it comes to potential pharmacologic targets. The severity of itch is generally correlated with heal-

The pruritus severity scale

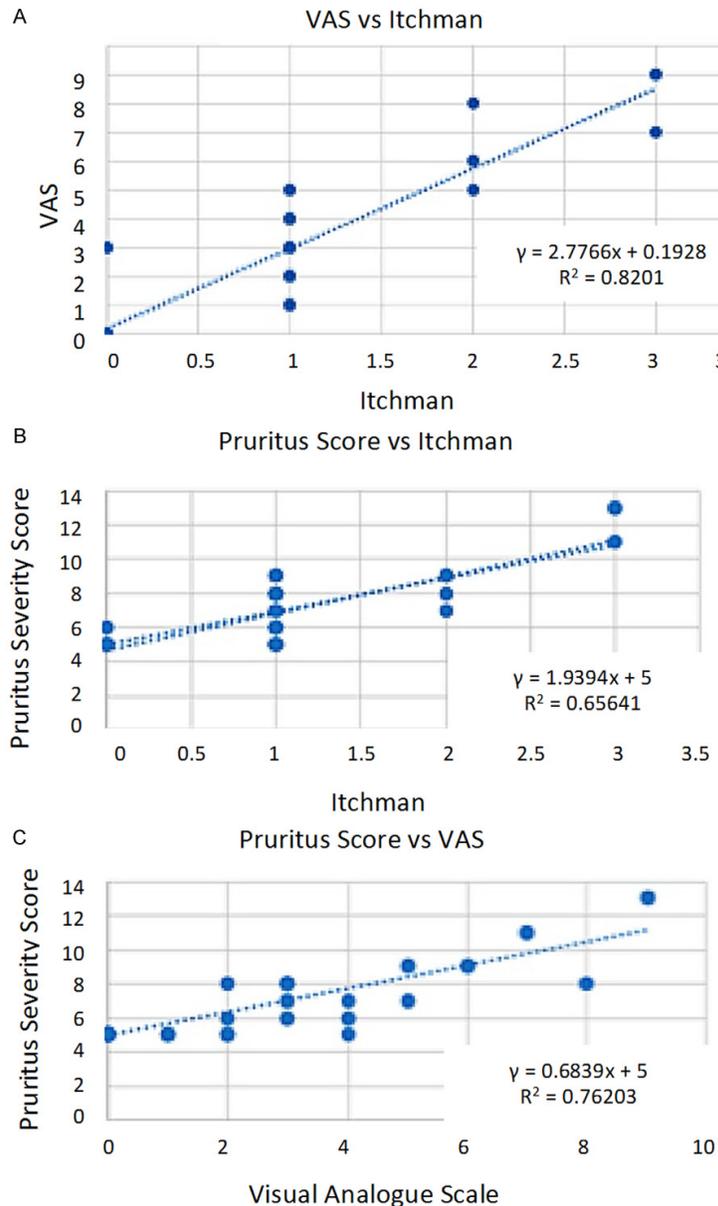


Figure 3. Bivariate correlations between scores.

ing time and extent of burn surface area [4]. Therefore, every effort should be made to accurately assess it in order to guide treatment.

In most clinical trials regarding pruritus therapy, the VAS is the most widely used score to assess the efficacy of the treatment modality [12, 16-20]. It's widespread use in the literature strengthens its validity, making it a useful comparator to our novel score. The Itch Man Scale has also been validated in paediatric patients, which can allow for an accurate comparator in the paediatric population [7]. Whilst these sc-

ores have been validated in the assessment of burn itch, they lack pertinent detail that can give a more in depth assessment of the symptom.

This study is the first to use the Pruritus Severity Scale in a clinical setting. In our validation study we used the Visual Analogue Scale (VAS) and the Itch Man Scale (IMS) tools and compared them with our PSS using bivariate correlations [6, 7]. Bivariate correlation was also the method of validation used in the 5-D Itch Scale study, whereby it was also used to correlate to the VAS tool [8]. However, this scale was limited as it was not specifically designed for burns patients, and therefore was noted to give a lower than expected score due to differences in the location of the pruritus. In our scale, the location of the burn is weighted differently so that it reflects the localised nature of burn related pruritus. By showing positive linear correlations between our score and the VAS & IMS tools ($r = 0.71, 0.72$), we can say that our score compares favourably to these scoring systems. High R^2 values of 0.76 and 0.65 support the validity of our results.

In our scale, the role of injury caused by scratching was incorporated as a novel assessment parameter. It is a valid method of objectively recording itch severity and to date has not been explored as a component of itch severity in burns patients [21]. This additional component of our PSS allows for a more objective assessment of pruritus while still retaining some of the more traditional subjective measures to give a more complete clinical picture. We believe that this novel score is quick, easy to use and allows for more comprehensive assessment than other quick assessment tools, without being as cumbersome as other comprehensive tools.

Conclusion

As pruritus can significantly impact on patient's psychological and physical well-being, every effort should be made to comprehensively assess and manage this symptom. The Pruritus Severity Scale was shown to be an accurate, objective tool that was able to effectively record the patient's experience of itch. It shows an early level of validity. It is an easy to use, quick, standardised tool that could be applied to clinical trials, assess surgical outcomes and improve overall patient care.

Disclosure of conflict of interest

None.

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The pruritus severity scale

Pruritus in Burns Patients Assessment Form

[Patient sticker]

Name:
DOB:
Gender:
MRN:

Date of Injury:
TBSA (%):
Mechanism:
Depth (circle appropriate):
Partial – superficial/deep/mixed
Full Thickness
Mixed

Management:

Conservative

Surgical intervention Details (Dates and Procedures):

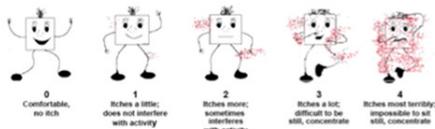
Suggested patient follow-up post-burn (depending on need for dressings and monitoring of response to medication):
1 month; 3 months; 6 months; 1 year; 2 years

Pruritus Assessment:

Date of appointment:																				
Healed (Yes/No)																				
Hypertrophic Scar (Yes/No)																				
Itch Man Scale ¹																				
Visual Analogue Score ²																				
Pruritus Score ³ : (Score 1-3 for each category)	Region (1-3)																			
	Duration (1-3)																			
	Severity (1-3)																			
	Frequency (1-3)																			
	Discomfort (1-3)																			
	Total Score (5-15)																			
Meds Prescribed ⁴ : (tick as appropriate and include dosage)	No																			
	Gabapentin (Dose)																			
	Cetirizine and Cyproheptadine (Dose)																			
	Chlorpheniramine (Dose)																			
Completed by																				

Pruritus Scoring Systems and Pruritus Management

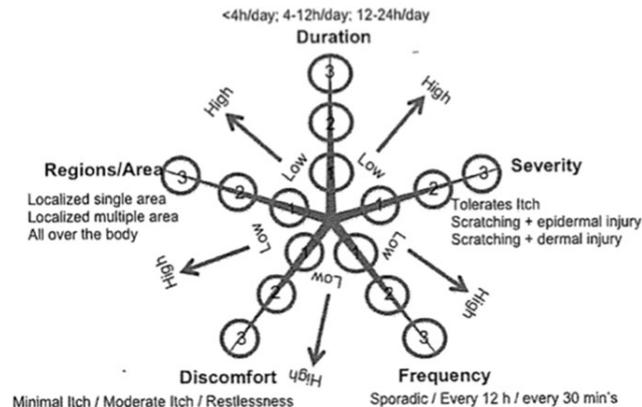
¹ Itch Man Scale



² Visual Analogue Score: Mild 2-5; Moderate 6-8; Severe 9-10

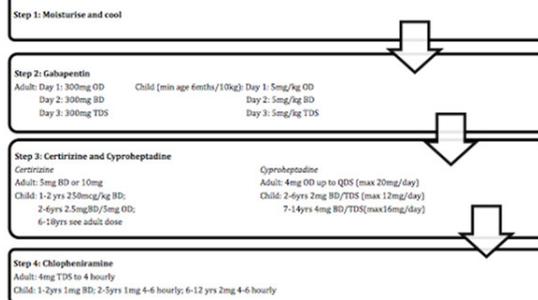


³ Pruritus Score



Total Score:
≤ 5: Insignificant
6-9: Mild
10-12: Moderate
≥ 13: Severe

St Andrew's Anti Itch Ladder



Appendix 1. Pruritus in burns patients assessment form.

The pruritus severity scale

Appendix 2. Itchman, VAS & Pruritus Severity Scale scores

Patient	Itch Man	VAS	Pruritus Score
1	3	7	11
2	0	0	5
3	1	3	7
4	1	3	7
5	0	0	5
6	NR	NR	13
7	1	3	6
8	1	2	8
9	NR	7	11
10	0	3	6
11	1	NR	8
12	1	4	7
13	0	0	5
14	1	2	6
15	1	4	5
16	2	6	9
17	1	2	5
18	1	NR	5
19	2	6	9
20	1	1	5
21	2	5	7
22	3	9	13