Evidence-based and clinical views on acute wound healing and scar formation
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Chapter 8

Values of patients and caregivers for donor site scars: An inter-observer analysis between patients and caregivers and prediction of cosmetic satisfaction

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Burns 2012
Chapter 8

Abstract

Background
The Patient and Observer Scar Assessment Scale (POSAS) is used to judge scars and involves patients and caregivers. Although the opinions of both are integrated, agreement between them is poorly investigated, especially in donor site scars (DSSs). Furthermore, it is unknown which POSAS-items are mostly associated with overall cosmetic satisfaction with the scar.

Methods
We included 106 DSS-patients. Twelve weeks after wound healing, patients and caregivers rated the DSS in vivo using the POSAS, comprising seven items. They were unaware of each other’s judgment. Inter-observer reliability (IOR) was expressed as intra-class correlation coefficients (ICC). Items of the POSAS that best predicted patients’ overall satisfaction were identified using multivariable regression analysis.

Results
Eleven caregivers from different medical centres judged the DSSs. IOR for the POSAS-items was ‘moderate’ at best regarding the item ‘overall opinion’ (ICC 0.44, 95% confidence interval 0.27 to 0.58). IORs regarding other POSAS-items were ‘poor’. Itching and relief best predicted patients’ overall satisfaction (total variance explained, $R^2 = 0.174$). For caregivers, pigmentation and pliability were most predictive ($R^2 = 0.318$).

Conclusion
Patients and caregivers appreciate different aspects of scar characteristics using the POSAS. This calls for shared decision-making, in which patient opinions are incorporated in the treatment choice.
Background

Scars are undesired manifestations of the normal wound healing process. If located in visible areas, scars may have a psychological impact and could affect the patient’s quality of life. Evaluating scars is important to balance pros and cons of wound care options and make well-informed clinical decisions for treatment of wounds and prevention of scars.

To support the judgment of the eventual healing result, many scales are available to classify scars, such as the VSS (Vancouver Scare Scale), POSAS (Patient and Observer Scar Assessment Scale), MAPS (matching assessment of scars and photographs), and the Manchester scar scale. None of these scales really stands out or is generally accepted, though the VSS and POSAS are mostly used in daily practice. The POSAS is unique in that it takes the opinion of the patients into account and consists of two scales: the Patient and Observer Scar Assessment Scale. Patients and observers, i.e. their caregivers, score slightly different items related to the scar characteristics, e.g. colour, thickness, relief, pliability, and more subjective factors, such as pain and itching. In burn scars the POSAS is considered superior to other assessment scales.

Nowadays, incorporating patient’s values and opinions in the decision process is promoted to ensure high-quality patient-centred care. However, caregivers still tend to overlook or misrepresent the patients’ opinion about their scars, which may lead to external decision-making about treatment choices. Hence, clinicians should be aware of the scar characteristics patients value most. Previous research regarding the POSAS in patients with scars outside the realm of DSS, showed a good agreement among caregivers. This scale has already been validated to classify burn- and linear scars, which suggests its usefulness in DSS after split-skin grafting, as these are acutely created and have a linear shape.

However, up to now it is unknown if patients and their caregivers differ in their perspectives regarding the desired result of the donor site scar (DSS). Furthermore, it is unclear which item (e.g. colour, thickness, or pain) or combinations of items best predicts the overall opinion of patients and caregivers about the scar.

Therefore, the aim of this study was to investigate the extent to which patients and their caregivers agree in their appreciation of the scar using the POSAS and which scar characteristics contribute most to their judgments.
Chapter 8

Methods

Patients

For this study we used data from the patients who were included in our recently completed randomized clinical trial regarding donor site treatment (REMBRANDT trial; www.trialregister.nl; NTR1849) on the effectiveness of six commonly used dressings, and had a complete POSAS score, i.e. without any missing data. This trial, involving 14 Dutch university and general hospitals, included adult patients who had a single donor site wound (DSW) with a surface area of at least 10 cm$^2$ after split-skin grafting for any indication. All patients gave written informed consent. The study was approved by the medical ethics review boards of the contributing hospitals. Inclusion criteria and study protocol have been described in detail previously.\textsuperscript{16}

Observers

Twelve weeks after complete wound healing a group of specialized wound care nurses, surgical nurses, and researchers judged the DSS in vivo using the observers’ part of the POSAS. We defined complete wound healing as re-epithelialization of the total wound surface, i.e. without any remaining scabs.

The POSAS contains seven questions on vascularity, pigmentation, pliability, thickness, relief, surface area, and overall opinion. All items were scored on a 10-point scale, ranging from 1 (best possible outcome) to 10 (worst possible outcome). The caregivers had some, but not extensive, experience in scar assessment, because the POSAS can be used reliably even by inexperienced observers.\textsuperscript{14} Nevertheless, all caregivers were instructed on the use of the POSAS by an expert. Patients and observers scored the POSAS during the same outpatient visit. Patients were asked to rate their scar using the Patient and Observer Scar Assessment Scale, i.e. the patients’ part of the POSAS, containing seven questions about pain, itching, colour, pliability, thickness, relief, and overall opinion. Subsequently, the caregivers also assessed the scar. Caregivers and patients were unaware of each other’s judgment.

Data analysis

We collected basic demographic data of the patients, comprising age, sex, location of the DSS, and mean time to complete wound healing.

Inter-observer agreement

Inter-observer reliability (IOR) regarding the POSAS scores between caregivers and patients was expressed as intra-class correlation coefficient (ICC), including their 95%
Do patients and caregivers agree?

Confidence intervals (CI), using a one-way ANOVA model for single measure agreement. This IOR is the measure we used to assess the agreement between patients and caregivers. The ICC takes values from zero (no agreement) to one (perfect agreement). We considered an ICC above 0.8 as ‘very good’, between 0.8 and 0.6 as ‘good, between 0.6 and 0.4 ‘moderate’ and below 0.4 ‘poor’. The ICC was calculated for all POSAS-items the caregivers and patients had in common. Furthermore, we used the 95% limits of agreement approach (a.k.a. Bland & Altman plots) to assess the score agreement between the patients’ and observers’ judgment as expressed by the POSAS-items.

**Prediction of cosmetic satisfaction**

Next to the IOR, we determined which item(s) of the POSAS best predict the overall opinion of patients and caregivers regarding scar cosmetics. We used the same analytic strategy for both patients and caregivers. First, we calculated the Spearman rank correlation for every POSAS item because of non-normal score distributions, with “overall opinion” as the dependent variable.

Subsequently, we included the item with the highest Spearman rank correlation using a forward multivariable regression model. The significance criterion for inclusion of an item in a multivariable regression model was set at a p-value below 0.10. Next, other POSAS-items were entered one by one in the order of their strength of the univariable association with the overall opinion score. A new item was considered relevant to the model if its addition resulted in an absolute increase in $R^2$ of more than 0.05. Data analysis was carried out using SPSS software (PASW statistics, version 18.0, IBM, Armonk, NY, USA). Due to the non-normal distribution, we conducted a log-transformation of the dependent variable.

**Results**

**Patient and observer characteristics**

We studied 106 patients, including 75 men and 31 women, with a mean age of 59.6 years (SD 16.6, range 18 to 90). Mean time until complete wound healing was 25.3 days (SD 12.4, median 22, range 9 to 65). Most of the DSSs were located on the thigh (n = 102; 96%), and rarely on the buttock (n = 2; 2%) or upper arm (n = 2; 2%). Eleven caregivers judged the DSS, including five specialized wound care nurses, two surgical nurses, and four researchers with a medical or nursing background. They were employed in five different medical centres.
Inter-observer reliability and score agreement

For each common item the IORs between patients and caregivers are shown in Table 1. Agreement regarding their overall judgment of the DSS was ‘moderate’ at best (ICC 0.44, 95% CI 0.27 to 0.58). Agreement regarding the other POSAS-items was ‘poor’, although their 95% CIs were wide. The limits of agreement approach showed that 95% of the overall opinion scores of patients differed up to three points from the caregivers’ scores without a systematic difference (Figure 1).

Table 1. Inter-observer reliability between patients and caregivers

<table>
<thead>
<tr>
<th>Item</th>
<th>ICC</th>
<th>95% Confidence Interval</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thickness</td>
<td>0.31</td>
<td>0.13 – 0.47</td>
</tr>
<tr>
<td>Relief</td>
<td>0.35</td>
<td>0.17 – 0.51</td>
</tr>
<tr>
<td>Pliability</td>
<td>0.38</td>
<td>0.19 – 0.52</td>
</tr>
<tr>
<td>Overall opinion</td>
<td>0.44</td>
<td>0.27 – 0.58</td>
</tr>
</tbody>
</table>

The intra-class correlation coefficient (ICC) was calculated using a one-way ANOVA model for single measure agreement.

Figure 1. Bland & Altman plot of POSAS-scores between patients and caregivers. Each circle represents a donor site scar judged by patient and caregiver; many circles overlap. Difference against mean plot for measurements of overall opinion by patients and observers using the POSAS (mean difference -0.02, SD 1.65)

Items predicting overall judgment

Correlation

For both patients and caregivers, each POSAS item score was significantly associated with their overall opinion (P-value < 0.10). Correlation coefficients ranged from 0.17 to 0.33 in patients, and from 0.22 to 0.50 in caregivers (see Table 2).
For patients, relief and itching showed the highest association with their overall opinion in the multivariable model (Table 3). Although relief was not significant anymore after adding itching, we forced relief into the model, together with itching, because of the highest association in the univariable analysis. Adding itching to the model explained another 5.1% of the variance in overall opinion score, leading to an $R^2$ of 17.4%. Subsequently, we added and removed each POSAS item to the model with relief and itching, but the $R^2$ did not increase with more than 5%. Together with relief in the multivariable model, itching was statistically the most significant predictor. However, relief discriminated best ($b = 0.13$, 95% CI 0.01 to 0.26, $P$-value = 0.066) (see Table 4). This means that a one-point higher score for relief resulted in a 14% higher overall score of the DSS.

For the caregivers, pliability and pigmentation of the DSS showed the highest association with their overall opinion in the multivariable model and were statistically significant predictors of their overall judgment (Tables 3 and 4). Pliability was statistically the most

### Table 2. Associations between POSAS-items and overall opinion of the patients and caregivers. Items with the highest association are stated first.

<table>
<thead>
<tr>
<th>POSAS-items</th>
<th>Patients</th>
<th>Spearman's correlation coefficient</th>
<th>Caregivers</th>
<th>Spearman's correlation coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relief</td>
<td>0.33</td>
<td></td>
<td>Pliability</td>
<td>0.50</td>
</tr>
<tr>
<td>Itching</td>
<td>0.30</td>
<td></td>
<td>Pigmentation</td>
<td>0.45</td>
</tr>
<tr>
<td>Pliability</td>
<td>0.27</td>
<td></td>
<td>Relief</td>
<td>0.42</td>
</tr>
<tr>
<td>Color</td>
<td>0.26</td>
<td></td>
<td>Thickness</td>
<td>0.37</td>
</tr>
<tr>
<td>Pain</td>
<td>0.23</td>
<td></td>
<td>Vascularity</td>
<td>0.32</td>
</tr>
<tr>
<td>Thickness</td>
<td>0.17</td>
<td></td>
<td>Surface</td>
<td>0.22</td>
</tr>
</tbody>
</table>

POSAS; Patient and Observer Scar Assessment Scale

### Multivariable analyses

For patients, relief and itching showed the highest association with their overall opinion in the multivariable model (Table 3). Although relief was not significant anymore after adding itching, we forced relief into the model, together with itching, because of the highest association in the univariable analysis. Adding itching to the model explained another 5.1% of the variance in overall opinion score, leading to an $R^2$ of 17.4%. Subsequently, we added and removed each POSAS item to the model with relief and itching, but the $R^2$ did not increase with more than 5%. Together with relief in the multivariable model, itching was statistically the most significant predictor. However, relief discriminated best ($b = 0.13$, 95% CI 0.01 to 0.26, $P$-value = 0.066) (see Table 4). This means that a one-point higher score for relief resulted in a 14% higher overall score of the DSS.

For the caregivers, pliability and pigmentation of the DSS showed the highest association with their overall opinion in the multivariable model and were statistically significant predictors of their overall judgment (Tables 3 and 4). Pliability was statistically the most

### Table 3. Overview changes in $R^2$ adding POSAS-items

<table>
<thead>
<tr>
<th>POSAS-item(s)</th>
<th>Patients $R^2$</th>
<th>Adding new item increased $R^2$ with:</th>
<th>Caregivers</th>
<th>POSAS-item(s)</th>
<th>$R^2$</th>
<th>Adding new item increased $R^2$ with:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Relief</td>
<td>0.123</td>
<td></td>
<td>Pliability</td>
<td>0.240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relief, itching</td>
<td>0.174</td>
<td>0.051</td>
<td>Pliability, pigmentation</td>
<td>0.318</td>
<td>0.078</td>
<td></td>
</tr>
<tr>
<td>Relief, itching, pliability</td>
<td>0.187</td>
<td>0.013</td>
<td>Pliability, pigmentation, relief</td>
<td>0.356</td>
<td>0.038</td>
<td></td>
</tr>
<tr>
<td>Relief, itching, color</td>
<td>0.202</td>
<td>0.028</td>
<td>Pliability, pigmentation, thickness</td>
<td>0.340</td>
<td>0.022</td>
<td></td>
</tr>
<tr>
<td>Relief, itching, pain</td>
<td>0.176</td>
<td>0.002</td>
<td>Pliability, pigmentation, vascularity</td>
<td>0.361</td>
<td>0.043</td>
<td></td>
</tr>
<tr>
<td>Relief, itching, thickness</td>
<td>0.185</td>
<td>0.011</td>
<td>Pliability, pigmentation, surface</td>
<td>0.320</td>
<td>0.002</td>
<td></td>
</tr>
</tbody>
</table>

*The correlation coefficient squared ($R^2$) is a measure of the amount of variability in the dependent variable “overall opinion” explained by the other POSAS-items. POSAS; Patient and Observer Scar Assessment Scale.
significant predictor and discriminated best. A one-point higher score for pliability resulted in a 19% higher overall score of the DSS (95% CI 10 to 29%). Adding pigmentation to the model explained another 7.8% of the variance in overall opinion score, resulting in an $R^2$ of 31.8%.

**Discussion**

Patients and caregivers use different characteristics when judging the scar of a donor site wound. Itching and relief appear to be the most important characteristic of patients’ overall satisfaction, whereas for caregivers pliability and pigmentation have more impact.

The limited agreement we observed between caregivers and patients is consistent with previous studies in other wound types. O’Toole et al. found that surgeons’ perceptions of cosmetic outcome differed from those of patients with lower extremity traumas.\(^{19}\) Kaija et al. found a moderate agreement in cosmetic outcome after conservative treatment of breast cancer.\(^{20}\) In our study we found a poor agreement for almost all items of the POSAS (excluding opinion on overall judgment) between caregivers and patients. However, agreement between caregivers in burn- and linear scars has shown to be good.\(^{3,14,15}\) So, although the POSAS seems to be a reliable tool in the communication among patients and caregivers they appreciate the scars differently.

Caregivers should realize that the patients’ own view of their scar affects quality of life.\(^{21}\) The serious impact of itching on patient satisfaction, as found here, is in accordance with previous studies regarding burn- and linear scars.\(^{3,14,22}\) Thus, the proper action of caregivers dealing with scar minimization should be to focus on patient-relevant issues, such as itching and a smooth scar surface. They should encourage patients to value pros and cons of treatment options, so that patients can balance both when deciding with the caregiver for the most suitable treatment option.\(^{23}\) These treatments should match the

<table>
<thead>
<tr>
<th>POSAS-item</th>
<th>Unstandardized Coefficient b</th>
<th>Standard Error</th>
<th>95% Confidence Interval for b</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Patients</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Relief</td>
<td>0.13</td>
<td>0.07</td>
<td>-0.01 - 0.26</td>
<td>0.066</td>
</tr>
<tr>
<td>Itching</td>
<td>0.11</td>
<td>0.04</td>
<td>0.02 - 0.20</td>
<td>0.013</td>
</tr>
<tr>
<td>Caregivers</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pliability</td>
<td>0.17</td>
<td>0.04</td>
<td>0.09 - 0.25</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Pigmentation</td>
<td>0.08</td>
<td>0.02</td>
<td>0.03 - 0.12</td>
<td>0.001</td>
</tr>
</tbody>
</table>

POSAS; Patient and Observer Scar Assessment Scale.
needs and preferences of the patient (e.g. less relief and itching). For donor site wounds, the results of our recently completed trial will help choose the dressing material that best suits this purpose.\textsuperscript{16} These considerations are also true for research on scar prevention, where the outcomes patients value the most are often disregarded.\textsuperscript{24}

Some limitations of this study should be mentioned. First, we assessed the DSSs after twelve weeks. This is a rather short period, but does allow analysis of the agreement between the patients’ and caregivers’ judgments, which is not likely to improve in the long term. Nevertheless, patient satisfaction may vary in time, especially when the acceptor site is completely healed, and scar characteristics may change even after complete re-epithelialization. After complete maturation of the scar, patients’ overall satisfaction may be more influenced by other items in the POSAS, for example colour instead of itching. Therefore, the predictive value of POSAS-items should be assessed and compared on different time-points. Second, different caregivers judged the wounds, which could influence the results. Yet, this mimics the real life situation in which several caregivers may be involved in the care for such patients. Up to now the agreement among various caregivers regarding their judgment of DSSs remains unclear. Third, although the judgments of patients and caregivers were compared, there was no reference standard with regard to the “truth” about the scar characteristics. This is of minor importance in our study as the patients’ perception seems the ultimate outcome caregivers should deal with, when pursuing the ideal of patient-centred care. Finally, the precision of the agreement we found was limited, as illustrated by the wide confidence intervals. This may imply an insufficient number of patients with DSSs investigated. However, this imprecision does not affect the conclusions of our study, as the upper limit of the ICCs indicated a moderate agreement at best. More patients would likely have narrowed down the confidence intervals to “poor” levels.

We conclude that patients and caregivers adhere to different characteristics of donor site scars. Scar perception is dependent upon many variables, which have different predictive values, depending on the perspective of the assessor. Given this discrepancy, patient preferences should be considered in decision-making on wound treatment and scar prevention options.
References


