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Reliable scar scoring system to assess photographs of burn patients



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ABSTRACT

Background: Several scar-scoring scales exist to clinically monitor burn scar development and maturation. Although scoring scars through direct clinical examination is ideal, scars must sometimes be scored from photographs. No scar scale currently exists for the latter purpose. **Materials and methods:** We modified a previously described scar scale (Yeong et al., *J Burn Care Rehabil* 1997) and tested the reliability of this new scale in assessing burn scars from photographs. The new scale consisted of three parameters as follows: scar height, surface appearance, and color mismatch. Each parameter was assigned a score of 1 (best) to 4 (worst), generating a total score of 3–12. Five physicians with burns training scored 120 representative photographs using the original and modified scales. Reliability was analyzed using coefficient of agreement, Cronbach alpha, intraclass correlation coefficient, variance, and coefficient of variance. Analysis of variance was performed using the Kruskal–Wallis test. Color mismatch and scar height scores were validated by analyzing actual height and color differences.

Results: The intraclass correlation coefficient, the coefficient of agreement, and Cronbach alpha were higher for the modified scale than those of the original scale. The original scale produced more variance than that in the modified scale. Subanalysis demonstrated that, for all categories, the modified scale had greater correlation and reliability than the original scale. The correlation between color mismatch scores and actual color differences was 0.84 and between scar height scores and actual height was 0.81.

Conclusions: The modified scar scale is a simple, reliable, and useful scale for evaluating photographs of burn patients.

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1. Introduction

Burn treatment has improved dramatically in recent decades. Early excision and grafting of burn wounds have greatly reduced morbidity and mortality [1,2]. Unfortunately, pathologic scarring affecting both function and cosmesis remains commonplace in burn patients, often delaying reintegration of these individuals into society. Improved outcomes have shifted greater attention to wound and scar management in an attempt to improve esthetic and functional results. Evaluation of esthetic results depends on the ability to assess the evolution of scars over time and the outcomes of corrective interventions. This requires scar scoring methods that are simple, reliable, and objective. Several scar scores have been described [3–5], with the Vancouver scale being the most widely used in clinical practice [6]. However, an ideal scoring system has yet to be developed.

Scoring scars through direct clinical examination is vital and irreplaceable. However, photographs of patients are commonly used in clinical practice to score scars, either because it is the only option or more convenient. Some scales have been applied to patient photographs to measure reliability between observers [7–10]. Unfortunately, these clinic-based scales are not specifically designed for analysis of patient photographs and may not be appropriate for this purpose. Development of a simple and reliable system to assess scars in photographs would be extremely useful from both a clinical and a research standpoint. Reliable comparisons over time, by multiple observers who may be blinded to treatment interventions, would be possible with a scale developed specifically for photographic evaluation. Objective, blinded analysis of a large number of patients enrolled in clinical studies would also be possible. Yeong *et al.* [8] described a very reliable clinic-based scar scoring system that relies on assessments of four scar characteristics. Here, we describe a modification of this scale to obtain a simple and highly reliable score system for the assessment of

photographs of burn patients. Validation of the method was performed to demonstrate utility for future studies.

2. Methods

2.1. Photographs

The study was approved by the Institutional Review Board of the University of Texas Medical Branch, and written informed consent was obtained from patients, parents, or legal guardians before enrollment. One-hundred twenty representative photographs of 40 severely burned patients admitted to our hospital from 2000–2008 were selected by a plastic surgeon who did not participate in the scoring. Representative photographs from 6, 12, and 24 mo after burn injury were selected so that different stages of scar maturation and hypertrophy could be presented to observers and the full-spectrum of scoring could be tested. All photographs were taken in the Medical Photography Department at our hospital using standard lighting conditions as well as a standard background and distance. Photographs were taken using two Photogenic Powerlight 600s located 9 feet from the subject and set at 58, 2 white umbrellas (Photogenic Professional Lighting, Bartlett, IL) reflecting 6 feet, and a Nikon D200 camera with a Nikon 105 mm *f*/2.8 AF Micro lens (Nikon Inc, Melville, NY), which was set to Manual: ISO 160, 1/60 at *f*10. The focal length was adjusted in accordance with the patient's height. The photographer was located between the two Powerlights and 9 feet from the patient, who was standing 3 feet in front of a standard surgical blue background. Color control patches (Eastman Kodak Company, Rochester, NY) were used to calibrate color. All photographs were stored digitally and then randomly ordered in a PowerPoint slideshow (Microsoft Office PowerPoint 2003 SP3; Microsoft Corporation, Redmond, WA). The representative scar was outlined, and a full picture of the patient was included to illustrate the normal skin for comparison purposes (Fig. 1).

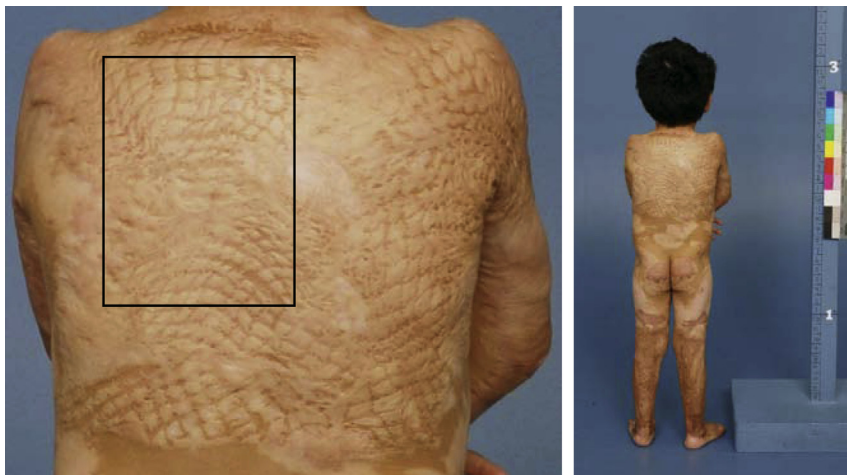


Fig. 1 – Example of a slide presented to observers. The studied area was outlined, and normal skin was included in the photograph for comparison. If necessary, a zoom-out or a picture of the entire patient was included in the same slide.

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