Effect of Camera Angle on Accuracy of Wound Areas Determined by Digital Planimetry

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Objectives:
(1) To describe and illustrate potential errors of using digital photography to assess wound areas
(2) To describe appropriate procedures to eliminate or substantially reduce these errors

ABSTRACT

Problem Statement: A useful method to track a wound’s progress is to measure its area via planimetry of digitized photographs. However, without care, this method can result in large errors.

Rationale: One potential error source relates to the angle (θ) between the camera’s line-of-sight and wound plane. We sought to mathematically and experimentally estimate this area error.

Methods: Shapes of known area, and shapes resembling complex wounds, were photographed with a digital camera at various angles. Photographs included horizontal and vertical scales for calibration. Areas were estimated by tracing the perimeter of the digitized image shape using computerized planimetry.

Results: Mathematical analysis predicted shortening of the shape’s width in proportion to sinθ. For example, in comparison to a photo taken at θ=90° (pointing directly down to the wound), a photo taken at 30° has a projected width that is ½ of the true dimension. This results in an area estimate that is ½ of the actual wound area. The predicted area errors for various angles were confirmed by measurements of various shapes.

Conclusions: The intrinsic potential error described can be overcome in two ways. (1) Take wound photos as close to 90° as possible – this yields no angular area error and a horizontal calibration is sufficient. (2) If this is not possible, and the photographic angle is less than 75°, then calibrating the image in both dimensions will eliminate most of the angular area error. This requires that calibration scales in both directions are included in the wound photograph.

References: