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Role of Digital Planimetry in Management of Scald Burns

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Abstract

Wound measurement is an essential part of wound management, providing clinicians with critical insights into wound behaviour, treatment effectiveness, and necessary interventions. Various techniques, including photographic records, the ruler method, and digital planimetry, have been developed for accurate wound assessment. This study focused on using digital planimetry via ImageJ software to measure and evaluates a 7-year-old male patient's scald burn wounds, involving the genitalia, bilateral thighs, and lower abdomen, with a total surface burn area of 7%. After wound preparation using the TIME concept, images were analyzed using ImageJ to calculate wound area. The method allowed for precise measurements, which informed clinical decisions, including the use of negative pressure wound therapy (NPWT) to promote healing.

Keywords: Digital Planimetry; Wound Measurement; Imagej

Abbreviations

TBSA: Total Body Surface Area; TIME: Tissue Management, Inflammation Control, Moisture Balance, And Epithelial Edge Advancement; NPWT: Negative Pressure Wound Therapy.

Introduction

Wound measurement is an essential component of effective wound management, helping clinicians assess the wound's progression and enabling timely interventions to prevent deterioration and promote healing. By tracking the wound's size and changes, clinicians can evaluate the effectiveness of current treatments and make necessary adjustments. Several methods are used for wound measurement, such as photographic documentation, comparisons, the ruler method, and graphing techniques. Among these, digital planimetry has proven to be a valuable tool for precise wound measurement. In this study, digital planimetry was employed to assess wound size and guide strategies for reducing it.

Materials and Methods

The study was conducted in a tertiary care hospital in South India, following approval from the departmental ethics committee. The patient was a 7-year-old boy who sustained scald burns, affecting the genitalia, bilateral thighs, and lower abdomen. On examination, the burns were classified as superficial partial thickness, covering approximately 7% of the total body surface area (TBSA). The wound bed was

prepared using the TIME (Tissue management, Inflammation control, Moisture balance, and Epithelial edge advancement) concept, and digital planimetry was employed for wound measurement.

We followed the procedure outlined by Shetty R, et al. [1] for calculating the wound surface area using ImageJ software.

- **Step 1:** The wound was cleaned to clearly define its surroundings.
- **Step 2:** A sterilized 4×4 cm grid was placed beside the wound (Figure 1).
- **Step 3:** A high-quality photograph of the wound was taken and uploaded to the computer. The image was then analyzed using the free, open-source ImageJ software.
- **Step 4:** The wound edges were outlined, and the area was calculated. Since the grid area was known to be 16 cm^2, the number of pixels within both the grid and the marked wound area were calculated for accurate measurement (Figure 2).

The wound area was measured as 3,024,327 pixels, and the grid area was 462,252 pixels. Using the known grid area of 16 cm^2, the wound area was calculated as follows:

$$\text{Area of wound} = 16\,(\text{wound measurement}/\text{grid measurement})$$
$$= 16\,(3024327/462252)$$
$$= 104.68.$$

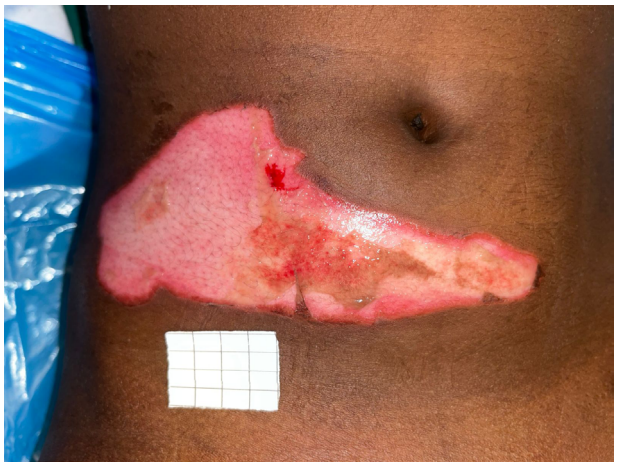

Figure 1: Raw area over the lower abdomen.

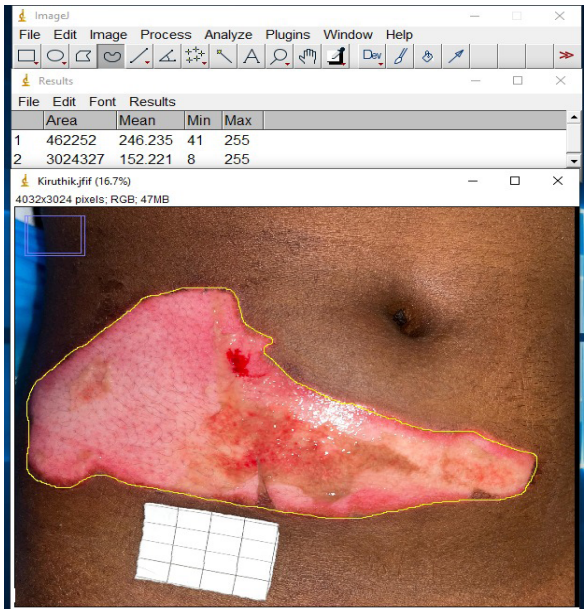

Figure 2: Digital planimetry with ImageJ.

Results

Digital planimetry facilitated precise measurement of wound size and provided guidance for wound bed preparation. Additionally, it informed the implementation of negative pressure wound therapy (NPWT) to reduce the wound size effectively.

Discussion

Wound assessment is crucial for promoting effective healing. Regular evaluations support proper management and guide decisions on necessary interventions [2]. Over time, wound measurement techniques have advanced, ranging from contact methods like the ruler and graphing techniques to non-contact methods such as digital planimetry [3]. In this study, we employed a grid system, clinical photography, and image analysis software for precise wound measurement. Routine measurements help clinicians track healing progress and determine if further interventions, such as grafting, are required. A reduction in wound size generally signifies good healing, while stagnation may prompt changes in treatment protocols. Research indicates that a wound size reduction of 30% or more within four weeks is a strong predictor of successful healing [4]. Although clinical photography for wound measurement is not yet standardized, maintaining consistency in camera settings is critical for accurate results. Despite being somewhat labor-intensive, this method remains valuable for clinical assessment and legal documentation.

A study by Mayrovitz HN, et al. [3] demonstrated the effectiveness of computerized planimetry in wound measurement. Similarly, research conducted by Wang Y, et al. [4] compared digital planimetry with other wound measurement techniques and concluded that digital planimetry is a reliable and effective alternative [5,6]. Research on ImageJ software is relatively scarce, with most studies concentrating on animal models. However, this technique proves to be useful for evaluating graft loss, assessing graft success, and analyzing real-world images, including facial assessments conducted before surgical procedures [7].

Conclusion

The use of digital assessment tools, such as ImageJ software, offers an accessible and cost-effective method for accurate wound measurement in wound management.

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