Short Communication

WOUND SURFACE MEASUREMENT USING DIGITAL PLANIMETRY IN DOGS

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ABSTRACT

The study was carried out to evaluate the feasibility and efficacy of digital planimetry apps for wound measurement in dogs. Twenty four clinical cases of dogs with the history of wound presented for wound management were randomly divided into four groups consisting of six animals each and wound measurements were taken on 0, 2, 4 and 7th day. The wound was measured with length, breadth, area and circumference using Imito Measure mobile application through smart phone camera. Based on reduction in wound size healing rate was assessed. Digital planimetry applications are accurate and precise in wound measurement compare to standard ruler method and tracing method.

Key words: Digital Planimetry, Wound Measurement, Wound healing, Mobile application, Dogs

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INTRODUCTION

Wound measurement is a clinical assessment process of determination size, depth, and nature of wound. This process includes inspection, measurement, images, and detailed documentation of each animal's wound. Wound measurement is an ongoing process requiring precision and care. Measurements are taken over time at regular intervals to measure any changes to wound (enlargement, reduction or appearance). The measurement of wound size is crucial in the management of wounds, as it provides valuable information for monitoring the healing process and assessing the effectiveness of treatment. There are two main methods of wound measurement manual and digital. Manual methods rely on operator's accuracy and knowledge, while digital methods provide unbiased accurate measurements

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and documentation. Digital planimetry is a method of measuring the area of an object or region using a digital camera and a calibration marker (Begum *et al.,* 2018). The use of smartphones equipped with high-definition digital cameras and various sensors is very common and these equipments are practical for wound measurement. The use of mobile devices allows the wound area measurement with better precision (Sigam and Denz, 2015), as it is good to identify the camera distance of the wound, so it allows to estimate the wound area in a mobile device.

MATERIALS AND METHODS

A randomized controlled clinical trial involving 24 dogs with wounds was conducted to evaluate the effectiveness of combining Low-Level Laser Therapy (LLLT) with platelet rich plasma (PRP) and collagen dressing in the treatment of canine wounds. The dogs were divided into four groups: Group I (Control) received conventional wound treatment, Group II received LLLT combined with conventional treatment, Group III received LLLT and autologous PRP application and Group IV received LLLT with collagen dressing (Table 1).

Detailed clinical examination was carried out in all animals to rule out major systemic disorder. The physiological parameters were recorded in all the animals. Regular wound measurement was done to assess the wound healing outcomes and comparing them to conventional wound treatment.

A wound surface study was conducted through digital planimetry, utilizing a smart phone photograph of the wound and measuring the area with the imito wound application (imito®; imito AG, Zurich, Switzerland) a non-contact digital planimetry application employing the calibration marker.

Points to be considered while taking measurements are:

1. Calibration marker must be positioned at the same level as the wound.
2. The photographs must be taken directly of the wound, avoid axis deviation.

The generally accepted standards for assessing wounds the main fundamental metrics are:

1. Area reduction over time.
2. Reduction in wound volume.

The calibration marker provided by the imito® was placed near the wound area and the mobile phone camera was focused parallel to wound (above 10-15cm) without axial deviation, a green square appeared over the calibration marker after the mobile application detects the marker through mobile camera. Then a click was made over calibration marker image on the mobile screen to capture the wound picture along with calibration marker. After that with the help of magical stylus pen, the margins of circumference of the wound were drawn. After completing the encircling over the selected wound area by using the

measure option wound's length, width, area and circumference were measured (Plate 1) on days 0, 2, 4, and 7 The percentage of surface area reduction over time was calculated using the following formula.

$$\text{Wound Size Reduction (\%)} = \frac{\text{SAI - AC}}{\text{SAI}} \times 100$$

SAI - Surface area (L×W) initial

SAC - Surface area current

RESULTS AND DISCUSSION

The imito® measure application used in the present study to measure the wound surface area was found easier and accurate (Bodea *et al*., 2021). The digital photography of the wound with smart mobile phone with the specific calibration marker provided with the imito® application facilitated accurate measurement of wound surface area. The length, width, circumference, and surface area of the wound were measured on days 0, 2, 4, and 7 and used to calculate the percentage surface area reduction. The percentage wound surface area reduction on day 7th compared to day 0 (Table 2) obtained in the study in group I was 26.66 ± 1.78, group II was 44.48 ± 2.64, group III was 46.29 ± 2.26 and group IV was 55.28 ± 3.05. There was a significant decrease in the percentage wound surface area reduction on 7th day ($p<0.01$) in group II, III and IV animals compared to group I animals. The percentage wound surface area reduction on day 7 was highest for the group IV animals treated with low level LASER therapy with collagen dressing followed by group III treated with low level LASER therapy with platelet rich plasma intra lesion infiltration and group II treated with low level LASER therapy and conventional treatment.

Digital wound planimetry proved to be a useful technique for measuring the surface area of wounds, crucial for monitoring healing progress and assessing treatment efficacy when compared to conventional method of measuring wound diameter like vernier caliper, rulers and acetate tracing methods (Chang *et al.,* 2011). With technological advancements, the imito Mobile app facilitated accurate wound measurements in dogs. In the present study, the mobile app used to measure the wound was found useful and had given precise wound measurements, aided by a calibration marker provided with the app. This eliminated the common challenge of errors associated with photographing wounds during assessment. The use of the imito Mobile app was not only accurate but also convenient in measuring wounds having irregular wound surface. Obtaining wound measurements through the app was significantly easier compared to traditional methods like using a ruler or tracing paper. Additionally, the digital images captured could be stored for future reference, enabling the tracking of healing progress over time. This concurs with the findings of Biagioni *et al*. (2021). Around 30 % - 40 % reduction in wound surface area in first 2-3 weeks indicates the effectiveness of the wound management practices followed. Limitations of digital planimetry apps are the impossiblity to measure three dimensional wounds and analyze the depth of wound.

Table 1. Design of experiment

Group	No. of dogs	Protocol employed
Group I	6	Conventional wound treatment with Povidone iodine / Gamma benzene hexachloride
Group II	6	Wound treated with Low Level Laser therapy and Conventional wound treatment with Povidone iodine / Gamma benzene hexachloride
Group III	6	Wound treated with Low Level Laser therapy and Platelet rich plasma intra lesional infiltration
Group IV	6	Wound treated with Low Level Laser therapy and Collagen dressing

Table 2. Mean (±SE) of wound size reduction percentage on 7th day compared to day 0

Parameter	Group I	Group II	Group III	Group IV
Woundsize reduction (%)	**26.66 ± 1.78^{A}**	**44.48 ± 2.64^{B}**	**46.29 ± 2.26^{B}**	**55.82 ± 3.05^{B}**

Mean bearing different superscripts (AB) in a row differs highly significantly ($P<0.001$)

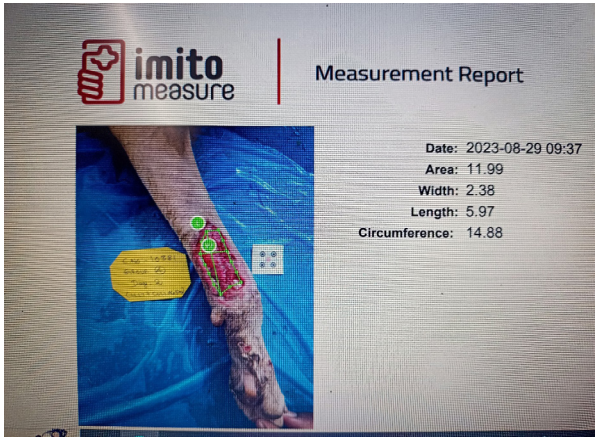

Plate 1. Digital planimetry report of selected animal

CONCLUSION

The imito Mobile app was observed to be a valuable tool for wound measurement in dogs. Additionally, the digital images captured could be stored for future reference.

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