NPL
National Physical Laboratory

Non-contact Wound Measurement System

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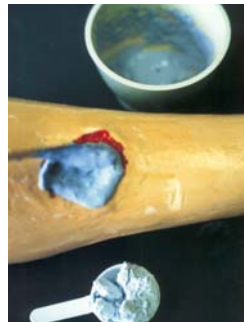[2]National Physical Laboratory, Teddington, TW11 0LW
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Measurement of Chronic Wounds

Chronic wounds such as leg ulcers heal very slowly. By constantly monitoring the size of lesion, clinicians know if a wound is responding to their interventions or not. There are two main methods of measuring the volume of a wound. The first is to fill the wound with saline. The volume dispensed from the syringe equals the wound volume. The second method is to fill the wound with an alginate or silicone based paste and weigh the amount of material used.

Current wound measurement techniques, however, are slow, inaccurate, painful and risk infection.


Mavis II Non-contact Wound Measurement System

The Mavis II instrument is a highly sophisticated measuring system providing extremely accurate volumetric, profile and colour data for assessing healing processes for wounds and sores.

Like all measuring devices, the accuracy of this instrument is highly reliant on its reproducibility and calibration. As part of the development team, the NPL's Length Group has been responsible for the provision of the traceable dimensional metrology required to calibrate the instruments and associated wound calibration standards.

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Measurement of Area And
Volume Instrument System
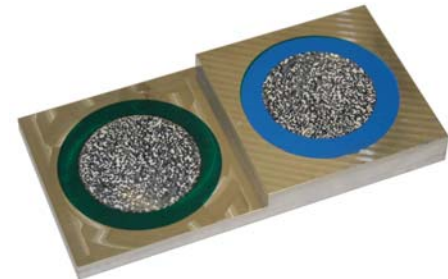
Calibration Artefacts

The wound calibration standards developed during this project, consist of flat metal artefacts with a range of sizes of high-precision concave shapes cut into their surfaces. These shapes have been designed to simulate a typical wound. The concave surfaces have been coated with special structures and these have been designed so both the NPL's metrology systems and the Mavis II instrument can reliably detect them.

Artefact Calibration

The artefacts are calibrated using the NPL's **High-Precision Non-contact Vision Machine**. This is a state of the art co-ordinate measuring system fitted with optical and mechanical probes that scan along the profile of the concave surfaces. It records the dimensional co-ordinates of the profile with micrometre precision. The vision machine is fitted with a laser interferometer and this is used to ensure that the length measurements are traceable to national standards.

From the data, the volume of the wound calibration standard is calculated. The NPL calibrated wound calibration standards are supplied with each Mavis II instrument, enabling the end users to verify the performance of the instrument or recalibrate it as required.
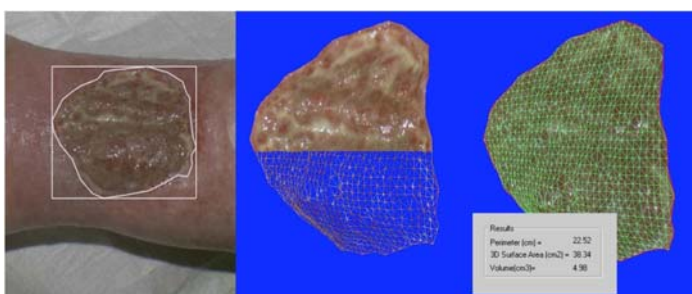

Colour Characterisation of the Mavis II System

The Mavis II system has been characterised to produce CIE colorimetry from an RGB image file. The CIE XYZ tristimulus values of each of a number of patches in a GretagMacbeth colour chart are measured using a spectrophotometer. The RGB data, obtained from an image of that chart, are then modelled to the XYZ data. It has been found sufficient to use a quadratic regression model that yields a median value of colour difference of < 3.5 CIELAB units.

Example

The wound can be rapidly and accurately characterised by perimeter area volume and colour, without contact.

Source Image   *Results*

Acknowledgments

Royal National Hospital
for Rheumatic Diseases
NHS