# Thermographic appearance of the surface during the process of wound healing

Dear Sir,

It is well known that unhealed wound or delay in wound healing can not only impair the quality of life of a patient but also becomes a serious public health problem [1]. The quantitative measurement of wound temperature has been used to understand the progression of wound healing in selected studies [1]. In the present article, we share our initial experience with thermographic imaging of the surface wounds where the selected cases that underwent different surgical procedures were included in the study (Figs. 1-5). For thermographic imaging, the participants were positioned in standard sitting position and area of interest was captured with the camera (SCT model 640, M/s Securean, South Korea, with emissivity set to 0.98). Before capturing the images, a standard amount of time was allowed to create a balance between body heat and environment.

Researchers have extended the role of thermography to evaluate the body surface temperature [2-5]. In clinical medicine, thermographic imaging has been used to follow the surface changes associated with inflammation [5-9]. Infrared thermography technology uses the emission characteristics of infrared radiation from a surface or object and this heat distribution can be recorded with a thermographic camera [10,11]. These temperature gradients data can be used for computational analysis and can be displayed as colorful hues [5-11].

Conventionally, local signs of inflammation help in assessing the process of inflammation (infections as well normal wound healing). The role of thermography has been explored to understand the process of wound healing by many investigators [7,12-14]. It has been suggested that a relative reduction in the area of a wound on follow-up imaging suggests the wound healing [12]. In

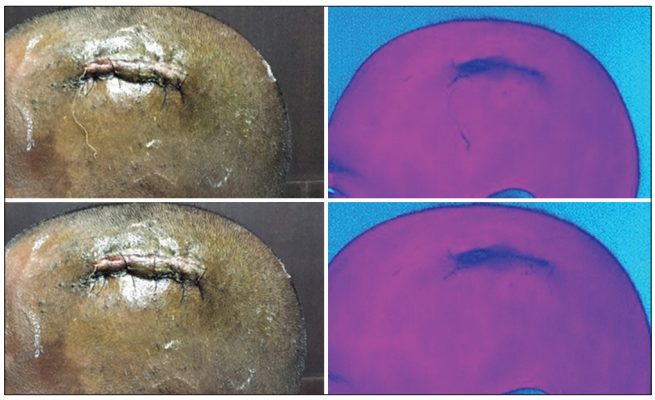

**Figure 1: Clinical and thermographic images (day 5th post-surgery) showing increased temperature at the wound edges**

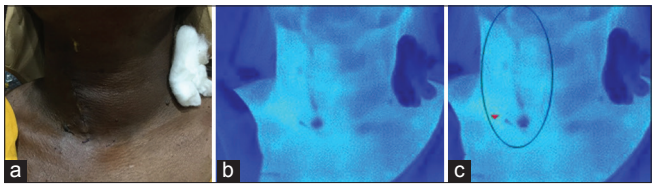


**Figure 2: (a-c) Clinical and thermographic images (day 10th post-surgery) showing increased temperature at the wound edges**

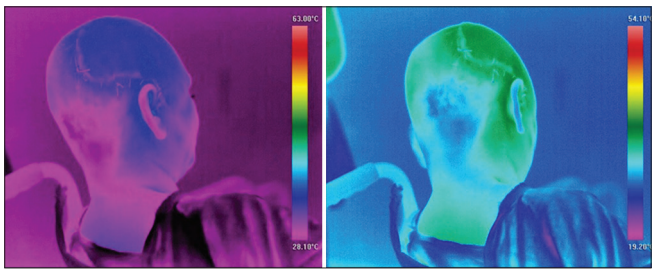

**Figure 3: Clinical and thermographic images (day 21st post-surgery) showing reduced temperature at the wound edges**

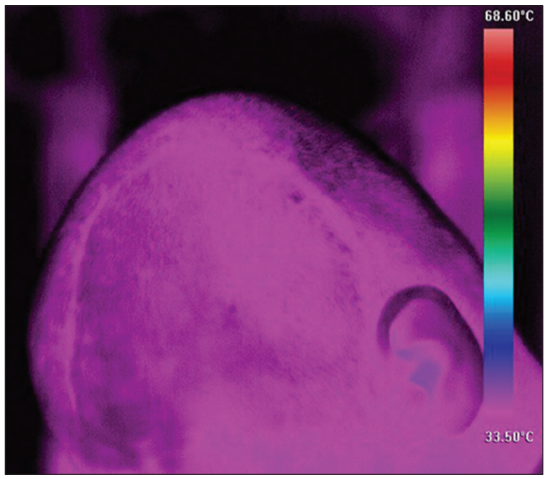


**Figure 4: Clinical and thermographic images (day 25th post-surgery) showing further reduce in temperature at the wound edges**

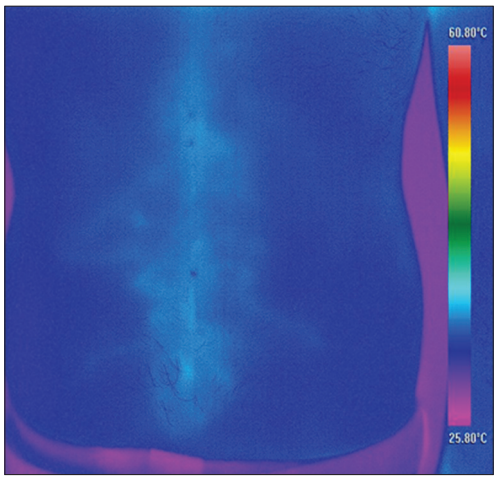


**Figure 5: Clinical and thermographic images (day 30th post-surgery) showing reduced temperature at the wound edges**

a study, where the authors studied the thermographic appearance of the post-operative wounds on day 0, 1, 5, 7, and 10, it was seen that due to increased vascular permeability surrounding area of the wound appeared as a cold spot (due to the presence of coagulated blood) [15,16]. This was followed by a decrease in the cold area and increase in the warm area which was a reflection of an increase in inflammatory activity (day 3 or day 4) (Figs. 1 and 2) [15]. As seen in our patients, it has been shown that healing phase (approximately 14th day) showed a lower temperature due to the presence of abundant collagen incision, suggesting that the wound is moving from proliferative stage to maturity stage (Figs. 3-5) [17-19].

In summary, thermographic imaging can be used to follow wound healing after surgical intervention in a non-invasive manner; however, there is a need for larger studies to confirm the utility of this technique.

**Vedavyas Srigiriraju[1], P Ramamohan[2], Muniraju Katikala[1], Vishnu Vardhan Reddy[1], Amit Agrawal[2]**

*From [1]Research Associate, Department of Neurosurgery, [2]Professor, Department of Pharmacology, Narayana Medical College Hospital, Nellore, Andhra Pradesh, India*

**Correspondence to:** Dr. Amit Agrawal, Department of Pharmacology, Narayana Medical College Hospital, Chinthareddypalem, Nellore – 524 003, Andhra Pradesh, India.
E-mail: dramitagrawal@gmail.com

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