

## Application of Non-Contact Thermometer in Burns Patients

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### Abstract

The care of the patient with major burns in the Intensive Care Unit (ICU) is a complex and challenging task. They differ from the other critical care patient groups in several ways. Temperature recording is an important parameter for monitoring the burns patients. In burn patients it is difficult to record temperature due to bulky dressing especially when patient is unconscious and oral temperature also cannot be recorded. And central methods of recording temperature may not be available and are costly. Infrared thermometry a form of non-contact temperature measurement method, offers several advantages over other conventional temperature measurement methods in victims of burn injuries. In this paper we are highlighting the importance of non-contact thermometer in burns patients.

**Keywords:** Burns; Infra red; Thermometer; Hyperthermia.

### Introduction

One of the major challenges faced in burns patients is confronting their hyper metabolic state and temperature management [1]. Hyperthermia could be part of the inflammatory response to the insult or of infectious origin. Irrespective of the reason, sustained hyperthermia above 40°C can culminate in cellular injury and death [2].

Measurement of temperature in major burns with conventional thermometer is found to be difficult due to the presence of:

- ♦ Involvement of the conventional sites used to measure with burns or wound dressings,
- ♦ Altered sensorium of patient,
- ♦ Possibility of transmission of contagious organisms.

This poses the clinician with the need for measurement of temperature using alternative methods such as trans-esophageal or trans-rectal. But these methods might not be available in all centers and might not be suitable in unstable patients.

Infrared (IR) thermometers measure reflected infrared light, which just like any light ray is Electromagnetic Radiation, with lower frequency (or longer wavelength) than visible light and can be correlated to a specific surface temperature being measured.

IR sensors collect the low amounts of energy (usually 0.0001 watt) from the target, which is then amplified by a precision amp, and convert into a voltage output. The CPU then converts this to a digital temperature reading after compensating for the ambient temperature and emissivity effect.

### Methods

The study was conducted in the department of Plastic Surgery, JIPMER, Pondicherry, India during the period, May 2014 to April 2015. A commercially available IR thermometer was used to measure the temperature of patients at a distance of 1 to 2 cm from the surface selected (figure 1 and 2). The cost of thermometer was INR 2500/-.

### Results

Forty two burn patients were enrolled in the study including 12 pediatric and 30 adult burn patients. It

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was useful especially in pediatric patients as it is difficult to take oral temperature in pediatric patients by conventional thermometer. Out of 42 patients 12 patients who developed septicemia was monitored using IR thermometer. Overall there was good compliance as patient was not disturbed while recording temperature. The commonest site of recording the temperature was forehead followed by groin and axillae.



**Fig. 1:** Non-contact Infra red Thermometer



**Fig. 2:** Recording of temperature using non-contact Infra red Thermometer

### Discussion

Thermoregulatory failure leading to elevation of core body temperature more than 37.5°C (37.5 to 38.3°C) is hyperthermia. The core body temperature

is managed in a tight range by the balance of heat production and heat loss.

An infrared thermometer is a thermometer which infers temperature from a portion of the thermal radiation sometimes called blackbody radiation emitted by the object being measured. They are sometimes called laser thermometers if a laser is used to help aim the thermometer, or non-contact thermometers or temperature guns, to describe the device's ability to measure temperature from a distance. By knowing the amount of infrared energy emitted by the object and its emissivity, the object's temperature can often be determined.

Infrared thermometers are characterized by specifications including accuracy and angular coverage. Simpler instruments may have a measurement error of about  $\pm 2^\circ\text{C}/\pm 4^\circ\text{F}$ .

The design essentially consists of a lens to focus the infrared thermal radiation on to a detector, which converts the radiant power to an electrical signal that can be displayed in units of temperature after being compensated for ambient temperature. This permits temperature measurement from a distance without contact with the object to be measured. A non-contact infrared thermometer is useful for measuring temperature under circumstances where thermocouples or other probe-type sensors cannot be used or do not produce accurate data for a variety of reasons.

### Conclusion

Non-contact IR thermometer is useful in burns patients to record temperature effectively, safely with no physical stress to patients and the avoidance of transmission of contagious organisms.

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