

# **An Infrared-View of the Convective-Warming Devices Bair Hugger 750 and WarmTouch.**

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## INTRODUCTION

Perioperative mild hypothermia is associated with adverse outcomes, including cardiac events, coagulopathy, surgical-wound infections, and prolonged hospitalization [1]. Therefore, normothermia should be preserved during the perioperative period with convective-air warming [1]. At the moment, the optimal forced-air warming technique is under discussion. In a laboratory study with a copper-manikin, Braeuer and colleagues have shown relevant differences between forced-air warming systems measuring heat flux with 16 heat flux transducers and surface temperatures with 16 thermocouples [2]. Despite 16 measuring points this method cannot give a complete and direct depiction of the whole temperature distribution of the blankets.

Here we show for the first time in a laboratory study a comparison of two convective-warming devices with an infrared-camera.

## METHODS

We compared the following two forced-air warming systems:

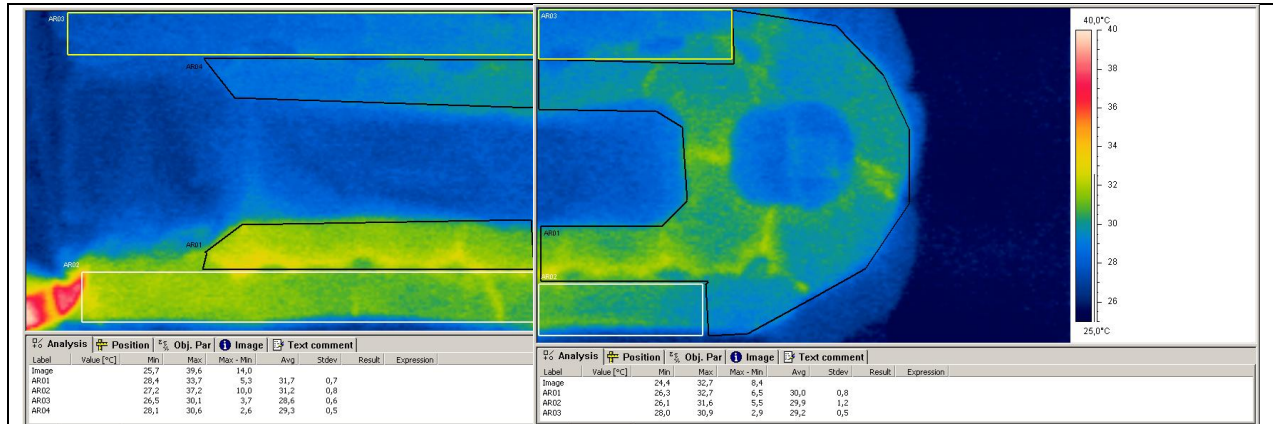
1. Bair Hugger® Model 750 Warming Unit and full under-body blanket model 635 (Arizant Healthcare Inc.).
2. WarmTouch™ Patient Warming System and CareQuilt™ full body blanket (Tyco Medical Inc.).

The measurements were performed in the laboratory-rooms of Continental-Regensburg by a certified engineer.

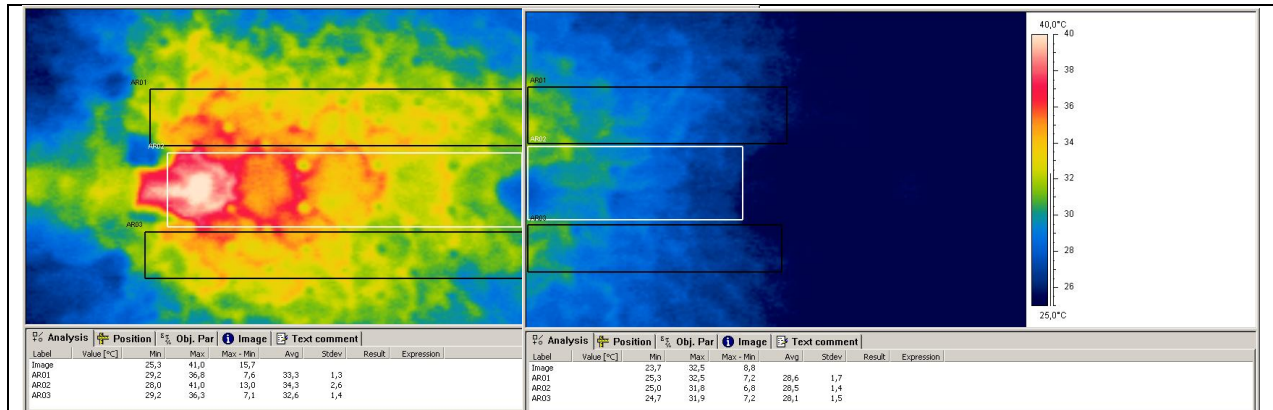
Both warming-blowers were connected to the corresponding blanket and temperature control was set to the highest step. Then we accomplish a warming period for 20 minutes before starting the infrared investigations.

A FLIR infrared-camera (FLIR Agema Thermovision D900 IR camera, FLIR Systems GmbH, 60437 Frankfurt, Germany) was used for high-definition digital IR images of the surface temperatures of both blankets. All images were electronically stored and processed using the image analysis software ThermoCAM Researcher™ 2.9 (FLIR Systems).

## RESULTS



The infrared depiction of convective warming (acclimatization period for 20 min) with Bair Hugger® Model 750 Warming Unit and full under-body blanket model 635 shows an inhomogen distribution of the temperature. Only the left side of the blanket, where the nozzle (red area) blows heat into the blanket, is warmed. The right side shows no effective warming.



Also an inhomogeneity is seen with the second device. The infrared depiction of convective warming (acclimatization period for 20 min) with WarmTouch™ Patient Warming System and CareQuilt™ full body blanket (Tyco Medical Inc.) shows an effective warming in the area of the lower part of the body. The nozzle (white/red area) blows heat into the blanket near by the lower legs. The upper part of the body shows no effective warming.

## CONCLUSIONS

The aim of this infrared-investigation was to obtain more insight in the warming characteristics of convective warming. The infrared pictures show an inhomogeneity with both devices. Interestingly, the power of the blower does not automatically allow a prediction about the warming effectivity. Braeuer and colleagues have shown a higher heat transfer of Bair Hugger® 750 (41.5 °C, 26.2 L·sec<sup>-1</sup>, 623 W ) compared with WarmTouch™ (43.1 °C, 14.5 L·sec<sup>-1</sup>, 342 W; Nozzle temperature (°C), Air flow (L·sec<sup>-1</sup>) Heat flow (W)). Our results show, that not the power of the blower but the construction of the blanket is critical for the temperature distribution.

## REFERENCES

[1] Sessler DI. Mild perioperative hypothermia. *N Engl J Med* 1997;336:1730-7.

[2] Brauer A, English MJ, Steinmetz N, et al. Efficacy of forced-air warming systems with full body blankets. *Can J Anaesth* 2007;54:34-41.