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Objective Evaluation of Output Energy by Modulating the Intensity of the Infrared Diathermy

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Objective

Infrared radiation is an invisible band of energy in the electromagnetic spectrums, which has been used to relief the pain. It transfers energy, in the form of heat that can be recognized by thermos receptors in the target tissue. Infrared is divided into near infrared, including infrared heaters and heat lamps (750–1400 nm) emitting temperatures of 1300 °C, medium infrared (1400–3000 nm) and emits temperatures of 500–800 °C and far infrared which, operates in the wave lengths above 3000 nm, and emits much lower temperatures and no visible light. This study aims to investigate whether the energy transfer amount increases with the intensity control of the infrared device.

Methods

We compared 14 infrared devices used in our hospital's thermoelectric therapy sector. Infrared radiation output 20mW and peak wave length of 850 nm (IR-2009, Yeollin Sesang, Korea). The radiation output was measured using an laser power energy meter (NOVA II, OPHIR, Korea). An energy meter was placed at a distance of 30 cm from the IR light source, and the energy was measured while increasing the intensity from 1 to 10 after darkening the surrounding environment.

Results

The radiation energy of a total of 14 infrared devices were measured, and the output energy value was recorded according to the intensity change of 1 to 10. A linear increase in energy output was observed with increasing intensity in each infrared devices and statistical significance difference was observed. (P=0.001) The linear regression equation can be obtained by analyzing the data of the energy measurement data, and the energy transfer value according to the intensity change can be predicted. (Intensity = -0.486 + 0.324 X, r2=93.5) A statistical significantly difference between the two groups were also observed, as the energy output data can be grouped into two different groups of intensity variations. (P=0.001)

Conclusions

The results of this study can be used to predict the energy transfer value according to the intensity control of the infrared therapy device used in clinical practice. Energy output data analysis showed a linear increase in output energy transfer as the intensity of the devices was increased. Some device has a stronger energy transfer than the predicted value, standardization and quantification of infrared devices are required.

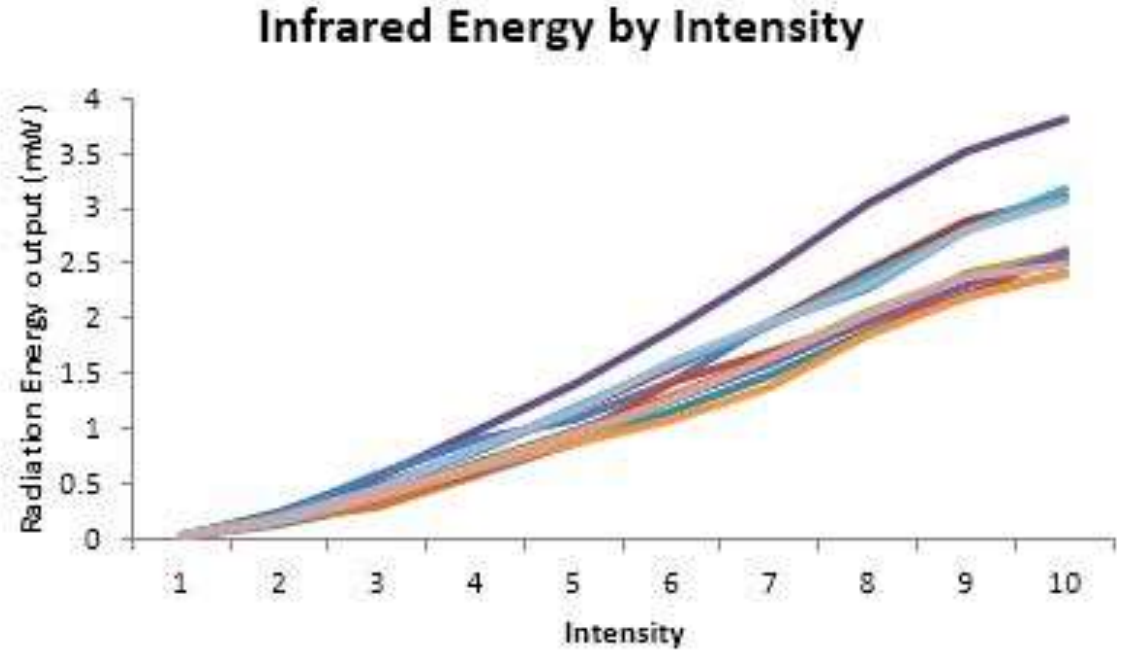

Fig 1. Characteristics of the infrared output energy value was recorded according to the intensity change of 1 to 10.

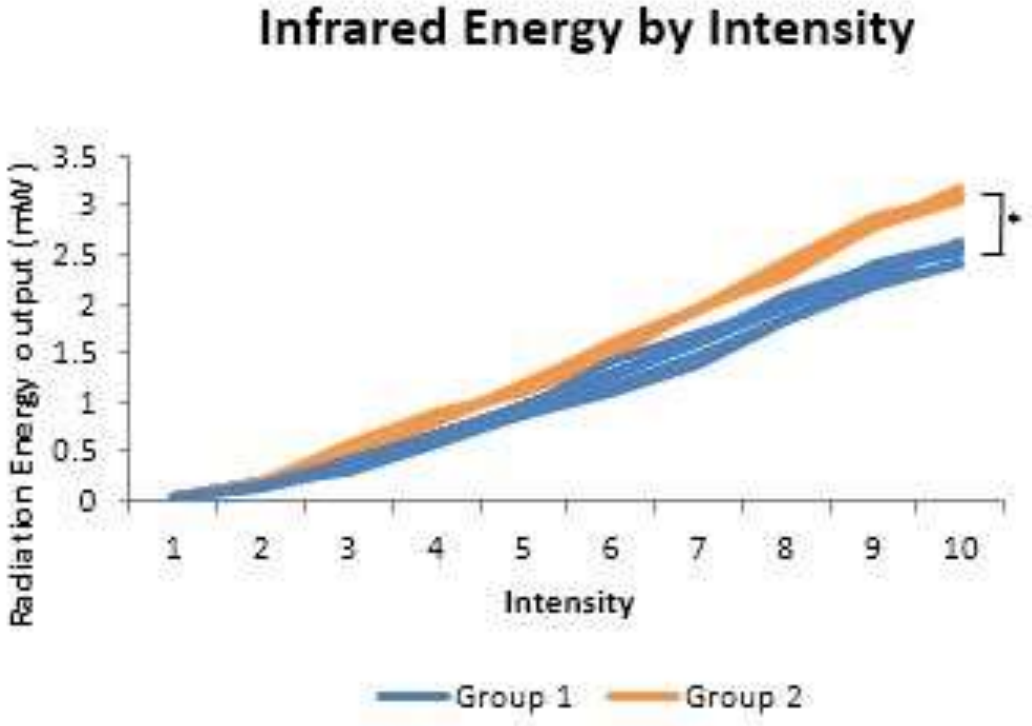

Fig 2. Comparison of the between the two groups as the increasing output energy variations. *, P=0.001 by Mann-Whitney test.