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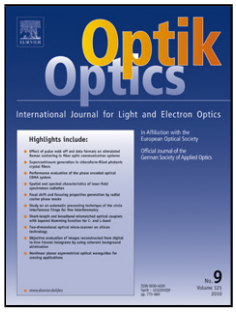

Title: Simulation of the Effect of Spot Size on Temperature Field and Weld Forming in Laser Tissue Welding

Authors: Cong Li, Kehong Wang, Jun Huang

PII: S0030-4026(17)31188-9
DOI: https://doi.org/10.1016/j.ijleo.2017.09.118
Reference: IJLEO 59726

To appear in:

Received date: 16-6-2017
Accepted date: 29-9-2017

Please cite this article as: Cong Li, Kehong Wang, Jun Huang, Simulation of the Effect of Spot Size on Temperature Field and Weld Forming in Laser Tissue Welding, Optik - International Journal for Light and Electron Optics https://doi.org/10.1016/j.ijleo.2017.09.118

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Simulation of the Effect of Spot Size on Temperature Field and Weld Forming in Laser Tissue Welding

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ABSTRACT. Laser Biological Tissue Welding is a great potential for tissue suture replacement technology. However, most of the biological tissue laser welding research focused on the chronic histology after laser irradiation, the lack of systematic analysis of laser parameters and other related factors on the impact of tissue welding anastomosis effect. In this work, in order to understand the heat transfer and heat distribution, a two-layer structure model of skin was developed and validated with the experimental results, which is based on the theory of bio-heat transfer. Under the condition of different spot sizes, the temperature response of the model, including the peak temperature, the temperature field distribution and the time behavior, were calculated according to the Gaussian distribution laser heat source. We evaluated the effect of changes in laser spot size on the thermal denaturation zone produced during laser skin welding. The calculated result basically in good agreement with the experimental result indicated that the developed model was validity and reasonable.

Keywords: Laser biological tissue welding，Simulation，Temperature field，Weld forming，Spot size

1. Introduction

As a minimally invasive technique, Laser Biological Tissue Welding (LTW) has the advantages of simple operation, short operation time, rapid wound healing, mild inflammation and unobvious scarring. The laser procedure showed remarkable advantages compared to conventional suturing: it reduces postoperative

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