Current Issue
Browse Issues
Search
About this Journal
Instruction to Authors
Online Submission
Subscription
Contact Us
RSS Feed

Acta Medica Iranica
2009;47(4) : 95-101

"Ultrasound Monitoring of Temperature Change during Interstitial Laser Thermotherapy of Liver: An In Vitro Study"

T. Gorji-Ara, M. Mokhtari-Dizaji, H. Ghanaati

Abstract:

Background/objective: In thermal tissue ablation, it is very important to control the increase in the temperature for having an efficient ablation therapy. We conducted this study to determine the efficacy of measuring pixel shift of ultrasound B-mode images as a function of change in tissue temperature. Materials and Methods: By fixing some microthermocouples in liver tissues, temperature at different points was monitored invasively in vitro during laser-induced thermotherapy. According to our results, optimum power and exposure time were determined for ultrasound temperature monitoring. Simultaneously, noninvasive temperature monitoring was performed with ultrasound B-mode images. These images were saved on computer from 25ºC to 95ºC with 10 ºC steps. The speed of sound changes with each 10°C temperature change that produce virtual shifts in the scatter positions. Using an image processing method, the pixel shift due to 10 °C temperature change was extracted by motion detection. Results: The cubic regression function between the mean pixel shifts on ultrasound B-mode images caused by the change in speed of sound, which in turn was a function of the mean change in temperature, was evaluated. When temperature increased, pixel shift occurs in ultrasound images. The maximum pixel shift was observed between 60 to 70 ºC (temperature changes (ΔT) of 35–45 ºC). After 70ºC, the local pixel shift due to change in the speed of sound in liver tissue had an irregular decreasing. Pearson correlation coefficient between invasive and non-invasive measurements for 10°C temperature changes was 0.93 and the non-linear function was suitable for monitoring of temperature. Conclusion: Monitoring of changes in temperature based on pixel shifts observed in ultrasound B-mode images in interstitial laser thermotherapy of liver seems a good modality.

Keywords:

hyperthermia ، induced ، thermotherapy ، temperature monitoring ، ultrasound B-mode images

TUMS ID: 3546

Full Text HTML Full Text PDF 245 KB

top