

## **CT Thermometry During Hepatic Radiofrequency Ablation: Assessing The Correlation Between CT Number Shift And Tissue Temperature**

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### **BACKGROUND:**

Radiofrequency ablation (RFA) is commonly used for ablation of small primary or metastatic liver tumours. Post-ablative evaluation is normally done by visual inspection of the appearances of ablated tissues on computed tomography (CT) images. This study aimed to explore the correlation between CT number shift and tissue temperature in order to create CT thermal maps for more objective assessment of ablation adequacy.

### **METHODOLOGY:**

RFA was performed on ex-vivo bovine livers (n=15) containing embedded fibre optic temperature sensors. Multiple CT scans were performed at approximately 3 min intervals throughout the ablation and cooling process. CT numbers were measured on the ablated tissues adjacent to the temperature sensors. The correlation between CT number shift and tissue temperature was analyzed using Microsoft Excel program. Further, CT thermal map for real time monitoring of the tissue temperature was developed using Matlab program.

### **RESULTS:**

A negative linear correlation was found between CT number and tissue temperature ( $y = -1.7086 x + 1.8212$ ,  $r^2 = 0.61$ ; where  $y = \text{HU change}$  and  $x = \text{temperature change}$ ). CT number decreased as tissue temperature increased during RFA, and subsequently increased as tissue temperature decreased during the cooling period, with a rate of 1.7 HU per degree Celsius.

### **CONCLUSION:**

There was a strong correlation between CT number shift and tissue temperature during RFA. Using the equation developed from this study and the aid of 3D thermal map algorithms, it is possible to estimate tissue temperature based on the CT number measured during real-time CT guided RFA. This approach will help the interventionalists in determining the ablation efficacy.