
Title:

A Pilot Clinical Study on Cryo-thermal Therapy of Liver Cancer

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Abstract (max 400 words): (Your abstract must use Normal style and must fit into the box. Do not enter author details)

Introduction: A novel cryo-thermal therapy was developed for tumor ablation by alternating cooling and radio frequency (RF) heating of tumor tissues. Mechanically inducing a whole-body immune response against distal metastases in animal models is considered as a promising strategy against metastatic cancer. In this study, we aimed to assess the safety and efficacy of the cryo-thermal therapy of liver cancer in clinic.

Methods: 8 patients with colorectal cancer liver metastases were included in this pilot study. Lesions ranging from 1.2 to 4.0 cm were treated with cryo-thermal ablation. First, Argon-helium knives (Cryo-HIT™) were inserted in the target area with the distance between adjacent probes less than 15 mm. When the ice ball was 5mm beyond the boundary of the tumor, the power was reduced to maintain ice ball unchanged until 15min. After rewarmed, a cycle of RFA was performed by Umbrella Electrode (MedSphere International, Inc.). According to the preoperative planning, the power and heating time was set to maintain the temperature 50 degrees about 5mm beyond the tumor for 15min. All patients underwent standard magnetic resonance imaging of liver cancer on day 1 or 2 prior to the ablation procedure, and 1 month and 3 month after. The size and apparent diffusion coefficient (ADC) value of each lesion were compared. The blood test and immunology indexes were run for each patient before the ablation procedure, and on day 3, 1 month, 3 month and 6 month after.

Results: The ablation procedure was well tolerated in all patients without major complications or procedure-related mortality. Complete response was achieved in all treated lesions. There was no irregular or nodular enhancement observed in all lesions on 1 or 3 month follow-up. The mean ADC value showed predictable increasing following ablation from 0.90 to 1.19 to $1.25 \times 10^{-3} \text{ mm}^2/\text{s}$. The immunology indexes in these cases with disease progression and free indicated that the effectiveness of the therapy seemed related to the patient's immune status. After the cryo-thermal tumor ablation, matured DCs and macrophages were correlated with good prognosis. Existing data suggested that further investigation of the subsets and function of T cells, MDSCs, NKs, DCs, and macrophages after the ablation would be necessary to evaluate the anti-tumor immunity induced by the cryo-thermal therapy.

Conclusion: Cryo-thermal therapy is safe and highly effective for local tumor ablation without major complications. The mechanism of anti-tumor immune response induced is investigating.