Image guided cryoablation of cancer with intratumoral injection of anti-CTLA-4 and PD-1 immune check-point inhibitors

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Background
Image guided cryoablation of cancer destroys tumor tissue and can activate tumor-specific T cells by increasing the presentation of tumor antigens and causing the release of “Danger signals” to stimulate the immune system. However, the development of a systemic anti-cancer...
**Figure 2**

Image above is a CT scan performed during the ablation procedure demonstrating ablation needle with a right upper lobe lesion.

**Figure 3**

The image above demonstrates a FDG PET/CT scan performed 2 months after treatment with minimal peripheral FDG uptake of the ablated tumor site.

The above image is a FDG PET/CT performed 2 months after treatment showing resolution of infra-hilar adenopathy, with minimal residual uptake in peri-aortic adenopathy.
immune response may be restrained by immune checkpoint inhibitors. In recent years, the U.S. Food and Drug Administration–approved antibody drug ipilimumab, nivolumab and pembrolizumab as inhibitors of CTLA-4
and PD-1. By blocking these immune check-point receptors, these antibodies can promote tumor rejection, but their full application has yet to be fully determined.

Methods
In our human case studies, we offer a proof-of-concept in multiple tumor types that intra-tumoral CTLA-4 and PD-1 blockade combined with cryoablation of a primary tumor can cause regression of secondary tumors at a distant site.

Results
From past clinical experience, we know that secondary tumors are unlikely to be affected by cryoablation alone, the combination treatment was sufficient to cause complete cancer regression and tumor rejection. Cryoablation is currently used to treat a targeted tumor, our results suggest that combination therapy with CTLA-4 and PD-1 blockade, by direct injection into the ablated tumor, will enhance anti-tumor immunity and rejection of tumor metastases.

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