18F-FDG PET/CT-based early treatment response evaluation of nanoparticle-assisted photothermal cancer therapy - DTU Orbit (27/12/2018)

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Within the field of nanoparticle-assisted photothermal cancer therapy, focus has mostly been on developing novel heat-generating nanoparticles with the right optical and dimensional properties. Comparison and evaluation of their performance in tumor-bearing animals are commonly assessed by changes in tumor volume; however, this is usually a late-occurring event. This study implements 2-deoxy-2-[F-18]fluoro-D-glucose positron emission tomography imaging to perform early evaluation of the treatment outcome of photothermal therapy. Silica-gold nanoshells (NS) are administered intravenously to nude mice bearing human neuroendocrine tumor xenografts and the tumors are irradiated by a near-infrared laser. The animals are positron emission tomography scanned with 2-deoxy-2-[F-18]fluoro-D-glucose one day before and one day after treatment. Using this setup, a significant decrease in tumor uptake of 2-deoxy-2-[F-18]fluoro-D-glucose is found already one day after therapy in the group receiving NS and laser treatment compared to control animals. At this time point no change in tumor volume can be detected. Moreover, the change in tumor uptake, is used to stratify the animals into responders and non-responders, where the responding group matched improved survival. Overall, these findings support the use of 2-deoxy-2-[F-18]fluoro-D-glucose positron emission tomography imaging for preclinical and clinical evaluation and optimization of photothermal therapy.

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