Image-Guided Surgery (IGS) and Personalised Postoperative Immunotherapy To Improving Cancer Outcome

Objective

The basic concept of our proposal is to develop nanoparticle-based encapsulated libraries of different immunotherapeutic biomolecules for treatment after surgery as part of a novel cancer management strategy. The current state-of-art for the management of cancer starts with surgery, after identification of an accessible tumour mass. Surgery remains an effective treatment option for many types of cancer today and it is considered curative treatment for most solid tumours. It forms part of a multidisciplinary approach used in conjunction with radiotherapy or chemotherapy. These approaches, however, have several limitations, including inability of surgical resection to affect distal metastatic disease, toxicity to healthy tissues with chemotherapy and lack of effectiveness of radiation therapy in more aggressive tumours. The observation that cancer can relapse months or years after initial surgery implies that micrometastases still resides within the body in a latent state. Our proposal is to take cancer therapy to beyond state-of-art by implementing techniques which will take us into new directions. This includes a) new methods to identify immune gene profiles and biomarkers b) transgenic mouse models where the complex interactions that underlie immune function can be visualised as multiplexed events in real time and c) the use of nanoparticle-based libraries of immune modulating reagent combinations. There are three key objectives within this project: i) to use immune gene signatures to monitor disease progression and therapeutic efficacy of immunotherapy combinations on nanoparticle-based platforms, ii) to optimise the platform to encapsulate libraries of immune components for more personalised, accurate and timely delivery of the payload to its intended target and iii) to optimise the overall cancer management process of image-guided surgery followed by postoperative immunotherapy so that we can ultimately provide a lifetime of protection against cancer.
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