Workshop report: Expanding the use of PET in clinical cancer research

Meeting summary

- 90 delegates from a variety of specialties attended this one-day workshop in London, jointly organised by the NCRI Biomarkers and Imaging CSG and the NCRI PET Research Initiative.
- Chaired by Prof. Fiona Gilbert (University of Aberdeen), the workshop provided practical advice to CSG members on designing PET studies in oncology, and information on imaging with non-FDG tracers in research.
- Key points from the talks and breakout groups are summarised below. Some of the slides are available on request as PDFs from http://ncrndev.org.uk/index.php?option=com_content&task=view&id=134&Itemid=272
- The NCRI PET Core Lab provides a co-ordination function for UK-based PET trials. The group is based at St Thomas' and accredits sites to the NCRI PET Clinical Trials Network, harmonises standards, and performs quality assurance (QA) for multicentre trials. For more details on how the group could help you deliver the QA for your PET trial, contact pet-trials@kcl.ac.uk.
- Further resources to support PET researchers are available at www.ncri-pet.org.uk. These include the PET scan funding flowcharts discussed on the day, details of which centres are accredited as part of the NCRI PET Trials Network, and databases indicating availability of novel radiotracers, UK trials involving PET and facilities at different sites around the UK.
- Participants were also encouraged to make use of the expertise on the Biomarkers and Imaging CSG to help develop translational components of late phase clinical trial protocols, and to provide suggestions for future workshop topics.

Introduction

On 30th Sept 2011 the National Cancer Research Institute (NCRI) Biomarkers and Imaging Clinical Studies Group (BI CSG) and the NCRI PET Research Initiative co-hosted a workshop at the Royal Institute of British Architects, London. The workshop was aimed at members of the clinical research community wanting to incorporate PET imaging into their clinical studies, and was attended by approx 90 delegates from a variety of backgrounds. The main objectives of the workshop were:

1. To encourage the appropriate use of PET in clinical oncology trials
2. To provide practical advice on designing PET research studies in oncology
3. To disseminate information on imaging with non-FDG tracers for research

Why include FDG-PET in your research?

Prof. Fiona Gilbert (University of Aberdeen) opened the meeting and handed over to Prof. Ken Miles (Brighton & Sussex Medical School) to report on the range of uses of ^{18}F-fluorodeoxyglucose (FDG)-PET in the clinical setting. FDG-PET uses a radiolabelled analogue of glucose to image cellular

metabolism. Prof. Miles described how the inclusion of FDG-PET into the clinical management of cancer could increase the accuracy of diagnosis, staging and treatment response evaluation, highlighting studies in lung cancer and Hodgkin's lymphoma. Furthermore, the presentation of a model for patient stratification and response evaluation using PET in therapeutic trials showed how using PET in this setting may increase statistical power and reduce the number of patients required, and thereby lower the cost of a clinical trial.

Selecting non-FDG PET radiotracers for oncology

As well as FDG, novel tracers are being developed to study other processes relevant to cancer. Dr Ashley Groves (University College London) gave a presentation on non-FDG radiotracers and how they can be used to image proliferation, fatty acids, hypoxia, receptors, vascularity, membrane metabolism, apoptosis, osteoblast metabolism and dopamine transporters. The logistics of selecting appropriate tracers were addressed, with the main focus on the consideration of radioisotope production and the problems associated with their short half lives.

NCRI PET Clinical Trials Network and Core Lab

Ms Lucy Pike (King's College London) outlined the role of the NCRI PET Research Network and the PET Core Lab, which operates out of Guy's & St Thomas' Hospital, London. The PET Core Lab manages a network of accredited PET sites, and delivers quality assurance (QA) for multicentre PET trials. Other support on offer includes advice on protocol development for PET-CT, for example on acquisition and processing.

Funding PET research scans within the NHS

Dr Wai Lup Wong (Mount Vernon Hospital) gave an overview of how to correctly allocate the funding of PET scans within UKCRN portfolio trials in proposals, with a valuable explanation of the definitions of service support, research or treatment costs. This can be very complex for PET, as the scans within a single trial may fall into different categories. The PET Research Network is producing guidance on this to help researchers and R&D managers to understand how to apply the current ARCO guidance appropriately, which will be made available at www.ncri-pet.org.uk once completed.

Imaging cell proliferation with ^{18}F-Fluorothymidine

Dr Bal Sanghera (Mount Vernon Hospital) & Dr Laura Kenny (Imperial College London) discussed how ^{18}F-Fluorothymidine (FLT) could be used to image tumour proliferation and response to therapy in clinical research. Sanghera addressed the issues currently preventing the availability of a reliable source of FLT, including the complications of producing and transporting the radiotracer and reported on the logistics of imaging with FLT. The need for validation of FLT through further clinical studies was also addressed. Kenny followed by exploring the use of quantitative FLT data and kinetic modelling, examining the correlation between FLT and other proliferation markers such as Ki67, and showing results on its use in early evaluation of response to treatment.

Imaging with ^{18}F-Fluorocholine

Discussion of non-FDG tracers in PET imaging of tumours continued with a presentation from Dr Athar Haroon (UCL) on the use of choline tracers in prostate cancer, noting that ^{18}F-Choline may offer advantages over ^{18}F-FDG in detecting recurrent prostatic disease, though it has no real role in primary staging. Combining ^{18}F-Choline PET with MR appears to be a useful future strategy.

Imaging tumour hypoxia

Dr Russell Moule (Mount Vernon Hospital) addressed imaging tumour hypoxia with PET. Clinically, hypoxia is an independent prognostic factor for treatment outcome, and there are a range of experimental tracers being studied for imaging hypoxia, each with different attributes. Because hypoxia is dynamic, there are also questions about when to image and whether serial imaging is required.

The afternoon was divided into 3 parallel breakout sessions:

Imaging with ^{18}F-Fluorothymidine – Breakout group 1

Subsequent to the morning's presentations on using FLT-PET in clinical studies, the afternoon breakout session, chaired by Dr Bal Sanghera and Prof Fiona Gilbert, allowed deeper discussion on the challenges of research with FLT and how these might be overcome. It was postulated that researchers could form collaborations to purchase FLT in bulk at reduced rates, and that designing studies to allow several alternative imaging days for a patient could be helpful. Incorporation of an FLT-PET sub-study into existing clinical trials could also be an efficient way of validating its clinical utility.

Implementing and funding of PET studies - Breakout group 2

Prof Ken Miles (Brighton and Sussex Medical School) & Prof Paul Marsden (Kings College London) highlighted the barriers and opportunities to coordinating and funding PET studies. The group discussed concerns around obtaining funding. CRUK New Agents Committee has a track record in funding imaging studies as part of early clinical trials and developing protocols to evaluate safety and efficacy of new first in man tracers. Funding committees such as CRUK BIDD will fund imaging studies in late phase clinical trials, although consideration of statistical power issues and quality assurance have to be carefully considered. The Biomarker and Imaging CSG together with the PET Expert Group can give advice on developing funding applications.

Preparing a PET research proposal: a generic paradigm for FDG-PET as a response marker - Breakout group 3

The PET-CT Expert Group set up by the NCRI PET Research Network has been developing a guidance document for researchers who want to explore the use of FDG-PET as a biomarker for early evaluation of treatment response. Dr Wai Lup Wong (Mount Vernon Hospital) & Dr Simon Hughes (Royal Victoria Hospital) chaired this session, taking input on the draft document from those present. The next step will be to seek wider input from the CSGs on the content, particularly as regards the tumour-specific sections of text.

Summary

The workshop was very well received by those who attended, with feedback forms showing that most people found the day useful. The inclusion of a general overview of PET imaging with both FDG and non-FDG tracers was appreciated, as was the opportunity to discuss the practicalities of incorporating PET imaging into clinical trials with highly experienced researchers.

Future plans

It is the aim of the NCRI BI CSG to promote high quality translational (correlative) science within the NCRN portfolio of clinical trials in cancer by identifying and monitoring strengths, weaknesses, opportunities and barriers as well as supporting methodology harmonisation, design of generic protocols and education. The group hopes to achieve this through interaction with tumour-specific

CSGs. To this end, the NCRI BI CSG is intending to host a further workshop on the topic of PET imaging in clinical trials in around two years' time.