Imaging

Poster presentations (Tue, 25 Sep, 09:00–12:00) Imaging

1000 POSTER

[18]FFRP-170: A novel hypoxia maker for PET: Initial clinical data for the usefulness and the correlation between tumor response to radiotherapy and [18]FFRP-170 uptake

Y. Takai[1], T. Kaneta[2], R. Iwata[3], S. Frumoto[4], Y. Ishikawa[3], M. Tsujitani[5], S. Yamada[6], H. Yasuda[7], E. Nakata[1], S. Maruoka[1]. *[1]Tohoku University, Technological Radiology, Sendai, Japan; [2]Tohoku University, Radiology, Sendai, Japan; [3]Tohoku University, Cyclotron and Radioisotope Center, Sendai, Japan; [4]Tohoku University, Biomedical Engineering Research Organization, Sendai, Japan; [5]Pola Pharma, Basic Research, Yokohama, Japan; [6]Tohoku University, Radiation Oncology, Sendai, Japan; [7]Kyoto University, Translational Clinical Oncology, Kyoto, Japan*

Background: [18]FFRP170, 1-(2-fluoro-1-[hydroxymethyl]ethoxy)methyl-2-nitroimidazole, is a new PET tracer for imaging hypoxia. [F18]FRP170 was synthesized in our department from hypoxic cell sensitizer RP-170 which was originally developed in POLA Industry, designed as a more hydrophilic 2-nitroimidazole analog than [F18]FMISO. A purpose of this study is to investigate the potential of this new hypoxia marker for clinical use and especially to predict tumor response to radiation.
Materials and Methods: Sixteen cancer patients have been examined by PET/CT (Siemens ECAT EXACT HR+) using this new hypoxia marker. Ten patients had non-small cell lung cancer (NSCLC), 4 had postoperative recurrent esophageal cancer, 1 small cell lung cancer (SCLC) and 1 malignant Schwannoma. Among them, seven patients (recurrent esophageal cancer 4, NSCLC 1, SCLC, malignant Schwannoma) were received radiotherapy. CT scans were performed just before radiotherapy and one month after the end of radiotherapy to evaluate tumor responses to radiotherapy. The correlation between [18]FFRP-170 uptake and tumor response to irradiation was investigated from the data of these patients. All patients were injected 185 MBq of [18]FFRP-170 and PET images were obtained 120 min after injection.
Results: The tumor/muscle (T/M) ratio (SUVmax of tumor/SUVmax of muscle) of [18]FFRP-170 of all patients were 1.43±0.33:1.0–2.14 (average±SD:range). SUVs of other organ such as brain, lung, thigh, neck, heart and mediastinum were very low, they are around 0.35–1.08, while those of liver and kidney were around 2–2.5. Among seven patients who received radiotherapy, NC and MR were found in two patients (postoperative recurrent esophageal cancer and malignant Schwannoma), and their T/M ratios were 2.14 and 1.75. Four patients showed PR, and their T/M ratios were 1.25, 1.33, 1.5, 1.5. Another one (SCLC) shows good PR, its T/M ratio is 1.0.
Conclusions: In accordance with the low lipophilicity of the tracer, SUVs of organs at about 120 min were very low except liver and kidney. All tumors in 16 patients were able to recognize easily by PET/CT. Therefore, [18]FFRP170 showed the potential for tumor imaging in lung, mediastinum and neck. Furthermore, the correlation between tumor response to radiation and [18]FFRP-170 uptake seem to be existed. We conclude from these data that [18]FFRP-170 is a promising new hypoxia marker in cancer patients and have possibility to predict tumor radiosensitivity.

1001 POSTER

Assessment of pharmacodynamic effect in a phase I study of MN-029, an IV administered vascular disruptive agent, using dynamic contrast-enhanced MRI

E. Ashton[1], S. Remick[2], A. Tolcher[3], R. Gammans[4], K. Locke[4], M. Munsey[4]. *[1]VirtualScopics Inc., Oncology R& D, Rochester New York, USA; [2]CASE Comprehensive Cancer Center, Developmental Therapeutics Program, Cleveland Ohio, USA; [3]Institute for Drug Development, Cancer Therapy and Research Center, San Antonio Texas, USA; [4]MediciNova Inc., Research and Development, San Diego California, USA*

Background: MN-029 is a vascular disrupting agent that inhibits microtubule assembly, resulting in disruption of the cytoskeleton of endothelial cells. This effect leads to a temporary reduction in tumor blood flow. It was an aim of this study to measure this effect in humans using dynamic contrast-enhanced MRI (DCE-MRI), and to establish a PK-PD relationship for MN-029.
Materials and Methods: DCE-MRI data were acquired at two time points (baseline and 6–8 hours post-dose) for 25 patients (24 analyzable) in this study using a standardized protocol at two imaging sites. Imaged subjects were arranged into eight cohorts, with doses ranging from 16 mg/m^2 to 225 mg/m^2. A 5 slice, 5 cm slab was imaged, with spatial resolution of 2 mm in-plane and 10 mm between images. Images were acquired in the coronal plane using a semi-keyhole technique, with TE/TR/TI/FA of 2.42/1000/340/16 and temporal resolution of approximately 3 s per slab. Ktrans and IAUCBN(90), both of which are dependent on blood flow and vascular permeability, were measured at each pixel within each target tumor, and mean and median values were reported for each parameter.
Results: A scatter-plot comparing change in median Ktrans with plasma AUC for MN-029 over the first 24 hours post-dose shows a clear correlation between increased exposure to MN-029 and reduction in Ktrans ($r = 0.72$). This correlation is statistically significant ($p < 0.001$). 9 subjects had stable disease after 3 cycles, and six subjects had prolonged (⩾6 months) stable disease (carcinoid [3], melanoma [2] and pancreatic [1]); the 3 carcinoid tumor subjects had stable disease for >12, 27 and >31 cycles. No objective responses were seen in this trial based on RECIST criteria. However, semi-automated measurements of tumor volumes from CT data showed a measurable reduction in tumor burden at eight weeks post-dose in the subject with the largest reduction in Ktrans (−40%).
Conclusions: Analyzable data were acquired in this study for 24 of the 25 imaged patients. Results show a clear dose-dependent vascular response. Too few subjects were imaged at high dose levels to demonstrate clinical treatment effect. However, it is interesting to note that the subject with the greatest response as measured by DCE-MRI at 6–8 hours post-dose showed a measurable reduction in tumor volume at 8 weeks post-dose.

1002 POSTER

The usefulness of FDG-PET in predicting response to neoadjuvant chemotherapy (NCT) in patients with locally-advanced breast cancer (LABC)

M.E. Schneider-Kolsky[1], P. Midolo[2], S. Hart[3], J. Stuckey[4], A. Baldey[4], J. Fox[3], P.A.W. Rogers[5], A. Strickland[2], B. Susil[6], V. Ganju[2]. *[1]Monash University, Medical Imaging & Radiation Sciences, Melbourne, Australia; [2]Monash Medical Centre, Medical Oncology and Clinical Haematology, Melbourne, Australia; [3]Monash Medical Centre, Surgical Oncology, Melbourne, Australia; [4]Monash Medical Centre, Radiology, Melbourne, Australia; [5]Monash Medical Centre, Centre for Women's Health, Melbourne, Australia; [6]Monash Medical Centre, Anatomical Pathology, Melbourne, Australia*

Background: The aim of this study was to evaluate if standard uptake values (SUV) of FDG-PET prior to and during NCT with Docetaxel (D)100 mg/m^2 and FEC100 is superior to standard clinical and radiological methods in predicting pathological response in patients (pts) with LABC.
Materials & Methods: Following informed consent, 47 pts with LABC suitable for NCT were recruited (44 pts evaluable). Participants were randomly assigned to receive either sequential FEC100 (x4) and D 100/m^2(x4), or the reverse sequence. Serial assessment of response was performed with physical exam, mammography, ultrasound, serial tumour biopsy and PET scans. SUVs at baseline and % reduction of SUV during chemotherapy were correlated to pathological response (complete, partial or no response) and compared to imaging parameters obtained by corresponding mammography and ultrasound.
Results: Nine (19.1%) of women recorded a complete pathological response (pCR), 15 (31.9%) a partial (pPR) and 20 (42.6%) had no response (NR) to chemotherapy. The sequence of drug had no effect on the pathological response. There was a statistically significant difference between baseline SUVs with pCR and with NR [median, range SUV 9.7 (5.8–26.6) versus 6.4 (1.7–11.5), $p = 0.024$]. Baseline mammography and ultrasound measurements were not correlated with pathological response ($p = 0.5$ and 0.22 respectively). There was a significant difference between complete and no pathological response and % reduction of SUV after four cycles of NCT (median, range SUV 83.3%, −11–100 versus 50.4%, −24–100, $p = 0.009$).
Conclusion: This study has shown that women with high baseline SUVs and higher % reduction of SUVs after four cycles of chemotherapy are more likely to achieve a pCR to NCT. FDG PET appears to be an important adjunct to conventional imaging of women with breast cancer and may significantly contribute to a more individualised management.