E-catherina, Beta-catenina) in locally advanced rectal cancer patients candidates to neoadjuvant treatment.
**Materials and Methods:** 28 consecutive $_cT_3$ rectal cancer patients were prospectively studied with PET-CT and inmunohistocheministry in the biopsy specimen from staging rectocolonoscopy (8 molecular variables). All patients had conventional imaging systems for initial staging including pelvic MRI and endorectal ultrasound.
**Results:** PET-CT dimensions of the primary lesions ranged from $27\times22\times29$ to $59\times54\times81$ mm (median $37\times34\times40$ mm). Extra-rectal metastatic disease was detected in 6 studies (5 pelvic N+ and 1 N+/M+ liver). SUVmax ranged from 3.7 to 17.1 (median 8.6). Molecular IHC global distribution was: Ki67 28/28 (20%-90%); cox-2 24/28 (5%-100%); p53 18/28 (5%-100%); EGFR 9/28 (2%-60%); VEGFR 28/28 (30%-100%); cerb-2 6/28 (5%-100%); E-catherina 26/28 (60%-100%); betacatenina citoplasmic 28/28 (80–100%); betacatenina; nuclear 28/28 (20%-100%). There were no identical IHQ profiles or SUVmax values among the complete cohort of patients. EGFR was not expressed with SUVmax inferior to 5.2 (median value for the subgroup 10.7).
**Conclusions:** $_cT_3$ rectal cancer is an heterogeneous molecular disease when evaluated by molecular imaging and inmunohistochemistry at the time of initial staging. Multiparametric correlations may be used to guide biotarget oriented neadjuvant treatment decisions.

**2107** POSTER

**Imaging assessment of the in vivo metabolic-vascular relationship of primary colorectal cancer by integrated 18-FDG PET/Perfusion CT – feasibility and validation with immunohistochemical markers of angiogenesis and hypoxia**

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**Background:** Integrated 18-FDG PET/Perfusion CT evaluation of the *in vivo* metabolic-vascular relationship may provide insight into tumour biology at primary colorectal cancer staging. The aim was to its feasibility and to assess how the metabolic-vascular relationship relates to angiogenesis and hypoxia.
**Materials and Methods:** Following IRB approval, 26 patients (15 male, 11 female, mean age 66.8 years) with suspected colorectal adenocarcinoma underwent integrated 64-MDCT/PET (VCT Discovery, GE Healthcare) staging. FDG PET (190 MBq tracer IV; 60 minute uptake; 2D acquisition) was followed by Perfusion CT (50 mls Omnipaque 350 mg/mL; 5 mL/s IV; 120 kV; 60mAs, 8x5 mm collimation). Standardized uptake value ($SUV_{max}$ and $SUV_{mean}$); vascular parameters (blood flow, blood volume, permeability surface area product); and the flow-metabolic ratio ($BF/SUV_{mean}$) were noted. Following surgery and immunohistochemical staining (CD 105, VEGF, and GLUT-1) of matched histological sections, correlation between PET, Perfusion CT and histopathological features were assessed using Spearmann rank correlation.
**Results:** 17/26 underwent surgery alone: pStage I (3); pStage II (4); pStage III (5); Stage IV (5). Mean (SD) whole tumor $SUV_{mean}$ and $SUV_{max}$ were 12.6 (6.6) and 21.3 (9.2) respectively. Mean (SD) whole tumor blood flow, blood volume and permeability surface area product were 82.1 (38.4) ml/min/100 g tissue, 5.94 (1.97) ml/100 g tissue, 13.2 (5.63) ml/min/100 g tissue respectively. There was a positive correlation between $SUV_{mean}$ and BF ($r = 0.47$; $p = 0.05$), BV ($r = 0.5$; $p = 0.04$); and PS ($r = 0.56$; $p = 0.02$); and between $SUV_{mean}$ and CD105 ($r = 0.70$, $p = 0.002$). There was no significant correlation between BF and CD105 ($r = 0.45$, $p = 0.07$). The flow- metabolic ratio ($BF/SUV_{mean}$) correlated negatively with VEGF ($r = -0.57$, $p = 0.02$) but not with GLUT-1 ($r = 0.22$, $p = 0.38$).
**Conclusion:** Integrated 18-FDG PET/Perfusion CT is feasible. Flow and metabolism appear coupled in colorectal cancer. The higher the flow-metabolic ratio, the lower VEGF expression suggesting these tumors may be less angiogenic.

**2108** POSTER

**Comparison FDG-PET/CT findings of head and neck cancer after preoperative radiotherapy with pathological findings**

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**Background:** Positron emission tomography (PET) using [$^{18}$F] fluorodeoxyglucose (FDG) has been suggested to improve the accuracy in identifying subclinical local or regional disease for head and neck cancer after radiotherapy. Furthermore, the introduction of combined PET and CT provides more accurate tumor localization. The purpose of this study is to analyze a correlation between findings of FDG-PET/CT for head and neck cancer patients after completion of radiotherapy and pathological findings of viability of cancer cells.
**Methods and Materials:** The study population consisted of 23 patients with head and neck cancer who were evaluated with FDG-PET/CT after completion of preoperative radiotherapy. Primary tumor sites included nasal cavity/paranasal sinuses (11), oropharynx (6), hypopharynx (2), oral cavity (2), larynx (1), unknown (1).
**Results:** There were 9 patients with viable cancer cells, including 7 primary and 2 neck region. All of them had abnormal PET/CT findings, too, though there contained remarkable false positive cases.
**Conclusions:** The sensitivity of PET/CT for head and neck cancer patients after completion of radiotherapy was so high to regard abnormal high FDG accumulation as the possibility of existence of viable cancer cells. But it is necessary to consider false positive cases often among the patients.

| Pathological findings | FDG-PET/CT findings | | |
|---|---|---|---|
| | Abnormal | Normal | Total |
| Viable cell (+) | 7/2 | 0/0 | 7/2 |
| Viable cell (−) | 8/7 | 8/14 | 16/21 |
| Total | 15/9 | 8/14 | 23/23 |

primary site/neck region

**2109** POSTER

**Comparison of 18FDG PET/CT scan and bone scintigraphy in detecting bone metastasis in nasopharyngeal squamous cell carcinoma**

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**Purpose:** To evaluate the accuracy of FDG PET/CT and Bone scan for the diagnosis of bone metastases in patients with nasopharyngeal squamous cell carcinoma (NPSCC).
**Methods & Materials:** 125 patients with NPSCC have been identified in our database that had 18F FDG-PET/CT study. Of whom 88 patients (54 males and 34 females; age range 15–100 years) have met our inclusion criteria; biopsy proven NPSCC, bone scan and PET/CT within 30 days. Comparison was done on a lesion-by-lesion analysis. Additionally, the metabolic activity of the identified bone lesions was measured using the maximum Standardized Uptake Values (SUV max). CT bone window was used to describe the structural changes, whether lytic, sclerotic or mixed type. Biopsy, MRI, MDCT, and the clinical course of the patients were our references.
**Results:** PET/CT identified 77 lesions in 11 patients, compared to 42 lesions identified by bone scan in 11 patients as well. Additionally, PET/CT also detected distant metastases in 3 patients involving liver, lung, adrenal glands and lymph nodes. Each modality missed one patient with biopsy confirmed bone metastases (false negative). Therefore, PET/CT and bone scan were equally true positive in 11 patients. PET/CT was true negative in 76 without false positive readings, while bone scan was true negative in 73 patients and false positive in 3. The overall sensitivity, specificity, NPV and PPV of PET/CT and bone s0can was 91.6% vs. 91.6%, 100% vs. 96%, 98.7% vs. 98.6% and 100% vs. 78.5% respectively. Morphologically, 51.9% of the true lesions (40/77) had no structural changes by CT, one third were lytic 30% (23/77), 15% (12/77) were sclerotic and only 2 lesions that had mixed lytic/sclerotic. The corresponding mean SUV max was 5.4, 7.7, 6.7, and 7.8 respectively.

**Conclusion:** PET/CT is a powerful tool in assessing the visceral as well as the skeletal metastases. It is not necessary to add bone scan to PET/CT for the staging purposes of NPSCC.

**2110** POSTER

**Evaluation of response to sorafenib treatment in advanced hepatocellular carcinoma (HCC): role of Positron Emission Tomography (PET) imaging**

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**Background:** HCC is a major health issue, with increasing incidence worldwide. Sorafenib (an oral potent multikinase inhibitor directed against both tumor proliferation and angiogenesis) is the only aproved treatment that has shown to increase overall survival in advanced HCC. Conventional radiologic response assesment of HCC to sorafenib is difficult and RECIST criteria only demonstrates stable disease for most of the cases. PET is a noninvasive technique which might be an effective tool for evaluating response.
**Methods:** Advanced HCC patients (pts) were assesed before starting sorafenib treatment with a TAC-Fluorodeoxiglucose-PET sacn (FDG-PET). Those who had an elevated standardized uptake value (SUV) in any HCC lesion (positive FDG-PET scan when SUV >2.5) where reassesed with TAC -PET three weeks after the begining of sorafenib. Sorafenib was administered at the usual 400 mg/bid schedule.
**Results:** A basal PET scan was performed in 8 advanced HCC pts resulting in 5 positive PET scans (62%) and 3 negative (38%); mostly were male (6 pts) with a median age of 66.7 years (range 59 to 75); Child-Pugh status A/B/C 4/4/0; cirrhosis ethiology: HBV 1 pt/HCV 2 pts/Alcohol 3 pts/Primary biliary cirrhosis 1 pt/Unknown 1 pt; alpha -Phetoprotein mean level was 732.0 ng/ml (range 4.9 to 5338.0). All the 8 patients received at least 6 weeks of sorafenib. A second PET scan was performed to the 5 pts with basal positive PET 3 weeks after sorafenib had been started (range 2−4 weeks); 4 were negative and 1 positive. This correlated with 4 pts with radiologic stable disease and 1 pt with progressive disease. The 3 pts that had a negative basal PET scan progressed to sorafenib therapy. Median survival was longer for those 4 pts who had a metabolic response on FDG -PET (8 months) than for the 1 pt who had no metabolic response (4 months) and than for the 3 pts who had a baseline low SUV (5 months).
**Conclusions:** In this series 60% of advanced HCC showed with increased glucose uptake on baseline FDG -PET; early metabolic response on FDG-PET documented 3 weeks of sorafenib treatment seems to be a good predictor of clinical outcome. On the other hand, a low glucose uptake at base line FDG-PET might predict no response to sorafenib therapy.

**2111** POSTER

**Response and survival in oesophageal cancer patients following neoadjuvant chemotherapy assessed by FDG-PETCT imaging**

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**Background:** Combined positron emission tomography with computed tomography (PETCT) using the tracer [18F] 2-fluoro-2-deoxy-D-glucose (FDG) is an important modality for staging oesophageal cancer and may also predict pathological response to chemotherapy. We conducted this retrospective review to assess the relationship between metabolic response measured by FDG-PETCT imaging following neoadjuvant chemotherapy in oesophageal cancer and survival.
**Methods:** Oesophageal cancer patients presenting to Northern Ireland Cancer Centre between January 2003 to May 2007, who had FDG- PETCT assessment for staging and also following neoadjuvant chemotherapy before surgery were included. Routine FDG-PETCT findings were collated and metabolic response evaluated. Responders were defined as $\geqslant$35% reduction in the tumour standard uptake values [SUV] for FDG. Median overall survival and Median event-free survival were obtained for metabolic responders and non-responders.
**Results:** 52 patients with a median age of 64.5 years (28−77) were identified. Of these, 42 (81%) had oesophageal carcinoma and 10 (19%) had Siewart type I or type II oesophageal-gastric junction (OGJ) carcinomas. Metabolic response was identified in 40 (77%) of patients. After a median follow up of 25.2 months, the median progression free and overall survival in metabolic responders and non responders has not been reached. 70% (n = 28) of responders and 63.6% (n = 7) of non responders are alive.
**Conclusions:** With the limited follow up and low number of expected events in this series, we did not find a correlation between metabolic response to neoadjuvant chemotherapy by FDG-PETCT with overall or event free survival. Further follow up of this group of patients is required; however, our data are in keeping with that recently reported by other groups.

**2112** POSTER

**Disease characterisation of triple negative breast carcinomas using functional MRI**

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**Background:** Triple negative (ER-/PR-/Her2−) breast carcinomas (TNBC) are aggressive tumours with relatively underexplored imaging features. This study aims to assess DCE-MRI (Dynamic contrast enhanced MRI) characteristics of these tumours compared to a more favourable prognostic group, ER+/PR+/Her2− BC.
**Materials and Methods:** 80 patients (pts) with locally advanced BC underwent DCE-MRI prior to neoadjuvant chemotherapy as part of 2 prospective studies and were identified as ER-/PR-/Her2− or ER+/PR+/Her2− from core biopsy specimens. Baseline DCE-MRI kinetic parameters reflecting tissue perfusion, permeability and extracellular leakage space were measured from whole tumour regions of interest. Values for inflow transfer constant ($K^{trans}$), outflow rate constant ($k_{ep}$), leakage space ($v_e$), $IAUGC_{60}$, relative blood volume (rBV), Mean Transit Time (MTT) and relative blood flow (rBF) were compared across receptor status using the Mann-Whitney U test.
**Results:** 37 pts were assessable in total (16 pts ER-/PR-/Her2−, 21 pts ER+/PR+/Her2−). 22 pts with other receptor phenotypes were excluded, 12 were unable to undergo MRI, full receptor status was not available in 8 and 1 pt's tumour was not visible on MRI. TNBC comprised 19% of the total study population with a median age of 42.5 yrs (range 34−57) and median tumour size 60 mm (range 40–100). In the ER+/PR+/Her2− group, the median age was 49 yrs (range 26−70) and median tumour size 50 mm (range 25–150). Median $k_{ep}$ values were significantly higher in TNBC (0.70 vs 0.56, $p < 0.05$). Significantly lower median values for $v_e$ were also observed in TNBC (0.33 vs 0.39, $p = 0.001$) and MTT was shorter (44.27 vs 47.69, $p = 0.007$). There was no correlation between age and any kinetic parameters. When stratified according to tumour size and nodal status, $k_{ep}$ was higher in TNBC but the differences did not reach statistical significance. Values for $v_e$ were significantly lower in T3/4 TNBC (0.33 vs 0.41, $p = 0.009$) and for node negative BC (0.33 vs 0.41, $p = 0.004$). In node positive BC rBF was significantly higher in TNBC (5.87 vs 1.96, $p = 0.046$) and MTT shorter (43.69 vs 47.28, $p = 0.008$). Baseline $v_e$ was the best predictor of triple negativity (sensitivity 81%, specificity 76%, area under ROC curve 0.80).
**Conclusions:** Increased cellularity and scant stromal content of tumours displaying the triple negative phenotype can be depicted reliably by the DCE-MRI parameter $v_e$ which describes the extravascular extracellular space. Furthermore, increased $k_{ep}$ reflecting the rapid return of contrast into the vasculature suggests that capillary permeability is also higher in TNBC.