cancer the role of PET-CT imaging has not been well established yet. In order to further explore the use of PET for rectal cancer in radiotherapy, it is important to determine whether PET-imaging adequately visualizes the tumour volume. Therefore, we correlated the tumor dimensions as measured on the pathology specimen with three pre-surgical diagnostic tools, namely PET based automatic tumour delineation, MR imaging and endoscopy.
Materials and Methods: Nineteen patients with rectal cancer, who underwent both MR and PET-CT imaging, followed by short-course radiotherapy (RT; 5×5 Gy) and surgery within 3 days after RT, were included. Tumor contours were automatically created based on the PET-images using the signal-to-background-ratio method. The independently measured tumor length on pathology was compared with the automatic PET-CT based measurements and the independent-investigator-based MRI and endoscopy measurements.
Results: PET based measurements strongly correlated with pathology reaching a Pearson correlation of 0.91 ($p < 0.001$). In contrast, MR-based measurements correlated less strongly, but still significantly (Pearson correlation = 0.75; $p < 0.001$), whereas endoscopy-based measurements did not reach significance at all (Pearson correlation = 0.34; $p < 0.18$). These findings were alsow confirmed on Bland-Altman and intraclass analysis.
Conclusion: Automatically generated PET based tumour contours provide a very useful tool to accurately non-invasively determine the largest cranio-caudal tumor dimension in rectal cancer. Thus, PET based automatic measurements provide an excellent tool to accurately determine the target in radiotherapy and response evaluation.

2103 POSTER

Accuracy of integrated PET-CT for mediastinal lymph node metastases in non-small cell lung cancer

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Background: [18F] Fluorodeoxyglucose Positron Emission tomography (FDG-PET) and Computed Tomography (CT) are routinely performed in the workup study of non-small cell lung cancer (NSCLC) to exclude distant metastases. The Institute for Clinical and Evaluative Sciences (ICES) report also concluded that PET is more efficacious than CT in identifying mediastinal involvement. The purpose of our study is to estimate the diagnostic accuracy of integrated PET-CT in mediastinal staging of NSCLC.
Methods: A retrospective study was performed comparing PET-CT and CT with pathological assessment of the mediastinum in 38 patients with potentially resectable NSCLC. To assess the agreement between PET-CT, CT and pathological results a Cohen's kappa coefficient was calculated.
Results: Sensitivity and specificity were 0.50 (95%CI 0.25−0.75) and 0.86 (95%CI 0.64−0.96) for integrated PET-CT; 0.47 (95%CI 0.22−0.73) and 0.79 (95%CI 0.54−0.93) for CT alone. Overall the diagnostic accuracy for PET-CT and CT were 0.71 (95%CI 0.55−0.84) and 0.65 (95%CI 0.49−0.80) respectively ($p > 0.05$). There was a low correlation between mediastinal staging with PET-CT or CT and pathological results (PET-CT vs. Histology Kappa = 0.38 and CT vs. Histology Kappa = 0.264).
Conclusion: In our study integrated PET-CT did not provide a significant advantage over CT alone to assess mediastinal lymph node metastases. Mediastinoscopy is still mandatory to determine mediastinal status.

2104 POSTER

The role of FDG PET (CT) for diagnosis of peritoneal carcinomatosis of colorectal origin

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Introduction: Since the early 1990 s, in patients with peritoneal carcinomatosis (PC), a regional treatment associating a cytoreductive surgery (CS) with a hyperthermic intraperitoneal chemotherapy (HIPEC) is used to treat some patients with a curative intent. This aggressive treatment requires the most precise evaluation of the disease in the peritoneum to evaluate disease extension and eventually therapeutic response aiming to better select patients for surgery. Nevertheless, the evaluation of the PC by conventional imaging (computed tomography) remains difficult.
The aim of the study is to evaluate the diagnostic performance of FDG-PET (CT) in the diagnosis of PC of colorectal origin, and the correlation between the most metabolically active lesions (and/or the most extensive) on the preoperative FDG-PET (CT) and the most involved abdominal region assessed intra-operatively using the Peritoneal Cancer Index (PCI).
Materials and Methods: Retrospective research of the Bordet PET (CT) database was performed to select 52 colorectal cancer patients: 26 patients with PC operated on for explorative surgery with intraoperative biopsy who have been submitted to a preoperative 18-FDG-PET (CT), and a reference group of 26 patients without PC (no peritoneal carcinomatosis at surgery or a favourable clinic at one year follow-up). FDG-PET (CT) images were blindly re-assessed by 2 experienced nuclear medicine physicians, in consensus. A pre-established patient-based and a 9 quadrant-based classification was used to classify the presence and relative intensity of PC. The highest quadrant score of FDG-PET (CT) was compared to the highest quadrant score of the PCI.
Results: FDG-PET (CT) correctly identified the presence of PC in 22 patients out of 26. There were 3 false positive and 3 false negative PET (CT) scorings. The patient-based sensitivity and specificity of PET (CT) were respectively 85% (22/26) and 88% (23/26). The negative predictive value was 85% (23/27); the positive predictive value was 88% (22/25) and the accuracy was 87% (45/52).
The highest FDG PET (CT) quadrant score correlated with de highest PCI quadrant score in 77.3% of the patients.
Conclusion: PET (CT) is an accurate method for detecting peritoneal carcinomatosis in patients with colorectal cancer. PET (CT) seems to be a promising imaging modality for treatment response evaluation (good imaging-surgical correlation) before performing CS and HIPEC.

2105 POSTER

Post-neoadjuvant molecular re-staging of rectal cancer: correlations of PET-CT and inmunohistochemical (IHQ) chemoradiation induced changes

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Background: To analyze molecular changes induced by chemoradiation in rectal cancer and correlate histopathological to molecular imaging/profile response findings.
Matherials and Methods: 28 consecutive patients treated with Oxaliplatin and chemoradiation containing neoadjuvant program were prospectively studied with PET-CT and 8 molecular variables determined by IHC (Ki67, p53, cerb-2, Cox-2, EGFR, VEGFR, E-catherina, Beta-catenina). Histopathological response was assessed using the Tumor Regresion Grade (TRG) scale.
Results: Dimensional PET-CT findings of the residual primary lesion ranged from $7.0\times2.8\times57$ mm to $7\times6\times12$ mm (median $15\times18\times16$ mm). SUVmax values ranged from 1.3 to 7.3 (median 2.9). Molecular IHC determinations in the surgical specimen selectively analyzed the areas of residual cancer. Presence of residual cancer related molecular expression were: Ki67 24/28 (1%-90%); Cox-2 16/28 (10%-100%); p53 16/28 (5%-100%); EGFR 5/28 (5%-20%); cerb-2 3/28 (20%-100%); VEGFR 19/28 (20%-100%); E-catherina 17/28 (5%-100%); betacatenina citoplasmic 24/28 (80%-100%); betacatenina nuclear 21/28 (70%-100%). Histopathological classification compatible resistant rectal cancer to chemoradiation ($\leqslant$TRG 2) had significantly superior SUVmax values. Dominant molecular events were observed in Ki67, p53, VEGFR and E-catherina expression. Except for pT_0 patients, there were no identical IHQ profile expression after chemoradiation in the cohort of patients. All SUVmax values over 4.4 were pT_3 or TRG2 specimens categories (5/28).
Conclusions: Molecular assessement of post-neoadjuvant (oxaliplatin containing) induced effects in rectal cancer identifies an heterogeneous pattern of response both in bio-imaging and IHC determinations. Molecular pattern of resistant disease is correlated by PET-CT and downstaging/tumor regression grade scales.

2106 POSTER

Molecular staging of cT3 rectal cancer: PET-CT and inmunohistochemical (IHC) profile correlations

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Background: To analyze prospectively bio-imaging PET-CT findings and multi-molecular expression (Ki67, p53, cerb-2, Cox-2, EGFR, VEGFR,

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.