

24×1.2 mm, pitch 0.1, rotation 1s, slice 1.5 mm, increment 0.8 mm, temporal resolution 0.5 s), 1.5T MRI (coronal dynamic 3d-flash; TREAT with TR/TE 2.13/0.72 ms, voxel size 2.7×2.7×4.0 mm, t-res. 1.4 s) and linac-integrated CBCT (720 projections, 3 min. rotation, t-res. ~1 s). Static CT without respiration served as control. 3 observers recorded lesion size (RECIST x/y/z-diameters) and axial displacement using standard viewing software. Interobserver- and interphase-variation coefficients (VC for different respiratory phases) indicated the reproducibility of measurements. **Results:** Mean lesion sizes on static and dynamic CT were equal (x: 1.88 vs. 1.87 cm; y: 1.30 vs. 1.39 cm; z: 1.71 vs. 1.73 cm; all $p > 0.05$), but appeared larger on MRI and CBCT (x: 2.06/1.95 cm [$p < 0.05$ vs. CT]; y: 1.47/1.28 cm [MRI vs. CT/CBCT $p < 0.05$; CT vs. CBCT $p = 0.89$]; z: 1.86/1.83 cm [CT vs. CBCT $p < 0.05$, other $p > 0.05$]). The interobserver-VC for lesion sizes were 2.54–4.47% (static CT), 2.29–4.48% (4D-CT); 5.44–6.22% (MRI) and 4.86–6.97% (CBCT). Interphase-VC for lesion sizes were 2.28–3.54% (4D-CT), 6.56–8.36% (MRI) and 7.30–10.0% (CBCT). Mean axial displacement decreased from static CT (1.65 cm; VC = 2.77%) over 4D-CT (1.40 cm; VC = 2.9%) and CBCT (1.23 cm; VC = 5.9%) to MRI (1.16 cm; VC = 12.3%).

Conclusions: As a consequence of lower spatial and temporal resolution, 4D-MRI and CBCT slightly overestimate lesion size and underestimate displacement with a lower reproducibility of measurements compared to 4D-CT. All modalities are suitable to measure size and displacement of target lesions. Prior to a clinical application, the technical limitations were anticipated in this ex-vivo study.

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POSTER

Screening of malignant tumours – importance of fibrinogen serum levels by comparison with other biological parameters

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Background: The named Constitutional Syndrome (asthenia, anorexia, weight loss, fever, etc), with any fact to be localized, is frequently observed and to know its nature (infectious, inflammatory, tumoral etiology) is urgent. To have biological parameters of easy and fast evaluation, reliable and low cost is often profitable.

The aim of this study was to prove the utility of fibrinogen serum levels for screening of malignant tumors and to compare that with others biological parameters.

Patients and Methods: We have studied 472 tumoral patients. They were distributed in 10 subgroups according to localization. Age: 13–92 years old. Gender: 70% males. Extension: 62% of them with any metastasis. In all patients the following biological parameters were evaluated in serum: fibrinogen, platelets, haemoglobin, E.S.R., albumin, α_2 globulin, α_1 antitrypsin, acid and alkaline phosphatases, LDH, γ -GT, a-fetoprotein and CEA. The results were compared with healthy and pathological (no tumoral populations). Statistical analysis included probability, sensibility and specificity.

Results: Fibrinogen was elevated in 44% of tumoral patients, with statistical difference in comparison with healthy and no tumoral populations ($p < 0.001$ both subgroups); that increase was also significant in 9 of 10 tumoral subgroups. Sensivity of fibrinogen to detect malignant tumors was 68% and specificity 80%. Not other biological parameter clustered so much statistical facts in favour of malignant tumor.

Conclusions:

1. Fibrinogen is a biological parameter of easy, fast and economical measurement.
2. It is increased in a wide tumoral population, even in absence of metastasis.
3. Its utility to diagnosis is reinforced when it is associated to other altered biological parameters.

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POSTER

CT study on eye lens protection during whole-brain radiation by change of the line of sight

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Background: The seamless registration of the subfrontal region and protection of the eye lenses is a notorious problem in whole-brain radiation. Objective of this investigation is whether a change of the line of sight by looking up, down, or straight ahead leads to a greater distance between the subfrontal brain (cribriforme plate) and lenses. Therefore potentially an improved dose distribution of the subfrontal region with uppermost protection of the eye lenses can be achieved.

Methods: 12 patients with an indication for whole-brain radiation were studied. During the planning CT scan (slice thickness 3 mm) they were instructed to look up, down and straight ahead. Three consecutive CT scans

were performed. The distance between the eye lenses and cribriforme plate was measured for each CT scan.

Results: The distance between the lenses and the cribriforme plate was significantly increased by 6–9 mm when patients were looking down. Looking up (1–3 mm) and looking straight ahead (4–5 mm) were associated with an intermediate distance to the irradiated area.

Conclusion: Instructing the patient to look down results in a significantly improved distance between the lens and the cribriforme plate. With this simple method a better coverage of the brain can be achieved with protection of the eye lenses.

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POSTER

The diagnostic value of FDG-PET in soft tissue and Ewing's sarcoma

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Soft tissue sarcoma and Ewing's sarcoma comprise a group of relatively rare tumors in which the conventional diagnostic techniques often yield unspecific and doubtful findings.

Purpose: The aim of this study was to compare the value of FDG-PET and CIM (conventional imaging modalities: CT, MRI) in patients with Ewing's sarcoma and soft tissue sarcoma.

Patients and Methods: The consecutively admitted patients with histologically proven Ewing's sarcoma (5 pts.) and soft tissue sarcoma (13 pts.) were examined by FDG-PET for postoperative residual disease, recurrency detection and therapeutic response assessment. The soft tissue sarcoma group consisted of 3 fibrosarcomas, 3 liposarcomas, 1 synovial sarcoma, 2 malignant Schwannomas, 1 pleomorphic liposarcoma and 3 leiomyosarcomas.

CIM and FDG-PET were performed within 2 month interval and the findings were compared. Histology and clinical/imaging follow-up served as gold standard.

Results: The tumors were mostly localised in thorax region (8/18) and retroperitoneum (7/18). The sensitivity, specificity, positive predictive value and negative predictive value for CIM were as follows: 55.56%, 33.33%, 45.45% and 42.86% and for FDG PET: 77.78%, 88.89%, 87.50% and 80.0%. CT findings were false positive in 4/7 pts. and false negative in 2 pts. in retroperitoneal localisation. In the same region there were no false positive or false negative FDG PET findings. In the thorax CT finding was false positive and false negative in 2/8 pts., respectively. For the same localisation FDG PET was false negative in 2/8 pts., without any false positive finding. The only one false positive FDG PET finding was located in the lower extremity.

Conclusion: Our series demonstrated better sensitivity and specificity of FDG PET in comparison with CIM in recurrency or residual disease detection, especially in the retroperitoneal soft tissue sarcoma.

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POSTER

Action Cancer: digital mammography with satellite transmission on a mobile unit

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Background: Action Cancer, a charitable organisation in Northern Ireland, provides free, high quality breast cancer screening services to women who fall outside eligibility for the National Health Service Breast Screening Program (NHSBSP), specifically those aged 40–49 years and >65 yrs. With reports that digital mammography better visualises dense breast tissue prevalent in younger women, without reduced image quality for older women, Action Cancer chose to utilise a digital mammography system. The purpose of this paper is to describe the unique system in place, which utilises satellite transmission for the mobile unit.

Material and Methods: Working closely with Siemens Medical Solutions and utilising the 'Mammomat Novation' system Action Cancer installed the digital screening technology in the main clinic and on their mobile services unit (The Big Bus). The Big Bus, a £1.5 million partnership project between the organisation and the private sector, is an 18 metre-long unit, housing screening, health check and therapeutic services, the only one of its kind in Europe.

Results: Since September 2006 Action Cancer successfully implemented the only digital screening system in Northern Ireland, both in their main clinic and on their Big Bus. Following Quality Assurance (QA) standards, at Action Cancer House (ACH) the image is taken on the SIEMENS Novation DR and is then sent to mammoreport station and archive. For the Big Bus, however, once the image is taken on the SIEMENS Novation DR, it is then sent to sienet sky system where prototype compression technology

is applied. The image is then exported by satellite to Italy where the information is extracted over the internet and sent to ACH. At this point the image is uncompressed and sent to mammoreport station and archive. The capture of the image to arrival at the mammoreport station and archive requires only minutes to complete and all images are double reported.

Conclusions: In itself, the use of digital mammography is more beneficial compared with traditional film, e.g. lower radiation, images are more easily manipulated by radiologists for ease of reporting, there is easier storage of images and is ultimately more economical and cost effective. For Action Cancer the use of satellite transmission with digital mammography on a mobile unit is an extremely successful method for providing access to high quality screening services, especially to those in underserved areas.

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POSTER

The usefulness of FDG-PET in diagnosis and management of peritoneal seeding patients with colorectal cancer

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Background: Peritoneal seeding of colorectal cancer(CRC) is a common cause of morbidity and eventual mortality. But accurate diagnosis of peritoneal seeding is not easy and remains a diagnostic challenge.

Purpose: This study examined and compared diagnostic accuracy of F-18 FDG PET and CT in detecting peritoneal seeding in CRC. We retrospectively identified characteristic patterns of F-18 FDG uptake for detecting peritoneal seeding.

Methods: This study enrolled 63 CRC patients suspected peritoneal seeding on clinical symptoms and performed FDG PET-CT and CT. Final diagnosis was made by biopsy or ascitic aspirate and 49 patients of them diagnosed peritoneal seeding (seeding+) and 22 patients diagnosed as without peritoneal seeding (seeding-). We also assessed FDG PET scans from 20 healthy volunteers(control) as a normal control study. PET and CT Images visually interpreted by two experienced physicians, who had achieved consensus in diagnosis. In each FDG PET scan, the maximum standardized uptake values (SUVmax) were measured over peritoneal lesions in seeding+ patients, over the area of most intense intestinal uptake in seeding-patients and control respectively. The characteristics of FDG uptake patterns were evaluated as followed: overall pattern (focal or diffuse), heterogeneity (yes or none) and intensity (low, or equal, faint to moderate, intense)

Results: The sensitivity and positive predictive value (PPV) of FDG PET were superior to CT for the detection of peritoneal lesions (sensitivity: 71.4% vs 57.1%, specificity: 72.7% vs 54.5%; PPV: 85.4% vs 73.7%, NPV: 53.3% vs 36.4%). The FDG uptake patterns in seeding + patients was divided into nodular (14), diffuse (23) and mixed pattern (12). SUVmax threshold of 5.2 produced a diagnostic accuracy of FDG PET of 78% by ROC analysis. The additional information provided by FDG PET allowed more accurate diagnosis in 12 patients (24%), and led to alteration of the therapeutic strategy in 6 (12.2%) of the enrolled patients with peritoneal seeding.

Conclusions: FDG-PET was more sensitive than CT for the detection of peritoneal seeding in patients with CRC and altered patient management in some of them. Thus, the application of FDG-PET may be beneficial to the management of peritoneal seeding in patient with CRC.

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POSTER

Lymph node fluorodeoxyglucose (FDG) uptake as a predictor of chemotherapy sensitivity in malignant lymphoma

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Background: The usefulness of the FDG PET for malignant lymphoma was discussed for many times and verified with the contribution to the diagnosis, treatment and recurrence evaluation. However, quantitative analyses were rarely identified for this disease entity.

Purpose: To evaluate quantitative value of FDG uptake as a proliferating index and clinical significance as a response predictor, we performed this study.

Methods: A retrospective analysis were performed in 42 patients with malignant lymphoma who had FDG-PET before multiagent-chemotherapy. In all study patients, reassessment of histological specimens was

performed by a hematopathologist. In addition, the proliferating activity was analyzed using the Ki-67 (MIB-1) immunohistochemical assay. We investigated the nodal FDG uptake (visual analysis and semiquantitative analysis; SUV and relative uptake ratio) in lymphoma patient before chemotherapy. We compared maximum nodal FDG-PET uptake-ratio with Ki-67 expression. Attenuation-corrected whole body PET images were acquired 60 minutes after injection of 370–555 MBq FDG with a dedicated PET scanner (ECAT HR+ scanner, Siemens-CTI, Knoxville, Tenn., USA). Images visually interpreted by two experienced nuclear physicians, who had achieved consensus. We analyzed the degree of FDG uptake. Visually, the degree of FDG uptake was classified from grade -1 to grade 3: -1, lower; 0, equal; 1, slightly higher; 2, moderately higher; 3, intensely higher. Maximal standard uptake value (max SUV) and uptake ratio of max SUV for lesion to the mean SUV for contralateral basal lung were calculated.

Results: Hodgkin's lymphomas were in 6 cases. According to the WHO classifications, the most common histologic subtype was diffuse large cell lymphoma among 36 Non-Hodgkin's lymphoma patients. All chemotherapy regimens contained doxorubicin. Nodal FDG uptakes were showed linear correlation with Ki-67 expression levels (correlation coefficient $r=0.667$, $p=0.0001$). Total response rate to chemotherapy was 70.2%. The patients with higher nodal FDG uptakes (grade +2, +3) had higher response rates than with lower nodal FDG uptakes (grade +1, 0, +1) (45.2% vs 25.0%, $p=0.018$).

Conclusions: The nodal FDG uptakes were significantly related with the responses to doxorubicin-based multiagent chemotherapy. In conclusion, nodal FDG uptakes may be able to function as a predictor of chemotherapy sensitivity.

Symptom Science

Poster presentations (Wed, 26 Sep, 09:00–12:00)

Symptom science

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POSTER

Body image and breast symptoms in early breast cancer: first results of the UK standardisation of breast radiotherapy (START) trials

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Aims: To determine the impact on body image and breast symptoms of radiotherapy (RT) fractions >2 Gy in terms of normal tissue damage in women with early breast cancer. In the UK START trials (ST-A and ST-B) a randomised comparison of 41.6 Gy or 39 Gy each in 13 fractions was tested against a control dose of 50 Gy in 25 fractions (ST-A) and 40 Gy in 15 fractions against the same control (ST-B).

Methods: Women participating in the quality of life (QL) sub-study completed the 10-item Body Image Scale (BIS), EORTC BR23 QL scale, and protocol specific questions relating to skin appearance following RT and (in wide local excision [WLE] patients only) breast appearance, shrinkage and hardness. Questions were recorded on a 4-point scale from "not at all" to "very much". QL was completed after surgery but before RT and at 6, 12, 24 and 60 months follow-up. For BIS and the breast symptoms subscale score (both numeric scores) comparisons between RT schedules and change from baseline were tested using weighted GEE models including type of surgery as scores are known to vary between subgroups. Individual breast symptom items were classified as to whether patients had ever reported levels of "quite a bit" or "very much", and survival analysis used to compare schedules.

Results: 2180 (99%) women completed baseline QL (mean age 56.9 years, range 26–87). 82.9% of patients underwent WLE and 33.3% received adjuvant chemotherapy. In both ST-A & B, there was no significant impairment of BIS or the breast symptoms subscale score by any one of the regimens compared with the others, and scores improved during follow-up compared with baseline. Rates of change in skin appearance and breast hardness following RT were lower in 39 Gy (ST-A) and 40 Gy (ST-B) vs 50 Gy. There was also a suggestion of a dose-response relationship for breast swelling and overall change in breast appearance, although this was not significant.

Conclusions: The QL domains reflecting normal tissue effects following radiotherapy endorse the clinical finding that hypofractionated RT schedules can be used in early breast cancer.