Material and methods: The records of 208 patients irradiated with tangential photon fields for breast cancer with more than 2 follow-up visits over 6 months were reviewed. Data on clinical factors previously reported to be associated with RP were collected. Actual and percent irradiated lung volumes receiving more than 20Gy were measured from CT-based treatment plan.

Results: Average (± standard deviation) actual and percent irradiated lung volume for breast/chest wall irradiation were 169 (± 14.9) cc and 14.9 (± 3.8) %, respectively. Addition of regional lymph node irradiation resulted in increase of 183 (±80.2) cc in actual irradiated lung volume and 16.5 (±6.2) % in percent irradiated lung volume. RP developed in 11/208 (5.3%) patients. There was an increased incidence of RP among patients treated with loco-regional radiotherapy (10.3%) vs. those receiving local radiotherapy only (2.5%) (p = 0.02). Previously reported clinical factors associated with RP, such as smoking, underlying lung disease, chemotherapy exposure, use of tamoxifen, failed to show statistical significance in this study. Radiotherapy related parameters, such as actual irradiated lung volume and percent irradiated lung volume were also not statistically related to development of RP.

Conclusions: RP was a rare complication, both with local and loco-regional RT. The addition of regional lymph node irradiation increased the incidence of RP. Failure to show correlation between actual or percent irradiated lung volume and RP may be due to majority of the patients receiving radiotherapy to less then significant actual or percent lung volume.

520 POSTER

Estimation of dose constraints using biologically-normalized dose-volume histogram (BN-DVH) for hypofractionated radiotherapy in the treatment of prostate cancer

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Background: Improvements in prostate cancer treatment techniques have allowed dose-escalation to be achieved by non-conventional fraction sizes (e.g. > 2.4 Gy/fraction), reducing the overall number of fractions from 35-44 to 20-28. The aim of this study is to determine the equivalent range of dose-constraints for rectum and bladder between conventional fractionation and hypofractionation treatment plans.

Materials and Methods: Dose volume histograms (DVHs) for bladder and rectum from ten treatment plans for T1-T2 prostate cancer patients treated with 73.5 Gy (isocentre)/35 fractions/7 wks are exported from ADAC Pinnacle planning system into a spreadsheet with 500 bins per DVH. Each dose-bin is converted to its biological equivalent dose based on the linear quadratic model using alpha/beta ratio of 3. Cumulative biologically-normalized DVHs (BN-DVH) based on this conversion are generated and collated. The average BED D50, D35, D25, and D15 from the BN-DVH and their equivalent doses as given over 16 fractions are calculated using the linear-quadratic formula.

Results: Preliminary results from the first five rectal and bladder DVHs show wide ranges of D50, D35,&etc, for treatment given over 35 fractions (Table 1). The range of values seen at each volume-dose bin is amplified after conversion to BN-DVH.

Table 1: Preliminary results of DVH constraints for conventional fractionation vs. hypofractionation using BN-DVH calculations

	Average Dose over 35# (range)	Average Dose per BN-DVH (range)	Average Dose over 16# (range)
Rectum D50	46 Gy (38-56)	67 Gy (52-85)	37 Gy (31-45)
D35	55 Gy (41-66)	85 Gy (58-107)	44 Gy (34-52)
D25	62 Gy (51-70)	100 Gy (77-117)	49 Gy (41-55)
D15	70 Gy (68-72)	117 Gy (112-122)	55 Gy (53-56)
Bladder D50	38 Gy (25-51)	52 Gy (31-76)	31 Gy (21-41)
D35	49 Gy (39-60)	73 Gy (54-95)	40 Gy (32-48)
D25	56 Gy (41-68)	87 Gy (58-112)	45 Gy (34-53)
D15	66 Gy (59-71)	108 Gy (93-119)	52 Gy (47-55)

Discussion: The BN-DVHs seen in this sample of patients suggest a prescribed dose of 55 Gy/16 fractions would achieve dose-constraints similar to conventional treatment over 35 fractions. The influence of the number of fractions (e.g. 16 vs. 20 vs. 28), the value assigned to the alpha/beta ratio (e.g. 2.5, 3.0, 3.5, 4.0), and the potential advantage in normal organ sparing using IMRT over 3D conformal planning will be examined and presented.

521 POSTER

The use of electronic portal image device (EPID) in the isocenter verification in stereotactic radiosurgery

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Background: The Winston-Lutz test (W-L test) is used as a standard method of isocenter verification in Stereotactic Radiosurgery (SRS). The W-L test is based on x-ray portal image that disable direct digital analyze. The aim of the paper is to present the new method of isocenter verification based on EPID.

Methods and Materials: Linear accelerator Clinac 2300C/D (Varian) equipped with EPID and BrainLab stereotactic accessory including micro-Multileaf Collimator (mMLC) and EPID were used. Digital verification method is based on W-L test, however in digital verification method it is EPID that collects images in order to precise verification of isocenter. During digital verification method mMLC leaves are set to H' shaped field (two pairs of leaves in the middle of the field form small square gap). Then first two portal images are taken. Using laser positioners a small metal phantom ball is located in isocenter. To check isocenter invariability several portal images are obtained at various collimator, gantry and couch positions. After each portal field acquisition a quick visual and digital check is done to control if ball is inside square formed by mMLC. The idea of digital analysis is to subtract two portal images: one with phantom ball and second without ball in the same collimator position. Digital check is performed by independent computer program WinIzo'; developed in Treatment Planning Unit in Center of Oncology Institute in Gliwice, Poland. Digital analyze subtract two portal images (first without ball, second with ball, both with the same collimator position) and shows optical density symmetry distribution.

Results: Isocenter verification method based on EPID and WinIzo application enables to obtain and compare results presented in visual and digital form. Moreover, images analyze is improved. The correction of ball position can be done after each single portal acquisition and there is no need to wait till the whole test is preformed (as in basic W-L method).

Conclusions: Comparing to standard W-L test, presented method is faster, less expensive and more precise. The EPID based method is a standard Quality Assurance procedure in Center of Oncology Institute in Gliwice, Poland.

522 POSTER

Safe integration of high dose rate endoluminal brachytherapy in the conservative treatment of patients with esophagus cancer and external beam radiation with or without chemotherapy

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Background: The current study addresses the feasibility and outcome of treatment with high dose rate endoluminal brachytherapy as a boost and external beam radiation with or without chemotherapy for patients with oesophagus cancer from a single institution experience.

Material and Methods: Patients with either squamous or adenocarcinoma and no metastatic disease were eligible. Brachytherapy was given once or twice weekly to a dose of 20 Gy in 5 fractions prescribed at 1 cm in combination with external beam therapy. The dose prescription was either 50 Gy in 25 fractions with 2 cycles of concurrent chemotherapy using 5-Fluorouracil at 1000mg per Meter Square per day, 96-h continuous perfusion and Cis-platinum at 75 mg per Meter Square on day one, on weeks 1 and 5; or 35Gy in14 fractions alone for patients with karnosky performance of $\leq$ 70. Toxicity was scored using the RTOG acute toxicity scoring system. The primary outcomes were: treatment related toxicity, local control and the functional results prior to local recurrence. Statistical analyses were done using Kadplan-Meir methods.

Results: 45 patients were treated with radical intent. There was an equal distribution between adenocarcinoma and squamous cancer. The mean age was 70 years (range: 45-89). Thirteen patients received brachytherapy and external beam radiation and 32 patients were treated with brachytherapy, chemotherapy and external beam radiation. No patient developed a perforation or fistula during our study. There was no treatment related death. The incidence of Grade 2 toxicity for esophagus was 85%, for bone marrow 55% and Grade 3 hematological toxicity was seen in 15% of patients. The mean follow up was 20 months (range 6-70 months). The actual 2 year and 5 year local recurrence rates documented by biopsy were 33%