Purpose: Tumour volumetric changes can be observed during radical chemo-radiotherapy (CRT) for locally advanced non-small cell lung cancer (NSCLC); but it is unclear whether these changes are predictive of outcomes. This study aims to a) examine whether the magnitude of tumour regression is correlated with disease control and survival; b) explore the potential difference between adenocarcinoma (AC) and non-adenocarcinoma (non-AC) NSCLC subtypes.

Methods and Materials: Primary tumour volumes were recorded and analyzed on weekly serial cone beam computed tomography (CBCT) images of NSCLC patients treated with CRT from January 2006 to June 2007 at our institution. Tumour volume regression was divided into three categories: < 10%, 10-30%, and ≥ 30%. Outcome measures included locoregional failure-free survival (LRFFS), distant failure-free survival (DFFS), and overall survival (OS), which were calculated using the Kaplan-Meier method. Univariate analysis (UVA) and multivariate analysis (MVA) of LRFFS, DFFS and OS were performed using the Cox regression model. Further analysis was performed comparing AC and non-AC subgroups.

Results: Forty-five patients with Stage II-III NSCLC were included. Median age was 64 years (range: 43 - 79 years). Median follow up was 22.1 months for all patients, and 90 months for alive patients (range: 9.0-108 months). The distribution of 7th Ed. AJCC stage was as follows: Stage IIB (37%), IIIA 66.7%, IIIB 24.4%. Twenty patients (44.4%) had AC, while 25 patients (55.6%) had non-AC histologies. All patients received concurrent chemotherapy. Twenty-eight patients (62.3%) received a total radiation dose of ≥ 60 Gy, 15 patients (33.3%) received 45 Gy as part of trimodality therapy determined upfront, and two patients (4.4%) received 58-59 Gy due to missed fractions. Among all 45 patients, 23 patients (51.1%) had ≥ 30% regression by treatment completion. In UVA for all patients, young age (p = 0.02) and AC histology (p = 0.03) were significantly associated with better LRFFS; young age was significantly associated with better DFFS (p = 0.048) and OS (p = 0.49). For patients with AC histology, MVA showed that ≥ 30% regression by fraction 15 and younger age were significantly associated with better LRFFS (p = 0.007, 0.006 respectively), DFFS (p = 0.007, 0.004), and OS (p = 0.02, 0.004). For patients with non-AC histology, ≥ 30% regression by treatment completion was significantly associated with better LRFFS (p = 0.02), but none of the factors had any significant correlation with DFFS or OS.

Conclusions: Evaluation of primary tumour regression on CBCT images during CRT may be predictive of treatment response. Early tumour regression, as indicated by ≥30% regression by fraction 15, was shown to be associated with better outcomes for adenocarcinoma histologic subtype in our study. This observation may provide insight into when, how and in which patients to best utilize adaptive radiotherapy.


163 CUMULATIVE INCIDENCE OF BRAIN METASTASIS AFTER DIAGNOSIS OF NON-SMALL CELL LUNG CANCER: ESTIMATES FROM A REGIONAL CANCER CENTRE COHORT

Adrijana D’Silva1, Shannon Otsuka1, Haocheng Li1, Jackson Wu1, Don Morris1, Gwyn Bebb1

1Tom Baker Cancer Centre, Calgary, AB
2University of Calgary, Calgary, AB

Purpose: Non-small cell lung cancer (NSCLC) is the most common primary cancer to metastasize to the brain. However, the incidence or likelihood of developing brain metastasis, after initial diagnosis and treatment, is generally unknown, as provincial population-based cancer registries do not routinely capture metastatic relapses. At our centre, a retrospective cohort study has gathered longitudinal clinical data for all NSCLC patients consulted since 1999 (Glans-Look Lung Cancer Database). In this report, we describe the cumulative incidence of brain metastasis observed for NSCLC patients diagnosed between 1999 and 2010.

Methods and Materials: Clinical data, including date of brain metastasis diagnosed by CT/MR imaging, is abstracted from electronic and paper charts by full time research coordinators. De novo cases of brain metastasis were defined as positive CT/MR within 30 days of initial cancer diagnosis and distinguished from relapsing cases (Stages I-IV at initial diagnosis). Cumulative incidence of relapsing brain metastasis was computed, stratified by cancer stage at initial diagnosis and adjusted for competing risk of death before developing brain metastasis. Survival difference between de novo and relapsing brain metastasis (those initially Stage I-III) was examined by a pre-specified proportional hazard regression model, adjusting for age and year of diagnosis.

Results: A total of 5,264 NSCLC incident cases diagnosed between 1999 and 2010 were identified and analyzed (90% have died). Median age at initial cancer diagnosis was 70 years. Proportion of Stage I, II, III and IV patients was 18%, 8.3%, 20% and 54% respectively. A total of 451 patients relapsed with brain metastasis, giving a five year cumulative incidence of 8.6%, 14% and 8.0% for Stage I-II, Stage III, and Stage IV, respectively.

Conclusions: The five-year cumulative incidence of brain metastasis was 8.6%, 13%, and 8.0% among Stage I-II, Stage III and Stage IV NSCLC patients. Twenty-two percent of Stage IV NSCLC patients presented with de novo brain metastasis, whose median survival was significantly worse than that for Stage I-III patients with relapsing brain metastasis.

164 RADIOTHERAPY FOR PALLIATION IN KAPOSI SARCOMA

Elizabeth Barnes, Emily Sinclair, Mary Doherty, Dalal Assaad, Oleh Antonyshyn, Jeffery Fialkov, May Tsao

Odette Cancer Centre, Toronto, ON

Purpose: Kaposi sarcoma (KS) is a non-curable malignancy which can present with cutaneous lesions. Some patients with KS can have a long indolent chronic course. Radiotherapy is often used to help palliate local symptoms for cutaneous lesions which bleed or cause pain.

Methods and Materials: A retrospective review was undertaken for all KS patients treated with radiotherapy at our centre from January 2, 1999 to December 31, 2014 (inclusive). This study was approved by the local hospital Research Ethics Board. Demographic information (date of birth, gender, co-morbidities) were retrieved along with radiotherapy details, symptoms, treatment side-effects and outcomes.

Results: A total of 48 patients with KS (44 classical, 0 endemic, one iatrogenic, three AIDS related) were seen in our multidisciplinary skin clinic during this study period. Eighteen patients received radiotherapy to 107 sites (1-20 sites per patient). There were five females and 13 males. Ages at the time of initial radiotherapy ranged from 44-93 years of age. Radiotherapy dose ranged from 6 Gy in 1 fraction to 30 Gy in 10 fractions with the most common scheme being 8 Gy in 1 fraction or 20 Gy in 5 fractions. Of the 107 sites treated, 106 showed regression of the KS lesions with benefit in terms of pain, swelling or bleeding. One site in the posterior leg showed progressive KS despite 8 Gy in 1 fraction which continued to bleed and ulcerate. Two patients had initial partial response to radiotherapy but had relapse within the radiated fields requiring repeat radiotherapy. One patient had relapse within the radiated fields and subsequently was observed. No fatal toxicities occurred. The most common side effects were dry desquamation, hyperpigmentation and lymphedema of the legs.
Conclusions: Low dose radiotherapy provides effect palliation of distressing symptoms resulting from cutaneous KS with acceptable toxicity.

A PRACTICAL ENERGY MODULATION TECHNIQUE TO AVOID ENucleation FOR ADVANCED PERIOCULAR CANCERS
Jon-Paul Voroney, Alana Hudson, Yannick Poirier, David Spencer, Ferenc Jacso, Kevin Martell
Tom Baker Cancer Centre and University of Calgary, Calgary, AB
Purpose: Consider a 2x2x1.5 cm basal cell cancer invading right medial canthus periorcular embryonic fusion plane. Usual techniques fail: an irregular PTV 4x4x2.5 cm deep, a concave surface, a deep tumour, and adjacent structures. Oculoplastics/Mohs risk enucleation. Electrons with an internal eye shield require bolus and limit energy to 9 MeV. High energy conformal RT risks medial retinal damage. Systemic agents may palliate but do not cure. We describe low energy electron RT (e- ) with an orthovoltage (ortho) bump. “Bump” modulates energy by replacing some e- with ortho to increase surface dose and optimize dose distribution. Bump applies to any anatomic location to a depth of 2-3 cm. Bump can use e- with a tungsten eye shield and ortho for maximal eye sparing. With orbit invaded, morbidity follows. Radiotherapy may be the best eye-preserving option.

Methods and Materials: Central-axis dose calculation using measured % depth dose were compared with central and off-central axis dose calcs using kVDoseCalc, a dose engine validated in kV cone-beam and ortho therapy; and Monte Carlo for e- off-axis dose calc. We compare conformal RT, arcs, and bump, for periorcular cancer cases. We compared central axis data for a 4x4 cm field with: 1) 9 MeV alone; 2) 9 MeV with 0.7 cm custom wax; 3) 9 MeV, 80% of dose, 100 kV DXR bump, SSD 10 cm, 20% of dose; 4) 9 MeV, 80% of dose, 200 kV DXR bump, SSD 50 cm, 20% of dose. Patients treated at our institution in 10 or 20 treatments received 8 or 16 electron treatments (prescribed to account for REB of electrons) and 2 or 4 photons treatments, for a total dose of 45 Gy in 10 fractions, or 50 Gy in 20 fractions.

Results: For the case above tables based on measured dose give: Surface dose (1) 86%; (2) 90%; (3) 100%; (4) 94% Dmax (100%) (1) 2.0 cm; (2) 1.3 cm; (3) 2.0 cm; (4) 2.0 cm Dose @ 2.7 cm (1) 89%; (2) 58%; (3) 87%; (4) 91% Surface and depth refer to skin surface. Dose is normalized: Dmax = 100%. REB and geometry are not included. Comparing dynamic conformal ARCs, VMAT, electrons +/ bolus or tantalum mesh, and bump show the benefits of 9 MeV with 100-200 kV bump. Dose drop off is swift at ~40% cm beyond D90%. Dose spares eye. Low SSD, low kV bump results in best homogeneity and surface dose; high kV bump gives best dose at depth. Patients can be scanned with a 3D printer wax replica eye shield to reduce artifact and enable accurate dose calculation. Actual patient results are illustrated with isodose distributions; for three clinical cases, the dose above 80% to retina was 2.5 cc for conformal treatment, 1.0 cc for dynamic conformal arc and < 0.5 cc for bumps, demonstrating excellent shielding for the bump technique.

Conclusions: Energy modulation with ortho and electrons can result in improved dose distribution. Benefits include: increased treatment depth, improved dose homogeneity, no bolus, increased shield effectiveness, and reduced penumbra; important when treating near the eye.

MEASUREMENT OF TUMOUR HYPOXIA IN PATIENTS WITH LOCALLY ADVANCED NON-SMALL CELL LUNG CANCER (NSCLC) USING POSITRON EMISSION TOMOGRAPHY (PET) WITH 18F-FLUORODEOXYGALACTOSOMAT ARABINOSIDE (18F-FAZA)
Angela Lin 1, Douglass Vines 2, Brandon Driscoll 2, Lisa W. Le 2, Stephen Breen 2, Alexander Sun 1
1Princess Margaret Cancer Centre, Toronto, ON 2University of Toronto, Toronto, ON
Purpose: Tumour hypoxia is an adverse prognostic factor in many cancers. 18F-FAZA is a hypoxia tracer, which can provide a non-invasive method of hypoxia imaging with PET, but has not been widely studied in NSCLC. This study aims to evaluate the feasibility and potential benefits of using 18F-FAZA-PET scans to assess NSCLC tumour hypoxia.

Methods and Materials: Thirteen of the planned 20 patients with Stage II – III NSCLC are included thus far in this prospective study by imaging with FAZA-PET before initiation of radical chemoradiotherapy. Patients were imaged two hours post-injection with FAZA. Attenuation correction was performed using a helical computed tomography (hCT) for respiratory gated PET (gPET). The exhale bin was used for analysis for the purpose of this study. The hypoxic volume (HV) was defined as all voxels within the tumour with standard uptake value (SUV) more than three standard deviations from the mean values obtained from muscle SUV as defined by Mortensen et al. 2012. The Tmax/Mmean ratio was defined as maximum tumour SUV divided by the mean value of muscle SUV. The hypoxic fraction (HF) was determined by dividing the HV by the entire gross tumour volume (GTV). Pearson correlation (rho) was performed to evaluate the significance of these metrics.

Results: A hypoxic volume (HV) in the primary tumour was identified in 12 patients (92.3%). The hypoxic fraction (HF)