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tion of dose distributions in lung tumours have been used to correct DVH's planned in a static situation with pencil beam to a dynamic situation, considering breathing motions and a more correct dose calculation.

Results: At 17 mo. after end of study there is one local relapse alone and 7 cases displaying distant metastasis of which 2 are combined with regional failure (1 T1 and 6 T2). Grade 3 toxicity was seen in 3 patients with dyspnoe at 3, 6 and 9 months, not correlated with pneumonitis or fibrosis. Spirometry data will be reported. Grade 3 toxicity with pain in the thorax was seen in 2 patients at 9 and 12 months not associated with rib fracture or tumor in proximity to the thoracic wall. 13/59 (22%) did not have any side effects. The most common side effect at 6 weeks was grade I skin reactions (19 patients with grade I and 4 with grade 2). At 17 mo. after end of study 11 pts. had obtained CR, 30 showed PR and 8 pats. had either local failure and/or distant metastases.

Conclusion: Using 15 x 3 Gy to stage I NSCLC results in acceptable early toxicity and favourable local control rate non inferior to what has been reported with fractionated RT.

P3-170 **NSCLC: Radiation Posters, Wed, Sept 5 – Thurs, Sept 6**

The necessity of a correct dose calculation algorithm for stereotactic lung irradiation

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Background: For stereotactic lung irradiation, the dose is frequently prescribed to an isodose surface that encompasses the Planning Target Volume (PTV). This method is sensitive to incorrect modeling of the beam penumbra. Most dose calculation algorithms present in commercially available treatment planning systems model the beam penumbra in water correctly. However, the beam penumbra in lung is much wider due to radiation and particle transport effects in low-density tissue, and is approximated only to a reasonable accuracy by few of the available calculation algorithms.

The aim of this study is to determine the effect of two dose calculation methods, with and without heterogeneity correction, on the prescribed dose to the tumor and the dose distribution in surrounding tissue.

Methods: In our institute, stereotactic treatment plans for lung consist of 10 - 20 non-opposing photon beams (maximum energy 10 MV). Beam shapes and weights are optimized using Direct Machine Parameter Optimization (DMPO) available in the Pinnacle treatment planning system. A dose of 3 x 18 Gy is prescribed on the isodose surface that encompasses 95% of the PTV. Dose calculation is performed using the collapsed cone convolution/superposition algorithm, including all effects of tissue heterogeneity (heterogeneous plan). This algorithm is proven to be accurate in the presence of tissue heterogeneities through measurements in phantoms and comparison with Monte Carlo simulations. To simulate an inaccurate dose calculation, we recalculated for 15 patients the clinical treatment plan without heterogeneity corrections (homogeneous plan) while maintaining the number of Monitor Units (MU) from the clinical plan. The following dose parameters were compared between the two plans: absolute isodose surface encompassing 95% of the PTV (Dpres), relative maximum dose in the PTV (Dmax), ratio of the 50% prescription isodose volume to the PTV (R50), maximum dose 2 cm from PTV (D2cm), and percentage of lung volume receiving 20 Gy or more (V20).

Results: Compared to the heterogoneous plan, Dpres of the homogeneous plan increased from 54 Gy (by definition) to an average of 59 ± 4 Gy (range 54 to 67 Gy). Due to increased attenuation and tightening of the beam penumbra in the homogeneous plan, Dmax was lower for the homogeneous plans (average 124% vs. 132%), while dose fall-off outside the PTV was steeper. The latter is reflected in a lower R50 for the homogeneous plans (4.2 ± 0.8) than for the heterogeneous plan (4.9 ± 1). D2cm and V20 were comparable for the two calculation methods (29 ± 2 Gy and 5 ± 2 %, respectively).

Conclusions: The absence of any heterogeneity correction (as required by some trial protocols) results in profound errors in dose distributions and the prescribed dose of stereotactic lung irradiation. Any dose calculation algorithm that does not predict penumbra broadening accurately (e.g. pencil beam algorithms), will result in errors in the calculated dose distributions which will affect the dose. The quality of the dose calculation algorithm is therefore an important parameter when comparing the local control and toxicity results of stereotactic studies in lung.

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Outcomes for non-small cell lung cancer patients presenting with brain metastases

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Purpose: Assess the outcomes of non-small cell lung cancer (NSCLC) patients presenting with brain metastases (BM).

Background: The brain is a common site of metastases and frequently the first site of treatment failure in non-small cell lung cancer (NSCLC). Patents presenting with synchronous BM may represent a unique population that could potentially benefit from aggressive therapy. At this time, generally accepted treatment guidelines have not been established for these patients.

Methods: Retrospective review of patients presenting with NSCLC with synchronous BM. Patients were assessed regarding treatment for both intracranial and intrathoracic disease. Aggressive treatment to the brain included either craniotomy or gamma knife radiosurgery and aggressive treatment to the primary lung cancer consisted of surgery, chemoradiation therapy or both.

Results: 75 NSCLC patients presented with synchronous BM treated between 1998-2002. 34 M: 41F, median age 60 years (40 -85), and median Karnofsky score 79 (40 - 100). Sixty-percent (45 pts) had extracranial metastases at the time of diagnosis, and 36 patients (48%) had a single brain metastasis. Treatment was considered aggressive (e.g. craniotomy or Gamma Knife radiosurgery) for CNS disease 43 patients and for chest disease (e.g. surgery or chemoradiotherapy) in 20 patients. With a median follow-up was 15 months (1-107), median survival was 8.4 months in the aggressive treatment group and 7.7months in the "palliative" treatment group (p= 0.44). Ten patients survived more than 2 years (median 48 months for this cohort), and 9/10 received aggressive CNS treatment while 5/10 recieved aggressive intrathoracic treatment. The patterns of relapse were similar in the aggressive and palliative treatment groups. Twenty one patients recurred in the brain, (10/43 in aggressive treatment group, 11/36 palliative group). 9 patients recurred or demonstrated progressive disease in the lung (1/12 aggressive treatment group, 8/63 in non-aggressive group). In an analysis of prognostic factors including performance status,

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