function and ultimate tumour control.

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CARDIAC TOXICITY IN CENTRAL NON-SMALL CELL LUNG TUMOURS TREATED WITH STEREOTACTIC BODY RADIATION THERAPY (SBRT) - IS THERE A “NO-FLUTTER ZONE”?
Elysia Donovan¹, Gordon Okawara², Jim Wright³, Theodoros Tsakiridis¹, Anand Swaminath²
¹University of Toronto, Toronto, ON
²McMaster University, Hamilton, ON

Purpose: Cardiac toxicity has been well-described following conventional radiotherapy to the thorax, however the long-term cardiac effects of ablative stereotactic body radiotherapy (SBRT) doses are unknown. Furthermore, appropriate dose constraints to the heart to minimize long-term cardiac toxicity have not been well characterized, nor has the potential effect of pre-existing cardiac disease on toxicity risk.

Materials and Methods: We conducted an institutional database review to assess cardiac events in patients treated with SBRT for central early-stage lung cancer or metastasis within 5cm of the heart, prior to the year 2017 to allow sufficient follow up. Descriptive statistics were used to report patient and treatment information, and cardiac events. Linear regression was used to assess the relationship between cardiac events and age, gender, cardiac history, smoking history, tumour size, and cardiac dose (mean, maximum, volume receiving, 5Gy, 10Gy and 30Gy).

Results: Forty-seven patients met criteria, 39 patients with primary NSCLC, and eight with central lung metastasis. Median follow up time after SBRT was 21.5 months (range 2.1-61). Mean tumour diameter was 4.3cm (range 2.5-7.4). Seventeen (36.2%) patients had a pre-existing cardiac history, most commonly ischemia or MI. Median distance from the tumour to heart in all included patients was 1.8cm (range 0.0-4.9). Eight of 47 patients (12.1%) had a cardiac event following SBRT (two de novo, six in patients with cardiac history), at a median time of 30 months (range 17-34). Six of the eight patients had tumours located within cm of the heart. Maximum heart doses ranged from 20.8Gy to 61.7Gy (median 51 Gy), while MHD ranged from 2.3-7.8Gy (median 5.6Gy). Only one cardiac death attributed to atrial fibrillation causing stroke occurred, in a patient with a prior history of atrial fibrillation. On univariate analysis, previous history of cardiac disease (OR 4.4; p=0.03) was with an increased risk of cardiac events. On multivariate analysis, there was a trend towards association between cardiac history and cardiac events, however this was not statistically significant (OR 5.2, p=0.1). Mean and maximum heart dose, V5, V10, V30, were not significantly associated with cardiac disease.

Conclusions: Overall, current SBRT dose constraints for the heart appear to be safe with low risk of cardiac events, and our findings do not support previous reports of an association between cardiac events, death and SBRT dose. Cardiac history was the main predictor of cardiac event post-SBRT, and this should be considered when treating patients with SBRT for central tumours in close proximity to the heart.

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OLIGO-TERMINOLOGIES OF OLIGOMETASTATIC DISEASE - CONSISTENCY OF NEW CONSENSUS DEFINITIONS WITHIN CURRENT SABR TRIALS
George J. Li¹, Andrew J. Arifin², Faiez Al-Shafa³, Patrick Cheung¹, George B. Rodrigues⁴, David A. Palma⁵, Alexander V. Louie⁶
¹University of Toronto, Toronto, ON
²Western University, London, ON

Purpose: Oligometastatic disease (OMD) is a rapidly growing area of oncology research. Consensus statements have recently been developed by ESTRO/ASTRO and ESTRO/EORTC to harmonize terminology describing OMD. The purpose of this study was to assess patient populations eligible for ongoing clinical trials evaluating stereotactic ablative radiotherapy (SABR) in OMD, in the context of key definitions from both statements.

Materials and Methods: Definitions of key terms from both ESTRO/ASTRO and ESTRO/EORTC consensus statements for OMD were summarized. Using the clinicaltrials.gov database, a search of ongoing OMD clinical trials evaluating the use of SABR was performed from inception to January 2020, using the keywords “oligometastasis”, “stereotactic radiotherapy”, and related terms. Results were independently reviewed by two investigators (GJL and AJA), with discrepancies settled by a third (AVL). Information from these trials including study design, population criteria, and overall survival in patients with oligometastatic cancer, with phase III trials currently testing SABR in up to 10 metastases. Whether SABR could provide similar benefits in polymetastatic disease (>10 metastases) is unknown. A critical first step is to determine the feasibility of planning SABR for a large number of metastases throughout the body while maintaining acceptable organ-at-risk (OAR) doses. Therefore, we sought to evaluate the dosimetric feasibility of using SABR in polymetastatic disease (>10 sites) while adhering to OAR constraints to be used in a phase I trial (ARREST).

Materials and Methods: Five craniospinal CT simulations were utilized to retrospectively contour 24 (n=2), 30 (n=2) and 50 (n=1) tumour targets not present on the initial scan. Standard PTV margins were added based on institutional immobilization practices. OAR constraints from published clinical trial protocols were used. Radiotherapy plans for the highest dose level in our planned phase I trial (30Gy in 5 fractions) were created utilizing a minimum number of isocentres. Plans were created using Raystation (Raysearch Laboratories, Stockholm, Sweden) for delivery on linear accelerators using volumetric modulated arc therapy.

Results: The gross tumour volumes (GTVs) ranged from 134.8-184.2cm³ in our five test cases. The first two cases with 24 GTVs have been planned and were deemed to be clinically acceptable. PTV volumes were 483.0cm³ and 417.4cm³, utilizing five and six isocentres for treatment respectively. Median PTV D95 was 29.7Gy and 29.0Gy, whole body V10 was 21.2% and 17.4%, and V5 was 41.8% and 44.8%. All OAR goals were met, though low-dose conformality was less than traditional SABR treatment plans (R100 of 1.04 and 0.93; R50 of 9.90 and 6.98, respectively). The remainder of the test cases will be presented.

Conclusions: In our test cases, planning SABR in polymetastatic disease appears dosimetrically feasible. Our Phase I clinical trial (ARREST) is under development, which will evaluate the feasibility and toxicity of delivering SABR in polymetastatic disease in a 3+3 dose escalation study. The starting dose level will be 12Gy in 2 weekly fractions, escalating the dose by adding 6Gy weekly until our target dose of 30Gy in 5 weekly fractions. Our study population will include >10 sites of disease, all tumour types, and patients must have exhausted standard lines of systemic therapy.