function and ultimate tumour control.

194 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 Wright2, Theodoros Tsakiridis2, 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.

195 CAN POLYMETASTATIC DISEASE BE ARRESTED USING SABR? A DOSIMETRIC ANALYSIS TO INFORM DEVELOPMENT OF A PHASE 1 TRIAL Mark T. Corkum1, Hatim Fakir2, David A. Palma3, Timothy K. Nguyen1, Glenn S. Bauman4 1London Health Sciences Centre, London, ON

Purpose: Phase II randomized trials suggest that stereotactic ablative radiotherapy (SABR) improves progression-free 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 conformity 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.

196 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. Rodrigues2, David A. Palma2, Alexander V. Louie1 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 in an effort 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
Patients with gynecologic cancers

Materials and Methods:

Purpose:

Conclusions:

Purpose:

Materials and Methods:

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Purpose: The role of stereotactic ablative radiotherapy (SABR) for gynecologic malignancies has not been clearly defined despite recent clinical uptake. This study evaluates the outcomes of SABR in patients with metastatic gynecologic cancer at a single institution.

Materials and Methods: Patients with gynecologic cancers treated from 2009-2019 were extracted from an institutional SABR database. Descriptive statistics were used to report patient and treatment characteristics, toxicity and chemotherapy-free interval. Local recurrence free survival (LRFS), distant progression-free survival (DPFS), and overall survival (OS) probabilities were calculated using Kaplan-Meier methods. The relationship of primary site, tumour grade, dose of radiotherapy, and disease free interval (DFI) to LRFS and DPFS were assessed using Cox regression methods for multivariable analysis (MVA).

Results: One hundred nine lesions in 77 patients with gynecologic cancer were treated with SABR. Median age was 63 and follow up after SABR was 16.4 months (1-79.6). Patients were treated with SABR for oligoprogressive disease (n=58), oligometastatic disease (n=34), or for local progression in critical areas (n=17). Primary site included cancers of the endometrium (n=36), cervix (n=19), ovary (n=15), and vulva or vaginal (n=7). Median DFI was 22.3 months (1.6-143.3) from diagnosis to metastasis. Treatment was delivered to lesions in the lung (n=25), pelvis (n=23) spine (n=17), para-aortic (n=16) and distant nodes (n=7), abdominal organs (n=13), and bone (n=8). Radiotherapy doses ranged from 25-60Gy (median 35Gy) in 2-5 fractions. Patients had between one and six lesions treated. Thirteen lesions recurred locally (11.9%) at a median of 7.6 months (range 0.5-17.6), and 76% of patients eventually had a distant recurrence after SABR. Median DPFS was 7.8 months (95% CI 3.6-11.9), and OS 31.5 months (95% CI 12.2-60.4). At 2 years, LRFS was 77.6%, DPFS was 19.6%, and OS was 51.9%. Thirty-two patients eventually required chemotherapy at median six months (range 1-37). There were no Grade 3-5 acute or late toxicities reported. On MVA, primary site, tumour grade, dose of radiotherapy and DFI were not significantly associated with LRFS or DRFS.

197 FIRST IN HUMAN RADIOFREQUENCY TRANSPONDER GUIDED DEEP INSPIRATION BREATH HELD STEREOTACTIC ABLATIVE RADIOTHERAPY OF A LUNG TUMOUR IN THE PRONE POSITION: A CASE REPORT


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Purpose: Pulmonary tumours located in close proximity to the heart are not typically amenable for radical Stereotactic Ablative Radiotherapy (SABR) due to inability to respect dose-volume tolerances of cardiac tissues. We developed and delivered a novel methodology for safe SABR delivery for a lung tumour located 3mm adjacent to the heart.

Materials and Methods: A 66-year-old male with a 3.2x2.8cm left lower lobe lung (LLL) tumour located 3mm adjacent to his heart was assessed for image-guided SABR using a standard free-breathing 4DCT simulation scan and volumetric modulated arc therapy (VMAT) treatment planning however, cardiac constraints could not be met. A multidisciplinary team at CancerCare Manitoba designed a more precise SABR simulation and delivery technique. Three endobronchial radiofrequency tumour tracking beacons (Calypso™, Varian Medical Systems) were implanted in the small airways surrounding the LLL tumour. Custom immobilization setup with prone neck rest and full body vacuum lock bag was built, and CT simulation scan was obtained in Deep Inspiration Breath Hold (DIBH). Gated SABR (54Gy/3#) was delivered with telemetry confirming proper tumour positioning during DIBH with a 3mm PTV margin. Post-SABR position telemetry was collected for analysis.

Results: Prone DIBH SABR was delivered using 10MV Volumetric Modulated Arc Therapy (2400MU/min) over 6 to 8 breath holds per fraction with median duration of 25s per breath hold. Cone-beam images confirmed an acceptable heart-tumour separation as well as beacon location. Calypso telemetry revealed an average change in beacon position during DIBH for all fractions of 0.6, 0.3 and 0.7mm in the lateral, Superior-Inferior and Anterior-Posterior directions respectively. Interestingly, in the prone DIBH position, the LLL tumour to heart separation was observed to increase to a closest point of approach of 8mm, thereby increasing the therapeutic ratio of the SABR treatment. SABR was well tolerated and no severe acute or late toxicity was experienced.

198 STEREOTACTIC ABLATIVE RADIOTHERAPY (SABR) IN OLIGOMETASTATIC AND OLIGOPROGRESSIVE GYNECOLOGIC CANCERS: CLINICAL OUTCOMES OF A SINGLE INSTITUTION ANALYSIS


University of Toronto, Toronto, ON

Purpose: The role of stereotactic ablative radiotherapy (SABR) for gynecologic malignancies has not been clearly defined despite recent clinical uptake. This study evaluates the outcomes of SABR in patients with metastatic gynecologic cancer at a single institution.

Materials and Methods: Patients with gynecologic cancers treated from 2009-2019 were extracted from an institutional SABR database. Descriptive statistics were used to report patient and treatment characteristics, toxicity and chemotherapy-free interval. Local recurrence free survival (LRFS), distant progression-free survival (DPFS), and overall survival (OS) probabilities were calculated using Kaplan-Meier methods. The relationship of primary site, tumour grade, dose of radiotherapy, and disease free interval (DFI) to LRFS and DPFS were assessed using Cox regression methods for multivariable analysis (MVA).

Results: One hundred nine lesions in 77 patients with gynecologic cancer were treated with SABR. Median age was 63 and follow up after SABR was 16.4 months (1-79.6). Patients were treated with SABR for oligoprogressive disease (n=58), oligometastatic disease (n=34), or for local progression in critical areas (n=17). Primary site included cancers of the endometrium (n=36), cervix (n=19), ovary (n=15), and vulva or vaginal (n=7). Median DFI was 22.3 months (1.6-143.3) from diagnosis to metastasis. Treatment was delivered to lesions in the lung (n=25), pelvis (n=23) spine (n=17), para-aortic (n=16) and distant nodes (n=7), abdominal organs (n=13), and bone (n=8). Radiotherapy doses ranged from 25-60Gy (median 35Gy) in 2-5 fractions. Patients had between one and six lesions treated. Thirteen lesions recurred locally (11.9%) at a median of 7.6 months (range 0.5-17.6), and 76% of patients eventually had a distant recurrence after SABR. Median DPFS was 7.8 months (95% CI 3.6-11.9), and OS 31.5 months (95% CI 12.2-60.4). At 2 years, LRFS was 77.6%, DPFS was 19.6%, and OS was 51.9%. Thirty-two patients eventually required chemotherapy at median six months (range 1-37). There were no Grade 3-5 acute or late toxicities reported. On MVA, primary site, tumour grade, dose of radiotherapy and DFI were not significantly associated with LRFS or DRFS.

Conclusions: This cohort of patients had excellent LRFS and DPFS when treated with SABR for oligoprogressive, oligometastatic and locally progressive disease. SABR also has the potential to delay time to chemotherapy in patients with gynecologic cancers. Prospective multicentre trials will be critical to establish which primary disease sites and characteristics procure the greatest benefit from SABR use, to delineate optimal dose regimens, and to define the ideal time to implement SABR with other oncologic treatments.