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Purpose/Objective: Our purpose is to optimize RT target definition and treatment planning in lung-sparing VMAT for malignant pleural mesothelioma. In this multistep process, we identified 2 main objectives: 1) to investigate which imaging modality is optimal for GTV definition (CT, PET/CT or MRI); 2) to develop a model able to identify the maximum safe dose escalation level for each patient.
Materials and Methods: Sixteen consecutive stage I-IV MPM patients were retrospectively identified from an institutional database and included. For the contouring phase, a CT with IV contrast, ^{18}FDG-PET/CT and MRI were obtained. CT was rigidly co-registered with PET/CT and with MRI. Three sets of pleural GTVs were defined: GTV_{CT}, $GTV_{CT+PET/CT}$ and GTV_{CT+MRI}. 'Quantitative' and 'qualitative' evaluations of the contoured GTVs were performed. For the planning phase, the GTV with the lower 'geographical miss' rate was chosen to generate the PTV. The first 6 consecutive left-sided and right-sided patients were selected, for a total of 12 patients. For all patients, VMAT plans were created. Prescription dose was 50 Gy in 2-Gy fractions delivered to the PTV, and progressive dose-escalation steps (with 4 Gy increment) were attempted. The correlation between the contralateral/ipsilateral lung volume ratio and the PTV/total lung volume ratio with the achieved PTV dose was investigated.
Results: Compared to CT, PET/CT identified geographical miss in 10/16 patients, and MRI avoided frank GTV underestimation in 15/16 patients. In 15/16 patients, MRI modified also PET/CT contours. Differences in mean volumes ranged from 1.7 to 5% and were not significantly different. Mean Jaccard index (indicating lower concordance) was lower in MRI-based contours versus all the others. For 10/12 patients was possible to generate a 50 Gy VMAT plan. The maximum achievable dose was 54 Gy, 58 Gy and 62 Gy in 7, 4 and 1 patients, respectively. A significant correlation between the contralateral/ipsilateral lung volume ratio and the PTV/total lung volume ratio with the achieved PTV dose was found (p=0.05).

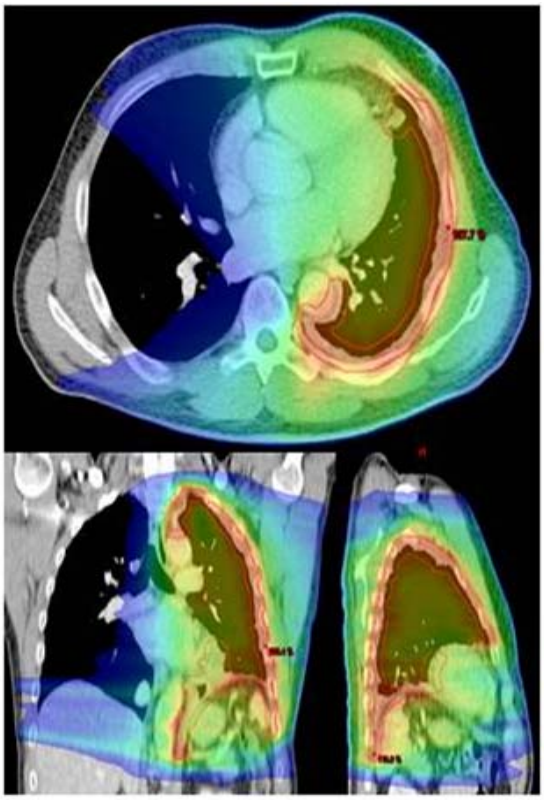

Figure 1. Axial, coronal and sagittal view of a 54 Gy VMAT plan.

Conclusions: To the best of our knowledge, this is the first study showing that the integration of MRI into the target volume definition in MPM may allow improving the accuracy of GTV delineation and reducing the probability of geographical misses. Patients with a higher ratio of contralateral/ipsilateral lung volume and lower ratio of PTV/total lung volume are less likely to achieve a therapeutic RT dose.

PO-0804
Volumetric Total Lymphoid Irradiation: step-up an effective treatment for stem cell transplantation in lymphoma

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Purpose/Objective: For patients with relapsed/refractory Hodgkin's disease (HD) and non-Hodgkin lymphoma (NHL), autologous hematopoietic stem cell transplantation (aHSCT) is the standard of care. HD treatment by accelerated hyperfractionated total lymphoid irradiation (TLI) with three-dimensional conformal radiotherapy (3D-CRT) has been investigated in dated clinical trials with good clinical outcomes. Today IGRT and IMRT allow the reduction of unbearable radiation dose to healthy tissues. Herein we report our preliminary clinical experience in planning and delivery of newly designed short-course hypofractionated TLI by Helical Tomotherapy (HT) followed by HDT and aHSCT.
Materials and Methods: From February 2011 to March 2012,

10 patients with relapsed/refractory HD (n=7), diffuse Large B Cell (n=2) and follicular B-cell NHL (n=1) were treated. Median age was 41 years (range 20-61) and median number of previous lines of therapy was 3 (range 2-4). Conditioning chemotherapy consisted of high-dose melphalan 140 mg/sqm for all patients except one heavily pre-treated. Hypofractionated TLI was delivered as a12 Gy radiotherapy course in 3 consecutive daily fractions followed after 2 days rest by HDT and hHSCT. A conventional 3D-CRT-TLI plan was compared with all HT-TLI plan for all patients. Daily IGRT was performed to validate the patients setup margins reliability due to the large extension of the target (from the nodal chains of the neck to the inguinal ones included the spleen). Outcomes measures were treatment related mortality (TRM), progression free survival (PFS) and overall survival (OS).
Results: All patients had chemosensitive disease at salvage chemotherapy, with complete remission (CR) obtained in 6 patients (HD=5, NHL= 1), and partial remission (PR) in 4. Conditioning regimen was very well tolerated. All patients showed complete engraftment and median time to neutrophil and platelet recovery was of 15 (range 9-21) and 17 days (range 9-21), respectively. Three patients developed grade 3/4 mucositis, grade 2 vomiting and 5 reported fever of undetermined origin. There was no TRM within the first 100 days. After a median follow-up of 36 months (range 31 – 44) the 3-year PFS and OS were 50% and 90% respectively. In HL patients the 3-year PFS was 71% and OS was 100%. HT-TLI in comparison with conformal 3D-CRT-TLI reduced the mean and the higher (V80%) doses to the organs at risk from 5% to 76% and from 47% to 100% respectively. The target volume was irradiated with higher conformity and homogeneity with HT. Measured setup corrections and replanned dose on daily MVCT scans showed robustness of the patient immobilization technique.
Conclusions: Although from a limited number of patients, this original analysis showed the clinical feasibility of hypofractionate HT-TLI with HDT and ASCT. Preliminary outcomes in high risk HL shown remarkable efficacy to be considered as safe and effective eligible treatment.

PO-0805

Intensity Modulated Radiotherapy for the treatment of retroperitoneal sarcoma

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Purpose/Objective: To analyze toxicities, dosimetry parameters, and oncology outcomes in a series of patients with retroperitoneal sarcoma treated with Intensity Modulated Radiotherapy (IMRT).
Materials and Methods: Retrospective analysis of 35 consecutive patients with histologically proven retroperitoneal sarcoma treated with IMRT from 2006 to 2013 in our institution. IMRT was delivered in a step-and-shoot technique with daily IGRT. Toxicity was described following the CTCAE v4 classification. As several patients had some symptoms before IMRT, we made a matched-pair comparison (paired-sample sign test) between treatment related acute/chronic toxicities and baseline symptoms. Relapse-free and survival intervals were estimated by using Kaplan-Meier method.
Results: Median follow up was 28 months. Of the 35 patients there were 18 women and 17 men. Median age 57 was years (22-74). 19 and 16 patients were treated after extended resection, and preoperatively, respectively. 24 patients presented a primary tumor, and 11 were treated for a first local recurrence. 26 patients presented a liposarcoma (11 G1, 4 G2 and 11 G3). Median tumor size was 17.5 cm (5-30). Median radiotherapy dose was 50.40 Gy with 1.8 Gy fractions. Median dosimetry values were: PTV volume 1033cc, contralateral kidney 3.68 Gy, and peritoneal Cavity 22.34 Gy. The most frequent acute toxicity was gastrointestinal (GI) (26/35, mainly G1; 18 patients), followed by lymphopenia (22/35, all without clinical significance). Most frequent (no clinically relevant) ≥ G2 toxicities were: lymphopenia (n=19), GI (n=8) and albumine decrease (n=3). Late ≥ G2 toxicities were: GI (n=6), fatigue (n=3), lymphopenia (n=3), kidney injury (n=2) and anemia (n=2). In comparison with baseline, there were found significant differences in the following acute (fatigue [p=0.04], GI [p<0.001], and lymphopenia [p<0.001]) and late (≤G2 kidney injury [p=0.008]) toxicities. Recurrences were observed in 11 patients: local (n=10), sarcomatosis (n=3) and distant (n=5; 2 Lung, 1 Liver, 1 bone, 1 Node). A salvage treatment was delivered in all patients. Median time to local failure was 8 months (0-35). At 2-year, disease free survival, locoregional free-survival, and overall-survival rates were 77%, 82%, and 83%, respectively.
Conclusions: IMRT for retroperitoneal sarcomas is well tolerated with no acute clinically relevant severe toxicity. Mild late Kidney injury was observed in 23% pts. Outcomes are consistent with those observed in recent studies. The ongoing trial EORTC 62092-22092 is awaited to establish the true role of high precision preoperative radiotherapy in retroperitoneal sarcoma.

PO-0806

Dosimetric evaluation of TomoTherapy and 3D conventional radiotherapy with respect to bone marrow sparing

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Purpose/Objective: Craniospinal irradiation (CSI) is indicated for various diseases of the central nervous system, such as germinoma, medulloblastoma and ependymoma, in curative settings, or as palliative treatment in patients with good performance status suffering from meningeosis carcinomatosa. Due to the irradiation of a very large volume and its close proximity to the vertebrae, a major side effect of CSI is bone marrow suppression. We performed a treatment plan comparison of 3D and IMRT as TomoTherapy to evaluate the different techniques regarding bone marrow