Purpose or Objective: Since the beginning of clinical activity in 2011, approximately 600 patients has been treated with hadron therapy at CNAO (National Center for Oncological Hadrontherapy), among which 42 were sacral chordoma undergoing carbon ion radiotherapy (CIRT) with a radical intent. The aim of the current study is to analyze the feasibility of the insertion of a newly customized spacer prior to CIRT in sacral chordoma patients, in terms of procedure validation and patient tolerance, in selected cases where the sacral chordoma is contiguous to the rectum or the bowel loops in order to safely escalate the dose to the tumor target.

Material and Methods: Since 2014, 6 consecutive sacral chordoma patients (3 males and 3 females) eligible for active scanning beam delivery CIRT at CNAO (prescribed dose 70.4 Gy in 16 fractions), were enrolled for spacer placement at IRCCS Policlinico san Matteo - Dept. of General Surgery. For each patient silicone spacer was shaped according to intraoperative findings from a 10x10 cm silicone sheet with a width of 1 mm (Distrex, Padua, Italy). Prior to the surgery and clinical use, a variety of measurements was performed to evaluate the physical stability of the spacer during and after irradiation, as well as its main properties when exposed to carbon ion beams. During CIRT, at the end and each 3 months afterwards, patients were followed up for acute and late CIRT toxicity with clinical visit and high field magnetic resonance (MRI).

Results: Three patients underwent laparotomy and 3-laparoscopic spacer placement. A representative CIRT plan recalculation performed on one of the enrolled patient CT performed before spacer insertion showed that during CIRT the presence of the spacer keeps the rectum tract far away from the irradiated area, thus the radiation field is unaffected by rectum filling or intestine movement. Patient imaging during follow up did not show any anatomical variations.

Conclusion: Silicone spacer placement is a valuable tool for safe dose escalation in sacral chordoma patients undergoing CIRT.

Purpose or Objective: To determine the efficacy and the morbidity of the post-operative concurrent chemoradiotherapy in patients with advanced localized soft tissue sarcomas (STS) of the limbs: results of a retrospective analysis.

Material and Methods: From 1991 to 2012, 68 patients with primary high grade STS of the limb were treated in our institution with an adjuvant concurrent chemoradiotherapy, following limb sparing surgery. The median age was 47.5 years (range, 19 to 74). The most common location was the thigh (56%). The resection was complete (R0) and marginal (R1) in 46 (68%), and 22 (33%), respectively. The median tumor size was 6 cm (range, 8 to 20 cm), deep in 83% of cases, and grade was 2 (FNCLCC) in 28 patients (42%) and 3 in 38 (58%), 2 missing. Adjuvant radiotherapy was delivered by brachytherapy (BRT) plus external radiotherapy (EBRT) in 26 patients (38%) and by EBRT alone in 42 (62%). The median dose of BRT and EBRT were respectively 20 Gyg (range 12 to 30 Gy) and 60 Gy (range, 45 to 70). The median time between surgery and EBRT was 48 days (range, 20 to 140). Concurrent chemotherapy (CT) was a combination of doxorubicin (60 mg/m2 total dose (TD) and ifosfamide (7.5 g/m2 TD), with a median number of 4 cycles (range, 1-4).

Results: With a median follow-up of 105 months (CI95% 89-125), the 5-year disease-free survival and overall survival rates were 67%(CI95% 53.9-77) and 81%(CI95 68-89); 25 relapses were observed (6 local, 18 distant, and 1 local and distant). A severe (grade 3-4) hematologic toxicity was observed in 32% of cases, mainly leucopenia; 13 patients (20%) experienced a dose reduction of CT. Severe non hematologic complications occurred in 15 patients (22%), mainly acute cutaneous toxicity (14 patients, 21%). Indeed, 50% of complications were grade 3-4 wound complications and acute dermatitis. Six patients (10%) experienced an EBRT interruption. Severe wound complications were very rare (2 cases), as they were not an indication for secondary operation for wound care. In univariate analysis, median EBRT dose was a prognostic factor for hematologic severe complications, the median dose being 64 Gy in patients with grade 3-4 toxicities vs 56 Gy in patients with grade 1-2 toxicities (p=0.01). Tumor location was a prognostic factor for grade 3-4 wound complications and acute dermatitis. Indeed, 50% of complications were grade 3-4 (5/10) when tumor was located in upper limb, vs 17% in inferior limb (10/58); (p=0.035). No correlation between age, sexe, tumor size, and toxicity was found.

Conclusion: Adjuvant concurrent chemoradiotherapy is efficient, feasible and well-tolerated in soft tissue sarcomas of the limbs.
after the end of the radiation treatment, which required the use of high dose-opioid and gabageric pain relievers, chronically. In fact, this was the main factor to consider in our study. Local control was analyzed too.

Results: Eight patients were treated with 3 Gy / fraction, four of them suffered neuropathic pain in radiation field that required chronic drug treatment. (RR 50%). None of the five patients treated with the 2 Gy per fraction technique had neuropathic pain in legs.

Conclusion: Our preliminary results indicate that the 2 Gy per fraction treatment avoids the onset of neuropathic pain after the radiation treatment. Although the patient recruitment was low, we can affirm that both radiation techniques were very useful in the classic KS local control. The 2 Gy per fraction treatment was not associated to neuropathic pain, compared with the hypofractioned radiation treatment.

EP-1410

BBRT in the treatment of metastases from soft tissue sarcoma (STS): Single-institution Experience

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Purpose or Objective: To evaluate the results of stereotactic ablative radiotherapy (SABR) in selected metastatic sarcomas patients

Material and Methods: Outcomes of 21 consecutive metastatic STS patients (32 consecutive lesions) receiving SABR between 2012 and 2015 at our center were retrospectively analyzed.

Results: Most patients (85%) had a performance status of 0-1 and the median age at treatment was 62.4 years. Metastases treated were localized in lung (37.5%), brain (37.5%), liver (9.5%), soft-tissue (12.5%) and pancreas (3%). The median size of the treated lesion was 2.1 cm. The median biologic equivalent dose delivered was 120 Gy (range, 52.7-213.8 Gy) delivered in a median number of 5 fractions (range, 1-13). The majority of patients received systemic agents prior SABR (16/21). With a median follow-up of 18 months, the 2 years local control rate was 86% (CI 95%: 51-100%; median: not reached), with four progressives lesions. Only one patient experienced a grade 3 toxicity consisting of an ear bleeding. Two years overall survival and progression free survival rates were respectively 72% (CI 95%: 47-96%) and 39% (CI 95%: 15-63%).

Conclusion: SABR in metastatic sarcoma seems to be an effective tool in local control that might be used as an alternative to local other treatments in highly selected patients.

Electronic Poster: Clinical track: Paediatric tumours

EP-1411

Evaluating the utility of 18F-DOPA-PET imaging for neurosurgical planning of pediatric gliomas

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Purpose or Objective: MRI characteristics and extent of disease in glioma is important for surgical planning. However, MRI may not adequately guide biopsy location in non-enhancing tumors. Furthermore, post-radiation changes are difficult to differentiate from progressive tumor. We previously demonstrated the PET tracer 3,4-dihydroxy-6-[18F]fluoro-l-phenylalanine(FDOPA) has a sensitivity for gliomas and may improve neurosurgical planning in adults. This study evaluates the utility of FDOPA-PET/CT imaging in biopsy and resection planning in pediatric patients.

Material and Methods: MR/CT and FDOPA-PET/CT images were obtained in 5 patients with primary or recurrent malignant gliomas. Regions of interest were defined based on areas of MRI contrast enhancement (CE) and FDOPA uptake to include both concordant (MRI-CE and high-FDOPA) and discordant (MRI-non-CE and high-FDOPA, MRI-CE and low FDOPA) regions. Ratios of maximum tumor SUV (SUVmax) normalized to mean SUV (SUVmean) of normal brain tissue (T/N) were determined using the SUVmax from each biopsy coordinate and the SUVmean from contralateral normal brain tissue.

Results: The FDOPA-PET images guided biopsy site selection in four patients. One patient with contrast enhancement in an eloquent location near a region of prior radiotherapy did not undergo biopsy after FDOPA-PET failed to show increased uptake. Average tumor SUVmax was 2.135 (range 2.92-1.27), and the T/N average T/N ratio was 1.6 (range 1.92-1.18). Biopsies within the region of highest uptake were performed in 3 patients and were consistent with Grade III or Grade IV, despite lack of contrast enhancement 1 patient. In one patient, SUVmax was in an eloquent region of thalamus and was deemed an unsafe location for biopsy. Biopsy from an adjacent region revealed infiltrating glioma, non-diagnostic for grade. Regions of increased FDOPA uptake extended beyond those identified with MRI in two patients.

Conclusion: FDOPA-PET imaging appears to have utility in guiding biopsy region selection and may assist with identifying regions of higher-grade disease in pediatric patients with astrocytomas.

EP-1412

Respiration-induced organ motion in children during image-guided radiation therapy

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Purpose or Objective: Respiration-induced organ motion is one of the main contributors to intrafractional motion, limiting the maximum achievable accuracy in radiation therapy (RT). Knowledge on respiration-induced organ motion in children during RT is extremely scarce and urgently needed for better definitions of abdominal and thoracic safety margins. It also allows to assess whether developments and introduction of child-friendly breathing exercises and/or coaching during the treatment course could have an added value to control and minimize respiration-induced organ motion. Therefore, the aim of this study is to investigate how respiration influences the diaphragmatic motion, as indicative of organ motion in the abdomen and thorax, during image guided RT (IGRT) in children and to find possible relationships with age and height. In addition, we investigated trends in the respiration-induced diaphragmatic motion during the treatment course.

Material and Methods: This retrospective study consisted of 15 patients with a mean age of 10.6 years (range 2.2-16.9 years) and a mean height of 140 cm (range 90-167 cm), treated at our institute between 2006 and 2015, for whom for setup correction routinely acquired valuable images of the thorax were available. This amounted to a total of 15 reference CT (refCT) scans and 86 Cone Beam CT (CBCT) scans. CBCTs were reconstructed for the inhale and exhale respiratory phases and registered to the refCT using Elekta XVI software. First, the vertebrae were aligned. Subsequently, the diaphragm was manually aligned in craniocaudal (CC) direction only. The result yields the mean peak-to-peak (PP) motion (i.e., magnitude could motion) of the diaphragm in the CC direction, derived from registration outcomes of the inhale and exhale CBCTs to the refCT.