after the end of the radiation treatment, which required the use of high dose-opioid and gabagärcic 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 other local 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 of motion) of the diaphragm in the CC direction, derived from registration outcomes of the inhale and exhale CBCTs to the refCT.
Possible time trends were investigated by analyzing the derived PP motion from daily CBCTs as a function of treatment day. The reproducibility of the PP motion was measured as the standard deviation (SD) over the mean PP motion per patient. We used a linear regression model to analyse the relationship between these outcomes and age and height.

**Results:** Over all patients, PP motion was on average 8.6 mm (range 4-15 mm) and varied largely within and between patients. Time trends differed between patients. PP motion correlated with age and height ($p<0.05$). PP motion increased by 0.42 mm for every yearly increase in patients’ age and for every 1 cm increase in height the PP motion increased 0.07 mm (Figure 1). The SD ranged from 1.7 to 3.7 mm and correlated with age and height ($p<0.05$) (Figure 1).

**Conclusion:** Respiratory-induced diaphragmatic motion in children during IGRT is correlated with age and height; however, irregular breathing patterns were found. PP motion was variable throughout the treatment. Therefore, introducing child-friendly breathing exercises and/or coaching techniques may be beneficial to minimize PP motion and to enhance its reproducibility.

**EP-1413**

**Second neoplasms in survivors of childhood acute lymphoblastic leukemia treated with radiotherapy**

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**Purpose or Objective:** Second malignant neoplasms (SMNs) are a concern in survivors of childhood cancer. Chemotherapy forms the mainstay of treatment for acute lymphoblastic leukaemia (ALL), but radiotherapy has a role in certain situations. As both chemotherapy and radiotherapy can be carcinogenic, patients treated with both modalities may be at a higher risk of SMNs. This study aims to investigate the incidence of SMNs in patients treated with both chemotherapy and radiotherapy at KK Women’s and Children’s Hospital, Singapore.

**Material and Methods:** We performed a retrospective review of ALL patients treated in the largest maternal and children’s hospital in Singapore. Children aged 16 years and below diagnosed with ALL from 1993 to 2014 were identified in the Childhood Cancer Registry. Manual and electronic medical records were reviewed for information on demographics, management and SMNs.

**Results:** A total of 64 patients treated with both chemotherapy and radiotherapy were identified. Seventeen (26.6%) were female and 47 (73.4%) were male. The median follow-up was 9.2 years (range, 1.1-22.0 years). The median age at diagnosis was 5.3 years (range, 0.3-14.6 years). The median age at which radiotherapy was given was 6.6 years (range, 2.9-15.4 years).

SMNs were noted in 3 of 64 (4.7%) patients. Two of 3 patients had a SMN within the radiation field (both cranial). The histological diagnoses were basal cell carcinoma and cerebral PNET. The remaining patient had an ovarian immature teratoma outside the radiation field. The median latency period was 9.4 years (range, 8.3-13.3 years) from date of diagnosis to development of SMN. The estimated 10-year cumulative incidence was 4.3%, 95% CI [0.01, 0.13] using a competing risks analysis.

Radiotherapy data was available in 63 patients. Fifty-one of 63 (81.1%) received cranial irradiation, of which 3 (5.9%) also received spinal irradiation. Total body irradiation was performed in 20 of 63 (31.7%), and testicular irradiation in 17 of 63 (27.0%) patients. The orbit was targeted in 3 of 63 (4.8%) patients.

**Conclusion:** Long term survivors of ALL treated with both chemotherapy and radiotherapy may have a significant risk of second malignant neoplasms, which may occur years after the initial diagnosis.

**EP-1414**

**Using a DVH registry standardizes IMRT-CSI planning and reduces V20 in non-target tissues**

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**Purpose or Objective:** An intensity-modulated radiation therapy technique for craniospinal irradiation (IMRT-CSI) delivered on the Tomotherapy unit has been used at our centre since 2008. Defining and prioritizing dose constraints to target and organs at risk (OARs) are time-consuming. To facilitate and standardize the planning process, we developed a volume histogram (DVH) registry and tested its usefulness with two cohorts of patients treated to different doses of CSI.

**Material and Methods:** The registry consists of a back-end MySQL database and front-end webpages that are served via a web-server internal to the clinic. Approved plans are added to the DVH registry via a filter that standardizes the names of its fields. The registry a very useful tool for the treating team. We compared the findings with an earlier cohort of patients that planned before we started using the registry. We evaluated two cohorts of IMRT-CSI patients: (1) CSI dose 36 Gy in 20 fractions and (2) CSI dose 23.4 Gy in 13 fractions and compared the findings with an earlier cohort of patients that were planned before we started using the registry.

**Results:** Eighteen patients, age 3 to 17 years, were included in the registry. Eleven were treated to a dose of 36 Gy in 20 fractions and seven to a dose of 23.4 Gy in 13 fractions. Most (56%) had medulloblastoma. Significantly smaller variations were achieved for OARs for patients treated at 36 Gy using the DVH registry compared with patients in the earlier cohort, making the registry a very useful tool for the treating team. V20 were lower for all OARs except the trachea.

**Conclusion:** The results confirm that the DVH registry standardizes the planning process of IMRT-CSI patients. We will use constraints obtained from the 7 patients treated at 23.4 Gy to start planning new cases and evaluate the benefit of our DVH registry for this regimen.