12 months) and all three cases survived without relapse. In second cancer cases, all three cases were treated with 40.05 Gy per 15 fractions of radiation therapy (2 cases were treated with photon and one case with proton). However, all cases relapsed and two cases died of disease. CONCLUSION: Twelve Gy in 8 fractions cranio-spinal irradiation followed by 28.8 Gy (RBE) in 16 fractions of proton beam therapy is thought to be useful for the relapsed case. Re-irradiation for second cancer was disappointing and further study is warranted.

RONC-05. PRESERVING VISION IN OPTIC PATHWAY GLIOMA AMONG PATIENTS WITHOUT NEUROFIBROMATOSIS TYPE 1

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PURPOSE: Sporadic optic pathway/hypothalamic gliomas (OP/HGs) represent a unique entity within pediatric low-grade glioma. Despite favorable survival, the location makes treatment difficult and local progression debilitating. We conducted longitudinal assessment of visual acuity (VA) among patients treated in the modern era with chemotherapy (CT) or early radiotherapy (RT). METHODS: Clinical characteristics were abstracted for patients treated over a 15-year period (2000–2015) at a single institution. Comprehensive ophthalmologic data taken at three to six-month intervals was examined with age-appropriate VA metrics converted to LogMAR scale. Kaplan-Meir "blindness-free survival" (BFS) curves were calculated as time to bilateral functional blindness (i.e. LogMAR ≥ 0.8 in both eyes), stratified by treatment and compared using log-rank test. RESULTS: Thirty-six patients with median follow-up of 7.6 years (range: 2–17) were identified. Median age at diagnosis was 2.5 years (IQR: <1–5). Early RT was administered as initial therapy (n=6) or first-line salvage (n=5) in a total of eleven patients (31%) at a mean age of 12 years (range: 6–17). Twenty-five patients (69%) were maintained primarily on CT with a mean age at initiation of 2.4 years (range <1–8). Of these, five patients received RT after ≥2 systemic therapy regimens. In terms of visual preservation, five/eight-year BFS rates were 84%/59% and 100%/100%, for CT and early RT, respectively (p=0.046). CONCLUSIONS: In a contemporary cohort, early RT, defined as initial or 1st line salvage therapy for OP/HGs manifested in superior VA. Children undergoing CT are at highest risk of functional blindness following five years of treatment.

RONC-06. VOLUMETRIC-MODULATED ARC WHOLE-BRAIN RADIOTHERAPY FOR THE PREVENTION OF PERMANENT ALOPECIA IN PEDIATRIC PATIENTS

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Permanent alopecia is a grave late complication of multi-drug chemotherapy (CTx) plus cranial irradiation, reducing both patient self-esteem and quality of life in pediatric patients. We started to use craniospinal irradiation (CSI) using the volumetric-modulated arc whole-brain radiotherapy (VMAT-WBRT) in order to prevent permanent alopecia. We treated 5 pediatric patients with CSI using VMAT-WBRT, and report the initial clinical outcome. Five consecutive patients (4–11 years old) who received CSI using VMAT-WBRT from June 2015 to November 2018 were included into this study. One patient with embryonic carcinoma received radiotherapy (RT) with concurrent CTx; four patients with medulloblastoma (two patients with standard risk, and two patients with high risk) received RT followed by CTx. The prescribed doses of CSI were 23.4–35.2 Gy in 13–22 fractions, respectively. Optimization for VMAT-WBRT was performed to reduce doses to the hair follicles with keeping the dose coverage to the planning target volume. Although all patients experienced temporary alopecia, their hair fully recovered over the whole scalp within 8 months after finishing RT. One patient had disease progression after 6 months after completing CTx; this patient who was diagnosed as Group 3 subtype had diffuse meningeal dissemination confirmed with contrast enhanced spinal MRI before RT. The other four patients had no evidence of recurrence. Although CSI with VMAT-WBRT might be one of considerable options, more cases are needed to verify the efficacy to prevent permanent alopecia for pediatric patients who receive multi-drug CTx and cranial irradiation.

RONC-08. SURVIVAL IMPACT OF POSTOPERATIVE RADIOTHERAPY TIMING IN PEDIATRIC AND YOUNG ADULT EPENDYMOMA

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INTRODUCTION: Postoperative radiotherapy is commonly given for WHO Grade 2–3 intracranial ependymoma. Clinicians generally aim to begin radiotherapy ≤5 weeks following surgery, but the optimal timing remains uncertain. METHODS: The National Cancer Database was queried for patients (age ≤39 years) with localized WHO Grade 2–3 intracranial ependymoma treated with surgery and postoperative radiotherapy. Multivariable logistic regression was used to identify factors associated with delayed postoperative radiotherapy, defined as starting >8 weeks after surgery. Overall survival (OS) curves were plotted based on radiotherapy timing (≤5 weeks, 5–8 weeks, and >8 weeks after surgery) and compared by log-rank test. Multivariate analysis (MVA) was used to identify factors associated with OS. RESULTS: In the final analytic set of 1,043 patients, age ≥21 years (OR 2.07, 95% CI 1.56–2.74) and WHO Grade 2 tumors (OR 1.41, 95% CI 1.08–1.85) were significantly associated with delayed time to adjuvant radiotherapy. No difference in 3-year OS was observed in patients who initiated radiotherapy ≤5 weeks, 5–8 weeks, and >8 weeks after surgery (89.8% vs. 89.1% vs. 88.4%; p= 0.796). On MVA, anaplastic histology (HR 2.414, 95% CI 1.784–3.268, p<0.001) and subtotal resection (HR 2.398, 95% CI 1.519–3.788, p<0.001) were significantly associated with reduced OS. Timing of radiotherapy, total radiotherapy dose, age, insurance status, and other factors were not significant. CONCLUSION: Delayed postoperative radiotherapy was not associated with inferior survival in patients with intracranial ependymoma, suggesting delayed radiotherapy initiation may be considered in patients requiring longer postoperative recovery or referral to an appropriate radiotherapy center.

RONC-09. PSEUDOPROGRESSION AFTER PROTON THERAPY OF PEDIATRIC SPINAL PILOCYTIC ASTROCYTOMA AND MYXOPAPILLARY EPENDYMOMA

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BACKGROUND: Pseudoprogression after proton therapy of CNS tumors is a challenging clinical situation. The rate of pseudoprogression after proton therapy of pediatric spinal tumors is unknown. METHODS: Records of pediatric patients with spinal pilocytic astrocytoma (sPA; n = 9) or myxopapillary ependymoma (MPE; n = 6) with gross disease treated with proton therapy with at least 6 months of follow up from completion of proton therapy were retrospectively reviewed for demographics, treatment characteristics, and occurrence of pseudoprogression. Pseudoprogression was defined as a post-radiation increase in tumor size with subsequent decrease in size without additional tumor-directed therapy. RESULTS: The median age at radiation for sPA patients was 10.1y (range, 7.0 – 16.2y) and 12.7y (range, 7.9 – 14.4y) for MPE patients. The median prescribed dose was 45 GyRBE (range, 39.6 – 50.4 GyRBE) for sPA patients and 50.4 GyRBE (range, 45 – 54 GyRBE) for MPE patients. One sPA patient received concurrent vincristine. Median follow up after proton therapy was 44 months (range, 9 – 99 months). Six of nine sPA patients (67%) had pseudoprogression occurring at a median of 81 days (range, 34 – 136 days) after proton therapy; no MPE patients developed pseudoprogression (0%; p < 0.03). Two sPA patients with pseudoprogression were symptomatic and improved with medical therapy. CONCLUSION: Preliminary analysis suggests that pseudoprogression occurs frequently within 6 months after proton therapy for sPA and infrequently after proton therapy for MPE.

RONC-12. TREATMENT AGE AND NEUROCOGNITIVE OUTCOMES FOLLOWING PROTON BEAM RADIOTHERAPY FOR PEDIATRIC LOW GRADE GLIOMA

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INTRODUCTION: Younger age at radiotherapy increases cognitive risk for patients with pediatric low grade glioma (LGG). We examined the impact of age at treatment on cognitive trajectories in LGG patients treated with proton radiotherapy (PRT) compared to patients treated without radiotherapy (surgery only; SO). METHODS: We examined cognitive

scores of 48 LGG patients on a prospective, longitudinal study. General linear mixed models evaluated change in cognitive scores over time. RESULTS: The sample included 16 patients treated with PRT and 32 with SO (median follow-up=3.1 years, range 0.9–6.1). Median age of PRT patients was 8.2 years at diagnosis (range 1.0–14.4) and 9.4 years at PRT (range 4.2–16.7). 13 PRT patients also received surgery: 53.8% biopsy, 30.8% subtotal resection, 15.4% gross total resection. Tumor sites included: 31.2% hypothalamic/suprasellar, 25.0% optic pathway, 18.8% temporal, 25.0% other. Median age of SO patients was 8.2 years at diagnosis (range 2.9–18.6). Surgical outcomes were: 75.0% gross total resection, 21.9% biopsy/other. There were no group differences in diagnosis age, tumor volume, or shunt history (all $p>0.05$). Both PRT and SO groups displayed stable cognitive functioning over time (all $p>0.1$). Slopes (i.e., change in scores over time) did not differ between groups (all $p>0.1$). Age at treatment was not associated with slope or performance at last follow-up in either group (all $p>0.05$). CONCLUSIONS: We observed stable cognitive functioning, independent of age at treatment, following PRT for LGG. Outcomes were similar to patients receiving surgery only. Further examination in a larger sample is warranted.

RONC-13. RADIATION INDUCED BRAIN STEM GLIOMA AFTER RADIATION THERAPY FOR MIXED GERM CELL TUMOR

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We report a case of radiation-induced glioma in the pons after radiation therapy for germ cell tumor. A 17-year-old man was diagnosed as HCG and AFP secreting germ cell tumor at the age of 9. The tumor was located in the suprasellar region, which filled up most part of the third ventricle. Five courses of chemotherapy with cisplatin, etoposide, and cyclophosphamide, and whole ventricle plus local radiation therapy (total 51.2 Gy / 32Fr) were performed. After the treatment, most part of the tumor was regressed, and only small enhanced lesion remained. Six years after the treatment, he started to be ataxic, and worsened. An MRI revealed an enhanced lesion in the pons. Lesion biopsy was performed via the right cerebellar peduncle. Histopathological diagnosis confirmed the lesion was high grade glioma. He underwent extended local radiation therapy (50.4 Gy / 28 Fr) and administered temozolomide. Later, bevacizumab was added, and 3 months after treatment started, the size of the tumor was reduced and his symptoms were improving. There is no established treatment for radiation induced glioma. However, additional radiation therapy, temozolomide and bevacizumab appears to be useful to reduce tumor size and resolve the symptoms, even if it is transient.

RONC-15. OUTCOMES OF BRAIN AND SKULL-BASE TUMOURS IN ADOLESCENTS AND YOUNG ADULTS TREATED WITH PENCIL BEAM SCANNING PROTON THERAPY

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BACKGROUND: The use of highly conformal proton therapy in adolescents and young adults (AYAs) for management of brain/skull-base tumours is becoming increasingly common. This study aims to assess the long-term clinical outcomes, prognostic factors and employment status of AYAs (15–39 years) treated with pencil-beam-scanning proton-therapy (PT). METHODS: Between 1997–2018, 176 AYAs were treated with PT at the Paul Scherrer Institute. Median age was 30 years (range, 15–39) and the male/female ratio was 0.8. RESULTS: After a median follow-up of 66 months (range, 12–236), 24 (13.6%) local failures and 1 (0.6%) distant failure were observed between 6 and 152 months after PT. The most common histologies treated were chordomas/chondrosarcomas (61.4%), followed by meningiomas (14.2%) and gliomas (15.3%). The 6-year local-control (LC), distant-progression-free survival and overall-survival (OS) rate was 83.2%, 97.4% and 90.2% respectively. On univariate analysis, age ≥24 years was a negative prognostic factor for LC. Recurrent disease, infratentorial tumours and low-grade-glioma histology were poor prognostic factors for both LC and OS. The 6-year ≥G3 PT-related late toxicity-free survival was 88.5%. The moderate-high grade late toxicity crude rates were 37.8% G2, 12.2% G3, 0.6% G4 and 0.6% G5. No secondary malignancies were observed. The unemployment rate was 7.3% at PT, rising to 25.3% at survivorship. High-grade(≥G3) toxicity rate in the unemployed vs employed group was 21% vs 8.5%. CONCLUSION: PT is an effective treatment for AYAs with brain/skull-base tumours with good tumour control and acceptable long-term toxicity. Despite having satisfactory clinical outcomes, around 1 in 4 AYAs surviving brain/skull base tumours are unemployed.

RONC-16. PROTON BEAM THERAPY FOR PATIENTS WITH INTRACRANIAL EPENDYMOMA UNDER 3 YEARS OLD: INITIAL CLINICAL OUTCOMES

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BACKGROUND: Proton beam therapy (PBT) provides dosimetric benefits in sparing normal tissue when treating pediatric patients with brain tumors. We report the preliminary clinical outcomes of surgery and adjuvant PBT for patients under 3 years old diagnosed as intracranial ependymoma at our institute. METHODS: This is a retrospective review of the medical records for 3 children with ependymoma in the fourth ventricle, diagnosed between March 2013 and September 2019. PBT was performed after tumor resection in all the patients. RESULTS: Gross total resection was achieved in 2 males and 1 female patients with fourth ventricle WHO grade II to III ependymoma at 15, 18, and 37 months old. All the patients received adjuvant PBT (54.0 GyE/30 fractions) to the postoperative tumor bed under general anesthesia or sedation. PBT was acutely well tolerated, with mostly mild alopecia and skin reactions at the irradiated sites. At a median follow-up of 54 months (4–59 months) after irradiation, all the patients are alive without recurrence. No serious late adverse events were observed in any of the patients. CONCLUSION: The number of patients in this study remains small for drawing any definite conclusion, however our preliminary results are still encouraging. Further studies of a large number of pediatric patients with long term follow-up are needed to more fully assess tumor control and late adverse events.

RONC-17. STEREOTACTIC RADIOSURGERY FOR SPINE METASTASES IN PEDIATRIC MALIGNANCIES

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BACKGROUND: Spine stereotactic radiosurgery (SSRS) is a non-invasive technique that delivers ablative radiotherapy for optimal control of bony disease. While SSRS is known to provide excellent local control (LC) and minimal toxicity in adults, the role of SSRS in pediatrics is less clear. PURPOSE: To evaluate SSRS in pediatric patients with spinal metastases. METHODS: A retrospective review of patients (<18 yrs) treated with SSRS at MDACC was performed after IRB approval. Descriptive statistics were utilized for analysis. RESULTS: From 2011–2019, 12 metastatic osseous sites (3 cervical, 4 thoracic, 5 lumbar-sacral) in 9 patients were treated. Median follow-up was 9 months (range 2–41). Six males (67%) and 3 females (33%) all KPS ≥70, received radiation to ≤3 contiguous vertebral bodies. Median age was 16 yrs (range 8–18). No patients required sedation. Histologies included 7 osteosarcomas, one rhabdomyosarcoma and one Ewing's sarcoma. Metastatic epidural spinal cord compression scores ranged from 0 (6), 1b (3) and 3 (3). No sites had surgery prior to SSRS and one site received prior conventional radiation. SSRS doses included 24 Gy in 1 fraction (7), 24–27 Gy in 3 fractions (4) and 50 Gy in 5 fractions (1). Six-month LC was 83% with one local failure following 27 Gy. OS at 6 and 12 mo were 55% and 23%. There was no grade ≥3 acute toxicity, no radiation myelopathy or vertebral compression fractures. CONCLUSION: In this initial report, SSRS represents a promising modality that is well tolerated and provides excellent LC. However, further follow-up is warranted in the pediatric setting.

RONC-18. ANALYSIS OF BRAIN TUMOR INDUCED BY IRRADIATION IN CHILDHOOD - A SINGLE INSTITUTIONAL ANALYSIS

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BACKGROUND: Radiation-induced brain tumors are rare tumors that appear during long-term follow-up after radiation therapy. Children are at greater risk for radiation -induced brain tumors than adults. The clinical characteristics of radiation-induced brain tumor treated at our hospital