RARE-58. CONGENITAL METASTATIC CHORDOMA OF THE CLIVUS
Wiesława Grajewska, Maria Stepienik, Joanna Trubicka, Katarzyna Wójcik, Monika Kowalczyk, Piotr Kuch, Bozena Dembowska-Baginska, and Marta Perek-Polnik; Children’s Memorial Health Institute, Warsaw, Poland

Chordomas are rare midline axial skeletal neoplasms that typically present in adults. They are infrequent in childhood with typical localization in the sphen-occipital skull base. They are derived from remnants of the embryonic notochord. We present the case of 4 months old girl, who was born with “blueberry muffin” syndrome and was first negatively diagnosed for neuroblastoma and leukemia (two negative skin biopsies were performed) was admitted with axial laxity. In imaging tests there was a tumor of the skull base, metastases in the lungs and kidneys (that were not seen at previous assessments) and a small lesion in the heart. The third biopsy of skin lesion was performed and pathological examination revealed a neoplasm composed of cords, clusters, and chains of multivacuolated cells embedded within a myxoid matrix and separated by fibrous septa. No atypical and dedifferentiated features were present. Mitotic activity was not observed. Neoplastic cells showed the typical cytoplasmic immunostaining for EMA, S100 and cytokeratin AE1/AE3, strong nuclear brachyury expression, and retention of nuclear INI-1 expression. The diagnosis of chordoma was established. Neoplastic tissue and blood samples were obtained for molecular analysis using next generation sequencing, including germline mutations assessment (are ongoing). Chemotherapy as soft tissue sarcomas was undertaken. Currently a patient is on treatment with improvement of neurological status.

RARE-59. CARDIAC REMODELING IN PATIENTS WITH CHILDHOOD-ONSET CRANIOPHARYNGIOMA – RESULTS OF HITTEN AND KRANIOPHARYNGEOM 2000/2007
Panjarat Sowithayasakul1,2, Lena Katharina Benschmann, Svenja Boekhoff2, and Hermann L. Müller1; 1Department of Pediatrics, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand, 2Department of Pediatrics and Pediatric Hematology/Oncology, University Children’s Hospital, Department of Pediatrics and Pediatric Hematology/Oncology, Klinikum Oldenburg AöR, Oldenburg, Lower Saxony, Germany,

BACKGROUND: Hypothyroid obesity caused by childhood-onset craniopharyngioma (CP) results in long-term cardiovascular morbidity. Knowledge about clinical markers and risk factors is rare. PATIENTS AND METHODS: A cross-sectional study on thoracic echocardiographic parameters was performed to determine the associations with clinical and anthropometric parameters in 36 patients with childhood-onset adamantinomatous craniopharyngioma. RESULTS: Body mass index (BMI) correlated with the thickness of interventricular septum in diastole (IVSd) (r=0.604, p<0.001) and left ventricular diastolic posterior wall in diastole (LVPWd) (r=0.460, p=0.011). Due to wide range of disease duration (1–18 years) and prevalent obesity (BMI ≥ 25 in 75% of patients), we performed a linear regression analysis on BMI, rate of weight gain, systolic blood pressure, and disease duration. Analysis revealed a significant correlation between BMI and disease duration (r=0.645, p<0.001). All cardiac functions were within the normal range, indicating no association of severe functional impairments. CONCLUSIONS: Cardiac remodeling in patients with childhood-onset craniopharyngioma correlates with the degree of hypothyroid obesity and disease duration. However, echocardiography has limited sensitivity in craniopharyngioma patients with obesity, so cardiac magnetic resonance imaging (MRI) should be considered as an alternative diagnostic approach for patients with craniopharyngioma and hypothyroid obesity.

RARE-60. PREGNANCIES AFTER CHILDHOOD CRANIOPHARYNGIOMA – RESULTS OF KRANIOPHARYNGEOM 2000/2007
Panjarat Sowithayasakul1,2, Svenja Boekhoff2, Brigitte Bison4, and Hermann L. Müller1; 1Department of Pediatrics, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand, 2Department of Pediatrics, Faculty of Medicine, Srinakharinwirot University, Klinikum Oldenburg AöR, Oldenburg, Lower Saxony, Germany,

BACKGROUND: Data on female fertility, pregnancy, and outcome of offspring after childhood-onset craniopharyngioma (CP) are scarce. STUDY DESIGN: Observational study on pregnancy rate and offspring outcome in female CP patients recruited in KRANIOPHARYNGEOM 2000/2007. RESULTS: A total of 431 CP patients (223 female) have been recruited, and 269 (133 female) were postpubertal at study. Six of 133 female CP patients (4.5%) with median age of 14.9 years at CP diagnosis had 9 pregnancies, giving birth to 10 newborns. Three patients achieved complete surgical resections. No patient underwent postoperative irradiation. Five natural pregnancies occurred in 3 CP patients without pituitary deficiencies. Four pregnancies in 4 CP patients with hypopituitarism were achieved under assisted reproductive techniques (ART) (median 4.5 cycles, range: 3–6 cycles). Median maternal age at pregnancy was 35 years (range: 22–41 years). Six babies (60%) were delivered by caesarean section. Median gestational age at delivery was 38 weeks (range: 32–40 weeks). Median birth weight was 2.920 g (range: 2.270–3.520 g), the rate of preterm delivery was 33%. Enlargements of CP cysts occurred in 2 women during pregnancy. Other complications during pregnancy, delivery, and postnatal period were not observed. CONCLUSIONS: Pregnanecies after CP are rare and were only achieved after ART in patients with hypopituitarism. Close monitoring by an experienced reproductive physician is necessary. Due to a potentially increased risk for cystic enlargement, clinical, ophthalmological, and MRI monitoring are recommended in patients at risk. Perinatal complications, birth defects, and morbidity of mothers and offspring were not observed.

RARE-61. BODY COMPOSITION AND NUCHAL SKINFOLD THICKNESS IN PEDIATRIC BRAIN TUMOR PATIENTS
Juxiang Peng1,2, Svenja Boekhoff2, Maria Eveslage1, Brigitte Bison4, Panjarat Sowithayasakul2,5, and Hermann L. Müller1; 1University Children’s Hospital, Department of Pediatrics and Pediatric Hematology/Oncology, University Children’s Hospital, Carl von Ossietzky University, Klinikum Oldenburg AöR, Oldenburg, Lower Saxony, Germany, 2Department of Neurosurgery, Nanfang Hospital, Southern Medical University, Guangzhou, China, 3Institute of Biostatistics and Clinical Research, University of Münster, Germany, 4Department of Neuroradiology, University Hospital, Würzburg, Bavaria, Germany, 5Department of Pediatrics, Faculty of Medicine, Srinakharinwirot University, Bangkok, Thailand

BACKGROUND: Obesity, cardiovascular disease (CVD), and relapse/progression have major impact on prognosis in pediatric brain tumor (BT) patients. Cranial MRI is part of routine follow-up. METHODS: In a cross-sectional study, we analyzed nuchal skinfold thickness (NST), body mass index (BMI), waist-to-height ratio (WHtR), and body composition (BC) in 177 BT patients (40 WHO grade 1–2 BT; 31 grade 3–4 BT; 106 craniopharyngioma (CP);), and 33 healthy controls (HC). Association of NST and CVD risk factors (BMI, WHtR, waist-to-height ratio (WHtR), and blood pressure (BP)) were analysed in BT and HC. RESULTS: CP patients showed higher BMI, WHtR, NST and cSFT when compared with BT and HC, whereas these differences were not detectable between BT and HC. However, WHO grade 1–2 BT patients were observed with higher BMI, waist circumference and triceps cSFT when compared to WHO grade 3–4 BT patients. NST showed high correlations with BMI, WHtR, and cSFT. NST, BMI and WHtR had predictive value for CVD in terms of increased BP, and in multivariate analysis the final model risk ratio of 1.25 (1.14–1.37). In CP patients with hypothalamic involvement/lesion or gross-total resection, rate and degree of obesity were increased. CONCLUSIONS: As monitoring of MRI and BC play an important role in follow-up after BT, NST could serve as a novel useful parameter for assessment of BC and CVD risk in BT patients.

RARE-62. VISUAL FUNCTION IN CHILDREN WITH CRANIOPHARYNGIOMA AT DIAGNOSIS: A SYSTEMATIC REVIEW
Myrthe Nuijts1, Nienke Veldhuis2, Inge Stegeman1, Hanneke van Santen1, Giorgio Porro3, Saskia Imhol4, and Annouette Schouten-van Meerten5; 1University Medical Center Utrecht, Utrecht, Netherlands, 2Utrecht University, Utrecht, Netherlands, 3Princess Máxima Center for Pediatric Oncology, Utrecht, Netherlands

Childrenhood craniopharyngioma is a rare and slow growing brain tumour, often located in the sellar and suprasellar region. It commonly manifests with visual impairment, increased intracranial pressure and hypothalamic and/or pituitary deficiencies. Visual impairment in childhood adversely affects children’s daily functioning and quality of life. We systematically reviewed the literature to provide an extensive overview of the visual function in children with craniopharyngioma at diagnosis in order to estimate the diversity, magnitude and relevance of the problem of visual impairment. Of the 543 potentially relevant articles, 84 studies met our inclusion criteria. Visual impairment at diagnosis was reported in 1041 of 2071 children (50.3%), decreased visual acuity was reported in 546 of 1321 children (41.3%) and visual field defects were reported in 426 of 1111 children (38.3%). Variations in ophthalmological testing methods and ophthalmological definitions precluded a meta-analysis. The results of this review confirm the importance of ophthalmological examination in children with craniopharyngioma at diagnosis in order to detect visual impairment and provide adequate support. Future studies should
RADIATION ONCOLOGY

RCON-01. PROTON BEAM THERAPY IN THE MULTIDISCIPLINARY THERAPY FOR PEDIATRIC BRAIN AND SPINAL TUMOR AT KOBE CHILDREN’S HOSPITAL WITH KOBE PROTON CENTER
Atsufumi Kawamura1, Junji Koyama1, Nobuyuki Akutsu1, Yuske Demizu1, Toshinori Sogejima1, Yoshikazu Kosaka1, Mohammad Khodawal1, Zhuhiu Amy Liu1, Normand Lapierre1, Lauran Janzen1, Hitesh Dam1, Vijay Ramaswamy2, Dana Keilty1, Eric Bouffet2, and David C. Hodgson1
1Department of Neurosurgery Hyogo Prefectural Kobe Children’s Hospital, Kobe, Hyogo, Japan; 2Department of Radiation Oncology Hyogo Prefectural Ion Beam Medical Center Kobe Proton, Kobe, Hyogo, Japan; 3Department of Neurology Hyogo Prefectural Kobe Children’s Hospital, Kobe, Hyogo, Japan

It could be implied that Radiotherapy (RT) has the important role for the multidisciplinary therapy to Malignant Pediatric Central Nervous System tumor. And recently among RT, Proton Beam Therapy (PBT) is expected to be effective and decrease serious late effects after RT in malignant pediatric tumor. PBT could be controlled precisely the dose and depth and sparing the normal structures outside the target. Thus, PBT becomes applicable for pediatric solid tumor to insurance in April, 2016 in Japan. We have worked in closer cooperation with Hyogo Prefectural Ion Beam Medical Center and started PBT from April 2015. And from December 2017, our PBT has transferred to adjacent new medical center (Kobe Proton Center) which has the only institute that equipped the exclusive gantry for children in our country. The treated cases are 28 boys and 35 girls (age average 8.2 years old). They are 15 Germ cell tumor, 14 Ependymoma, 13 Medulloblastoma, 4 Chordoma, 4 Argyalpic teratoid/rhabdoid tumor, 3 Craniopharyngioma and others. We have simulated the applications of not only broad beam but also scanned beam to limit the dose distribution and prepare for the cranio-spinal irradiation. All cases underwent magnetic resonance imaging to evaluate the residual tumor and the complications. The effect of PBT in this series is similar to our experience of traditional RT. The follow-up is necessary to evaluate the advantage of PBT which could reduce delayed complications of RT.

RCON-02. MEASURING THE EFFECT OF CLINICALLY-RELEVANT RADIOThERAPY PROTOCOLS ON THE JUVENILE MOUSE BRAIN
Jessica Buck1,2, Kale Somers1, Jacqueline Whitehouse1,2, Meegan Howlett1,2, Hilary Hui1, Brooke Strowger1, Martin Ebert1,2, Andrew Mehnert1, Nick Gottardo1,2, and Raeline Endersby1,2; 1Telethon Kids Institute, Perth, Australia, 2University of Western Australia, Perth, Australia

Treatment for medulloblastoma involves craniospinal irradiation which is associated with devastating late effects. Clinical trials that simply reduce radiotherapy dosage have resulted in inferior survival rates, whereas new chemoradiotherapy combinations that improve survival have been identified using preclinical models. However, the potential late effects of novel treatment are currently understudied and the assessment of radiation-induced late effects in mice remains challenging. Here, we aimed to measure the effect of multifractionated radiotherapy on the juvenile mouse brain as a time measure for future studies. NOD/Rag1-/- mice were irradiated with 8 Gy whole-brain radiotherapy (WBRT) using an X-RAD Smart preclinical platform, 18 Gy fractionated WBRT (9x2Gy doses), single, or multiple sham treatments beginning at postnatal day (P)16. Mice were aged to adulthood (≥6m), then high resolution anatomical brain scans were obtained on a Bruker 9.4T MRI to measure the effects of WBRT on whole brain and specific regional area volumes. A single 8Gy dose (n=10) markedly reduced brain volume by 8.5% compared to single-sham controls (n=11, p<0.0001), whereas fractionated 18Gy treatment (n=7) did not cause significant differences in brain volume compared to multi-sham controls (n=4, p>0.59). Current analyses are focused on measuring treatment effects on specific areas of the brain, as well as other anatomical differences using a range of MRI techniques. These results will serve as a valuable tool to measure potential treatment-associated effects caused by novel chemoradiotherapy combinations on the developing brain. This will enable future studies to assess the potential safety of novel treatment to inform clinical decision making.

RCON-03. NEOCOGNITIVE CHANGES AFTER RADIATION FOR PEDIATRIC BRAIN TUMOURS: WHICH BRAIN SUBSTRUCTURES ARE MOST IMPORTANT?
Derek S. Tsang1, Laurence Kim1, Donald Mabbott2, Mohammad Khodawal1, Zhuhiu Amy Liu1, Normand Lapierre1, Lauran Janzen1, Hitesh Dam1, Vijay Ramaswamy2, Dana Keilty1, Eric Bouffet2, and David C. Hodgson1
1Princess Margaret Cancer Centre, Toronto, ON, Canada; 2Hospital for Sick Children, Toronto, ON, Canada

INTRODUCTION: The contribution of different intracranial structures on neurocognitive decline after radiotherapy (RT) in children is unclear. METHODS: This was a retrospective study of children with brain tumours treated from 2005 to 2017. Patients with longitudinal neurocognitive assessments and photon dosimetric data (if RT given) were included. Full scale intelligence quotient (FSIQ) was the primary endpoint; sub-indices of neurocognition were modelled separately (perceptual reasoning [PRI], processing speed [PSI], verbal comprehension [VCI] and working memory [WMI]). Multivariable linear mixed effects models were used to model endpoints, with age at diagnosis & dose to different brain regions as fixed effects and patient-specific random intercepts. RESULTS: Sixty-nine patients were included; ten patients did not receive any RT (n = 60). Median neurocognitive follow-up was 3.2 years. Right hippocampus mean dose was a strong predictor of declines in FSIQ (p < .001), VCI (p = 0.002) and PRI (p = 0.049). Dose to 50% of the supratentorial brain (D50) was the strongest predictor for WMI and PSI. Efforts should be made to reduce unnecessary dose to these brain structures.

RCON-04. RE-IRRADIATION AFTER TREATMENT OF MEDULLOBLASTOMA: RELAPSED CASES AND SECOND CANCER CASES
Toshinori Sogejima1, Nobutoshi Fukumitsu1, Yusuke Demizu1, Masayuki Mima1, Takeshi Suzuki1, Atsufumi Kawamura1,2, and Yoshikazu Kosaka1
1Kobe Proton Center, Kobe, Japan; 2Kobe Children’s Hospital, Kobe, Japan

PURPOSE: Late complications such as brainstem necrosis are considerable concern of re-irradiation for brain tumor. Proton beam therapy can reduce radiation dose of organs at risk such as brainstem, so is expected to reduce late complications. PATIENTS AND METHODS: Patients with medulloblastoma treated with re-irradiation from January 2015 to February 2019 at the Kobe Children’s Hospital and the Kobe Proton Center were reviewed. There were three cases of relapsed medulloblastoma and three cases of second cancer (glioblastomas). RESULTS: In relapsed cases, all three cases treated with 12 Gy in 8 fractions cranio-spinal irradiation followed by gamma knife radiosurgery (one) or 28.8 Gy (RBE) in 16 fractions of proton beam therapy (two). Follow-up periods were 8 to 19 months (median