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BACKGROUND: Central nervous system germ cell tumor (CNSGCT) is a rare pediatric brain tumor. However, they are found at a relatively high incidence in East Asia. Germinoma is sensitive toward radiotherapy and chemotherapy; however, non-germinoma GCTs (NGGCT) often show poor response. Some cases are a mixture of germinoma and NGGCT (mixed GCT), and they sometimes change histological subtypes at recurrence. Previous report demonstrated that a germinoma and NGGCT component within the same mixed GCT tissue shared the same gene mutation, whereas the genome-wide methylation profiles were distinct from each other. The methylation profiles of germinoma was similar to the primordial germ cells (PGC) at the migration phase, supporting a model that PGC is the cell of origin for CNSGCT. However, tumor heterogeneity hinder information of the mixed bulk RNA-sequence data, causing difficulty in elucidating the mechanism of tumor development. The purpose of this study was to investigate the tumor cells subpopulations at the resolution of individual cells by single-cell RNA-seq. RESULTS: Fresh surgical tumor tissue was immediately dissociated mechanically and enzymatically. Tumor cells are separated from CD45-labelled lymphocytes by FACS, and libraries were generated by Chromium Single cell 3' Reagent Kit. Total of 11 tumor samples were collected and sequenced. Unsupervised Clustering showed individual clusters. One of the clusters had high expression of Oct-4, which is a marker of germinoma. The other clusters showed different subtypes of cells representing the heterogeneity of CNSGCT. Further analysis including a pseudo-time course analysis is underway to identify the lineage of tumor cell development.

GCT-63. STEREOTACTIC RADIOSURGERY FOR RESIDUAL LESIONS OF PINEAL NON-GERMINOMATOUS GERM CELL TUMORS AFTER CONVENTIONAL RADIOTHERAPY: A RETROSPECTIVE STUDY

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OBJECTIVE: To explore the efficacy and safety of SRS for residual lesions of NGGCTs after conventional RT. METHODS: The clinical data of patients with iGCT who were admitted to Department of Oncology, Guangdong Sanjiu Brain Hospital between January 1, 2008 and December 30, 2019 were gathered. Those who were pathologically or clinically diagnosed with NGGCTs, with lesions located at pineal region, limited stage and residual lesions (with a maximum diameter>10mm) of pineal NGGCTs after RT with a total dose of 50-54Gy/25-30f, were eligible for the study. Several indexes such as local control rate, PFS, OS and treatment-related toxicity were analyzed. RESULTS: A total of 27 patients were included; all were male, with a median age of 16 years (range 8–31 years). The patients were followed-up to December 30, 2019, but there were 2 cases lost to follow-up. The median follow-up time was 34 months (range 8–142 months). After a month of treatment with SRS, the ORR and DCR were 71.4% and 95.2%, respectively. During follow-up, 5 cases had radiographic progressions, including 3 cases combined with increased AFP which were diagnosed with local recurrence and 2 cases diagnosed with GTS ; The 3y-PFS and OS were 85.2% and 88.0%.no acute radiation response was found after treatment with SRS, and only one patient had brain neurotoxicity. CONCLUSION: SRS for residual lesions of NGGCTs after RT is proved to be safe and feasible, with well tolerance, which is beneficial for the improvement of local control and the prolongation of survival.

GCT-64. TREATMENT RESULTS IN CHILDREN WITH LOCALIZED CNS NGGCT

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BACKGROUND/OBJECTIVES: Treatment of children with CNS NGGCT remains challenge: 5y OS is 60 – 80%; relapses are very aggressive. DESIGN/METHODS: Between 2003 and 2019, 14 children (median age 10.5, range 4 – 16 years) with localized intracranial NGGCT were treated with RT after induction chemotherapy (focal – 4, WVI+boost – 6, WBI+boost – 3, CSI+boost – 1). Tumor markers were elevated in 13 patients: 6 – AFP, 5 – HCG, 2 – both. One patient with level of HCG 72049 IU/l in serum and 121451 IU/l in CSF received 4 cycles of PEI + CSI 30 Gy with boost 54Gy. RESULTS: At a median follow-up of 4,7 years (range 1 – 16,25 years), 12 patients are alive. 5-year PFS and OS are 77,1% and 85,7%, respectively. Two patients (both AFP and HCG) progressed during RT (1 – focal, 1 – WBI+boost), both died. Two patients with high level of HCG recurred after therapy (WVI+boost – 1, focal – 1), both are alive. The first of them at recurrence (mts of lateral ventricle) received 4 cycles of PEI and RT (WBI+boost). The second patient had level of HCG 620IU/l and initially received focal irradiation 54Gy. At recurrence with distant spinal mts he received HD-CHT with auto-SCT, surgical resection of residual tumor and CSI with boost. CONCLUSIONS: Good results of treatment of localized CNS NGGCT with CSI, WBI or WVI in compare with focal RT show advantages of extended irradiation field. CSI should be considered for patients with extremely high levels of tumor markers and respectively poor prognostic histology.

GCT-65. INCIDENCE AND OUTCOME OF INTRACRANIAL MALIGNANT GERM CELL TUMOURS DIAGNOSED IN WESTERN DENMARK IN THE LAST DECADE

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INTRODUCTION: Intracranial malignant germ cell tumours (iGCT) are rare brain tumours mainly diagnosed in children and younger adults. MATERIAL AND METHODS: A retrospective analysis was performed by chart review of patients treated for iGCT in the northern and central region of Denmark. Teratoma only patients were not included in the study. RESULTS: 20 patients with iGCT were diagnosed from 2008–2019 in Western Denmark. The cumulative incidence was 1.05 per 100.000. The yearly incidence was 0.1 per 100.000. Mean age at diagnosis was 18 years (range 8–36 years), 17 were males and 3 were females. 13 patients presented with germinoma and 7 patients with non germinomateous germ cell tumours (NGGCT). Three patients had disseminated disease, two with germinoma and one with NGGCT. All patients had received radiotherapy and 18 patients were treated with multidrug chemotherapy including platinum and etoposide before irradiation. Two patients experienced recurrent disease, both non disseminated at diagnosis, one patient with germinoma and one patient with NGGCT. Both received salvage treatment including high dose chemotherapy with stem cell transplantation and reirradiation. Two NGGCT patients died, one patient after development of an anaplastic astrocytoma in the radiation field five years after radiotherapy and one patient after intracranial hemorraghe 18 months after salvage treatment for recurrent disease. Overall survival was 90%, 100% for GCT and 71% for NGGCT. CONCLUSION: The outcome of patients with iGCT in Western Denmark was comparable to the literature. A nationwide study of epidemiology and outcome of iGCT in Denmark is planned.

GCT-66. FINAL REPORT OF THE PROSPECTIVE NEXT/CNS-GCT-4 CONSORTIUM TRIAL (GEMPOX FOLLOWED BY MARROW-ABLATIVE CHEMOTHERAPY) IN PATIENTS WITH REFRACTORY/RECURRENT CNS GERM CELL TUMORS

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BACKGROUND: We report the responses, toxicities and long-term outcomes of gemcitabine, paclitaxel and oxaliplatin (GemPOx) regimen administered, in responsive patients, prior to single cycle marrow-ablative chemotherapy (thiotepa, etoposide and carboplatin) with autologous hematopoietic progenitor cell rescue (HDCx+AuHPCR). METHODS: Since De-

cember 2009, 11 recurrent/refractory patients (10 MMGCT, 1 germinoma; 10 males; mean age 16.5 years, range 7–46 years) have been treated with up to four cycles of gemcitabine (800mg/M2), paclitaxel (170mg/M2) and oxaliplatin (100mg/M2) administered on one day at 14 days intervals. RESULTS: All 11 patients were enrolled on a prospective multicenter trial, which was closed in October 2019. Three patients achieved complete remissions (tumor marker and/or imaging studies), five achieved partial remissions, two developed disease progression (PD), and one was withdrawn after one cycle for severe paclitaxel neurotoxicity followed by rapid tumor progression and death. One patient with PD after one cycle had pathologically-confirmed metastatic transformation to pure embryonal rhabdomyosarcoma, and rapidly expired. A second patient, with pure pineal choriocarcinoma, progressed after the second GemPOx cycle, ultimately died of tumor progression. Eight of the 11 responsive patients subsequently underwent HDCx+AuHPCR; five of these received some form of radiotherapy. Seven patients (six MMGCT, one germinoma) are alive and disease-free without recurrence for a mean of 94 months (range 74–118 months) since completion of therapy. CONCLUSION: GemPOx is an effective re-induction regimen for patient with recurrent CNS germ cell tumors, with acceptable toxicities; when followed by marrow-ablative chemotherapy and subsequent irradiation/re-irradiation, the regimen produces encouraging long-term disease-free survival.

GCT-67. CENTRAL NERVOUS SYSTEM GERMINOMA IN TWO CAUCASIAN AMERICAN SIBLINGS WITH AUTISM SPECTRUM DISORDER

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BACKGROUND: Central nervous system germ cell tumors (CNS-GCT) account for approximately 5% of all pediatric brain tumors. These tumors are pathologically heterogeneous, but have recurrent somatic mutations in KIT and rare germline variants in a Japanese cohort. Chromosomal abnormalities, specifically Klinefelter Syndrome, are associated with increased tumor development and familial cases have been reported, but no germline tumor syndromes are known. We describe a pair of siblings, both with autism spectrum disorder (ASD) that developed CNS-GCT, which previously has not been described outside of Japan. CASES: We report two siblings with ASD who developed CNS germinomas within two months of each other. The older brother, with basal ganglia and hypothalamic tumors, underwent surgical resection followed by treatment per ACNS0232 with chemotherapy and whole-ventricular irradiation (WVI). The younger sibling, with a midbrain tumor, also received ACNS0232, but due to poor response required additional chemotherapy and WVI. Both siblings are without evidence of disease 7 years after end of therapy. Genetic testing, including chromosomal microarray, karyotyping, and whole genome sequencing did not elucidate any variant identified as causative at that time. CONCLUSIONS: CNS-GCT are rare tumors, diverse in both histopathologic diagnosis and clinical outcomes. Currently there are known somatic alterations and germline chromosomal disorders associated with increased tumor development, but no known inheritable causes. Despite this, familial CNS-GCT have been reported in patients of Japanese descent. The description of two Caucasian American siblings with ASD and CNS-GCT is novel, refuting that familial CNS-GCT are limited to the Japanese population.

GCT-69. VOLUMETRIC CHANGE BEFORE CHEMORADIOTHERAPY AND INFLUENCE OF DIAGNOSTIC RADIATION EXPOSURE IN INTRACRANIAL GERMINOMAS

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BACKGROUND: Spontaneous regression in intracranial germ cell tumors has been reported in some literatures, but the mechanism has not been well known. We retrospectively measured the tumor volume before chemoradiotherapy and analyzed factors that influence reduction of tumor volume. PATIENTS AND METHODS: Plural MRI scans were done before the first course of chemotherapy regimen in 27 patients with primary intracranial germinomas. Their age ranged from 8 to 31 years. 35 lesions from them were enrolled and included 13 pineal, 4 neurohypophyseal, 4 basal ganglia, 4 bifocal type, and 2 multiple lesions. All regions were verified as pure germinoma or HCG-producing germinoma by histopathological examination. Tumor volume of 35 lesions was analyzed by volumetric assessment based on MRI. Ratio of volumetric change between the first MRI and the scan immediately before chemotherapy was defined as shrinking rate (%). Period between disease onset and the first chemotherapy was 20 to 47 days. Diagnostic radiation dose was calculated in each case. RESULTS: Initial tumor volume ranged from 0.962 to 72.356 cubic centimeters (mean: 8.27). Diagnostic radiation dose: 40.5 to 910.1 mGy. Shrinking rate ranged from -57.8 to 85.4% (mean: 30.8). In 10 regions, shrinking rate was within 30%. Shrinking rate was significant positively influenced by diagnostic radiation dose ($p<0.05$) and negatively influenced by initial volume ($p<0.05$). But, other factors such as age, sex, histopathological parameters did not influence tumor shrinkage. CONCLUSION: This study shows that the volume of intracranial germ cell tumors is changing dynamically before chemoradiotherapy in many cases. Diagnostic exposure to low-dose radiation influences tumor shrinkage of intracranial germinomas.

GCT-70. INTRACRANIAL GROWING TERATOMA SYNDROME IN CHILDREN

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Germ cell tumors account for less than 5% of all intracranial malignancies in children. Intracranial growing teratoma syndrome (GTS) is a rare pathophysiologic process characterized by growth of mature teratoma elements of a non-germinomatous germ cell tumor (NGGCT) during or following treatment with chemotherapy, in addition to normalization of or declining AFP/βHCG of the cerebral spinal fluid (CSF)/serum. A 13-year-old male presented with headache, emesis, and diplopia. MRI of the brain/spine revealed a localized 3.1 x 3.1 x 3.2 cm pineal tumor. Biopsy confirmed NGGCT (germinoma, immature and mature teratoma). Serum AFP (227ng/ul) and βHCG (12 IU/L) and CSF AFP (21ng/ul) and βHCG (31 IU/L) were elevated. Prior to cycle two of chemotherapy, he developed unstable gait and moderate hearing loss. Repeat MRI brain demonstrated tumor enlargement (4.4 x 5.2 x 5.1 cm) and obstructive hydrocephalus, although serum AFP/βHCG had normalized. Gross total resection of tumor confirmed GTS, without residual immature/malignant elements. Following six cycles of multiagent chemotherapy (carboplatin, etoposide, ifosfamide) and proton beam craniospinal irradiation (36 Gy with 18 Gy boost), he remains free of disease at eleven months since diagnosis. The pathogenesis of GTS remains unclear. Care must be taken to avoid misdiagnosing GTS as progressive NGGCT, as treatment and prognosis differ significantly. Second-look surgery, with a goal of complete resection, should be considered in cases of NGGCT when residual tumor grows during or following therapy, as this may represent GTS. Although histologically benign, GTS can be fatal. In patients with GTS, complete resection is usually curative.

GCT-71. SIOP STRATEGY TREATMENT FOR CENTRAL NERVOUS SYSTEM GERM CELL TUMORS IN A MIDDLE INCOME COUNTRY

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BACKGROUND/OBJECTIVES: Central nervous system (CNS) germ cell tumors (GCTs) represent 3% of primary paediatric brain tumours in occident. They can be divided into major groups including germinomas and nongerminomatous GCTs (NGGCTs). The aim is to describe demographic characteristics, Event Free Survival (EFS) and Overall Survival (OS) in patients with GCTs treated at Oncology Unit of Garrahan Hospital (HG). DESIGN/METHODS: Retrospective analysis of patients with GCTs admitted between September 1st,2000 to September 1st,2019. Variables analysed: age, localization, treatment, relapse and death. Patients were treated per SIOP-CNSGCTs protocol. For statically analysis SPSS (IBM), for EFS/OS Kaplan-Meyer, Long-rank for significance. RESULTS: Fifty-seven patients were included, comprising 38 Germinomas and 19 NGGCTS. Median age was 146 months (range 11–228). Primary site in localized Germinomas were pineal (16p), suprasellar (7p) and bifocal (7p). Five-year EFS and OS of 100% and 88.5%, respectively. Four patients presented metastatic disease, with an EFS and OS of 60.9% and 66.6%. Tumor site in localized NGGCT were pineal(8p) and suprasellar(5p). Five-year EFS was 81.8% and OS was 80.2%. No patients presented metastatic disease. All patients with high-risk tumor markers at diagnosis relapsed. No significative differences were found in OS neither EFS between groups (Germinomas OS5y 90% vs NGGCTs 74.6%p=0.19[CI95%0.0786–1.689]), (Germinomas EFS5y 78.9% vs NGGCTs5y 81.8%p=0.85[CI95%0.3046–4.230). Global OS and EFS5y was 83% and 72.9%. CONCLUSION: OS of our cohort is lower than what has been shown in current literature. This result may be related to the lack of resources and lower social economic status in our population.

GCT-72. ANALYSIS OF MICRORNA EXPRESSION PROFILE OF INTRACRANIAL GERM CELL TUMORS: A PROMISING TOOL FOR DIFFERENTIAL DIAGNOSIS

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