Title

RTHP-33. A SINGLE INSTITUTION RETROSPECTIVE ANALYSIS ON SURVIVAL BASED ON TREATMENT PARADIGMS FOR PATIENTS WITH ANAPLASTIC OLIGODENDROGLIOMA

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Postoperative radiotherapy is one of the most important treatment options for skull base chordoma. However, the response of chordoma to conventional fractionation radiotherapy is poor. Therefore, it is of great value to explore the therapeutic effects of hypofractionnated radiotherapy for refractory skull base chordoma. METHODS: A retrospective analysis was performed on the clinical data of patients with refractory skull base chordomas who were admitted to Guangdong Sanjiu Brain Hospital from 2007 to April 2019. The characteristics of the selected cases and prognosis-related factors were analyzed with Kaplan-Meier method. RESULTS: A total of 21 patients were enrolled in this study, including 11 male (52.4%) and 10 female (47.6%). Twenty patients received surgery, including gross total resection in 5 cases (25%), subtotal resection in 14 cases (70%) and biopsy in 1 case (5%). Among 18 patients who received radiotherapy, 17 (94.4%) received radiotherapy after the first diagnosis; 1 (5.6%) were treated with radiotherapy after tumor recurrence; and 3 (16.7%) received the secondary radiotherapy after tumor recurrence. The median overall survival of 11 patients receiving hypofractionnated radiotherapy (45-60Gy/8-20F) and 7 patients receiving conventional fractionation radiotherapy (40-60Gy/20-30F) reached 33 months (7–130) and 68 months (27–105), respectively. The results of Kaplan-Meier analysis revealed that the overall survival of patients who were treated with hypofractionnated radiotherapy was significantly longer than that of those receiving conventional fractionation radiotherapy. No one suffered from radiation-induced acute brain injury (≥grade 3), and only 1 patient who received hypofractionnated radiotherapy developed radiation-induced brain necrosis at 3 years after hypofractionnated radiotherapy. CONCLUSION: Hypofractionnated radiotherapy for refractory skull base chordoma can not only achieve a therapeutic effect, but also reduce the risk of radiation-induced necrosis.

RTHP-30. DOES THE TEMPORAL LOBECTOMY CAVITY NEED TO BE IRRADIATED? PATTERNS OF RECURRENCE AND IMPLICATIONS FOR POSTOPERATIVE RADIATION TREATMENT FIELD DESIGN FOR TEMPORAL LOBE GLIOMAS.

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BACKGROUND: Treatment of temporal lobe glioma (TLG) frequently includes partial or complete temporal lobectomy (TL) followed by radiotherapy (RT). However, there are two approaches for temporal resection cavity RT, 1) standard target volumes (STV) targeting the entire TL resection cavity, dura, and peri-tumoral brain parenchyma or 2) modified target volumes (MTV) targeting only the adjacent peri-tumoral brain parenchyma. We report patterns of failure and a dosimetric comparison of these approaches. MATERIALS AND METHODS: This was a retrospective review of 49 patients with WHO grade II-IV TLG who underwent partial or complete TL and post-operative RT between 1998 and 2018. Progression-free survival (PFS) was estimated using the Kaplan-Meier method. RESULTS: The median patient age was 56 years (range,21–76). Patients were diagnosed with glioblastoma (n=32,65%), anaplastic glioma (n=10,20%) and low-grade glioma (n=7,14%). Treatment included partial TL with STV (n=33,67%), partial TL with MTV (n=5,10%), complete TL with STV (n=8,16%) and complete TL with MTV (n=3,6%). Mean RT dose was 60 Gy (range,40–76) in 30 fractions (range,15–39). At median follow-up time of 18 months (range, 3–161), 44 patients (90%) experienced recurrence: 34 (77%) in-field, 5 (11%) out-of-field, and 5 (11%) both in- and out-of-field. Among the 39 in-field failures, the location of recurrence included brain parenchyma (n=38,97%), ventricle (n=6,15%), and dura (n=5,13%). No patient experienced isolated dural recurrence regardless of tumor grade, extent of TL, or radiation volume. Median PFS was 20 months (95% confidence interval [CI]: 15–24). RT volume (STV vs. MTV) was not associated with worsened PFS (hazard ratio: 1.1, 95% CI: 0.5–2.6). MTV was associated with significant reductions in mean or max doses to brain stem, optic chiasm, optic nerves, hippocampus, and pituitary compared to STV. CONCLUSION: Omitting RT to the entire TL cavity may reduce dose to multiple normal tissues with no detriments in dural recurrence or PFS.

RTHP-31. EMERGENCY RADIOTHERAPY IN INTRACRANIAL GERM CELL TUMORS (GCTS) PATIENTS WITH KPS≤ 40: ARETROSPECTIVE ANALYSIS OF 27 CASES

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OBJECTIVES: To evaluate the potential role of emergency radiotherapy in intracranial germ cell tumors GCTs) patients with KPS ≤ 40. METHODS: A total of 27 primary intracranial germ cell tumors (GCTs) patients with KPS ≤ 40 between Jan 2007 and Dec 2018 were retrospectively evaluated. The median age at initial diagnosis was 15 years (range, 528 years). Among those, 11 patients were germinoma and 16 patients were nonseminomatous germ-cell tumors (NGGCTs). There were 9 solitary pineal, 5 suprasellar, 3 basal ganglia and 10 multifocal and disseminated tumors. All patients received emergency radiotherapy (2 Gy/fx/d). Prior to radiotherapy, 11 patients were manifested with hydrocephalus, 10 with hypopituitarism and 5 with intracranial tumo apoplexy. RESULTS: The average follow up time was 44.4 months. The 5 year progression free survival rate and overall survival rate were 29.6% and 33.3%. The median overall survival time was 38 months. In particular, the median intracranial hypertension symptoms relief time was 2 days. The median KPS following radiotherapy was 80 comparing to 30 prior to radiotherapy ($P < 0.05$). A significant improvement on KPS of 46.7±27.3 was observed in this study. CONCLUSION: Emergency radiotherapy is implicated as a promising intervention for GCTs patients with elevated intracranial pressure (ICP). These advantages can be interpreted as direct cell killing effect and fast tumor shrinkage by ionizing radiation. However, to substantiate our findings, further investigations were highly warranted.

RTHP-32. FIRST EXPERIENCE WITH GAMMATILE PERMANENT IMPLANTS FOR RECURRENT BRAIN TUMORS

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Gammatile™ permanent brachytherapy implants have been FDA cleared for patients with recurrent brain tumors. We report our experience with the first 6 patients with recurrent high grade primary brain tumors treated with re-resection and implantation. Each tile contains 4 encapsulated radioactive Cs-131 seeds embedded in collagen. To determine the number of tiles needed, the potential tumor cavity surface area was estimated using the preoperative MRI images. The anticipated cavity surface area was calculated, the surface area of anticipated surgical approach was subtracted. This area was divided by 40mm^2 (tile area) and this number of tiles were ordered. At the time of surgery, after maximal safe tumor resection, tiles were placed into the resection cavity and the surgical cavity closed as usual. On post-implant day 1, CT and MRI scans were performed. The cavity was contoured, then expanded by 5mm to create HRCTV. T1 MRI enhanced lesions were contoured as residual GTV (GTV_r). A dose of 60Gy over the course of treatment was prescribed to HRCTV. In each of these 6 cases, over 95% of the HRCTV was covered by the 60Gy isodose surface, and GTV_r D_{90} ranged from 22.9Gy to 113.8Gy. The additional time required for the tile placement in all cases was less than 10 minutes. Post-operatively exposure rates at 1m were less than 6 mR/hr (ranging from 1.3 to 3.2mR/h). Permanent GammaTile for recurrent brain tumors is a viable option for selected previously irradiated patients who are operative candidates. Benefits include irradiation of the tumor bed starting immediately after resection with no need to wait for wound healing, and no need to subsequently surgically remove the tile. We were able to accurately predict the number of tiles needed, although in one case collagen spacers were utilized. Due to low exposure rates, radiation protection issues are very manageable.

RTHP-33. A SINGLE INSTITUTION RETROSPECTIVE ANALYSIS ON SURVIVAL BASED ON TREATMENT PARADIGMS FOR PATIENTS WITH ANAPLASTIC OLIGODENDROGLIOMA

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Anaplastic oligodendrogliomas are a type of high grade glioma defined molecularly by the 1p19q co-deletion. Currently, there is no curative therapy, and some studies have estimated median survival is estimated to be approximately 5 years. Current standard of care includes surgical resection followed by radiation and chemotherapy. However, the benefit of up-front radiation with chemotherapy compared to chemotherapy alone following surgical resection has not been shown in a randomized control trial. Given the long-term cognitive consequences of radiation therapy and the high percentage of patients who lives beyond 15 years with AO, there is an effort to balance longevity with radiation toxicity. As such we performed a retrospective single institution analysis of survival of patients with anaplastic oligodendroglioma over 20 years. 159 patients were identified as diagnosed with an anaplastic oligodendroglioma between 1996–2016. Of those, 57 patients were found to have anaplastic olidodendroglioma at original diagnosis and had long term follow-up. Sixty-six percent of patients were between the ages of 30–50 and mean KPS was 87.3. At the time of analysis, 33% of patients had died. In this cohort, 60% of patients were initially treated with radiation and chemotherapy (either temozolomide or CCNU) at diagnosis

and 40% were treated with chemotherapy alone. Median overall survival for the entire cohort was 142 months. The related risk of progression in the upfront chemotherapy only group is approximately 5.87 times higher than the patients who received radiation and chemotherapy (Hazard ratio=5.87, 1.92–17.90, p=0.002). However, there was no significant difference in overall survival in patients treated with upfront chemotherapy compared to patients treated upfront with chemotherapy and radiation (p=0.14). On univariate analysis, there was no association between age, KPS, EOR, or upfront vs. delayed radiation and survival. As such initial treatment with chemotherapy alone may be an option for some patients with anaplastic oligodendroglioma.

RTHP-34. IMPROVED SURVIVAL IN CNS LYMPHOMA WITH SALVAGE LOW-DOSE WHOLE-BRAIN RADIOTHERAPY WITH FOCAL BOOST AND CONCURRENT TEMOZOLOMIDE

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OBJECTIVE: There is no standard salvage radiotherapy (RT) regimen, nor a consensus on the concurrent chemotherapy use in CNS lymphoma. We assessed the efficacy of low-dose whole-brain radiotherapy (WBRT) with focal-boost to the area of disease and concurrent temozolomide for the salvage treatment of CNS lymphoma. METHODS: A single center retrospective study of CNS lymphoma patients seen between 01/2004 and 02/2019. The inclusion criteria were: diagnosis of CNS lymphoma, age > 18 years at diagnosis, radiation treatment to the brain, and formulation of plan at University of Michigan with at least one follow-up. Overall survival (OS) was determined by Kaplan Meier method. RESULTS: Out of 93 patients (median age 58, 45% female), 73% were diagnosed with primary CNS lymphoma (n=68), and the remainder with secondary CNS lymphoma. Radiation modalities were WBRT alone (n=52), low-dose WBRT + focal boost (n=33) and focal RT alone (n=8). Twenty-six patients (28%) received concurrent temozolomide with radiation. Those who received WBRT+boost achieved complete response at a significantly higher rate than those who received WBRT alone (36% vs 17% respectively, p=0.047). The median OS among all groups was 45 months. There was a significant improvement in OS in patients receiving low-dose WBRT+boost compared to WBRT alone (median 65 vs 14 months respectively, p=0.016). OS was significantly longer in patients who received concurrent temozolomide than in those who did not (median 86 vs 23 months respectively, p=0.0287). CONCLUSIONS: In CNS lymphoma salvage RT, a longer survival was observed with low-dose WBRT with focal-boost compared to WBRT alone, as well as with concurrent temozolomide. This result is limited by the selection bias to each of the treatment groups; however, the low-dose WBRT with focal-boost and concurrent temozolomide is a useful salvage alternative to standard WBRT as it may reduce long-term neurocognitive toxicity.

RTHP-35. RE-IRRADIATION USING PULSED REDUCED DOSE RATE RADIATION THERAPY IN PATIENTS WITH GRADE 2 GLIOMAS

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BACKGROUND: The time course of progressive grade 2 glioma can span nearly a decade. However, much less is known about re-irradiation in this cohort than in high grade patients. Pulsed reduced dose rate (PRDR) radiation therapy is a method of radiation delivery, which may spare normal tissues by slowing the rate of radiation delivery to allow repair. METHODS: We identified consecutive patients from an institutional database initially diagnosed with grade 2 glioma from 2001 to 2017 who underwent pulsed reduced dose rate radiation therapy. Radiation was delivered in 20 cGy pulses every three minutes, most commonly with a 3D conformal, three field technique, encompassing gross disease with a 1–2 cm margin. Kaplan Meier method was utilized to analyze patient outcomes. RESULTS: 35 patients with grade 2 glioma were identified. The median survival from the date of the first surgery was 103 months (95% CI 78–129 mo). 71% underwent at least a second resection and 86% of patients receiving chemotherapy. 80% of patients underwent transformation to grade 3 (51%) or grade 4 (29%) glioma. Overall survival from PRDR was 9.8 months (95% CI 4.5–14.5mo) and progression free survival was 6.2 months (95% CI 5.1–7.4) in all patients. Overall response rate was 37%. In patients who remained grade 2 histology, overall survival was 13.3 months and two patients remain disease free at 83 and 34 months with overall response of 71%. Four seizures were documented, otherwise treatment was well tolerated. CONCLUSIONS: Progressive grade 2 glioma can progress and evolve over nearly the course of a decade. This study demonstrates the efficacy of re-irradiation in prolonging survival in these patients by delaying progression. In patients who remain with grade 2 disease, prolonged salvage of their disease appears possible.

RTHP-36. REIRRADIATION FOR DIFFUSE INTRINSIC PONTINE GLIOMA: A SYSTEMATIC REVIEW AND META-ANALYSIS OF PATIENT OUTCOMES

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BACKGROUND: Diffuse intrinsic pontine glioma (DIPG) is a pediatric brain tumor with dismal prognosis despite initial radiation therapy (RT). The clinical consequences of attempting reirradiation (reRT) in these patients to alleviate both symptomatology and improve prognosis are currently unclear. Thus, the aim of this systematic review and meta-analysis was to clarify the efficacy and safety of reRT in DIPG. METHODS: Searches of 7 electronic databases from inception to January 2019 were conducted following the appropriate guidelines. Articles were screened against pre-specified criteria. The incidence and duration of clinical outcomes were then extracted and pooled by means of meta-analysis from the included studies. RESULTS: A total of 7 studies satisfied all criteria, describing 90 cases of DIPG in which reRT was attempted 11.8–14 months after initial RT. Based on a random-effects model, the incidences of clinical improvement and radiologic response following reRT were 87% (95% CI, 78–95%) and 69% (95% CI, 52–84%) respectively. The incidence of acute serious toxicity was 0% (95% CI, 0–4%). Pooled overall survivals from initial diagnosis, and time of reRT, were 18.0 months (95% CI, 14.2–21.7) and 6.2 months (95% CI, 5.5–7.0) respectively. CONCLUSIONS: Based on these results, the clinical consequences of reRT for DIPG when administered appropriately and safely at first progression appear acceptable, and potentially favorable, based on the limited evidence in the current literature. Concerns regarding acute serious toxicity were not realized. It is likely a sub-cohort of all DIPG diagnoses will be most amenable to improved prognosis with reRT, and greater investigation is required to identify their characteristics.

RTHP-37. RE-IRRADIATION OF GLIOMATOSIS CEREBRI WITH WHOLE BRAIN PULSED REDUCED DOSE RATE RE-IRRADIATION

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BACKGROUND: Gliomatosis cerebri was removed from the 2016 WHO classification but the clinical problem of gliomatosis remains. For many of these patients, re-irradiation of the whole brain may be the only option. We have employed pulsed reduced dose rate (PRDR) radiation therapy to limit the toxicity of whole brain re-irradiation in this patient population. METHODS: Consecutive patients were identified from an institutional database of patients treated with PRDR radiation to the whole brain between 2001 and 2016. Patients were treated by delivering a 20 cGy pulse of radiation every 3 minutes to opposed lateral fields with custom blocks using 6 MV photons, delivering radiation at an effective dose rate of 6.67 cGy/minute. RESULTS: A total of sixteen patients were identified who underwent re-treated with WBRT. The median age was 45 (28–66) with a median KPS of 80 (range 60–100). 15 of 16 patients had high grade gliomas. The most common dose was 30 Gy in 15 fractions (range 24–41.4 Gy), giving a median total dose of 90.75 Gy (range 61.4–100.8 Gy). Median overall survival from re-irradiation was 3.8 months (range 0.1–17.0 months) and overall survival from first progression was 11.2 months. 25% of patients survived over 6 months following treatment and the overall response rate was 25% (3 PRs, 1 stable). No grade 4 or grade 5 toxicities were attributable to pulsed reduced dose rate radiation therapy. CONCLUSIONS: PRDR radiation therapy provides a potential therapeutic intervention for progressive gliomatosis cerebri, providing a treatment option that can be implemented where no trial is available. As survival is short, these results will assist in counseling patients in considering re-irradiation versus supportive care.

RTHP-38. THE FEASIBILITY OF PSYCHOLOGICAL INTERVENTIONS FOR REDUCE THE NEED OF ANESTHESIA DURING RADIOTHERAPY IN < 5 YR PEDIATRIC PATIENTS WITH CNS MALIGNANCIES

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OBJECTIVES: The aim of this study was to explore the psychological intervention to reduce the use of sedatives in children when undergoing radiotherapy. METHODS: From January 2017 to December 2018, 53 pediatric patients, without limited consciousness, from 3 to 5 years old diagnosed with brain tumors and admitted to radiotherapy at the oncology centers of Guangdong Sanjiu Brain Hospital, received the systematic intervention (including desensitization, simulation play practice, distraction, etc.) to reduce medical fear for radiotherapy. A case-control study of semi-structured and play-based interventions was undertaken for psychological preparation