lower than that for both of these agents added sequentially. Interestingly, when the sequence of addition of drugs was reversed using 5azaD/SAHA, the reduction in growth (66% vs. 85%, $P < 0.05$) and percentage of apoptotic cells were lower than in cultures treated with SAHA/5azaD. The greatest amount of glioma cell death induced by SAHA/5azaD corresponded with higher protein levels of the cyclin dependent kinase inhibitor, P^{21}, and the minimum fraction of cells in active phases of cell cycle (19% in control vs. 11% in SAHA/5azaD). Furthermore, glioma cells treated with SAHA/5azaD or 5azaD/SAHA displayed the highest levels of acetylated histone H4 protein levels, indicating possible epigenetic changes. Our data indicating that the effects of SAHA/5azaD are likely mediated by epigenetic mechanisms is made evident by increases in P^{21} and acetylated histone H4 protein levels. Whether such strategies are also effective in primary human glioma tumor cells will be tested, which may ultimately open untapped territories to search for curative therapies.

ET-53. ACTIVITY OF GMX1777 AGAINST A PANEL OF BRAIN TUMOR XENOGRAFTS

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INTRODUCTION: GMX1777 is a prodrug of the small molecule GMX1778. GMX1778 is a potent inhibitor of the nicotinamide adenine dinucleotide (NAD^+) biosynthesis enzyme nicotinamide phosphoribosyltransferase (NAMPT). Blocking NAD^+ production by inhibiting NAMPT may result in tumor cell death. The significant NAD^+ dependence exhibited by cancer cells and their high rate of NAD^+ turnover make modulation of NAD^+ an attractive target for therapy. METHODS: Both subcutaneous and intracranial brain tumor xenografts were grown in athymic BALB/c mice. Groups of 10 mice were randomly treated with either drug vehicle or GMX1777. Tumor responses were assessed by tumor growth delay and regression for subcutaneous xenografts and by difference in median survival for intracranial xenografts. RESULTS: The results demonstrated statistically significant ($P < 0.001$) increases in median survival of 22%, 61%, and 83% compared with controls in mice bearing D-245 MG, D-54 MG, and D-456 MG intracranial tumors, respectively. In animals bearing D-245 MG subcutaneous tumors, doses of 40 mg/kg/day × 10 IM and 100 mg/kg/day × 10 IM produced statistically significant ($P < 0.001$) growth delays of 44 days, regardless of increase in dose. However, the 100-mg/kg dose produced regressions in 9 of 10 mice compared with 4 of 10 in the 40-mg/kg group. When GMX1777 was combined with the alkylating agent temozolomide, an 11% (NS) inhibition of tumor growth was observed. A dose escalation study was conducted using D-245 MG treated with a combination of GMX1777 and the rescuing agent niacin, which produced significant ($P < 0.004$) growth delays of 10 to 39 days. CONCLUSIONS: Our results demonstrated the therapeutic activity of GMX1777 against a panel of brain tumor xenografts. Furthermore, GMX1777 produced significantly beneficial results intracranially, which suggests that it crosses the blood-brain barrier. *(Funding: The ABC^2/Tisch Preclinical Therapy Screening Program and GeminX Pharmaceuticals.)*

ET-54. EFFICACY OF LBH589 (PANOBINOSTAT) AGAINST A PANEL OF PEDIATRIC BRAIN TUMOR XENOGRAFTS

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INTRODUCTION: Histone deacetylase (DAC) inhibitors have emerged as potent anticancer compounds. LBH589 is a novel pan-DAC inhibitor that induces death in tumor cells but not normal cells and has a long half-life in cells, leading to prolonged acetylation. In phase I trials, clinical activity has been seen with LBH589 against cutaneous T-cell lymphoma (CTCL). LBH589 is now being investigated in phase II clinical trials in CTCL, chronic myeloid leukemia, and multiple myeloma. The purpose of this study was to evaluate the efficacy of LBH589 against a panel of pediatric brain tumor xenografts. METHODS: Both subcutaneous and intracranial pediatric brain tumor xenografts were grown in athymic BALB/c mice. Groups of 10 mice were randomly treated with either drug vehicle or LBH589 (20 mg/kg/day) IP for 10 days. Tumor responses for subcutaneous xenografts were assessed by tumor growth delay and regression and for intracranial xenografts by difference in median survival. RESULTS: The results demonstrated statistically significant ($P < 0.001$) growth delays of 11, 18, 22, and 63 days in subcutaneous xenografts derived from childhood ependymoma (D-612 EP), childhood medulloblastoma (D-341 MED), and 2 childhood glioblastoma multiforme xenografts (D-212 MG) and (D-456 MG), respectively, with corresponding tumor regressions 2 of 10, 1 of 10, 4 of 10, and 9 of 9 treated mice. Of the 40 mice treated with LBH589, only 1 animal died; the average weight loss for treated animals was 6.5% of initial body weight. In mice bearing intracranial xenografts, LBH589 produced significant ($P < 0.001$) increases in median survival of 58% and 104% compared with controls in D-341 MED and D-456 MG, respectively. CONCLUSIONS: Our results demonstrate the therapeutic activity of LBH589 against a panel of pediatric brain tumor xenografts. Furthermore, LBH589 produced significantly beneficial results intracranially, which suggests that it crosses the blood-brain barrier. *(Funding: The ABC^2/Tisch Preclinical Therapy Screening Program.)*

QUALITY OF LIFE

QL-01. DIAGNOSIS TO DEATH: MEETING BRAIN CANCER PATIENT AND CAREGIVER EMOTIONAL NEEDS ALONG THE CONTINUUM OF DISEASE

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INTRODUCTION: The diagnosis of brain cancer is devastating for patients and their families. Brain cancer patients may suffer paralysis, cognitive impairment, and/or personality changes, and patients' families must immediately assume all the responsibilities previously held by the patients. The focus of my work is to provide emotional support for the patient and family throughout the course of the disease. METHODS: Patient information packets with materials for both the patient and the caregiver are given at diagnosis. There are information carrousels in the waiting room with more specific information. Individual and family counseling is available. Two patient and family/friend support groups meet twice monthly, and there are 2 online support listservs. There is a weekly caregiver recognition day, and every autumn there is a remembrance service for the families. RESULTS: The carefully chosen educational materials made available to patients and families help them process and acclimate to their new situation. They feel both heard and understood as a result of individual and family counseling and participation in supportive communities of their peers. Caregivers feel recognized for their efforts and sacrifices, and those left behind are comforted by the recognition of their loss. CONCLUSION: The diagnosis of a malignant brain tumor is shocking, and the prognosis is poor. The diagnosis affects the entire family in ways that are unparalleled in other cancer populations owing to the combination of physical and cognitive changes. Patients' personalities may change so dramatically that the family feels they lost them at diagnosis. Much support and comfort is needed for a disease population with such short survival expectancy.

QL-02. BIOLOGIC CORRELATES OF FATIGUE IN GLIOMA PATIENTS UNDERGOING RADIATION THERAPY

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AIMS: Fatigue is the most prevalent and distressing symptom resulting from cranial radiation. However, the clinical and biologic correlates of fatigue and its impact on other symptoms have not been explored. METHODS: Eight patients treated with cranial radiation reported on their fatigue (Brief Fatigue Inventory); concurrent neurologic and cognitive symptoms (MD Anderson Symptom Inventory [MDASI-BT]); and sleep (Epworth Sleepiness Scale [ESS]). Objective sleep data were obtained using actigraphy (ACT). Data were collected at baseline, weekly during radiation therapy, and 3 weeks after the completion of radiation therapy. Salivary melatonin was collected at baseline, week 6 of radiation therapy, and then 3 weeks after the completion of radiation therapy. Clinical data, including radiation dose to the pineal gland, were collected after the completion of radiation therapy. RESULTS: Patients were primarily male ($n = 6$) with a median age of 49 years. Fatigue varied during radiation therapy and peaked at week 3 and again at week 6. Fatigue severity at week 6 correlated with radiation dose to the pineal gland (range, 18–60 Gy; $r = 0.86$; $P = 0.05$), changes in self-reported sleep using the ESS ($r = 0.85$; $P = 0.016$), and a trend related to sleep onset latency as determined by ACT from week 0 to week 6 ($r = 0.70$; $P = 0.07$). Symptom changes, typically an increase in melatonin levels from week 0 to week 6, strongly correlated with worsening fatigue scores ($r = 0.90$; $P = 0.036$) and correlated with change in wake time after sleep onset by ACT ($r = 0.97$; $P = 0.033$). Fatigue severity correlated with the severity of reported neurologic symptoms ($r = 0.72$; $P = 0.043$) and cognitive symptoms ($r = 0.94$, $P = 0.01$) at week 6 but not at baseline, suggesting that a common biologic change during radiation may trigger these symptoms. CONCLUSIONS: These results suggest that radiation delivered to the pineal gland may alter melatonin production, leading to fatigue, altered sleep, and exacerbated neurologic and cognitive symptoms. A larger study delineating the role of melatonin in fatigue is underway.

QL-03. LIVED EXPERIENCE OF LONG-TERM SURVIVORS OF HIGHLY MALIGNANT GLIOMA

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INTRODUCTION: Advances in the diagnosis and treatment of malignant brain tumors have lengthened survival to the point at which undertaking survivorship (a traditionally under-researched topic) has become vital to improving patients' lives. The purpose of this study was to explore survivorship issues in patients ≥ 3 years after diagnosis of a highly malignant glioma. METHODS: Thirty-five survivors recruited from 6 sites in the United States were interviewed about their experience of having highly malignant brain tumors (e.g., changes in roles and responsibilities, symptom distress). Quantitative measures were used to assess physical symptoms, levels of depression, and cognitive status. Caregiver interviews were used to validate survivors' stories. Interviews were critically analyzed for common categories and themes. RESULTS: The average time from diagnosis was 6 years. Most survivors (n = 25; 71%) were diagnosed with a glioblastoma and received radiation and chemotherapy. Cognitive screening revealed moderate memory deficits in most survivors. Patients described life as disintegrating instability and described being overwhelmed with ongoing life changes starting from the time of diagnosis and continuing into present day. Many survivors could not manage previous work responsibilities. Roles were redefined and occasionally reversed with caregivers assuming previously held roles. Socially, some friends fell away, solid friends remained, and new friends emerged. Emotional and cognitive instability affected relationships with caregivers and others. Fear and uncertainty rose in anticipation of each magnetic resonance imaging study. Caregivers found themselves in protective and parental relationships with survivors. In most cases, caregivers stated that they would stand by their survivors even if their lives were not as they envisioned. Caregivers and survivors found unexpected benefits of having a brain tumor, including growing closer to each other and giving back through helping others with disabilities. CONCLUSIONS: Significant life-altering changes occur with survivors and their caregivers. Intervention-based assessment tools should be utilized at various intervals to identify and manage survivorship issues.

QL-04. TREATMENT AND DECISION-MAKING AT THE END OF LIFE OF HIGH-GRADE GLIOMA PATIENTS

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Because patients with high-grade glioma (HGG) cannot be cured of their disease, palliative treatment is of major importance. HGG patients and their physicians may be confronted with medical end-of-life (EOL) decisions such as whether to withhold or withdraw life-sustaining therapy and palliative sedation. Little is known about treatment and EOL decisions in HGG patients. It is assumed that confusion, cognitive deficits, and decreased consciousness could decrease the patient's ability to participate in EOL discussions. The aim of this study was to describe EOL wishes and medical decisions in HGG patients. The physicians and relatives of a cohort of 155 deceased HGG patients were asked to complete a questionnaire regarding the EOL phase of the specific patient. The questionnaires related to wishes regarding EOL treatment expressed by the patient and the patients' ability to participate in EOL decision making. Furthermore, the questionnaire for physicians inquired after EOL treatment. Descriptive data were recorded. Sixty-seven percent of the patients' physicians and 63% of the patients' relatives participated in the study. According to the relatives, 80% of patients expressed EOL treatment wishes, and 45% of patients had a living will. Physicians discussed EOL treatment wishes with the patient in 58% of the cases. Physicians and relatives indicated that the majority of patients (55–62%) were unable to participate in EOL decision making in the last week of life, largely because of confusion or cognitive disturbances (45–66%) and loss of consciousness (47–60%). In 86% of patients, any EOL decision was taken, and in 35% of patients, this probably shortened life. A decision contrary to the patient's wish was made in 14% of cases. Our findings should be used to develop specific protocols and interventions to improve the EOL decision-making process in HGG patients.

QL-05. DOES ELECTIVE METASTATIC EPIDURAL SPINAL TUMOR DECOMPRESSION HINDER SHORT-TERM FUNCTIONAL STATUS?

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INTRODUCTION: The purpose of this study was to describe differences in pre- and postoperative Oswestry Disability Index (ODI) scores for patients undergoing elective metastatic spinal tumor decompression with or without fixation and to evaluate whether such surgery has a deleterious effect on functional status. The long-term benefits of such a surgical intervention in cancer patients with regards to ambulation have been shown in prospective randomized trials. However, concern for patients' initial postoperative recoveries in the setting of limited survival often precludes surgical consultation. METHODS: The records of 3 women (age, 60.67 ± 14.74 years) and 6 men (age, 56.67 ± 4.33 years), including 3 smokers, undergoing metastatic epidural spinal cord tumor decompression surgery between August 2009 and February 2010 were reviewed. Average differences between pre- and postoperative ODI scores were determined for each group. RESULTS: The difference between pre- and postoperative ODI scores for the patient population was 9.52% ± 5.17% ($p = 0.07$). This change indicated no statistically significant change in the sample. The difference between ODI scores at the second postoperative follow-up at approximately 3 months was 2.% ± 6.11% ($p = 0.87$). This also showed no significant change in functionality. CONCLUSIONS: As evidenced by pre- and postoperative ODI scores, functional status was not hindered in patients undergoing elective metastatic spinal epidural tumor decompression surgery. The known long-term ambulation benefit of elective spinal decompression of epidural spinal metastases does not cause an initial, transient postoperative period of functional decline in these patients with limited survivability. Quality of life in the short term is maintained in the effort to prolong ambulation in patients with metastatic epidural spine tumors.

QL-06. ASSESSING THE FINANCIAL BURDEN EXPERIENCED BY INSURED MALIGNANT GLIOMA PATIENTS

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BACKGROUND: Patients undergoing treatment for malignant gliomas often face significant costs beyond traditional insurance coverage. These "out-of-pocket" costs fall into 3 main categories: 1) direct medical costs (e.g., hospital stays, physician visits, laboratory testing, pharmaceuticals); 2) direct non-medical costs (e.g., transportation, parking, cost of meals); and 3) indirect costs (e.g., lost wages). The purpose of this study was to collect prospective data regarding monthly expenditures given the few data that are available. METHODS: Patients with stage III or IV malignant gliomas within 6 months of initial diagnosis or relapse were eligible for this study. Weekly logbooks were issued to patients to record out-of-pocket costs during treatment prospectively or retrospectively for 6 months or until disease progression. Both direct medical expenses and direct non-medical expenses were measured. RESULTS: Twenty-four patients provided an average of 21 weeks worth of expense data. Of the patients in this sample, the median age was 57.5, 65% were male, 81% were married, and 54% reported an annual income greater than $75,000. The mean monthly out-of-pocket costs for this population were $2,153. The greatest average monthly costs were incurred in the form of hospital bills ($479), medication copayments ($413), and transportation ($280). Patients with annual incomes less than $75,000 had an average of $156 more in total monthly costs than patients with incomes greater than $75,000, and the proportion of income spent per expense type was similar for both groups. We found that 58.3% of patients spent money on complementary alternative medicine (e.g., supplements, dietary changes, massage therapy). CONCLUSIONS: Out-of-pocket costs incurred for insured patients with malignant glioma are not insignificant. They appear to be greater than the mean monthly costs reported in lymphoma and breast cancer patients ($1,888 and $1,455, respectively). With changing policies in health care, analysis of specific cost issues will become more important.

QL-07. PREGNANCY IN A PATIENT WITH ANAPLASTIC OLIGODENDROGLIOMA TAKING TEMOZOLOMIDE: A CASE REPORT

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INTRODUCTION: Temozolomide is a pregnancy category D medication that has been shown to cause numerous malformations of the external

organs, soft tissues, and skeletons of rats and rabbits in early testing. Dosing of 150 mg/m^2/day in rats and rabbits has been shown to cause embryolethality. METHODS: We retrospectively reviewed the medical records of a woman with right parietal anaplastic oligodendroglioma who conceived a child while on temozolomide treatment. RESULTS: A 19-year-old woman presented with a 5-month history of progressively worsening headaches, left-sided weakness, and numbness in her left hand. Magnetic resonance imaging (MRI) of the brain showed a large enhancing right parietal mass. The patient underwent a gross total resection of the tumor. Pathology was consistent with pure anaplastic oligodendroglioma with 1p/19q deletion. The patient then received focal irradiation with intensity-modulated radiotherapy to 5,940 cGy with concomitant temozolomide (90 mg/m^2/day) for 6 weeks. Following chemoradiotherapy, she was started on a dose-intensive regimen of temozolomide at 200 mg/m^2 × 5 days/month. Before starting therapy, the patient was provided with counseling advising 2 forms of birth control. She was receiving Depo Provera injections and using condoms throughout her therapy. After completing 17 cycles, she discovered that she was pregnant. The date of conception was estimated to be on day 5 of course 17 of treatment. Temozolomide was stopped immediately, and the patient was monitored carefully during her pregnancy. Monitoring included fetal ultrasonography and brain MRI every 3 months. MRI showed no evidence of recurrence, and the patient gave birth to a healthy baby boy at full term. There were no perinatal complications. CONCLUSION: We present the case of an uneventful pregnancy and a healthy baby born to a mother taking temozolomide 200 mg/m^2 daily × 5 days every month. To our knowledge, there are no other reported cases of pregnancy and temozolomide administration.

QL-08. QUALITY OF LIFE RESULTS OF AN EORTC PHASE III RANDOMIZED TRIAL OF ADJUVANT WHOLE-BRAIN RADIOTHERAPY VERSUS OBSERVATION AFTER RADIOSURGERY OR SURGICAL RESECTION OF 1-3 CEREBRAL METASTASES OF SOLID TUMORS

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BACKGROUND: The EORTC 22952-26001 phase III trial compared adjuvant whole-brain radiotherapy (WBRT) to observation after local treatment of a limited number of brain metastases in patients with stable solid tumors. No significant differences were found in terms of functional independence and overall survival between the 2 arms. We present here the health-related quality of life (HRQOL) results. METHODS: HRQOL (EORTC QOL-C30 and BN-20) was a secondary endpoint in the trial. Of 359 patients, 317 (88.3%) had baseline HRQOL assessments. Compliance was a challenge in this population: 51% of patients completed an HRQOL measure at 6 months, and 45.1% of patients completed an HRQOL measure at 1 year. Therefore, our analysis focused on only the first year after baseline. The primary HRQOL endpoint was global HRQOL; secondary HRQOL endpoints were cognitive functioning, physical functioning, emotional functioning, role functioning, and fatigue. Sensitivity analyses were planned and undertaken for all scales. P values ≤ 0.05 were considered significant, and clinical relevance required a difference of ≥ 10 points. RESULTS: Over the year studied, there were no significant differences in the primary endpoint, global HRQOL ($P > 0.12$). Patients who underwent WBR had a lower physical functioning score ($P = 0.0325$) and deteriorated cognitive functioning ($P = 0.006$). However, the difference in physical functioning was clinically relevant only at week 8, and the difference in cognitive functioning was clinically relevant only at 1 year. No differences between the treatment arms were found for role ($P > 0.1$) or emotional functioning ($P > 0.1$) or fatigue ($P = 0.077$). Exploratory analysis of several other HRQOL scales suggested worse scores for the WBRT group, but these differences were not clinically relevant and were not sustained in time for most other scales. Explorations also suggested that the detriment was generally greater in patients who had WBRT after radiosurgery than after surgical removal of the brain metastases. CONCLUSIONS: Patients who underwent WBRT suffered from worse HRQOL levels even if the differences were modest.

QL-09. "GROANS LESS, SEEMS MORE COMFORTABLE": HARVEY CUSHING'S REDEFINITION OF SUCCESS IN THE OPERATIVE TREATMENT OF SUSPECTED PEDIATRIC INTRACRANIAL LESIONS

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INTRODUCTION: A review of Dr. Cushing's surgical cases revealed his approach to palliative treatment in pediatric patients. METHODS: The Johns Hopkins Hospital surgical records from 1896 to 1912 were reviewed. Forty patients $\leq$ 18 years old who presented with suspected intracranial tumors and underwent surgical treatment were selected for analysis. RESULTS: The 40 patients selected underwent 59 surgical procedures. The mean patient age was 10.3 years (range, 2–18 years), and 35% of the patients were men. Eighteen patients (45%) had no tumors found intra-operatively. These patients had a mean length of stay of 33.3 days; underwent an average of 1.1 operations; and underwent 17 ventricular punctures, 5 lumbar punctures, and 5 intraoperative cerebrospinal drainage procedures. Cushing's illustrations document the thoroughness of his attempts to localize and resect suspected lesions. His notes document extensive use of bedside ventricular and lumbar punctures for palliation and artificial respirations to improve patients' immediate condition. Postoperative condition was improved in 11 patients and remained unchanged in 2 patients. Four patients died during their hospital stay. Autopsies were performed on 3 of the patients; 2 patients had negative findings, and 1 patient had a tuberculoma. Cushing remained in contact with 11 patients via letters. Seven patients had no outcome information; however, Cushing received notification of death for 5 of those patients. Six patients remained in contact with Cushing; 1 died, 3 remained well, 1 was unchanged, and 1 had worsening symptoms. The mean follow-up for patients with negative findings was 9.3 months. The mean time between the first operation and death was 13.6 months. CONCLUSIONS: These examples illustrate Cushing's commitment to improving quality of life in patients, offering decompressive procedures when attempts at location and resection of suspected tumors were unsuccessful. These cases further illustrate the challenges presented by the absence of neuro-imaging techniques and contemporary surgical equipment.

QL-10. SYMPTOM PROFILES IN ADULT PATIENTS WITH EPENDYMOMA: REPORT FROM THE EPENDYMOMA OUTCOMES (EO) PROJECT

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AIMS: The Ependymoma Outcomes Project is an online survey designed to collect information on the clinical course and current health status of patients with ependymoma. Gathering accurate patient information through this online survey can assist in assessing treatment and health practices for a rare disease. METHODS: Adult patients diagnosed with an ependymoma were invited to complete the Ependymoma Outcomes Questionnaire (EOQ) regarding patient demographics, clinical course, and symptom severity using the MD Anderson Symptom Inventory-Brain (MDSI-BT) and -Spine (MDASI-SP). Descriptive statistics were used to report associated demographic and symptom characteristics. RESULTS: Ninety-seven patients (41 men and 56 women) participated. The median age was 48 years (range, 22–77 years), and the median time for diagnosis was 55 months (range, 24–58 months). The most common symptoms at initial presentation in patients with brain ependymoma (n = 44) included headaches (52%), visual problems (46%), and nausea/vomiting (41%). More than half the patients (55%) reported having symptoms at fewer than 6 months prior to diagnosis. For patients with spine ependymoma (n = 47), the most frequent symptom at initial presentation was numbness/tingling (62%), followed by weakness (43%) and back pain (26%). Fifty-seven percent of spine patients reported symptoms at least 1 year prior to diagnosis. In all ependymoma patients, moderate-severe symptoms (defined as greater than 4 on a 0–10 scale) included fatigue (44%) and numbness/tingling (22%). Patients with brain ependymoma described significant cognitive issues (58%) and weakness (18%). Nearly half the spine tumor patients had significant weakness (49%), and a fifth of the patients had sexual dysfunction (20%). CONCLUSIONS: These results demonstrate that an online outcomes survey is feasible even for patients with rare tumors. Furthermore, the results indicate that there are differences in symptom presentation and length of symptoms at initial diagnosis between patients with brain ependymoma and patients with spine ependymoma. However, certain symptoms such as fatigue and sensory abnormalities are common to both groups.

QL-11. OPTIMAL TREATMENT OF MALIGNANT GLIOMAS: EMPIRICALLY EVALUATING THE ROLE OF THE CAREGIVER

Daniel I. Jacobs, Sean A. Grimm, Alfred Rademaker, Laurie Rice, James Chandler, Kenji Muro, Maryanne Marymount, Irene B. Helenowski, Lynne I. Wagner, and Jeffrey J. Raizer; Northwestern University

BACKGROUND: Given the physical and cognitive changes experienced by malignant glioma patients, the primary caregiver plays an essential role in both daily assistance and communication with the treating physician. These responsibilities can be quite burdensome. The purpose of this study was to assess the caregiver perspective on patient quality of life (QOL) and quantify the burden placed on the caregiver. METHODS: The Functional Assessment of Cancer Therapy-Brain (FACT-Br) was administered separately to malignant glioma patients and their caregivers at approximately 2-month intervals. Caregivers responded as they perceived the patient would to measure discrepancies in the patient and caregiver perspectives. In addition, the Caregiver Quality of Life Index-Cancer (CQOLC) was given to caregivers at baseline to assess social, physical, and emotional strain. RESULTS: Eighty-nine pairs of FACT-Br scales were collected from 28 patient-caregiver pairs. A consistent discrepancy between patient and caregiver was seen: patients reported their overall QOL to be better than perceived by their caregivers by an average of 5.7 points on the 200-point scale ($P = .02$). Significant differences were found within subscales of physical ($P = .01$), emotional ($P = .01$), and functional ($P = .01$) well-being. On the CQOLC, caregivers surveyed scored an average of 80.8 on the 140-point scale. This represents a significantly lower QOL ($P = .01$) than average for caregivers across all cancers (93.3). Caregivers in this sample responded most strongly regarding increased levels of stress, distress over seeing their loved one deteriorate, and an increased fear of their loved one dying. CONCLUSIONS: These results demonstrate that communicating with the caregiver can enable the physician to obtain a more comprehensive view of patient QOL and functional status. The treating physician must also recognize the social, physical, and emotional burden of the caregiver role.

QL-12. CORRELATION OF THE MDASI-BT WITH MRI IN PATIENTS WITH HIGH-GRADE GLIOMAS BEGINING BEVCIZUMAB THERAPY

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The purpose of this prospective pilot study of patients with recurrent high-grade gliomas receiving bevacizumab was to determine whether the MD Anderson Symptom Inventory-Brain Tumors (MDSI-BT) scores correlated with changes in the total bidimensional area of enhancing and non-enhancing tumors on magnetic resonance imaging (MRI) studies. If so, this would provide reported, quantifiable, clinical measures of tumor progression and would increase the accuracy of diagnosis. A secondary purpose was to determine if there are specific symptoms or symptom clusters that could aid in predictions of the disease trajectory in adults with recurrent malignant gliomas. Preliminary data were evaluated in March 2010. Twelve patients were enrolled starting in October 2009. Eight patients were eligible for MRI correlation evaluation. In this sample, scores on the MDASI-BT were positively associated with a change in the MRI total bidimensional tumor area results. A Spearman's rho showed a correlation of .88 (2-tailed $P < .007$). No other published studies have made this direct comparison between MRI bidimensional area results and MDASI-BT scores. Fatigue, weakness, drowsiness, and mood problems were the most prevalent symptoms. Symptom distress scored at the moderate-to-severe level for all 6 of the symptom interference constructs at some point for all patients. The symptom burden in this sample resulted in a significant decline in function and quality of life. There are not yet enough data to determine whether specific symptom clusters are present.

QL-13. THE ACCESS TO SPECIALIZED NEUROONCOLOGICAL TREATMENT FOR ADULT HISPANIC BRAIN TUMOR PATIENTS: FINDINGS FROM A SINGLE-INSTITUTION, RETROSPECTIVE STUDY

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BACKGROUND: The Hispanic population accounts for 15% of the U.S. population and represents up to 75% of the inhabitants of cities throughout Southern California. Racial disparities between Hispanic and Caucasian patients with breast or colon cancer are well documented, with Hispanic patients having less access to care and worse outcomes; however, no data are available for patients with primary brain tumors. This study was designed to determine whether adult Hispanic neurooncology patients experience longer delays to surgery, radiation therapy, and oncological care than Caucasian neurooncology patients. METHODS: This retrospective study was conducted at UC Irvine Chao Family Comprehensive Cancer Center. All patients who were diagnosed with a primary brain tumor between 2003 and 2009 were identified, and patients' self-reported ethnicities were recorded. Data collected included age, sex, diagnosis, and insurance status. The duration in days from the date of diagnosis to the date of surgery; from the date of surgery to the date of starting radiation, if indicated; and from the date of finishing radiation to the date of starting chemotherapy, if indicated, were recorded. RESULTS: The majority of Hispanic patients had state health insurance, while the majority of Caucasians had private, HMO insurance. Moreover, 12.8% of Hispanics were uninsured, compared to only 4.5% of Caucasian patients. There were no statistically significant delays in the groups' access to surgery, but a significant delay in access to needed radiation treatment was identified (38.5 days vs. 25 days, $p = 0.023$). CONCLUSIONS: This study demonstrates that racial and socioeconomic (insurance-based) disparities exist between Hispanic and Caucasian patients with brain tumors in terms of access to non-emergent care (radiation therapy). Larger studies are needed to confirm these findings.

QL-14. CAREGIVER DEMANDS AND CAREGIVER MASTERY IN PARTNERS OF HIGH-GRADE GLIOMA PATIENTS

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The partners of patients with high-grade glioma (HGG) encounter a variety of demands imposed by their new role as primary informal caregivers. However, little is known about the factors that are most burdensome for these caregivers and thus negatively affect their ability to cope with their new caregiver tasks. The aims of the present study were 1) to identify the caregiver demands that were most frequently reported by partners of HGG patients and 2) to identify the factors that most strongly predicted feelings of caregiver mastery. Forty-eight partners of HGG patients participated in this study. Caregivers more frequently reported physical caregiver demands (mean, 34.3; standard deviation [SD], 22.9; range, 1–100) such as helping with meals and managing treatment regime than demands concerning role alterations (mean, 23.9; SD, 19.4) such as changes in interpersonal relationships ($t = 3.66$ [42], $P = .001$). However, dealing with these role alterations at the same time was rated to be more stressful (mean, 50.4; SD, 14.9; range, 1–100) than physical caregiver demands (mean 33.2; SD, 10.1; $t = 8.44$[38]; $P = .000$). Moreover, caregivers were less confident about being able to manage these role alterations (mean, 55.0; SD, 13.5) than physical caregiver demands (mean, 40.1; SD, 17.9; $t = 4.62$ [38]; $P = .000$). Finally, lower levels of caregiver mastery were more strongly associated with higher levels of experienced stress ($r = .436$, $P = .007$) than with the amount of caregiver demands ($r = .315$, $P = .051$). Our study demonstrates that partners of HGG patients frequently experience physical caregiver demands. Role alterations are more burdensome, and caregivers are less confident about coping with these alterations. Moreover, feelings of caregiver mastery are more strongly associated with the stress of the demands than with the demands per se. This suggests that caregiving partners might benefit from psychological interventions aimed at enhancing coping abilities concerning their new role as primary informal caregivers. (This study was supported by an unrestricted grant of the Tug McGraw Foundation.)

QL-15. THE EFFECT OF PERITUMORAL EDEMA ON HEALTH-RELATED QUALITY OF LIFE IN WHO GRADE I MENINGIOMA PATIENTS

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BACKGROUND: Studies on the associations between pre- and postoperative peritumoral edema and health-related quality of life (HRQOL) in patients with WHO grade I meningiomas are lacking. In patients with other types of brain tumors, associations between peritumoral edema and clinical symptoms have been demonstrated. Peritumoral edema may contribute to the deficits in neurological and cognitive functioning and consequently patients' HRQOL. AIM: To determine the effects of pre- and postoperative peritumoral edema on HRQOL in patients with WHO grade I meningiomas. METHODS: Twenty-five patients with WHO grade I meningiomas who underwent surgery were individually matched to 25 healthy controls for age, sex, and education level. We determined functional status and

HRQOL at least 1 year postoperatively. HRQOL was assessed with the MOS SF-36, and functional and neurological status was assessed with the Barthel Index, KPS, and Order. Furthermore, we determined the volume of peritumoral edema on pre- and postoperative (3 months) magnetic resonance imaging. The contribution of peritumoral edema to HRQOL was investigated by correlational analysis. RESULTS: No significant differences were found in HRQOL between meningioma patients and healthy controls. However, 76% of patients reported a high level of fatigue, and 32% reported depression. Both pre- and postoperative tumor-related edema volume were found to be significant predictors of the patients' physical functioning, social functioning, and bodily pain. CONCLUSIONS: Peritumoral edema at the time of surgery predicts HRQOL in meningioma patients. Further research should focus on the potentially causal relationship between the effect of peritumoral edema treatment on the one hand and the impact of neurosurgical interventions in meningioma patients with peritumoral edema on the other.

QL-16. HEALTH-RELATED QUALITY OF LIFE IN RADIOLOGICALLY SUSPECTED MENINGIOMA PATIENTS WITH A WAIT-AND-SCAN APPROACH

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BACKGROUND Studies of the associations between treatment and health-related quality of life (HRQOL) in WHO grade I meningioma patients are lacking. In many patients with a suspected meningioma, a wait-and-scan approach is preferred, but the effect of such an approach on HRQOL is largely unknown. This study examined to what extent meningioma patients treated with a wait-and-scan approach experienced problems with HRQOL compared to healthy persons and meningioma patients who had surgery. We also investigated to what extent HRQOL is affected by differences in cognitive functioning in meningioma patients treated with a wait-and-scan approach. METHODS: Twenty-three meningioma patients treated with a wait-and-scan approach were age-, sex-, and education-matched with 23 healthy controls and 23 meningioma patients who underwent surgery. HRQOL was assessed with the MOS SF-36 questionnaire, and cognitive functioning was assessed with a standardized neuropsychological test battery. The relationship between cognitive functioning and HRQOL was investigated by using regression analysis. RESULTS: Compared to healthy controls, wait-and-scan patients attained lower levels of HRQOL but had intact neurocognitive functioning. Meningioma patients who underwent surgery had significantly larger tumors and a significantly higher epilepsy burden than the wait-and-scan patients. Wait-and-scan patients reported worse HRQOL than the surgery patients. The surgery group had poorer neurocognitive functioning. Better executive functioning within the wait-and-scan group was associated with better mental health and fewer role limitations due to emotional problems. Better information processing was associated with fewer role limitations due to health problems. CONCLUSIONS: Meningioma patients with a wait-and-scan approach reported a lower HRQOL than healthy controls and meningioma patients who underwent surgery. Lower HRQOL in these patients was partly related to cognitive dysfunctions. These data suggest that a wait-and-scan approach in suspected meningioma patients with minor signs or symptoms of disease is associated with compromised HRQOL.

QL-17. BEVACIZUMAB ADMINISTRATION TO GBM PATIENTS INCREASES TIME SPENT LIVING INDEPENDENTLY

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It seems apparent that the addition of bevacizumab to the treatment of GBM has resulted in an extension in patient survival. However, it remains unclear whether the survival time gained by bevacizumab is time spent with a high level of independent function. Several years ago, we proposed an Independent Living Score (ILS) (Recht L, Glantz M, Chamberlain M, Hsieh CC, J Neuro-Oncology 2003, 61:127–136) that is both quantitative and weighted to reward independent functioning later in the disease process. We applied this score to a group of patients that were treated with bevacizumab for recurrent GBM and compared their ILSs with those of a control group that was matched according to clinical variables and treated at the same institution. In our preliminary analysis, we examined 15 patients in the bevacizumab group and 14 patients in the group treated with standard therapy. All patients were diagnosed between 2006 and 2009, had histologically verified GBM, and were treated with concurrent radiation and temozolomide. Groups were not statistically different in terms of initial age and KPS score. Thirteen patients in the bevacizumab group and all patients in the control group died. Patients in the bevacizumab group survived longer (20 vs. 13 months, $P = .0.005$; log-rank survival). This was accompanied by a $> 70\%$ increase in ILS in bevacizumab-treated patients (14.1 vs. 8.2; $P < 0.02$; t-test), indicating that the increased survival in bevacizumab-treated patients was associated with maintenance of independent functioning. These preliminary results suggest that the addition of bevacizumab to GBM treatment not only improves survival but also prolongs patients' independent functioning.

QL-18. THE IMPACT OF SYMPTOM INTERFERENCE USING THE MD ANDERSON SYMPTOM INVENTORY-BRAIN TUMOR MODULE (MDASI-BT) ON PREDICTION OF RECURRENCE IN PRIMARY BRAIN TUMOR PATIENTS

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BACKGROUND: Primary brain tumors are a heterogeneous group of neoplasms. Tumor grade, patient age, extent of tumor resection, and patient performance status are established prognostic factors for progression and survival. Development of disease-related symptoms is predictive of tumor recurrence in other cancers but has not been reported for patients with primary brain tumors. METHODS: Demographic and clinical data were extracted from the medical records of a cross-sectional sample of 303 patients with primary brain tumors who completed the MD Anderson Symptom Inventory–Brain Tumor (MDASI-BT) module. Progression was based on the radiology report of the MRI obtained at the time of the visit or within 1 month. Clinical variables (patient age, extent of resection, tumor grade, and KPS), mean MDASI-BT scores, and the Activity Related Interference subscale WAW(work activity and walking) scores were analyzed by logistic regression modeling using backward elimination strategies for prediction of progression on MRI. RESULTS: The study enrolled 303 patients (182 men and 121 women). Patients' ages ranged from 18 to 84 years (median, 46 years). The majority of patients were white ($n = 251$); most patients had less than a gross total resection ($n = 189$; 62%) and a KPS ≥ 90 ($n = 210$). Grade I-IV tumors were included, with 200 patients (66%) having a grade III or IV tumor. Logistic regression was performed, with tumor grade ($P \leq 0.01$; 95% confidence interval [CI], 1.12-2.18) and mean WAW ($P \leq 0.0001$; 95% CI, 1.15-1.35) remaining in the model with 80% correct classification. In a subset of GBM patients ($n = 116$), WAW remained the strongest predictor of progression ($P < 0.001$; 95% CI, 1.1-1.4) with correct prediction of MRI findings in 73% of patients. CONCLUSIONS: Self-reported increased activity interference was associated with recurrence on MRI and was more predictive than KPS, age, or extent of resection. These results suggest that symptom interference corresponds to disease status, but this study is limited by the cross-sectional sample. Additional studies evaluating change over time are needed.

QL-19. DEVELOPMENT AND VALIDATION OF A BEHAVIORAL ASSESSMENT OF DISCOMFORT IN NONVERBAL BRAIN TUMOR PATIENTS: REM SCALE

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BACKGROUND: Brain tumor patients often suffer from troubles with verbal communication, particularly at the end of life. At this point, improving the patient's quality of life and optimally controlling the patient's pain and discomfort are the main goals. However, discomfort is difficult to quantify and relieve in the absence of dedicated tools. OBJECTIVES: To develop and validate a scale of behavioral assessment of discomfort in nonverbal brain tumor patients that is short and can be implemented by all health professionals when self-evaluation becomes insufficient and unreliable. PATIENTS AND METHODS: After investigations with experts in this field and a review of the literature, we proposed a scale including 6 items picked from behaviors and physical signs known to be suggestive of discomfort. During 6 months, all nonverbal brain tumor patients admitted to the neurology unit of Pitie-Salpetriere were included in the study. Two assessors assessed the patients' discomfort before and after a nursing session or treatment against discomfort using the REM scale and a Visual Analogic Scale (VAS), both measuring the clinicians' perception of the patients' discomfort. RESULTS: Fifty-nine patients (34 men and 25 women) were included in the study. The mean age was 58 years (range, 24–83 years). The REM was internally reliable (Cronbach $\alpha = 0.76$), and concurrent validity between total scores of REM and VAS showed significant correlations ($P < .0001$).

The inter-rater reliability was better for the REM (0.74) than for the VAS (0.60). Validity was demonstrated by the change in REM scores for uncomfortable patients with a nursing session or treatment between the 2 assessments, and no change in comfortable patients' scores ($P < .0001$). The principal components factor analysis revealed 3 factors accounting for 80% of the variance in discomfort expression. CONCLUSION: REM is a valid and reliable measure of discomfort in nonverbal brain tumor patients.

QL-20. SYMPTOM BURDEN IN PATIENTS WITH NEWLY DIAGNOSED GLIOBLASTOMA UNDERGOING RADIOTHERAPY PLUS TEMOZOLOMIDE AND ENZASTAURIN: RESULTS FROM A PHASE I/II TRIAL

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The combination of radiotherapy plus temozolomide and enzastaurin is active and well tolerated in patients with newly diagnosed glioblastoma. We report the symptom burden analysis for patients assessed with the MD Anderson Symptom Inventory–Brain Tumor (MDASI-BT). METHODS: Following surgery, patients in the phase I/II trial completed the MDASI-BT prior to radiotherapy, during chemoradiotherapy, and prior to each 28-day cycle of adjuvant chemotherapy. Patients rated 22 symptom items and 6 interference items from 0 to 10, with 0 being the best score. Scores were summarized for each assessment period using descriptive statistics and were classified as none (0), mild (1–3), moderate (4–6), or severe (7–10). Mean changes from baseline were analyzed by paired t-test. RESULTS: Sixty-six patients received the phase II recommended dose of enzastaurin; 73% of patients were men, and 83% of patients had KPS scores > 90. The median age was 56 years; the median number of adjuvant chemotherapy cycles completed was 4.5. The most common reasons for trial discontinuation were disease progression (58%) and adverse events (9%). Sixty-five patients provided MDASI-BT data; 63 patients completed the MDASI-BT at baseline. Assessment compliance over the first 12 cycles for patients continuing therapy was 93%. At baseline, > 65% of patients had mild or no symptoms. Fatigue increased during radiotherapy (mean change, 1.1; $P = 0.001$) and remained elevated during the course of therapy, with > 55% of patients reporting mild or moderate fatigue. Difficulties with concentration, memory, and appetite loss increased during or following radiotherapy, but these symptoms were rated as no worse than mild by > 69% of patients. Other symptoms and items were generally unchanged during therapy except for transient increases following radiotherapy. CONCLUSIONS: In this study, initial symptom burden was low, but fatigue, appetite loss, and cognitive issues increased during chemoradiotherapy. For patients who continued therapy, most symptoms returned to baseline levels.

QL-21. SEIZURE OUTCOME IN PATIENTS WITH LOW-GRADE GLIOMAS

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PURPOSE: More than 70% of patients diagnosed with a low-grade glioma will experience a seizure. We reviewed factors that predict seizure occurrence and outcome in patients with low-grade glioma to determine best seizure management. METHODS: We retrospectively reviewed 98 patients with low-grade gliomas who were evaluated in the Neuro-oncology Program between 2002 and 2008 and had at least 1 year of follow-up. Only patients with supratentorial tumors were included. We collected data on patient characteristics, tumor characteristics, seizures before and after surgery, and treatments for tumor and seizures. The Engel classification was used for seizure outcome. RESULTS: Of 73 patients with supratentorial tumors, 54 (74%) had a seizure; 46 had at least 1 presurgical seizure and 8 developed new-onset seizures after surgery. Multivariable regression showed that patients with ganglioglioma/gangliocytoma, DNET, grade II astrocytoma, grade II oligodendroglioma, or mixed oligo-astrocytoma had a higher occurrence of presurgical seizures than patients with pilocytic astrocytoma, ependymoma/subependymoma, or neurocytoma. Seizure type and cytogenetic status did not significantly affect seizure outcome. Chemotherapy and radiation therapy had a positive effect on seizure outcome. Two patients received a vagal nerve stimulator implant that decreased seizure frequency by > 50%, and 5 patients underwent epilepsy surgery that led to an Engel class I outcome in 4 of the patients. Anticonvulsant medication was tapered in 13 patients, and 10 of the 13 patients had no further seizures. Of 54 patients with seizures ever, 25 (46.3%) had a class I outcome. CONCLUSION: Seizure before surgery is the most important factor associated with the presence of seizures after surgery. Less than half of the patients with low-grade gliomas and seizure had a good seizure outcome. Chemotherapy and radiation therapy may have a favorable impact on seizure outcome.

QL-22. CASE STUDIES OF PATIENTS RECEIVING INTRAVENTRICULAR TOPOTECAN FOR TREATMENT OF NEOPLASTIC MENINGITIS

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As patients with chronic malignancies experience longer survival times, the leptomeninges may increasingly play host to metastatic disease from a variety of primary cancers. Without treatment, patients with neoplastic meningitis (NM) have an overall survival time of only a few weeks. Intrathecal (IT) and intraventricular (IVt) chemotherapy via an implanted ventricular reservoir circumvents the blood-brain barrier and blood-cerebrospinal fluid (CSF)-barrier to provide direct drug–tumor cell contact. However, the chemotherapeutic agents commonly used to treat NM via IVt or IT route often cause intolerable arachnoiditis evidenced by headache, nausea, and vomiting. If untreated, arachnoiditis may cause life-threatening increased intracranial pressure. Toxicities of IT chemotherapy often result in dose reductions, increased steroid use, and chemotherapy discontinuation. Research into effective and well-tolerated treatments continues. The use of IVt topotecan in the treatment of NM results in progression-free and overall survival outcomes similar to other IVt chemotherapies and is particularly well tolerated by most patients. We present case studies of 5 patients who received IVt topotecan for NM. Two patients had primary breast cancer, 1 patient had multiple myeloma, 1 patient had medulloblastoma, and 1 patient had melanoma. We found that IVt topotecan was well tolerated overall, with few symptoms of arachnoidits, making it a viable treatment for patients with NM originating from a variety of primary tumors. Because of its limited toxicity and equivalence in efficacy outcomes compared to other IVt chemotherapies, IVt topotecan should be considered as a first choice for IVt chemotherapy in patients in whom this local-therapy approach is deemed appropriate. Furthermore, IVt topotecan warrants further investigation in combination with other IVt chemotherapies and in combination with newer systemic chemotherapies.

QL-23. RETROSPECTIVE ANALYSIS OF INSOMNIA IN RECURRENT GLIOMA PATIENTS AND ITS ASSOCIATION WITH DEXAMETHASONE AND ANTI-EPILEPTICS

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In quality of life studies in primary glioma patients, sleep disturbance—insomnia in particular—has been identified as a frequent concern. While sleep dysfunction often accompanies depression, which can be seen in primary gliomas patients, insomnia is likely multifactorial in glioma patients, with etiologies ranging from the use of steroids and psychoactive medications to the presence of comorbid psychiatric/medical conditions and damage to neuronal tissue. To better understand insomnia and comorbid disturbances in glioma patients, we performed a retrospective analysis of patients with recurrent glioma who were in clinical protocols at a single center between January 2004 and May 2009. We obtained data on sleep disturbances, use of psychoactive medications, and comorbidities. In this analysis, 327 patients who underwent clinical treatment protocols for recurrent glioma received questionnaires focused on clinical complaints including insomnia, mood disturbance, fatigue, sedation, and cognition. Of the 327 patients, 277 (84%) had recurrent high-grade (grade III-IV) gliomas, and 50 (15%) had recurrent low-grade gliomas. One hundred forty-six (44%) of the patients with recurrent glioma indicated the presence of insomnia; of these, 66 patients (20%) were actively using medications for sleep. Similar complaints were seen in patients with recurrent low-grade glioma (20 patients; 40%) and patients with high-grade glioma (125 patients; 45%). The presence and absence of insomnia complaints were evaluated with other comorbidities using chi-square tests and analysis of variance. Age, gender, race, presence of mood complaints, stimulant use, antipsychotic drug use, antidepressant use, and location of tumor were not significantly associated with insomnia complaints in all patients. More patients with insomnia were currently using antiepileptics (121 patients; 85%; $P = 0.027$) and dexamethasone (76 patients; 52%; $P = 0.00$). In light of the frequency of insomnia and its associations, future investigations into sleep complaints in recurrent glioma patients, their impact on quality of life, and possible treatment are warranted.

QL-24. EXPLORING RELATIONSHIPS OF EXECUTIVE CONTROL AND INDEPENDENT FUNCTION: OBSERVATIONS OF COMPENSATION BEHAVIORS IN ADULTS WITH PRIMARY BRAIN TUMORS

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BACKGROUND: As technological advances improve survivorship rates for adults with primary brain tumors (PBTs), there has been increasing emphasis on understanding the relationship of executive control (ECF) and independent function (IF). While it is accepted that disturbances in ECF are important to IF, specifics remain unclear. Further, while exploring this relationship, observing compensatory behaviors that one may use to maintain independent function may be useful in explaining discrepancies between ECF and IF. The aim of this observational study was to describe compensatory behaviors used by adult survivors with PBT. METHODS: The sample consisted of 5 adults between the ages of 30 and 55 years who completed treatment for malignant PBT and had MMSE scores > 24. Participants completed several inventories designed for the self-report of cognitive function (Everyday Cognition Scale [ECog] and Everyday Memory Scale [EMS]), participation in cognitive activities (Florida Cognitive Activities Scale [FCAS]) and IF (OARS Activities of Daily Living Scale). The ECF test battery included the EXIT-25, Digitized-Trails B, Digit Symbols Modalities Test, Double Flags Visual Reproduction-Delayed, and the Controlled Oral Word Association Test. Observations of compensatory behaviors used by participants during standardized testing were recorded. Participants were also asked to describe the details of behaviors they incorporate in everyday life to perform independent functional activities. RESULTS: The patterns of compensatory behaviors in 5 long-term PBT survivors will be described qualitatively. The relationship between common compensatory behaviors and participants' performance on the ECF test battery and self-report of cognitive function and cognitive activities will be described. CONCLUSIONS: There are known discrepancies between ECF and IF as described by adult PBT survivors and their families. This study describes some potential patterns observed in compensatory behaviors that may aid in explaining these discrepancies. Knowledge of these patterns and individual differences may further aid in developing interventions to diminish cognitive decline over time.

QL-25. VITAMIN D INSUFFICIENCY OR DEFICIENCY IS PREVALENT AMONG PATIENTS WITH GLIOMAS

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INTRODUCTION: The prevalence of vitamin D insufficiency or deficiency (I/D) may be high among cancer patients, with a prevalence of up to 94% in breast cancer patients. Normal serum 25-hydroxy vitamin D levels may decrease all-cancer risk. There is an absence of data regarding vitamin D levels in glioma patients. OBJECTIVE: To assess the prevalence of vitamin D insufficiency (21–29 ng/ml) or deficiency ($<$20 ng/ml) among glioma patients. STUDY DESIGN: Retrospective case series. RESULTS: Eighty-eight patients diagnosed with a glioma (glioblastoma, anaplastic astrocytoma [AA], anaplastic oligodendroglioma [AO], anaplastic oligoastrocytoma [AOA], astrocytoma, oligodendroglioma, or oligoastrocytoma [MOA]) were enrolled in the study. The overall prevalence of vitamin D I/D was 56.8%. By diagnosis, 69.4% (34/49) of patients with glioblastoma had I/D compared to 40% (12/30) of patients with AA, AO, or AOA and 44% (4/9) patients with astrocytoma, oligodendroglioma, or MOA. Analyzed by age, I/D was lowest among 21- to 30-year-old patients (1/9 patients; 11.1%) while the prevalence ranged from 35.3% to 73.7% in subsequent age groups by decade. The prevalence of I/D was highest among patients whose levels were drawn within 1 year following diagnosis (27/38 patients; 71.1%) compared to patients whose levels were drawn 1–2 years after diagnosis (5/15 patients; 33.3%), 2–3 years after diagnosis (5/10 patients; 50%), or >3 years after diagnosis (13/25 patients; 52%). CONCLUSION: Our results suggest that there is a high prevalence of vitamin D I/D among patients with gliomas. There appears to be a higher rate of I/D among patients with glioblastoma than among patients with less aggressive histopathologies. In addition, age (other than very young age) did not appear to influence the prevalence of vitamin D I/D, while the first year after diagnosis with glioma may be the period during which patients are at highest risk for vitamin D I/D. Further analysis regarding known risk factors for vitamin D I/D, such as steroid regimen, antiepileptic drugs, and chemotherapy regimen, is warranted.

QL-26. FEASIBILITY STUDY OF MASSAGE THERAPY WITHIN A BRAIN TUMOR SETTING

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INTRODUCTION: Massage therapy is a commonly used complementary therapy employed in the care of cancer patients to reduce psychological stress and improve quality of life (QoL). A recent literature review concluded that massage therapy was safe and could be included as a part of conventional care for cancer patients. The objective of this study was to determine the safety, feasibility, and acceptability of massage therapy for brain tumor patients and to obtain a preliminary assessment of the efficacy of massage therapy on patient-reported psychological outcomes and QoL. METHODS: The study was a prospective, single-arm intervention study. Participants were patients with primary brain tumors (high-grade glioblastoma) followed at Duke's PRT-BTC who reported experiencing stress. Intervention was as follows: Each participant received a total of eight 45-minute massage sessions given twice weekly for 4 consecutive weeks. Massage sessions employed classic Swedish massage techniques. RESULTS: Our feasibility and acceptability findings were as follows: Twelve patients were approached to participate in study; of these, 10 achieved acceptable testing criteria and completed the study without experiencing any adverse events. As a group, the level of stress dropped significantly between week 2 and week 3. A trend for the reduction in stress continued into week 4. At the end of week 4, all patients' PSS scores were below the threshold to be considered stressed. We also evaluated changes in QoL via the FACT-BR. By the end of the study (week 4), patients reported significant improvements in emotional well-being, additional brain tumor concerns, and social/family well-being. There was also a trend for improvement in patients' physical well-being. CONCLUSIONS: Our findings indicate that participation in a massage therapy program is both feasible and acceptable to newly diagnosed brain tumor patients experiencing stress. Furthermore, patients in this study reported improvements in stress and QoL while receiving massage therapy. (Funds for this study were generously provided by the Massage Therapy Foundation.)

RADIATION THERAPY

RT-01. DETERMINANTS OF THERAPEUTIC RESISTANCE IN GLIOBLASTOMAS: LESSONS LEARNED FROM THE RTOG 0211 AND BEYOND

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CONTEXT: Activation of the epidermal growth factor receptor (EGFR) pathway has been implicated with mediating treatment resistance in glioblastoma multiformes (GBMs). OBJECTIVES: To identify a subset of GBM patients who may benefit from the addition of gefitinib to radiation therapy (RT) through molecular profiling. Using preclinical models, to identify strategies to overcome putative resistance to both RT alone and RT + gefitinib identified from the correlative clinical study. DESIGN: RTOG 0211 was a phase I/II study with 31 patients enrolled for phase I and 147 patients for phase II. Tissue microarrays (70 cases from RTOG 0211, 112 from historical controls) were used for clinical molecular correlative analysis. RESULTS: There was no median overall survival benefit for patients treated with gefitinib + RT versus RT alone. Younger age was significantly associated with better outcome (HR $\geq$ 50 vs. $<$50) = 1.86, (95% CI: 1.22 – 2.83; $P = 0.0037$) in RTOG 0211-treated patients. After adjusting for age, higher levels of SRC and IGFR1 were associated with adverse overall survival in RTOG 0211-treated patients. A cautionary note, GBM patients with elevated levels of SRC and PTEN appeared to have significantly improved overall survival if treated by RT alone versus RT + gefitinib. Patients with lower levels of PTEN appeared to trend towards improved clinical outcome when treated with RT + gefitinib versus RT alone. Addition of SRC inhibitors in the context of high SRC expression or overexpression of PTEN in the context of low PTEN expression could restore the therapeutic benefit of gefitinib in preclinical models. CONCLUSIONS: The addition of gefitinib to RT does not appear to benefit the general, unselected population of GBM patients. Of cautionary significance, our findings reveal biomarker profiles that predict worse outcomes in the setting of combined gefitinib + RT versus RT alone.