SURGERY

SURG-01. LITT FOR IN-FIELD RECURRENCE OF BRAIN METASTASIS AFTER STEREOTACTIC RADIOSURGERY: OUTCOMES AND MECHANISMS OF DEATH

Shabbar Danish[1] and Joel Kaye[2]; [1]Rutgers Cancer Institute of New Jersey, New Brunswick, NJ, USA, [2]Rutgers Robert Wood Johnson Medical School, New Brunswick NJ, USA

INTRODUCTION: Brain metastasis (BM) affects up to one-third of adults with cancer and carries a historically bleak prognosis. Thanks to advances in stereotactic radiosurgery (SRS), patients can live longer, and fewer succumb to their intracranial disease. However, rates of in-field recurrence after SRS range from 10–25%, either as true tumor re-growth or radiation necrosis (RN). In this setting, repeat SRS is not recommended and craniotomy may not be feasible or desired by the patient. Laser interstitial thermal therapy (LITT) is an emerging option with promising outcomes. In this study, we investigated outcomes and determined the mechanisms of death among patients with BM who underwent LITT for in-field recurrence after SRS. METHODS: Single institution retrospective review of patients with BM who underwent LITT for in-field recurrence after SRS. RESULTS: Between 2010–2018, seventy (70) patients with BM underwent LITT for in-field recurrence after SRS. At the time of review, 51/70 (72.9%) patients died, 16/70 (22.9%) were alive, and the status of 3/70 (4.3%) was undetermined. Among those who died, death was neurologic in 17/51 (33.3%), non-neurologic in 21/51 (41.2%), and undetermined in 13/51 (25.5%). Median survival after LITT for patients who died from neurologic and non-neurologic causes were 8.9 and 14.3 months, respectively. Mechanisms of neurologic death included progressive intracranial metastatic disease in eight patients and progressive RN in two. Mechanisms of non-neurologic death were nearly all related to progression of primary or systemic disease. CONCLUSIONS: For patients with BM who develop in-field recurrence after SRS, LITT is a viable alternative to craniotomy and can attenuate the neurological burden of this devastating disease. Among our patient population, very few died as the result of intracranial progression. Future studies that investigate which factors predispose patients to intracranial progression despite LITT will further improve its efficacy and ultimately improve the lives of cancer patients.

SURG-02. LASER INTERSTITIAL THERMAL THERAPY FOR BRAIN METASTASES: OUTCOMES AND PREDICTORS OF LOCAL RECURRENCE

Dhiego Bastos[1], Ganesh Rao[1], Isabella Glitza[1], Jonathan Loree[2], Jeffrey S Weinberg[1], David Fuentes[1], Jason Stafford[1], Komal Shah[1], Vinodh Kumar[1], and Sujit Prabhu[1]; [1]UT MD Anderson Cancer Center, Houston, TX, USA, [2]BC Cancer, Vancouver Centre, Vancouver, BC, Canada

BACKGROUND: LITT has been used to treat recurrent brain metastasis after stereotactic radiosurgery (SRS). Little is known about how best to assess the efficacy of treatment, specifically the ability of LITT to control local tumor progression post-SRS. Objectives: Evaluate the predictive factors associated with local recurrence after LITT. METHODS: Retrospective study with consecutive patients with brain metastases treated with LITT. Based on radiological aspects, lesions were divided into progressive disease after SRS (recurrence or radiation necrosis) and new lesions. Primary endpoint was time to local recurrence. RESULTS: 61 consecutive patients with 82 lesions (5 newly diagnosed, 46 recurrence and 31 radiation necrosis). Freedom from local recurrence at 6 months was 69.6%, 59.4% at 12, and 54.7% at 18 and 24 months. Incompletely ablated lesions had a shorter median time for local recurrence ($p< 0.001$). Larger lesions (>6cc) had shorter time for local recurrence ($p=0.03$). Dural based lesions showed a shorter time to local recurrence ($p=0.01$). Tumor recurrence/newly diagnosed had shorter time to local recurrence when compared to RN lesions ($p=0.01$). Patients receiving systemic therapy after LITT had longer time to local recurrence ($p=0.01$). In multivariate Cox-regression model the HR for incomplete ablated lesions was 4.88 ($p< 0.001$), 3.12 ($p=0.03$) for recurrent tumors, and 2.56 ($p=0.02$) for patients not receiving systemic therapy after LITT. Complication rate was 26.2%. CONCLUSIONS: Incompletely ablated and recurrent tumoral lesions were associated with higher risk of treatment failure and were the major predicting factors for local recurrence. Systemic therapy after LITT was a protective factor regarding local recurrence.

SURG-03. SPATIAL COORDINATES FROM GAMMA KNIFE RADIOSURGERY REVEAL PRIMARY CANCERS HAVE REGIONAL CNS TOPOGRAPHICAL DISTRIBUTION FOR BRAIN METASTASES

Josh Neman[1], Meredith Franklin[2], Zachary Madaj[3], Tim Triche Jr[3], Gal Sadlik[4], Krutika Deshpande[1], and Gabriel Zada[1]; [1]Department of Neurosurgery, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA, [2]Department of Preventive Medicine, Keck School of Medicine, University of Southern California, Los Angeles, CA, USA, [3]Department of Bioinformatics, Van Andel Institute, Grand Rapids, MI, USA, [4]Keck School of Medicine, University of Southern California, Los Angeles, CA, USA

Brain metastases arise in the central nervous system (CNS) following spread of circulating mesenchymal-type cells from primary tumors. While accumulating evidence underlines the importance of the neural niche in the establishment and progression of metastases, there still remains ambiguity over CNS anatomical spatial distribution from primary cancers. We evaluated 973 patients with brain metastases (breast, colorectal, lung, melanoma, renal) totaling 2,106 lesions treated from 1994–2015 with gamma knife radiosurgery at the University of Southern California Keck Medical Center for topographical distribution analysis. MRI images of the brain were taken and used in conjunction with the frame to precisely localize tumors and measure their size. Each tumor was given an x, y, and z-coordinate derived from the head frame that corresponded to its volumetric center within a 3-dimensional Cartesian field. Topographical analyses were conducted using logistic and multinomial spatial generalized additive models (GAM). For each cancer origin type we compared the observed brain metastases to set of randomly generated spatial observations to determine whether there were statistically significant localization patterns. Spatial pattern results show: 1) melanoma has highest probability to metastasize to the right frontal (74.5%, 95% confidence interval [CI] = 63.6%- 85.4%) and to occipital lobe (72.4%, 95% CI = 65.8%-78.9%), 2) while breast cancers have highest proclivity to metastasize to left cerebellar hemisphere (25%, 95% CI=16.0%-34.1%) and brainstem (16.6%, 95% CI= 10.8%-22.4%), 3) with lung tumors metastasizing to the left (23.7%, 95% CI= 16.0–31.3%) and right parietal (24.7%, 95% CI=16.7–32.8%), left temporal lobe (25.2%, 95% CI=21.4%-29.1%). Colon and renal metastases show weak spatial patterns across the CNS. We conclude there is evidence of non-uniform spatial distribution of metastasis in the brain. These tumor-specific CNS topography patterns may underlie the ability of cancer cells to adapt to the regional neural microenvironments in order to facilitate colonization and establishment of metastasis.

SURG-04. SIMULTANEOUS CRANIOTOMIES FOR MULTIPLE BRAIN METASTASES

Kelly Gassie[1], Kaisorn Chaichana[1], Henry Ruiz Garcia, Desmond Brown[2], Daniel Trifiletti[1], and Terry Burns[2]; [1]Mayo Clinic, Jacksonville, FL, USA, [2]Mayo Clinic, Rochester, MN, USA

BACKGROUND: It is well known that for patients with solitary metastatic disease in the brain, aggressive surgical treatment can prolong survival. However, there is a paucity of literature focusing on simultaneous resection of multiple metastatic brain tumors. METHODS: We analyzed 13 patients and 26 tumors between 2005–2019 who had simultaneous resection of at least 2 metastatic brain tumors via either one or two craniotomies. We independently analyzed those patients with simultaneous resection of metastatic disease in both the supra- and infratentorial compartments. RESULTS: Overall, 26 tumors were resected in a simultaneous fashion. There were 7 females (53.8%) and 6 males (46.2%) total. 5/13 (38.5%) patients had previously known brain metastases in which all 5 had previous adjuvant radiation. All 13 patients had 2 metastatic lesions resected during one operation. Gross total resection rate reached 88.5% with a median post-operative stay of 3 days. Complications presented in only 3 out of 13 cases (grade 2 and 3 according to CTCAE). Primary sites of metastatic disease were lung, breast, skin and renal. 12/13 (92.3%) had two distinct craniotomies and 23/26 (88.5%) tumors had gross total resection of both lesions. There were 11 frontal (42.3%), 7 parietal (26.9%), 2 temporal (7.7%), 1 occipital (3.8%) and 5 cerebellar (19.2%) tumors. There were three patients with both supra- and intratentorial tumors with simultaneous resection. All three patients had two craniotomies and two separate incisions. 1 of the 3 had pre-operative SRS. Overall, average local progression since surgery to at least one resected tumor bed was 88.3 days. CONCLUSIONS: Our results suggest that patients with multiple metastatic brain lesions have comparable outcomes and similar rates of surgical risk to those with solitary brain lesions. In patients with simultaneous supra- and infratentorial brain metastatic disease and indications for decompression, safe resection is feasible.

SURG-05. LASER INTERSTITIAL THERMAL THERAPY FOR MELANOMA BRAIN METASTASIS: A CASE SERIES

Ali Palejwala, Kyle O'Connor, Chad Glenn, and Michael Sughrue; University of Oklahoma, Oklahoma City, OK, USA

Stereotactic radiosurgery (SRS) and whole brain radiation therapy (WBRT) have been established as non-invasive treatment modalities for intracranial metastasis from malignant melanoma, with SRS emerging as a safe and effective stand along therapy. However, either due to tumor re-