group produced plasmonics-active gold nanostars (GNS) designed to preferentially accumulate within intracranial tumors and amplify the ablative capacity of LITT while better conforming to tumor boundaries and protecting surrounding tissue. MATERIALS AND METHODS: The 12nm GNS were synthesized using reduced HAuCl4 with Na3C6H5O7 seeds, mixed with AgNO3, C6H8O6, and HAuCL4, and coated with polyethylene glycol then functionalized with methoxy PEG thiol. CT-2A glioma cells were intracranially implanted into mice, followed 18 days later by IV injection of GNS. PET-CT was performed at 10-minutes, 24-, and 72-hours post-GNS administration, with autoradiography (AR) and histopathology (HP) on sacrifice after the last scan. To test the impact of GNS on LITT coverage capacity in appropriately sized *ex vivo* models, we utilized agarose gel-based phantoms incorporating control and GNS-infused central "tumors" in multiple shapes. LITT was administered with the NeuroBlate System. RESULTS: *In vivo*, GNS preferentially accumulated within intracranial tumors on PET-CT at the 24- and 72-hour timepoints. AR and HP confirmed high GNS accumulation within tumor. *Ex vivo,* in cuboid tumor phantoms, the GNS-infused phantom heated 5.5x faster than the control, rising 0.49°C per minute compared to 0.09°C. In a split-cylinder tumor phantom with half containing GNS, the GNS-infused border heated 2x faster and the surrounding area was exposed to 30% lower temperatures. In a GNS-infused star-shaped phantom, the heat spread contoured along phantom boundaries. CONCLUSION: Our results provide evidence for use of GNS to improve the specificity, efficiency, and potentially safety of LITT. The *in vivo* data support selective accumulation within intracranial tumors, and the GNS-infused phantom experiments demonstrate increased rates of heating within the tumor model, heat contouring to tumor borders, and decreased heating of surrounding regions representing normal structures.

SURG-08. LASER INTERSTITIAL THERMAL THERAPY (LITT) VERSUS RESECTION IN THE TREATMENT OF LESIONS IN OR NEAR THE PRIMARY MOTOR CORTEX

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INTRODUCTION: Laser interstitial thermal therapy (LITT) is a minimally-invasive treatment option for radiographically-progressive (RP) brain metastases. This study compares the functional outcomes of LITT vs resection (RS) for lesions in or near the primary motor cortex (PMC). METHODS: Retrospective review was performed of patients treated for PMC lesions by LITT or RS. Functional outcomes were graded relative to pre-treatment symptoms and categorized as improved, stable, or worsened at 30, 90, and 180 days post-LITT/RS. RESULTS: 36 patients were identified with median follow-up of 194 days (IQR 72–503), age 64 years (57–72), and estimated baseline KPS 80 (80–90). 35 (98%) had pre-treatment weakness or motor seizure; 15 (42%) received LITT and 21 (58%) RS; all RS were performed with intra-operative motor mapping while LITT were not. All LITT patients were treated for RP lesions (radiation necrosis (RN) or disease progression) vs. 24% of RS patients (p<0.01). LITT patients trended towards smaller lesions (1.9 cm vs 2.7 cm, p=0.03) and were more likely to show RN (67% vs 5%, p<0.01) and be discharged home (87% vs 52%, p=0.04), with shorter ICU (0 vs 1 day, p<0.01) and hospital stays (1 vs. 2 days, p<0.01). At 30 days, 89% of surviving patients who received RS had stable or improved symptoms, compared to 46% of the LITT cohort (p=0.02). At 90 days, the difference was 88% to 50% (p=0.07), and at 180 days 100% to 80% (p=0.2941). CONCLUSION: In the short term (30 days), patients with PMC lesions have better functional outcomes when treated with RS compared to LITT, while those who survive to the 180-day timepoint experience similar outcomes. These differences are likely due to transient, expected post-LITT edema that subsides with time. Taken together, prognosis and patient priorities are important considerations in the decision between LITT and RS.

SURG-09. BENEFITS OF LASER INTERSTITIAL THERMAL THERAPY IN THE TREATMENT OF BIOPSY-PROVEN RADIATION NECROSIS

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INTRODUCTION: Laser interstitial thermal therapy (LITT) is a minimally-invasive treatment option often used for patients with deep-seated intracranial lesions. It has been implemented as a definitive treatment for radiation necrosis (RN), which occurs in 9–14% of patients after stereotactic radiosurgery (SRS) for brain metastases (BM). Medical management (MM) with steroids is a common first-line therapy, with variable response and numerous side effects, especially regarding immunotherapy. METHODS: Patients with biopsy-proven RN after SRS for BM who received LITT or MM at two academic centers were retrospectively reviewed. Treatment failure was defined as radiographic progression that necessitated a change in management. Measurements of total (TLV) and contrast-enhancing lesion volume (ceLV) were obtained from MRI by semi-automated analysis using the BrainLab iPlan Cranial 3.0 software. RESULTS: Seventy-two patients were followed for 10.0 (4.2–25.1) months and 57 (79%) received LITT. Steroid cessation occurred at a median of 37 days post-LITT compared to 245 days after MM (p<0.01). On Kaplan-Meier analyses, there was no significant difference between the two groups in overall survival (LITT median of 15.2 months vs 11.6 months, p = 0.60) or freedom from local progression (13.6 months vs. 7.06 months), though LITT trended to show a benefit in both metrics. When controlled for follow-up duration, patients treated with LITT were three times more likely to be weaned off steroids prior to the study endpoint compared to those who were medically managed (p=0.003). The LITT cohort demonstrated a general radiographic trend of initially increased CeLV followed by contraction, with significant decreases from pre-operative at 10–12 months (p<0.01). The MM group did not demonstrate any statistically significant radiographic trends. CONCLUSION: These results suggest that LITT for RN significantly reduces the time to steroid cessation and characterize a stereotyped radiographic response to LITT. Future prospective studies will be important to their validation.

SURG-10. THE EVOLVING ROLE OF NEUROSURGERY FOR CENTRAL NERVOUS SYSTEM METASTASES IN THE ERA OF PERSONALIZED MEDICINE

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BACKGROUND: Novel therapies translating into improved survival of patients with advanced cancer have emerged. The number of metastases in the central nervous system is therefore seen to increase. Neurosurgery assumes an expanding role within multi-disciplinary care structures for such patients. METHODS: We performed a comprehensive literature review on the current status of neurosurgery for brain metastases patients. Based on the extracted data, we developed a review from experts in the field on the role of brain metastasis surgery in the era of personalized medicine. RESULTS: Traditionally, three metastases were considered the cutoff to offer surgical resection. With respect to the clinical status, the resection of a symptomatic mass may nowadays be considered even in presence of multiple tumors in a multimodal setting: surgical resection of brain metastasis provides immediate relief from mass effect-related symptoms and histology in case of unknown primary tumor; surgery may help stabilizing the disease, thus enabling further therapy; and in situations where immunotherapy is considered and non-surgical management would require long-term steroid administration, surgery may also provide expeditious relief of edema and reduction of needs for steroids. In patients with multiple brain metastasis and mixed response to non-surgical therapy, tumor resampling may allow tissue analysis for expression of molecular tumor targets. In patients with leptomeningeal dissemination and consecutive hydrocephalus, ventriculoperitoneal shunting improves quality of life but also allows for time to administer more therapy thus prolonging survival. Addressing the limited efficacy of many oncological drugs for brain metastases, clinical trial protocols in which surgical specimens are analyzed for pre-surgically administered agents may offer pharmacodynamic insights. CONCLUSION: Comprehensive neurosurgical care will have to be an integral element of multi-disciplinary oncological centres providing care to patients with brain metastases to improve on therapy and tumour biology research.

SURG-11. SURGERY FOR CONTROL OF BRAIN METASTASES AFTER PRIOR CHECKPOINT INHIBITOR IMMUNOTHERAPY: A SINGLE-CENTER SERIES

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BACKGROUND: Despite the promising results for treating metastatic cancer with checkpoint inhibitor immunotherapies, there are limited data on surgical outcomes for brain metastases (BMs) that have progressed after