METHODS: A single-center retrospective review was performed at an NCI-designated Comprehensive Cancer Center to identify all surgically-resected, previously-irradiated necrotic BrM without adjuvant recurrent malignancy from 1903–2018. Clinical, pathologic, and radiographic parameters were collected. Volumetric analysis determined EOR and longitudinally evaluated perilesional T2-FLAIR signal preoperatively, postoperatively, and at 3-, 6-, 12-, and 24-months postoperatively when available. Rates of time to 50% T2-FLAIR reduction was calculated using cumulative incidence in the competing risks setting with last follow-up and death as competing events. The Spearman method was used to calculate correlation coefficients, and continuous variables for T2-FLAIR signal change, including EOR, were compared across groups. RESULTS: Forty-six patients were included. Most underwent a minimally-invasive radiosurgery with or without whole brain radiation (n=42, 91%). Twenty-seven operations resulted in gross-total resection (59%; GTR). For the full cohort, T2-FLAIR edema decreased by a mean of 78% by 6 months postoperatively that was durable to last follow-up (p<0.05). EOR correlated with edema reduction at last follow-up, with significantly greater T2-FLAIR reduction with GTR versus subtotal resection (p<0.05). There was a trend towards decreased steroid use, from 8mg daily dexamethasone-equivalent (range 2–36) preoperatively to 3mg daily dexamethasone-equivalent (range 2–36) postoperatively (range 2–36; p=0.063). CONCLUSIONS: RN resection conferred both durable T2-FLAIR reduction, which correlated with EOR, and reduced steroid dependency.

SURG-04. SURGICAL RESECTION OF SYMPTOMATIC BRAIN METASTASIS IN PATIENTS WITH NON--small cell lung cancer irrespective from lesion count

Stephenie T. Jungen, David Reinecke, Anna-Katharina Meißner, Roland Goldbrunner, Stefan Grau; Centre for Neurosurgery, Department of General Neurosurgery, Faculty of Medicine and University Hospital Cologne, University of Cologne, Cologne, Germany

BACKGROUND AND PURPOSE: Current guidelines primarily suggest the resection in case of a limited number of brain metastases (BM). With an increasing number of local and systemic treatment options this approach needs reconsideration. Therefore, we aimed to evaluate the role of metastectomy in patients with non-small cell lung cancer (NSCLC) treated in a comprehensive setting disregarding lesion count. PATIENTS AND METHODS: In this monocentric retrospective analysis, patients receiving surgery for 1–3 BM with available demographic, clinical, and tumor-associated parameters were included. Prognostic factors for local control (LC) and overall survival (OS) were analyzed by Log rank test and Cox proportional hazards. RESULTS: Two-hundred-sixteen patients were included: 129 (59.7%) with single/solitary, 64 (29.6%) with 2–3, and 23 (10.6%) with more than three BM. Resection of the symptomatic BMs improved the patients’ Karnofsky performance index (KPI) significantly (p<0.001), enabling adjuvant radiotherapy in 199 (92.1%) and systemic treatment in 119 (55.1%) patients. After a mean radiological follow-up of eight (1–79) months, LC was observed in 83 (38.4%) patients and was not significantly influenced by BM count (p=0.064). After a mean OS after surgery of 12.7 (0–88) months, 120 (55.6%) patients had died. In univariate analysis, BM count showed no impact on OS (p=0.844), while age ≥/< 65 years (p=0.007), and ventriculoperitoneal shunting (27.5%). Eleven patients received adjuvant chemotherapy and 31 underwent radiotherapy. At post-treatment follow-up, symptomatic improvement in 6 patients (19.3%), and hydromyelia (6.5%) were described. Post-treatment performance status scores were statistically superior that pre-treatment scores for patients undergoing biopsy (p=0.001) and tumor resection (p=0.007) coupled with adjuvant chemo/radiotherapy. Mean follow-up was 8 months, and median overall survival was 3 months. Only two cases (4.8%) of pineal metastases recurrence were reported, and median progression-free survival was 3 months. In patients receiving adjuvant chemo/radiotherapy, no survival differences were reported between surgery and biopsy (p=0.912), nor between gross-total and subtotal resection (p=0.220).

SURG-05. NEUROSURGERY FOR BRAIN METASTASIS FROM NON-SMALL CELL LUNG CANCER: SURVIVAL OUTCOME AND PROGNOSTIC FACTORS

De-pe Li, Zhen-ning Li, Tao Duan, Zhen-ning Li, De-pei Li; Department of Neurosurgery, Trauma, Gamma Knife Center, Cancer Hospital, Beijing, China

BACKGROUND: Surgery is an important approach to treat non-small cell lung cancer (NSCLC) brain metastases (BM). Here, we analyzed the survival outcome and prognostic factors for patients with NSCLC after BM resection. METHODS: The Surveillance, Epidemiology, and Results (SEER) database was employed to address the incidence of BM from NSCLC and the current prognosis at population level. 674 contemporaneous NSCLC patients received BM resection at Sun Yat-sen University Cancer Center between 2010 and 2017 were collected. After Cox proportional hazards model was applied for identifying prognostic factors, 60,436 NSCLC patients diagnosed between 2010 to 2017 were enrolled from SEER database. Among them, 8,708 (14.4%) BM were identified at primary NSCLC diagnosis (synchronous BM, SBM). Median overall survival (OS) of SBM was 6 months with 1-, 3-, and 5-year survival percentages of 30.3% and 9.8%, respectively. Furthermore, the survival of BM patients without extracranial metastasis is significantly longer than those with extracranial metastases (median OS: 10 versus 5 months, P<0.001). 223 SBM (cohort A) and 449 BM with treatment history on primary NSCLC (cohort B) were collected from SYSUCC. In cohort A, 86 BM with extracranial metastases were found (38.2%) and the median OS was significantly shorter than those without extracranial metastases (15.2 versus 25.7 months, P<0.001). In cohort B, 255 cases with extracranial metastases were found (56.8%) and their prognosis was also worse than cases without extracranial metastases (median OS: 18.3 versus 22.1 months, P<0.002). Multivariate analyses revealed that younger age (HR=0.71, P<0.003), without extracranial metastases (HR=0.65, P<0.001) and radiation for BM (HR=0.78, P=0.003) were independent factors for better OS. CONCLUSION: Improved survival of patients received BM resection was observed in SYSUCC cohort as comparison with SEER patients with NSCLC and BM. Aggressive local treatment including surgery and radiation is still important in Modern management of BM from NSCLC.

SURG-06. METASTASES IN THE PINEAL REGION: A SYSTEMATIC REVIEW OF CLINICAL FEATURES, TREATMENT STRATEGIES AND SURVIVAL OUTCOMES

Paulo Palmusca1, Ali S. Hasider2, Christian Ogasawara2, Chiibueze D. Nwagwu2, Waseem S. Sago2, Tarek Y. El Ahmadi2; Department of Neurosurgery, Trauma, Gamma Knife Center, Canezuzo Hospital, Catania, Italy; 2Department of Neurosurgery, University College of Medicine, Houston, TX, USA, 3John A. Burns School of Medicine, University of Hawai‘i, Honolulu, HI, USA, 4Emory University School of Medicine, Atlanta, GA, USA, 5Duke University Medical Center, Durham, NC, USA, 6University of Texas Medical Branch School of Medicine, Galveston, TX, USA, 7Department of Neurological Surgery, University of Texas Southwestern Medical Center, Dallas, TX, USA

BACKGROUND: Pineal region metastases are rare but often lead to severe neurological deficits. Surgical resection may play a therapeutic role. METHODS: We searched PubMed, EMBASE, Scopus, and Cochrane according to PRISMA guidelines. Studies reporting clinical outcomes data of patients with pineal region metastases were included. Clinical characteristics, management strategies, and survival data were reviewed. RESULTS: We included 30 studies comprising 46 patients. The median age at diagnosis was 58 years (range 27–82). Lung cancer (30.4%) and carcinomas of unknown origin (15.2%) were the most frequent primary tumors. In 50% of patients, symptomatic pineal metastases preceded primary tumor diagnosis. Headache (66.7%) and confusion (45.2%) were the most common presenting symptoms. Paraneuropathy syndrome (47.6%) and hydrocephalus (87%) were commonly noted symptoms (63.4%) was previously seen in patients with extracranial metastases (median OS: 18.3 versus 22.1 months, P<0.001). Multivariate analyses revealed that younger age (HR=0.71, P=0.003), without extracranial metastases (median OS: 15.2 versus 25.7 months, P=0.001) and radiation for BM (HR=0.78, P=0.003) were independent factors for better OS. CONCLUSION: Improved survival of patients received BM resection was observed in SYSUCC cohort as comparison with SEER patients with NSCLC and BM. Aggressive local treatment including surgery and radiation is still important in Modern management of BM from NSCLC.

SURG-07. PLASMONIC GOLD NANOSTARS TO INCREASE THE EFFICIENCY AND SPECIFICITY OF LASER INTERSTITIAL THERMAL THERAPY (LITT) IN THE TREATMENT OF BRAIN TUMORS

Ethan Srinivasan1, Pakawat Chongsathidkiet2, Ren Odion3, Yang Liu4, Eric Sankey2, Tian Yu-Dinh5, Peter Fecici6; 1Duke University School of Medicine, Durham, NC, USA, 2Duke University Medical Center, Department of Neurosurgery, Durham, NC, USA, 3Duke University, Department of Biomedical Engineering, Durham, NC, USA

INTRODUCTION: Laser interstitial thermal therapy (LITT) is an effective minimally-invasive treatment option for intracranial tumors. Our
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 12 nm 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 gloma 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 cubic tumor phantoms, the GNS-infused phantom heated 5.5x faster than the control, raising 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 temperature. 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, efficacy, 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 Ethan Srinivasan, Emily Lerner, Ryan Edwards, David Huse, Peter Fecci, Duke University School of Medicine, Durham, NC, USA, 2Duke University Medical Center, Department of Neurosurgery, Durham, NC, USA

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 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 Emily Lerner, Ethan Srinivasan, Eric Sankey, Matthew Grabowski, Andrew Griffin, Elizabeth Howell, Balint Orvos, Vadim Tsvankin, Ahmet Akku, Krishna Joshi, Gene Barnett, Peter Fecci, Altunara Memmedova, Duke University School of Medicine, Durham, NC, USA, 2The Cleveland Clinic Lerner College of Medicine, Cleveland, OH, USA

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 followed 18x18 3.0 software. RESULTS: Seventy-two patients were followed for 10.0 (4.2–25.1) months and 77 (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 wean 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 characterizes 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 Philipp Karchesia, Emmanuel Le Ruhn, Stefan J. Grau, Matthias Preusser, Riccardo Squiffetti, Martin van den Bent, Michael Vogelbaum, Louisa von Baumgarten, Manfred Westphal, Michael Weller, Joerg-Christian Tonni, 1Ludwig-Maximilians-University, Munich, Germany, 2University Hospital Zurich, Switzerland, 3University Hospital of Cologne, Cologne, Germany, 4Medical University of Vienna, Vienna, Austria, 5University and City of Health and Science Hospital, Turin, Italy, 6Erasmus MC Cancer Institute, Rotterdam, Netherlands, 7 Moffitt Cancer Center, Tampa, FL, USA, 8University Hospital Hamburg, Hamburg, Germany

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 lesion 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 allowing further therapeutic options. For RN, surgery is considered non-surgical management would require long-term steroid administration, surgery may also provide expedient relief of edema and reduction of needs for steroids. In patients with multiple brain metastases 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 other 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 Kamin Morshed, Jason Chung, Vivek Sudhakar, Daniel Cummins, Kyle Young, Shawn Hervey-Smith, Alireza Ahmet, Andrew Griffin, Alice Prasada, Emily Lerner, Matthew Grabowski, Ryan Edwards, Duke University School of Medicine, Durham, NC, USA, 2The Cleveland Clinic Lerner College of Medicine, Cleveland, OH, USA

INTRODUCTION: The central nervous system (CNS) is one of the most frequent sites of metastatic progression with a 5% to 20% incidence. When the signal-to-noise ratio, there is limited data on surgical outcomes for brain metastases (BM) that have progressed after