

(range 1 – 89.7 months). Dose for repeat radiosurgery was 18–25 Gy in 1–5 fractions, and brachytherapy dose was 55–65 Gy at 5 mm depth. Twelve lesions subsequently had imaging evidence of radionecrosis vs. progression. Of these, eight underwent repeat resection with pathology demonstrating radiation necrosis in five patients (n=4 with SRS, n=1 with brachy) and tumor recurrence in 3 (n=2 with brachy, and n=1 with SRS). Toxicities included: Steroids, 14(35%); imaging progression/necrosis 12(30%); grade 3/4 event, 3(20%); and surgically confirmed radionecrosis 5(12.5%). Local control of retreated lesions at 6 months is 85.5%, and at 12 months is 79.3%, OS at 1 year is 52.5% and at 2 years 46.6%. Local control at one year for repeat stereotactic treatment was 82.9% and for Cs131 brachytherapy was 80.8% CONCLUSIONS: Aggressive re-irradiation after resection for pathologic confirmation appears to be appropriately safe and effective for the majority of patients after local failure of initial radiosurgery.

RADI-23. EXPLORING THE OPTIMAL TIMING OF ROUTINE INITIAL SURVEILLANCE MRI FOLLOWING TREATMENT OF BRAIN METASTASES WITH STEREOTACTIC RADIOSURGERY: A COMPARISON OF TWO APPROACHES

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PURPOSE: To measure the value of early initial surveillance MRI scans in patients with brain metastases undergoing stereotactic radiosurgery (SRS), as MRI scans are a significant cost and patient stressor. **METHODS:** We identified a retrospective cohort of patients with brain metastases treated with SRS and followed at a single institution with scheduled 6-week or 12-week initial surveillance MRI. Imaging interval was based on policy of different providers. Outcome measures included new/progressive lesions, salvage treatment, detection of new lesions before symptoms, and use of surgical resection. **RESULTS:** Two hundred patients were included: 100 consecutive patients scanned with 6-week and 12-week imaging. Eighty-seven and 74 patients in each group had available follow-up imaging and were analyzed. Median time to MRI was 6.7 weeks and 13.5 (p<.001). No difference in primary site, prior SRS, number of treated brain metastases, or use of targeted therapy/immune checkpoint inhibitors was detected. A lower percentage of patients with 6-week MRI had controlled extracranial disease at initial treatment (30% vs 47%, p=.003). Twenty-eight percent with 6-week MRI had findings concerning for new/progressive disease, compared to 47% with 3-month MRI (p=0.01). Fifteen percent (10/87) with 6-week MRI underwent intervention (i.e. SRS, whole brain radiotherapy, or surgery) compared to 34% (20/74) with 12-week MRI (p=0.004). Of patients receiving SRS, a higher percentage had new/worsening neurologic symptoms (45% vs 30%) at follow-up although a lower percentage had new lesions >1cm (20% vs 50%) when discovered. One patient in each group underwent surgical salvage. **CONCLUSION:** While shorter 6-week interval MRI surveillance post-SRS may detect new/progressive disease less frequently than 12-week MRI surveillance intervals, short interval MRI may be more likely to detect new/progressive lesions before symptoms develop. Surgical salvage was uncommon with either schedule. Further study may identify a high-risk subgroup who would benefit from early surveillance.

SURGERY

SURG-01. MANAGEMENT OF SOLITARY BRAIN METASTASIS LESS THAN 4 CM IN DIAMETER. SURGICAL RESECTION VERSUS STEREOTACTIC RADIOTHERAPY: A META-ANALYSIS.

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INTRODUCTION: To treat a solitary metastasis in the brain, surgical resection and/or radiotherapy are the standard treatments of care. However, the clinical scenarios in which to use these techniques alone or in combination are controversial. While a course of stereotactic radiotherapy is often administered to a patient who presents with multiple metastases, surgical resection is often directed against a larger solitary brain metastasis before irradiating the resection bed. The management of a smaller solitary tumor (diameter less than 4 cm) is less clear. Accordingly, our meta-analysis assembled studies that focused on patients with a solitary tumor less than 4 cm in diameter. **METHODS:** Following PRISMA guidelines (PROSPERO ID: CRD42021242434), we searched PubMed, Web of Knowledge, and

Cochrane Library databases for randomized controlled trials (RCT) and observational studies comparing surgery to radiotherapy for solitary metastatic brain tumors less than 4 cm in diameter. From 498 total records, we included 9 studies for meta-analysis. Analysis was performed on R. RESULTS: 2 RCTs and 7 observational studies were identified. 431 patients underwent surgical intervention, and 349 patients exclusively underwent radiotherapy. The surgical treatment cohort did not exhibit a difference in 1-year (OR [95% CI] = 0.866 [0.609–1.289]), 2-year (1.7 [0.843–3.428]), or overall survival (1.18 [0.598–2.327]). However, the surgical treatment group demonstrated greater local tumor recurrence after 1-year (3.975 [1.979–7.987]) and overall local recurrence (3.045 [1.276 - 7.268]). There was no difference between the overall rates of distant recurrence (0.565 [0.218 - 1.466]). **CONCLUSIONS:** Our analysis opens more discussion about the management of solitary brain metastasis. Patient selection is paramount in achieving better local control. Stereotactic radiotherapy should be considered for treatment of solitary brain metastasis less than 4 cm in diameter in selected patients. Future randomized control trials for small solitary masses are recommended.

SURG-02. STEREOTACTIC LASER ABLATION (SLA) FOLLOWED BY CONSOLIDATION STEREOTACTIC RADIOSURGERY (SRS) AS A TREATMENT STRATEGY FOR BRAIN METASTASIS THAT RECURRED LOCALLY AFTER INITIAL RADIOSURGERY (BMRS): A COLLABORATIVE INSTITUTIONAL EXPERIENCE

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INTRODUCTION: In independent clinical trials, ~30% of brain metastases recur locally after radiosurgery (BMRS). For these lesions, treatment with stereotactic laser ablation (SLA, also known as laser interstitial thermal therapy (LITT)) alone achieves a 12-month local control (LC¹²) of 54–85% while repeat SRS achieved LC¹² of 54–79%. Here, we report favorable outcomes for BMRS treated with SLA followed by consolidation radiosurgery (SLA/cSRS). **METHODS:** Clinical outcome of 18 patients with 19 histologically confirmed BMRS treated with SLA followed by consolidation SRS and >3 months follow-up were collected retrospectively across three institutions. Local control was defined as stability or decrease in contrast-enhancing (CE) and FLAIR volume. **RESULTS:** SLA achieved ablation of 73–100% of the BMRS CE volumes. Consolidation hypofractionated radiosurgery (5 Gy x 5 or 6 Gy x 5) was carried out 16–40 days post-SLA (median of 26 days). With a median follow-up of 185 days (range: 93–1367 days) and median overall survival (OS) of 185 days (range: 99–1367 days), 100% LC¹² was achieved. 13/18 (72%) patients that required steroid therapy prior to SLA/cSRS were successfully weaned off steroid by three months post-SLA/cSRS. Post-SLA, KPS declined for 3/19 (16%) patients and improved for 1/19 (5%) patients. No KPS changes occurred subsequent to consolidation SRS. There were no 30-day mortalities or wound complications. Two patients required re-admission within 30 days of SRS (severe headache that resolved with steroid therapy (n=1) and new-onset seizure (n=1)). Except for two patients who suffered histologically confirmed, local failure at 649 and 899 days, all other patients are either alive (n=5) or died from systemic disease progression (n=11). None of the treated patients developed symptomatic radiation necrosis. **CONCLUSIONS:** This collaborative institutional experience support efficacy and safety of SLA followed by consolidation SRS as a treatment for BMRS. The treatment strategy warrants further investigations.

SURG-03. THE EFFECT OF SURGERY ON RADIATION NECROSIS IN IRRADIATED BRAIN METASTASES: EXTENT OF RESECTION AND LONG-TERM CLINICAL AND RADIOGRAPHIC OUTCOMES

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OBJECTIVE: Radiation therapy is a cornerstone of brain metastasis (BrM) management but carries the risk of radiation necrosis (RN), which can require resection for palliation or diagnosis. We sought to determine the relationship between extent of resection (EOR) of pathologically-confirmed RN and postoperative radiographic and symptomatic outcomes.

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 admixed recurrent malignancy from 2003–2018. 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 prior stereotactic radiosurgery with or without whole-brain irradiation (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 12-months postoperatively (range 1–8; 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

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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 BM(s) 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 \geq 65 years (p=0.007), pre- and postoperative KPI \geq 70 (p=0.002 and p=0.005, respectively), extracranial metastases (p=0.004), adjuvant radiation therapy (p<0.001), and adjuvant systemic treatment (p<0.001) did. In regression analysis the presence of extra-cranial metastases (HR 2.30 95%CI 1.53–3.48; p<0.001), adjuvant radiation therapy (HR 0.97 95%CI 0.23–0.86; p=0.016), and adjuvant systemic treatment (HR 0.37 95%CI 0.25–0.55; p<0.001) remained independent factors for survival. **CONCLUSIONS:** The indication for resection of symptomatic BM in patients with NSCLC is justified even in case of multiple lesions to alleviate their neurological symptoms and to enable further treatment.

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

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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 End 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 (SYSUCC) were used for survival comparison and Cox proportional hazards model was applied for identifying prognostic factors.

RESULTS: 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-, and 3-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). 225 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 23.7 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=0.005) 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

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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. Parinaud's syndrome (47.6%) and hydrocephalus (87%) were commonly noted. Biopsy (67.4%) was preferred over surgical resection (32.6%). The most common CSF diversion protocols were endoscopic third ventriculostomy (45%) and ventriculoperitoneal shunting (27.5%). Eleven patients received adjuvant chemotherapy and 31 underwent radiotherapy. At post-treatment follow-up, symptomatic improvement (55.2%) and hydrocephalus reduction (80%) 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). Overall survival was neither correlated with surgical approach (P=0.157), nor with CSF diversion protocol (P=0.822). **CONCLUSION:** Pineal region metastases can severely impair clinical status. Biopsy or surgical resection may significantly improve symptoms and baseline performance status when combined with adjuvant chemo/radiotherapy and CSF diversion.

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

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INTRODUCTION: Laser interstitial thermal therapy (LITT) is an effective minimally-invasive treatment option for intracranial tumors. Our