INTRODUCTION: To assess tumor control and survival in patients treated with stereotactic radiosurgery (SRS) for 10 or more metastatic brain tumors, METHODS: Patients were retrospectively identified. Clinical records were reviewed for follow-up data, and post-treatment MRI studies were used to assess tumor control. For tumor control studies, patients were separated based on synchronous or metachronous treatment, and control was assessed at three-month intervals. The Kaplan-Meier method was employed to create survival curves, and regression analyses were employed to study the effects of several variables. RESULTS: Fifty-five patients were treated for an average of 17 total metastases. Forty patients received synchronous treatment, while 15 received metachronous treatment. Univariate analysis of LC showed that the median percentage of tumors controlled at 100%, 90%, and 70% was 100%, 50%, and 90% at 6, 12, and 24 months, respectively. Among patients with metachronous treatment, the median percentage of tumors controlled after each SRS encounter was 100% at all three time points. CONCLUSIONS: SRS can be used to treat patients with 10 or more total brain metastases with acceptable tumor control and survival that is equivalent to that reported for patients with four or fewer tumors. Development of new metastases leading to repeat SRS is not associated with worsened tumor control or survival. Survival may be adversely affected in patients having a higher volume of normal brain irradiated.

RADI-19. EVALUATION OF BRAIN METASTASIS LOCAL CONTROL POST RADIOSURGERY VIA MACHINE LEARNING AND RADIOMICS
Joseph Disce, Christopher Abraham, Douglas Caruthers, Sasa Mutic, and Clifford Robinson; Washington University; St. Louis, MO, USA

Stereotactic radiosurgery can be used to treat multiple, surgically inaccessible, metastatic brain lesions in a single, minimally invasive outpatient procedure. For brain metastasis, stereotactic radiosurgery can provide excellent local control depending on the robustness of the treatment plan. Previous studies have been performed correlating key radiation planning factors to higher local control probability such as tumor size and maximum dose. However, a separate non-inferiority study demonstrated that higher prescription isodose lines (in excess of 70%) or higher) did not correlate to local failure. The previous works were limited to shallow feature levels regarding only the diom plan information and lacked a predictive model. In order to address these conflicting conclusions and to support clinical decision making, we propose a radiosurgery informatics pipeline to support testing these hypotheses with observational data. First, a multidisciplinary team generated a mind-map of relevant information to inform database design. Portions of this mind-map were implemented in a relational database system (PostgreSQL), and populated with information from 1024 patients treated for brain metastases via stereotactic radiosurgery. Clinical information was derived from curated databases and the array of intervention variables were mined from the DICOM RT plans, structure sets, images and dose via MATLAB scripts. These factors include, but are not limited to, radiation dosimetry, prior whole brain radiation therapy (WBRT), prior radiosurgery status, and physician determined local control status. From this pipeline, we plan to use a multi-level feature-based supervised machine learning approach that will be created via boosting to predict local control in patients using local failure timing, or lack thereof, provided by physician. To control for local failure observer bias, an unsupervised machine learning model via random trees will be created to predict clusters of patient parameters with similar local control rates.

RADI-20. RETROSPECTIVE OUTCOME ANALYSIS OF INTRAOPERATIVE RADIOTHERAPY (IORT) FOR SURGICALLY RESECTION BRAIN METASTASES: AN INTERNATIONAL COOPERATIVE STUDY.
Christopher Cifarelli, J. Austin Vargo,1 Joshua Hack,1 K. Henning Kahl,2 Stefanie Breher,3 Gustavo Sarras,1 and Frank Giordano1; 1West Virginia University, Morgantown, WV, USA, 2Univeristy Hospital Mannheim, Germany

BACKGROUND & OBJECTIVE: The ideal delivery of adjuvant radiation to the surgical cavity of brain metastases (BMs) remains the subject of debate. Risks of leptomeningeal dissemination (LMD), local failure (LF) and radiation necrosis (RN) have prompted a reappraisal of the timing and/or modality of this critical component of BM management. IORT delivered at the time of resection for BMs requiring surgery offers the potential for improved LC and reduced LMD afforded by the elimination of delay in time to initiation of radiation following surgery and the possibility of dose escalation beyond that seen in stereotactic radiosurgery (SRS). This study provides a retrospective analysis with identification of potential predictors of outcomes. METHODS: Retrospective data was collected on patients treated with IORT immediately following surgical resection of BMs at three institutions according to the approval of individual IRBs. All patients were treated with the Zieos Intraframe device (Carl Zeiss Meditec, Germany) using spherical applicators ranging from 1.5 to 4.0cm with 50kV output. Statistical analysis was performed using SPS (IBM) with endpoints of LC, DBF, incidence of RN, and overall survival (OS) and p< 0.05 considered significant. RESULTS: 54 patients were treated with IORT with a median age of 64 years. The most common primary diagnosis was non-small cell lung cancer (40%) with the most common site of disease (18%) in the parietal lobe. Median follow-up was 7.2 months and 1-year LC, DBF, and OS were 80%, 58%, and 73%, respectively. LMD was identified in 2 patients (3%) and RN present in 4 patients (7%). The only predictor of LC was extent of resection with 1-yr LC of 94% for GTR vs 62% for STR (p=0.049). CONCLUSIONS: IORT is a safe and effective means of delivering adjuvant radiation to the BM resection cavities with high rates of LC and low incidence of RN.

RADI-21. STEREOTACTIC RADIOSURGERY FOR 10 OR MORE BRAIN METASTASES PROVIDES EXCELLENT RATES OF INTRACRANIAL DISEASE CONTROL WITH SUPERIOR HIPPOCAMPAL SPARING.
Matthew Susko,1 Michael Garcia,1 Lijun Ma2, Jean Nakamura3, David Raleigh,1 Shannon Fogh1, Encouse Golden3, Philip Teodosopoulos2, Michael McDermott2, Penny Sneed,1 and Steve Brausenstein1; 1University of California, San Francisco, Department of Radiation Oncology, San Francisco, CA, USA, 2University of California, San Francisco, Department of Neurological Surgery, San Francisco, CA, USA

BACKGROUND: Recent evidence supports hippocampal sparing during whole brain radiotherapy (WS-WBRT) to improve neurocognitive outcomes in patients with brain metastases (BM). This study sought to quantify the hippocampal dosimetry and treatment efficacy of stereotactic radiosurgery (SRS) to 10 or greater BM to clarify the roles of SRS and WBRT. METHODS: Patients at a single institution treated with SRS to 10 or more BM without WBRT from 1999 to 2016 were retrospectively reviewed. Treatment-related outcomes including overall survival (OS), freedom from progression (FFP), freedom from new metastases (FFNM), and adverse radiation effect (ARE)