Material and Methods: Between July 20011 and July 2015, 138 patients, 66 men and 72 women, with large brain metastases from different solid tumors have been treated with HSRT, using Volumetric Modulated Arc Therapy Rapid-Arc (VMAT-RA) in flattening filter-free (FFF) beams mode. The total doses prescribed were 30 Gy in 3 fractions or 30 Gy in 5 fractions in relation to the size and site of BM or 30 Gy in 3 fractions on tumor bed in patients underwent surgical resection.

Results: At a median follow-up time of 10.6 months (range 2-53 months) 6 (4%) patients had local relapse at a median time of 8 months (range 2-53 months) and 45 (32%) patients distant brain progression at a median time of 8 months (range 2-26 months). The 1- and 2-year local control rates were 90% and 87% respectively. The 1- and 2-year survival rates were 72% and 42 % respectively. At the last observation time 99 (71.7%) patients were alive and 39 (28.3%) dead. Eighty-five percent of patients succumbed to their extracranial disease and 15% died of progressive intracranial disease. During HSRS no increases of corticosteroid or AED have been needed. No and 15% died of progressive intracranial disease. During HSRS percentages of patients succumbed to their extracranial disease and 15% died of progressive intracranial disease. During HSRS no increases of corticosteroid or AED have been needed. No

Conclusion: Failure of surgery is a safe and effective treatment option for patients with large brain metastases. In our series better local control was recorded in case of metachronous BM, and oligometastatic brain failure were significant predictive factors for survival after DBF.

PO-0655
Targeted therapy and stereotactic radiotherapy in brain metastases from renal cell carcinoma
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Purpose or Objective: To retrospectively evaluate safety and brain control (BC) in patients (pts) with 1-4 brain metastases (BM) from renal cell carcinoma (RCC) submitted to stereotactic radiotherapy (SRT) or fractionated stereotactic radiotherapy (FSRT) with or without target therapies (TTs).

Material and Methods: 46 pts with 74 BM were treated. Male/female ratio was 31/15, median age was 62y (range, 29-76). Median KPS was 100% (range, 50-100), 14 (37%), 27 (59%) and 2 (4%) pts were in RPA class 1, 2 and 3, respectively, and 37 (80%) pts had extracranial metastases. Disease control was achieved in 28 (61%) and 18 (39%) pts. Neurologic functional score was generally good (NFS=0-2) having only 5 (11%) NFS=3. Relapse was defined “in-field” when more than 95% of the recurrence volume was within the original 50% isodose, and “out-field” in the other cases. Median number of irradiated lesions per patient was 1 (range, 1-4). 37 (80%) pts with 63 BM (85%) received RT at a median dose of 20Gy (range, 15-25). Remaining 9 (20%) with 11 lesions (15%) were underwent FSRT at a dose of 5x6-7Gy. 21 (46%) pts did not receive TTs, 19 (46%) received concomitant and 6 (8%) post- irradiation TTs (sunitinib, sorafenib, pazopanib, mTOR inhibitors, bevacizumab).

Results: At a median follow-up of 19 months (range, 1-51), 41 (89%) pts with 66 (89%) BM were evaluable. Local control was obtained in 96% of BM: there were complete remission in 29 (44%), partial remission in 25 (38%), stable disease in 9 (14%), and progression in 3 (4%) BM. During follow up, 21 (51%) pts had no brain progression, 4 (10%) had in-field relapse, 15 (37%) out-field relapse, and 1 (2%) in- and out-field relapse. Of 20 (49%) relapsing pts, 14 (70%) were retreated with DBF and FSRT (8, 3, 2, and 1 respectively). In-field relapse occurred after a median time of 21.5, out-field relapse after a median time of 8 months. At the time of analysis, 39/41 pts (95%) had died, 9 (22%) for brain progression, 30 (73%) for systemic progression. Global median duration of BC was 22 months (range, 3-51) and global median OS from irradiation was 19 months (range, 4-53). No difference in outcome and toxicity was registered comparing pts re-irradiating or not TTs. Deaths due to brain or systemic progression occurred after a median time of 12 and 20 months, respectively.

Conclusion: Effectiveness of RT and FSRT in RCC BM was confirmed. The addition of concomitant TTs, though safety, does not seem to improve outcomes.

PO-0656
Radiosurgery in brain metastases: a mono-institutional experience
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Purpose or Objective: To evaluate the local control and survival in patients with brain metastases treated with stereotactic radiosurgery (SRS) as primary treatment approach and to identify predictors of distant brain failure (DBF).

Material and Methods: From 2010 to 2014 three hundred and eleven brain metastases in 204 consecutive patients were treated with SRS at University of Turin. Patients eligible for SRS had one to five brain lesions, metastases size≤3 cm, Karnofsky performance status≥ 70 and life expectancy ≥ 3 months. A total of 172 patients with 266 brain metastases were analysed. Doses ranged from 18-24 Gy in single fraction related to lesion size. Local control (LC), overall survival (OS) and distant brain failure were estimated using the Kaplan-Meier method. Univariate and multivariate analysis were performed to determine the prognostic factors for treatment outcomes and DBF.

Results: The median follow-up was 24.9 months. The 6- and 12-month local control rates were 88.5% and 75.1% respectively. 46 patients recurred locally after SRS on 55 brain metastases, with a median time to local failure of 12.1 months. The median overall survival was 12.8 months, with 6- and 12-month OS rates of 74.5% and 53.8% respectively. On multivariate analysis, no significant prognostic factors were associated with local control and survival outcome, even if RPA class (I versus II) and metastases diameter showed a trend of significance for OS (p<0.1 e p=0.10 respectively). A distant brain failure was observed in 88 patients (43.2%), with a median time to DBF of 5.5 months. 60.8% of these patients maintained an oligometastatic intracranial disease ≤ 5 brain lesions ), while 39.2% of patients developed multiple brain metastases. Salvage therapy was delivered in 46.5% of DBF patients, consisting of WBRT in 28.4% of cases and SRS on metastases of new onset in 18.1% of patients. However, more than half of patients with DBF (53.5%) did not require any salvage treatment. Prognostic factors significantly associated with prolonged DBF-free survival on multivariate analysis included the number of brain metastases (≥2 p=0.000) and breast primary (p=0.026). Tumor sizes 10 mm, sable extracranial disease and oligometastatic brain failure were significant predictive factors for survival after DBF.

Conclusion: Stereotactic radiosurgery is an effective and well-tolerated treatment option in patients with oligometastatic disease. SRS might also represent a valid salvage strategy in patients relapsing in order to delay or completely avoid WBRT.

PO-0657
Does Radiomics have prognostic value in glioblastoma?
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Purpose or Objective: To retrospectively evaluate safety and DBF-free survival on multivariate analysis included the number of brain metastases ≤2 p=0.000) and breast primary (p=0.026). Tumor sizes 10 mm, sable extracranial disease and oligometastatic brain failure were significant predictive factors for survival after DBF.

Conclusion: Stereotactic radiosurgery is an effective and well-tolerated treatment option in patients with oligometastatic disease. SRS might also represent a valid salvage strategy in patients relapsing in order to delay or completely avoid WBRT.

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Does Radiomics have prognostic value in glioblastoma?
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Purpose or Objective: Radiomics is the high-throughput extraction of large amounts of features from radiographic images and allows to capture intra-tumoral heterogeneity in an non-invasive way. It can therefore have an important role in predicting clinical outcome and has the potential to support personalized medicine for the treatment of different types of cancer. The value of Radiomics has already been shown for head-and-neck- and non-small cell lung cancer. In this study we assess the prognostic value of CT Radiomics in glioblastoma (GBM) patients.

Material and Methods: Clinical data were obtained from 125 patients with a GBM, diagnosed with a biopsy only and treated with radiotherapy +/- TMZ between 2004 and 2015 at our institute. Patients underwent pre-treatment CT imaging and the tumor volume was manually delineated for treatment planning purposes. Pretreatment images from 74 patients were available for analysis. In total, 161 Radiomic features were extracted, comprising: a) first-order statistics, b) shape, and c) (multiscale) texture. Multivariable Cox proportional hazards (Cox PH) regression was performed using least absolute shrinkage and selection operator (LASSO) model selection (100 times 10-fold cross-validated). First, a Cox PH model consisting of only clinical features was fitted. A second model consisted of both clinical and Radiomic features, for which the Radiomic feature space was first reduced by selecting cluster medoids after hierarchical cluster analysis using correlation ($\rho>0.9$) as a distance metric. Reduced sets were used to perform the final Cox PH cluster analysis using correlation ($\rho>0.9$) as a distance metric. Reduced sets were used to perform the final Cox PH model.

Results: At a median follow up of 7.4 months, 8 (11%) of the patients were still alive at time of analysis. Mean age was 64 years (20 - 86). WHO performance status was <2 for 82%. Sixty-six percent of patients was concurrently treated with TMZ. Median overall survival was 6.5 months after treatment. The time-dependent AUC curves for the clinical model (C-index: 0.65) and the model including Radiomics (C-index: 0.71) are shown in Figure 1, Table 1. Incorporation of Radiomic features resulted in an overall higher time-dependent AUC. The model including Radiomics (C-index: 0.71) is significantly higher C-index than the clinical model (C-index: 0.65).

Conclusion: Radiomics has the potential to predict outcome using the pre-treatment CT and possibly identify clinical subgroups which can support personalized treatment for GBM. Additionally the dataset will be expanded to MR imaging, the leading imaging modality in GBM.

PO-0658 Linear accelerator radiosurgery for arteriovenous malformations: a single institution experience S. Yahya1, G. Heyes1, P. Nightingale2, S. Lamin2, G. Cruickshank2, I. Geh1, D. Spooner1, P. Sanghera1

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Purpose or Objective: Arteriovenous malformations (AVMs) are the leading cause of intra-cerebral haemorrhage. Stereotactic radiosurgery (SRS) is an established treatment for arteriovenous malformations (AVM) and commonly delivered using Gamma Knife. Linear accelerator (LINAC) SRS is often more widely available however there is debate over whether if offer equivalent outcomes. The aim of this project is to evaluate the outcomes using LINAC SRS for AVMs within a large UK neurosciences unit.

Material and Methods: Fifty sequentially treated patients with an AVM were identified from a prospective SRS database at a tertiary university hospital with a neurosciences unit. Planning was performed using Brainlab’s BrainScan 5.3.1 treatment planning system, utilising a rigid fixed headframe and radiographic localisation box to determine target co-ordinates. Treatment was performed using multiple co-planar arcs delivered with a Varian600C linear accelerator at 6MV fitted with the Brainlab external stereotactic collimator system (fixed cones 10-35mm diameter). A review of all imaging was undertaken by a neurovascular radiologist to confirm obliteration and post SRS necrosis. A retrospective review of case notes was undertaken to confirm toxicity which was recorded using CTCAE Version 4. All outcomes were correlated prospectively recorded dose metrics.

Results: Forty six patients data analysed with median follow up of 5 years (1-14 years).Median age at first SRS treatment was 37.3 years (15-71 years) with 24 male and 22 female patients. Median lesion volume treated was 1.97cm$^3$ (mean 2.81cm$^3$ range 0.11-19.50).The median radiosurgery dose was 19.9 Gy (range 13.0 – 28.7). The median normal brain volume V12Gy was 5.86cm$^3$ and the median gradient index was 4.4 (2-9.9). Overall obliteration rate at 3 years was 71.7%. The overall incidence of CTCAE v 4 grade 3 or 4 toxicity was 6.5%. One patient presented with cognitive and mobility decline 3 years after treatment and was diagnosed with hydrocephalus. One patient had recurrent bi-frontal headaches with nausea and vomiting (MRI showed necrosis). One patient had refractory epilepsy (pialenal AVM) although no imaging features present to support necrosis.

Conclusion: LINAC based SRS offers similar outcomes in terms of obliteration and toxicity to other platforms. Recent