5.2-11.5%), again with high heterogeneity (I2=81.0%) among studies.

Conclusion: All included studies have shown some limitations: most of them were retrospective and all were non-comparative; many of them were carried out in absence of a rigorous methodology and only few reported a measure of variability for the primary endpoint. Despite these limitations, we can conclude that SRS appears safe and effective treatment for intracranial meningioma.

PO-0642

Radiosurgery without whole brain radiotherapy in brain metastases from non-small cell lung cancer

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Purpose or Objective: patients (pts) with 1-4 brain metastases (BM) from non-small cell lung cancer (NSCLC) submitted to radiosurgery (SRS) alone were retrospectively evaluated.

Material and Methods: 130 pts with 207 BM were identified. Pts were treated with a 5-MV linear accelerator fitted with a commercial dynamic μMLC. Doses were prescribed to isocentre so that at least the 90% isodose line encompassed the target volume. Doses were chosen according to maximum diameter of the tumor as suggested by RTOG Protocol 90-05. Male/female ratio was 90/40, median age was 64 years (range, 31-86). Median KPS was 100% (range, 70-100). 42/130 (32%) pts had extracranial metastases, 83 (64%) pts had a controlled systemic disease, and 47 (36%) progressive disease. Neurologic functional score was generally good (NFS = 0), and only 15 (11.5%) pts had an NFS = 3 or 4. 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.

Results: In 82 (63%) pts there was only one BM, in remaining 48 (37%) 2-4 BM with a median volume of 0.8cc (range, 0.09-25) Median prescribed dose was 23 Gy (range, 12-25). At a median follow-up of 67 months (range, 24-110), 123 (95%) pts with 197 (95%) BM were evaluable. Local control, evaluated 3 months after SRS, was obtained in 95% of lesions: there were complete remission in 50 (25%), partial remission in 77 (39%), stable disease in 62 (31%), and progression in 13 (5%) BM. During follow up, 63 (51%) pts had no brain progression of disease, 11 (9%) had in-field relapse, 40 (33%) out-field relapse, and 9 (7%) in- and out-field relapse. Of 60 (49%) relapsing pts, 37 (62%) were retreated: 19 with SRS, 15 with whole brain radiotherapy (WBRT), 2 with fractionated stereotactic radiotherapy, and 1 with surgery and WBRT. No SRS-induced late toxicity was registered. At the time of analysis, 119/123 patients (97%) had died, 40 (34%) for brain progression, 72 (60%) for systemic progression and 7 (6%) for non-oncological causes. The median overall survival was 13 months, deaths from brain progression occurred after a median time of 51 months, while from systemic progression after 19 months.

Conclusion: SRS without upfront WBRT is an effective treatment of BM from NSCLC. Since that our results are similar to the best published data on SRS plus WBRT, SRS alone could be considered the treatment of choice in this setting.

PO-0643

Stereotactic hypofractionation in combination with radiosurgery in the treatment of brain metastases

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Purpose or Objective: To estimate the clinical results of hypofractionated stereotactic radiotherapy (HSR) alone or in combination with stereotactic radiosurgery (SRS) for the treatment of brain metastases using different radiation devices, which provide precise delivery of a high radiation dose to the target.

Material and Methods: Between November 2010 and July 2015, 257 patients with brain metastases were treated by HSR alone or simultaneous application of two stereotactic radiation techniques (SRS plus HSR) at the Radiosurgical Centre of IIBS (Saint Petersburg, Russia). Radiation treatment was performed with Gamma Knife 4C and Perfexion (Elekta AB, Stockholm, Sweden), Cyber Knife (Accuray, Sunnyvale, CA, USA) and linear accelerator TrueBeam STX (Varian Medical Systems, Palo Alto, CA) equipped with the BrainLAB Exac Trac system. The indications for HSR were determined by the presence of large volume lesions or proximity to critical brain structures. Patients with multiple brain metastases were subjected to a combination of HSR and SRS. Radiation schemes were selected depending on the number of metastases, size, location, proximity to critical brain structures, histological type of primary cancer and the patient's general condition. SRS was performed with the marginal dose of 18 – 24 Gy at 40 – 90 % isodose and HSR was performed with the total dose of 24, 27 or 30 Gy in 3 fractions. Following treatment the patients underwent control MRI examination with standard protocols (2 mm T2 and 1 mm T1 with double contrast enhancement) at 8 weeks and then every 3 months. The median follow-up period was 6 months.

Results: The study revealed that the application of hypofractionated stereotactic radiotherapy for the treatment of large volume or critically located brain metastases provides a high level of local control (12-month local control rate was 83 %). Complications in the form of radiation necrosis occured in 15 % of patients at a median of 6 months after treatment. The median overall survival for the entire patient cohort was 9 months. There was no statistically significant difference in the median survival of the patients receiving HSR alone and those receiving HSR plus SRS. The best results were obtained in patients belonging to the first RPA-class who achieved two-year survival in 70 % of the cases. The advantage of combining SRS and HSR is the possibility to deliver high radiation doses to large volume lesions, without exceeding the brain's tolerance. HSR allows one to achieve a rapid shrinkage of large volume tumors, which considerably improves the patient's neurological condition.

Conclusion: High-dose stereotactic radiation is a safe and effective method for controlling brain metastases. A combined application of SRS and HSR is a viable treatment strategy for patients with multiple brain metastases who have at least one large lesion or a lesion located in/near critical brain structures.

PO-0644

Hippocampal sparing brain radiotherapy using VMAT to the primary brain tumour

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Purpose or Objective: We hypothesized that hippocampal-sparing radiotherapy using volumetric modulated arc therapy (VMAT) could preserve cognitive function of the patients with primary brain tumor treated with brain radiotherapy.

Material and Methods: We prospectively collected patients who were diagnosed with primary brain tumor and treated with brain radiotherapy from March 2014 to April 2015. Brain radiotherapy was delivered using VMAT planning technique with inclined head position. Optimization criteria for the

hippocampus dose was Dmax less than 17Gy without compromising the coverage of planning target volume (PTV) and other organs at risk were prioritized over hippocampal constraint. The mini-mental state examination (MMSE) and Seoul verbal learning test for total recall, delayed recall and recognition (SVLT-TR, DR, R) were performed at baseline and at 7 and 13 or 16 months after radiotherapy.

Results: A total of 41 patients were accrued. Median age was 48 years (range 26-76) and 51.2 % of the patients were male. Eighteen patients (43.9%) had WHO grade I or II tumor whereas 23 patients (56.1%) had grade III or IV tumor. Median volume of PTV was 192.8 cc (range 33.4-522.6) and median prescribed dose was 60Gy (range 46-66). Concurrent chemotherapy was given to 18 patients (43.9%). Median D100% and Dmax to the contralateral hippocampus were 7.7Gy (range 0.6-24.8) and 16.6 Gy (range 3.56-60.4) respectively. Mean dose to contralateral hippocampus could be spared to less than 21 Gy in 39 patients with median value of 11.6 Gy (range 0.3-37.3) which was lower compared to previous documentation. Median value of maximal dose to lenses and eyeballs were 4.3 Gy (0.4-8.1) and 13.7 Gy (0.5-46.6) respectively. At median follow up of 7.8 months (range 0-14.8), median progression-free survival and overall survival were not reached. Cognitive function tests at 7 months were analyzable in 12 patients. For these patients, MMSE, SVLT-TR, SVLT-DR and SVLT-R at 7 months showed improved results compared to the baseline with 2.0% (95% CI, -0.8% to 4.7%), 11.0% (95% CI, 3.3% to 18.8%), 20.1% (-5.5% to 45.8%) and -0.6% (95% CI, -6.6% to 8.2%) increase respectively. No grade 4 or 5 toxicity was reported.

Conclusion: Hippocampus could be spared effectively in radiotherapy to primary brain tumors using VMAT. Despite limited follow up data, cognitive function tests of the patients showed promising results. Further follow up data would clarify the effect of hippocampal sparing on the cognitive function of the patients treated with radiotherapy for primary brain tumor.

PO-0645

18F-FET PET and MRI for treatment planning in glioblastoma

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Purpose or Objective: To analyze pre-treatment MRI- and 18F-fluoroethylthyrosine-PET- (FET-PET) based target volumes and patterns of failure following radiotherapy (RT) with concurrent temozolomide (TMZ) for primary glioblastoma multiforme (GBM).

Material and Methods: Thirty-four patients with primary GBM were treated using MRI based treatment volumes (GTVrm). Before treatment patients underwent FET PET/CT scans and biological tumor volume (GTVpet) were contoured but not used for target definition. Progression were defined according to RANO criteria. Tumor progression and pre-treatment MRI and PET scans were co-registered to the radiation dose map. Failures were classified based on location of primary GTVs and dose delivered at the site of failure. We investigated volumetric size and uniformity of MRI- vs. FET-PET/CT-derived GTVs and progression patterns assessed by means of FET PET/CT and MRI.

Results: FET-PET based GTVs measured 10 minutes after radionuclide injection (a.r.i.) (median 37.3 cm3) were larger than GTVs measured 60 minutes a.r.i. (median 27,7 cm3). GTVpet were significantly larger than corresponding MRI based GTVs (median 19,3 cm3). The congruence of MRI and FET signals for the identification of glioblastoma GTVs is poor with mean uniformity index of 0.4 (p=0,0). 74% of failures were located inside primary GTVpet. 68% of failures occured within the 95% isodose line, and 9% within 60 Gy isodose.

Conclusion: The size and geometrical location of GTVs differed in a majority of patients. The volume of GTVpet depends on time a.r.i. Tumor progression were mostly inside FET-PET volumes. FET PET better defined failure site then MRI. Finally dose inhomogenity inside GTVpet and GTVrm and favourable tumor control within 60Gy isodose advocates further studies with PET-MR based high-dose radiation therapy of GBM.

PO-0646

Temozolomide during radiotherapy of glioblastoma multiforme: daily administration improves survival

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Purpose or Objective: Temozolomide (TMZ) based chemoradiotherapy defines the current gold standard for the treatment of newly diagnosed glioblastoma. Data regarding the influence of TMZ dose density during chemoradiotherapy are currently not available. We retrospectively compared outcomes in patients receiving no TMZ, patients receiving TMZ during radiotherapy on radiotherapy days only (5/7) and patients receiving TMZ constantly 7 days a week (7//7).

Material and Methods:
From 2002 to 2012 a total of 432 patients with newly diagnosed glioblastoma received radiotherapy in our department. 118 patients had radiotherapy alone, 210 had chemoradiotherapy with temozolomide (75 mg/m²) daily (7/7 days a week) and 104 chemoradiotherapy with temozolomide only on radiotherapy days (5/7 days a week, Monday till Friday). Radiotherapy was applied in 30 fractions to a total dose of 60 Gy.

Results: Median survival after radiotherapy alone was 9.1 months, compared to 12.6 months with temozolomide 5/7 and to 15.7 months with temozolomide 7/7. The 1 year survival was 33% in the radiotherapy only group, 52% in the 5/7 group and 64% in the 7/7 group. Kaplan Meier analysis showed a significant improvement of temozolomide 7/7 vs. 5/7 (p=0.01 by the log-rank test), while temozolomide 5/7 was still superior to no temozolomide at all (p=0.02).

Conclusion: Our results confirm the findings of the EORTC/NCIC-trial by Stupp et al., establishing the daily temozolomide chemoradiotherapy as standard therapy for glioblastoma. Also a reduced temozolomide scheme can at first prolong the survival of glioblastoma patients, but not as much as the daily application.

PO-0647

Subventricular zones: new key targets for glioblastoma treatment

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Purpose or Objective: We aimed to identify subventricular zone (SVZ)-related prognostic factors of survival and patterns of relapse among patients with glioblastoma.

Material and Methods: Forty-three patients with primary diagnosed glioblastoma treated in our Cancer Center between 2006 and 2010 were identified. All patients received surgical resection, followed by temozolomide-based