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control rates and may ultimately improve OS. The combination of surgery followed by RT appears to be the current standard of care.

EP-1115

Stereotactic radiosurgery for brain metastases: neuropathological report of three autopsy cases

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Purpose or Objective: To elucidate the radiobiological effects of stereotactic radiosurgery (SRS) on brain metastases using autopsy cases.

Material and Methods: From 1995 to 2013, 9 brain specimens from 3 patients were available. They underwent autopsy after SRS in our hospital. These specimens were all brain metastases. The timing of autopsy was from 7 days to 20 months (median 10 months) after SRS. The 9 tumors received a margin dose of 16–20 Gy (median 20 Gy) at the 40–75% isodose line (median 40%), with a maximal dose of 16–50 Gy (median 45 Gy). Histopathological investigations were performed. The specimens were fixed in 20% neutral buffered formaldehyde and embedded in paraffin. Hematoxylin-eosin, Azan-Mallory, and Bodian stains were used. Immunohistochemical reactions included glial fibrillary acidic protein, alpha-smooth muscle actin, CD34, and CD68 antigens. Ki67 and p53 reactions were also used.

Results: The first case was a 59-year-old man diagnosed with 2 brain metastases from renal cell carcinoma. Both lesions were irradiated with SRS. He received SRS 4 times after the first SRS. At 1 week after the last SRS, he died from carcinomatous lymphangiosis. The second case was a 63-year-old man diagnosed with 2 brain metastases from lung cancer. Both lesions were irradiated with SRS plus whole brain radiotherapy (WBRT). Seven months later, he died from carcinomatous peritonitis. The third case was a 35-year-old woman diagnosed with 2 brain metastases from breast cancer. Both lesions were irradiated with WBRT plus SRS. When one of the lesions enlarged 1 year later, repeated SRS was performed. At 7 months after reirradiation, she died from carcinomatous lymphangiosis. In the first case, necrosis and viable tumor cells were observed mainly in the center of the lesion at 1 week after SRS, while apoptosis and fibrosis were observed in a small part of the lesion. Glial cells and neutrophilic leukocytes had accumulated around the lesion. In the lesions at 2 months after SRS, tumor cells and fibrosis were not observed; only macrophages and glial cells were observed in the SRS irradiated field. In the second case, fibrosis was observed at the periphery of the center necrotic region at 7 months after SRS. In the third case, almost all parts of the lesions were replaced with fibrosis at 19 months after SRS, while small foci of viable tumor cells, a large number of glial cells, and macrophages were observed around the fibrotic area.

Conclusion: In the tumors, apoptosis was only observed at 1 week after SRS. The time of fibrosis initiation varied in each case. Around the tumors, neutrophilic leukocytes and glial cells accumulated within 1 week after SRS. Macrophages accumulated at least 2 months after SRS. Stromal changes remained for a considerable period of time. It was remarkable that fibrosis occurred very soon after SRS, and other observations were generally compatible with previous reports.

EP-1116

Staged radiosurgery for petroclival meningiomas: preliminary results

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Purpose or Objective: The goal of surgical treatment of meningiomas is the total resection of the tumour. The complete removal of petroclival meningiomas can be difficult because of their proximity to cranial nerves. Stereotactic radiosurgery (SRS) is a well established treatment for many patients with intracranial meningiomas, either in the exclusive or adjuvant setting. However, SRS of large meningiomas might be associated with significant morbidity. Under these circumstances s-SRS has the potential to deliver sharply focused high doses per fraction without increasing the risk of toxicity.The aim of this study is to prospectively evaluate the feasibility of s-SRS for petroclival meningiomas, including large volume lesions.

Material and Methods: Between September 2011 and October 2013 at our Institute, s-SRS using the CyberKnife was prospectively performed on 30 patients (24 women and 6 men, men, mean age 57 years) with petroclival meningiomas. Patients with atypical or malignant meningiomas and those who had received prior radiotherapy were excluded. The average tumor volume was 11,86 cm3 (range 2,2–126,3 cm3); the average tumor prescription dose was 24,4 Gy, the number of fraction was 4 or 5.

Results: After a median follow-up of 30 months (range 13-36 months) the overall tumour control rate was 100% (25 patients with stable disease, 3 patients with partial response and 2 patients with complete response). Tumor control rates at 2 and 3 years was 100%. Among 28 patients who were symptomatic before staged radiosurgery, neurological follow-up showed an improvement in 43%, stable clinical course in 43% and a persistent deterioration of clinical symptoms in 14% of the patients. A transient neurological deterioration was observed in 11% of patients within the first year after treatment.

Conclusion: Our findings show that s-SRS using the CyberKnife is a safe and effective option in the treatment of large-volume petroclival meningiomas. A good tumour control and a low morbidity rate was achieved in our series, either as a primary or adjuvant approach. Long-term follow-up is warranted to confirm these results.

EP-1117

Frameless radiosurgery for acoustic schwannoma: a five-year experience

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Purpose or Objective: Frameless radiosurgery (SRS) plays an important role in the management of acoustic neuromas. This retrospective study aims to evaluate tumor control using this technique.

Material and Methods: Thirty four patients with unilateral acoustic neuromas (vestibular schwannomas) who underwent linear accelerator-based frameless SRS at low dose (12 Gy) to the tumor from July 2008 to February 2015 were evaluated. Twenty-one patients were male and 13 patients were female. The median age was 62 years (range 23-84) with a median follow-up period of 12.4 months (range 1-60). Treatment volume was 0.1 to 3.8 cm3 (median 0.93 cm3).

Results: Preliminary results from follow-up magnetic resonance imaging (MRI) showed: the tumor of 15 patients decreased in diameter, no changes was found in 14 and the tumor increased slightly in only one patient. All patients are alive, except for 1p who died from intercurrent disease 2 years after radiosurgery. Among 23p with acufeno, full improvement was demonstrated in four. There were no reported complications related to treatment.

Conclusion: We experienced excellent short term local control and low incidence of complication for acoustic schwannomas undergoing frameless SRS treatment. Our data compare favorably with the literature. Additional follow-up will be necessary to evaluate long term results of treatment.

EP-1118

Impact of susceptibility-weighted imaging MRI on radiosurgery for melanoma and RCC brain metastases

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Purpose or Objective: A patient with malignant melanoma and 4 visible lesions on a gadolinium (Gd)-enhanced T1 MRI scan of the brain was reported at the tumor board as having at least 7 probable metastases on the basis of the matching susceptibility-weighted imaging (SWI). SWI detects cerebral microbleeds and may therefore be more sensitive than Gd-T1 MRI in the detection of small haemorrhagic metastases and prediction of future sites of intra-cranial relapse. Our aim was to explore the potential usefulness of SWI in 1) the selection for radiosurgery and 2) the follow-up of patients with brain metastases from malignant melanoma and renal cell carcinoma (RCC).

Material and Methods: At the time of referral for radiosurgery, a 3-D Gd-T1 MRI was evaluated at the neuro-oncology multidisciplinary tumor board to determine the number of brain metastases. We retrospectively analysed the synchronous SWI sequence to explore any difference in the number of detectable lesions and hence putative metastases. Subsequent enhanced T1-weighted MRIs were evaluated for new metastases at the site of SWI abnormalities.

Results: T1 MRI scans detected 16 metastases in a sample of 11 patients with melanoma and RCC who were treated with primary or postoperative linear accelerator-based radiosurgery in our center. 25 regions of signal change were detectable on the matching SWI sequences. The scans were reviewed by a board-certified neuro-radiologist who confirmed that the 9 additional SWI lesions were non-metatastic. To date, none of the additional lesions have developed into enhancing brain metastases. Indeed, additional SWI changes on postoperative imaging resolved completely on subsequent imaging. Thus the 16 SWI changes with metastatic features correlated perfectly with the 16 metastases on Gd-T1 MRI. (Figure 1)

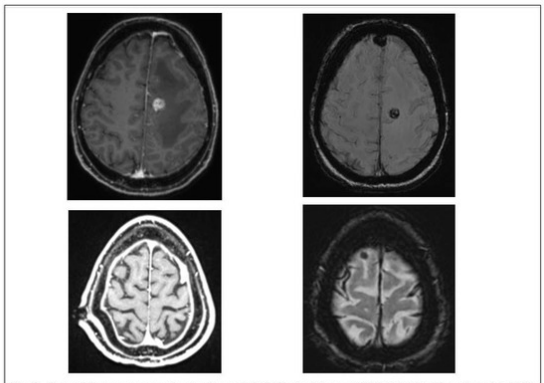

Fig 1. Top: Melanoma metastasis on T1 MRI (left) and SWI (right). The frontal SWI change is falcine calcification. Bottom: The SWI signal change (right) has no T1 correlate (left) and represents postoperative blood.

Conclusion: SWI sensitively detects blood products in primary and secondary brain tumours, but also in veins, vascular malformations and postop-operative bleeding and calcification. An expert neuro-radiology opinion in the context of the tumour board is essential for the accurate interpretation of SWI to avoid "overdiagnosis" of metastases, particularly in the post-operative setting. Occasionally however, additional lesions that are highly suspicious for metastases may be detected on SWI. The sensitivity and specificity of SWI for metastases should be determined in a larger cohort as it may assist patient selection for radiosurgery in borderline cases.

EP-1119

Treatment of Subependymal giant cell astrocytoma (SEGA): Is there a place for radiotherapy?

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Purpose or Objective: SEGA is a WHO grade I glioma that is almost exclusively seen in young patients with tuberous sclerosis complex (TSC). Despite the benign histology, SEGA can be severely symptomatic as it typically arises intraventricularly and can cause obstructive hydrocephalus. The current standard treatment of SEGA includes surgical resection and chemotherapy, the m-TOR inhibitor everolimus. Based on expert opinion, there is an international consensus that radiotherapy should not be used in the treatment of SEGA.
Here, we present a case of a patient with TSC, with inoperable bilateral ventricular SEGA. Years long before the availability of everolimus or its approval for treating SEGA, we treated this patient exclusively with radiotherapy.

Material and Methods: With stereotactic fractionated radiotherapy, a dose of 60 Gy in 30 fractions of 2 Gy, was delivered on the GTV. The patient was afterwards followed up with MR imaging. We did volumetric assessment of tumour size on each follow up MRI and tracked the changes in tumour size after radiotherapy.
We performed an extensive literature study to verify the sources of the consensus against radiotherapy in treatment of SEGA.

Results: The patient tolerated the treatment very well. No acute or chronic side effects were seen. A follow up over a period of 8 years, using MR imaging, showed about 70% decrease in tumour volume.
We found that the advice against radiotherapy appears to be based on very little, if any, evidence.

Conclusion: Radiotherapy can be a potential useful tool in the treatment of SEGA. The slow but progressive response of SEGA to radiotherapy resembles what is seen in other benign brain tumors e.g. meningioma. Radiotherapy has been discarded prematurely as a therapeutic option for SEGA and could be very well used to consolidate effect of everolimus. Prospective registration of patients and treatment outcome is needed to enhance knowledge.

EP-1120

Experience with robotic SBRT in treatment of intraspinal tumours

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Purpose or Objective: The role of radiotherapy in the treatment of intraspinal tumors constitutes a paradigm, justified by tolerance of spinal cord. Advances in SBRT (Stereotactic Body Radiation Therapy) as robotic and image-guided treatments have revolutionized in this group. The aim of this study is to analyze our preliminary experience treating intraspinal tumors using robotic SBRT.

Material and Methods: Clinical and dosimetric data on 19 patients between 2011 and 2015 were reviewed, patients with lesions in spinal canal including intramedullary and intradural extramedullary were selected solely. All patients were treated with robotic SBRT image-guided in real time (Cyberknife).