Optic Nerve assessment by optic coherence tomography (OCT) as routine test in meningioma patients prior and after Proton Therapy

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Introduction

The assessment of visual field (VF) measured via automatic perimetry (AP) is a standard examination. Optical coherence tomography (OCT) is a non-invasive, non-contact and painless imaging technique that provides high-resolution measurements and cross-sectional imaging of the retina and retinal nerve fibre layer (RNFL). The RNFL thickness is of particular interest in clinically manifest as well as subclinical optic neuropathies. The OCT is of special interest for patients with meningiomas involving the anterior optic pathway and provides essential information for the treatment planning and follow-up.

Patients and Method:

Visual parameters including VF and RNFL thickness were measured before start of radiation. VF was measured by AP, RNFL via OCT (Heidelberg Spectralis® OCT) at the Department of Ophthalmology at the Medical University of Vienna. The examination was performed prior to treatment planning for proton therapy and during follow up. Additionally the involvement of the anterior visual pathway (optic nerve, chiasma) was defined on the planning MRI. We will present the results of the baseline OCT and as an example three patients in which the OCT results lead to an intervention.

Results

24 patients with no ophthalmologic comorbidities were included. The mean age at time of radiation was 55.4 ± 12.8. On MRI the right optic nerve was in direct contact to the meningioma in 13 patients, the left optic nerve in 16 and the chiasma in 11 patients, respectively. At baseline a restriction of the VF was detected via AP in 12 patients on the left and in 7 patients on the right. Via OCT in 13 patients a deficiency was detected on the right side and in 9 patients on the left. Consequently the treatment planning, especially the constrains for structures of the anterior optic pathway, were adapted based on the additional information of the actual RNFL. During follow-up one patient showed pre-clinical pathologic changes in the OCT, which were not detected via AP.

Patient 1: In this patient at baseline the AP showed minor changes, while the OCT showed a major thinning of the optic nerve fiber layer. In concordance with the subclinical RNFL damage, the constraint for the optic nerve and chiasm were adapted.

Patient 2: In this patient 12 weeks after the radiation the OCT showed an incipient swelling of the optic nerve whereas the AP showed no changes. A conservative treatment with steroid was started leading to a full recovery.

Patient 3: The RNFL thickness of the right eye was within the normal value, although when compared to the left, eye, it showed in total, especially nasal and temporal, a reduced thickness compared to the contralateral side (left side > 95 μm) suspect for preexisting subclinical damage. Consequently the constrains for the structures of right anterior optic pathway were adapted.

Discussion & Conclusions

In this cohort the detection of the anterior visual pathway disorders was higher with OCT compared to AP pre and post proton treatment. OCT provides additional base line information which is beneficial for treatment planning, follow-up and as endpoint in future clinical trials.