ABSTRACT

Spectral domain optical coherence tomography (SD-OCT), a non-invasive imaging method, is based on an analysis of a near-infrared light deflected from tisssue layers, that provides detailed images of retinal structures. Nerve cells of the retina, that originate from neuroectoderm, reflect neurodegeneration of the central nervous system (CNS), as well as acute damage of nerve structures caused by optic neuritis.

The dissertation first presents established imaging protocol and quality standards for SD-OCT imaging in multiple sclerosis (MS). In the following section we introduce SD-OCT as a biomarker in MS. In a multicentric cross-sectional study, we had shown, that a single time measurement of peripapillary retinal nerve fiber layer thickness (RNFL) has a predictive value for a risk of disease progression in the next five years. Patients with a thickness of RNFL in the lowest tercile of the studied population had a relative risk of disease progression 2x higher than patients in the highest tercile. The second presented study tests whether the history of optic neuritis (ON) in MS is a risk factor for neurodegeneration of RNFL in later years. The study confirmed that long term changes of RNFL thickness in eyes post-ON and in eyes with no history of ON are not different. Therefore, we conclude that both, ON eyes and eyes with no history of ON, can be included in longitudinal studies (excluding the first six months of acute decline post ON) and considered equal. The next section demonstrates the use of SD-OCT in a clinical practice. In a pilot study of 10 patients with neuromyelitis optica (NMO), we have shown a loss of RNFL post ON in a pattern characteristic for NMO and how it differs from RNFL changes in MS-ON eyes. This finding gives a strong signal to carefully consider NMO in differential diagnosis. Finally, we present a case history of a patient with macular edema as a side effect of treatment with fingolimod, that documents utility of SD-OCT in monitoring development of macular edema in MS.

Key words: optical coherence tomography, multiple sclerosis, optic neuritis, retina, fingolimod.