

Title: Infrared Pupillary Asymmetry (IPA) for detection of a Relative Afferent Pupillary Defect (RAPD)

Background: Around 25% of patients suffering from multiple sclerosis (MS) present with optic neuritis. Therefore, early recognition of optic nerve involvement is important. A sensitive early clinical sign is the relative afferent pupillary defect (RAPD) which is detected by swinging a light across the pupils to observe the initial pupil response and asymmetry of the pupillary escape. However, bedside recognition of the RAPD can be challenging in dark eyes or in patients with anisocoria.

Goal: To test the value of the infrared (IR) camera of an optical coherence tomography (OCT) device to document, quantify and detect the RAPD.

Methods: In a pilot experiment, variables were determined which can interfere with the reproducibility of IR pupil diameter measurements. The most relevant were (1) eye to camera distance and (2) convergence which could be corrected with additional measurements. The pupil diameters and inter-canthus/inter-pupillary distances were quantified from IR images in (1) dim light, (2) light to the right eye and (3) light to the left eye. The Infrared Pupillary Asymmetry (IPA) was calculated as the pupil difference of the pupil diameter between the right and left pupil. A right RAPD is indicated by a positive IPA.

Results: Sixteen subjects have been recruited to this ongoing study. Eight were healthy controls (mean age 34 years, 4 female) and eight suffered from an optic neuropathy (mean age 46 years, 2 female). The range of the IPA was larger in subjects with an optic neuropathy (0.12) when compared to healthy control subjects (0.07). Receiver operator curves indicate that an IPA above 0.08 was reasonably able to separate patients from healthy control subjects (AUC 0.75). There was pRNFL atrophy in the affected eye (74  $\mu\text{m}$ ) compared to the unaffected eye (97  $\mu\text{m}$ ) in patients. In contrast, clinical assessment of the RAPD in these predominantly dark eyes was less reliable.

Conclusion: Infrared Pupillary Asymmetry is a useful additional tool for assessment of the RAPD in patients with a suspected optic neuropathy, particularly in dark irides.

Disclosures

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