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Choroidal thickness and myopia in relation to physical activity during childhood

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Purpose:

Decreasing physical activity (PA) has been suggested to be a driving force behind the rapid increase of myopia worldwide. The possible protective effects of PA might be through increased blood flow and subsequent change in thickness of the choroid. The purpose of this study was to correlate PA, myopia, and choroidal thickness (CT).

Methods:

A prospective study of 307 children from the CHAMPS-study Denmark. Objective data from a GT3X accelerometer (ActiGraph, USA) worn at 4 periods between 2009 and 2015 were used to determine the amount and intensity of PA. Intensity was estimated as counts/minutes, and cut off-points were defined at four intensity levels; sedentary (SED), light (L), moderate (M) and vigorous (V). Eye examinations were performed in 2015 and included autorefractometry in cycloplegia (Tonoref II, Nidek, Japan), axial length (AL) by biometri (Lenstar 900, Haag Streit, Switzerland) and fovea-centered radial scans of 4 sections by enhanced depth imaging optical coherence tomography (EDI-OCT) (Heidelberg Spectralis, Germany). By a validated semi-automated method we measured the CT at 17 targets per eye representing anatomically different choroidal locations (subfoveal, 1 and 3 millimeter in each direction of fovea). Linear regression and slope coefficients of repeated PA were performed to evaluate the association between PA, myopia and CT.

Results:

Mean age at follow-up was 15.4±0.7 years (range 14.3 to 17.5) and 52.4% were boys. The mean spherical equivalent (SE) was 0.3±1.5 diopters (cycloplegia) and 17.9% were myopic (SE≤-0.5 diopters). The mean AL was 23.5±0.9 mm. The mean subfoveal CT was 369±87 µm. The mean CT for myopic vs. non-myopic eyes was 259±65 µm vs. 354±71 µm (macula), 313±77 µm vs. 382±84 µm (fovea), 306±71 µm vs. 368±80 µm (1 mm zone) and 267±52 µm vs. 312±59 µm (3 mm zone), respectively. All CT measurements were thinner in myopic eyes (p<0.0001) and in boys (p<0.05). By age- and sex-adjusted linear regression there were no associations between PA and SE, AL or any CT measurements. There was no association between accumulated PA and the overall CT for SED, L, M and V PA (2.31 µm/% (p=0.22), -3.99 µm/% (p=0.15), -5.43 µm/% (p=0.57) and -0.53 µm/% (p=0.95), respectively).

Conclusions:

We found no association between physical activity and the choroidal thickness, axial length or refractive error. However, the choroid was thinner in myopic eyes and in boys. The role of choroidal thickness on the development of refraction should be investigated in prospective studies.