MORPHOMETRIC FUNDUS CHANGES DETECTED BY OCT AND OCT ANGIOGRAPHY IN CHILDREN WITH ANEMIA

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Relevance. Anemia is one of the most common pediatric disorders with systemic impact, including significant effects on ocular structures. Chronic hypoxia and impaired microcirculation cause early ischemic and neurodegenerative changes in the retina, even in the absence of clinical retinopathy. Modern diagnostic techniques such as Optical Coherence Tomography (OCT) and OCT Angiography (OCTA) allow detection of subclinical fundus alterations, which is crucial for preventing irreversible visual impairment in children with anemia.

Aim. To assess morphometric fundus parameters (FAZ area, FAZ circularity index, vessel density of SCP and DCP, RNFL and GCC thickness) and functional parameters (MD and PSD indices of static automated perimetry) in children with anemia and compare them with healthy controls.

Materials and Methods. A total of 90 children aged 7–18 years were examined at the Bukhara Regional Multidisciplinary Children's Hospital (2023–2025):

- Control group: 30 healthy children,
- Iron deficiency anemia (IDA): 30 patients,
- β-thalassemia: 30 patients.

Ophthalmic examinations included OCTA/OCT (Optopol REVO FC) and Static Automated Perimetry (SAP) to evaluate both structural and

functional parameters. Hematological tests (hemoglobin, erythrocyte count, MCV, ferritin) were performed in parallel. Statistical analyses were conducted using Mann–Whitney U test, Kruskal–Wallis test, and Fisher's φ* criterion, with significance set at $p<0.05$.

Results. Iron deficiency anemia (IDA): Children demonstrated a significant decrease in FAZ circularity index and reduced vessel density in the superficial capillary plexus ($p<0.05$). OCT findings showed a tendency toward RNFL and GCC thinning, though not statistically significant. SAP revealed mild reduction of MD values compared with controls.

β-thalassemia: Patients exhibited marked enlargement of FAZ area and perimeter, significant reduction of circularity index, and decreased vessel density in SCP, DCP, and radial peripapillary plexus ($p<0.001$). OCT confirmed thinning of RNFL and GCC, consistent with early neurodegenerative changes. SAP showed decreased MD and increased PSD values, indicating functional visual field impairment.

Controls: Morphometric and functional parameters remained within age-related normal ranges.

Conclusions. Children with anemia demonstrate significant subclinical fundus changes detectable by OCT and OCTA even before clinical manifestations of retinopathy. IDA is mainly associated with early microcirculatory ischemic alterations, while β-thalassemia shows a combination of ischemic and neurodegenerative changes.

Functional testing (SAP) correlates with morphometric alterations, confirming early visual function decline in anemic children. OCT and OCTA biomarkers can serve as objective tools for screening and dynamic monitoring in pediatric anemia, enabling timely prevention of vision-threatening complications.

LITERATURE:

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