Microcirculation remodelling in children with arterial hypertension

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• Microvascular changes with rarefication of small arterioles and neuronal damage are regarded as a late complication of arterial hypertension.

• New optical technologies allow to analyze retinal vessels density and retinal thickness.
Optical coherence tomography angiography (OCTA) is a new, fast, noninvasive imaging technique for visualization of blood vessels of retina.

OCTA enables reproducible, quantitative assessment of the microcirculation in layers of retina.
The aim of our study was to analyze
- retinal vessels density, (VD),
- retinal thickness, (FT),
- foveal avascular zone, (FAZ)
- and its relationship with central systolic blood pressure (cSBP), central pulse pressure (cPP), subclinical target organ damage (TOD) in a non-selected group of children with primary (PH) and secondary hypertension (SH).
Participants and methods

- 131 (36 girls) children in mean age 14.9 ±3.0 years with PH (82) and SH (49) were included in the study.
- Retinal vessel density and retinal thickness were measured with optical coherent tomography RTVue XR Avanti with AngioVue (Optovue, Fremont, CA, USA).
- cSBP and cPP was estimated from pulse wave analysis assessed by oscillometric method.
- Subclinical TOD was assessed as carotid artery intima-media thickness (cIMT), pulse wave velocity (PWV) and left ventricular hypertrophy (LVH).
• Patients with PH and SH did not differ in terms of foveal, parafoveal thickness, superficial, deep vascular density of foveal and parafoveal areas of retina.

• When patients were divided according to presence or absence of hypertensive subclinical TOD it was found that patients with increased cIMT had lower foveal thickness (p=0.04), parafoveal thickness (p =0.05), foveal deep vessel vessels density (p = 0.01) and greater foveal avascular zone (p = 0.02).
Results 1

Correlation between fovea deep vessel density and carotid intima-media thickness (cIMT) \( (p = 0.007) \).
Results 2

Correlation between foveal thickness and carotid intima-media thickness (cIMT) \( (p = 0.01) \).
Correlation between foveal avascular zone and carotid intima-media thickness (cIMT) ($p = 0.008$).
Results

• Foveal and parafoveal thickness correlated negatively with cPP and augmentation index (p<0.05).

• LVH and increase of PWV was not associated with changes in foveal thickness and retinal vascular density.
Conclusions

• Arterial hypertension in children and adolescents leads not only to subclinical arterial injury but also to significant alterations in microcirculation density expressed as lower foveal thickness, increase of avascular foveal zone and decreased density of deep foveal vessels.

• These changes were especially expressed in those of hypertensive children in whom subclinical arterial injury was also present.