CHILDHOOD OBESITY: DOES IT HAVE ANY EFFECT ON YOUNG ARTERIES?

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PREVALENCE OF OVERWEIGHT AND OBESITY, AGE: 2-19, 1980-2013

OBESITY AND CARDIOVASCULAR MORBIDITY AND MORTALITY

- Obesity is associated with significantly decreased life expectancy

- Most cardiovascular (CV) deaths are attributed to overweight and obesity
  (Lim SS et al. Lancet. 2012; 380:2224–60.)

- Obese children are prone to develop early CV morbidity and are at increased risk for CV mortality in their adult life
CHILDHOOD OBESITY AND ARTERIAL STIFFNESS

CRITERIA FOR ARTERIAL STIFFNESS MEASUREMENTS IN OW/O CHILDREN AND ADOLESCENTS

- Aortic (PWV_{ao})/carotid-femoral (cfPWV) pulse wave velocity should be measured
  
  (Pannier et al., Hypertension. 2005; 45:592-596.
  Vlachopoulos et al., J Am Coll Cardiol. 2010; 55:1318–27.)
PREDICTIVE VALUE OF PWVs MEASURED IN AORTA AND MUSCULAR TYPE ARTERIES

Pannier et al., Hypertension. 2005; 45:592-596.
CRITERIA FOR ARTERIAL STIFFNESS MEASUREMENTS IN OW/O CHILDREN AND ADOLESCENTS

• Aortic (PWV_{ao})/carotid-femoral (cfPWV) pulse wave velocity should be measured

• Age of OW/O patients and controls must be identical
AGE RELATED REFERENCE VALUES OF PWV\textsubscript{ao} FOR BOYS AND GIRLS

CRITERIA FOR ARTERIAL STIFFNESS MEASUREMENTS IN OW/O CHILDREN AND ADOLESCENTS

- Aortic (PWV_{ao}), or carotid-femoral (PWV_{cf}) pulse wave velocity should be measured
  (Pannier et al., Hypertension. 2005; 45:592-596.
  Vlachopoulos et al., J Am Coll Cardiol. 2010; 55:1318–27.)

- Age of OW/O patients and controls must be identical
  Hidvégi et al., J Hypertens. 2012; 30:2314–21.)

- Brachial systolic blood pressure (SBP_{brach}) should be the same in patients and controls
  Urbina et al., Hypertension. 2009; 54:919–950.)

Evaluating literature we found NO PAPER fulfilling these rigorous criteria.
AIM

To compare the arterial function parameters

- aortic pulse wave velocity (PWV<sub>ao</sub>)
- aortic augmentation index (Aix<sub>ao</sub>)
- aortic systolic blood pressure (SBP<sub>ao</sub>)

AND brachial systolic blood pressure (SBP<sub>brach</sub>)

measured simultaneously in OW/O patients and healthy subjects in a large population aged between 3-18 years,

strictly applying the previously discussed criteria
PATIENTS AND METHODS

- 6.816 Caucasian subjects (3.668 boys) aged 3–18 years, in Szolnok town (Hungary), 2012-2016.

- Subjects were categorised by their body mass index (BMI) into N, OW and O groups regarding their age and sex as well (Cole et al. Pediatr Obes. 2012; 7:284–294.)

- AFPS were measured by an invasively validated device (Arteriograph, TensioMed Ltd, Budapest, Hungary) (Horváth et al. J Hypertens 2010; 28:2068–75.)
arteriograph measurement in kindergarten

- Small size, portable
- Automatic measurement
- User-independent
- Fast, cc. 2 minutes
- Painless

Informed consents from parents were given to show this picture on congress „Artery2018”
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• Propensity score matching was carried out using the “Nearest Neighbour” method with the grouping variable weight (BMI category of N, OW and O) and $SBP_{brach}$, HR, age and sex as variables (SPSS 23.0.0.0 statistical package, SPSS Inc., Chicago, Illinois, USA)
## RESULTS – BASIC CHARACTERISTICS

<table>
<thead>
<tr>
<th></th>
<th>N</th>
<th>OW</th>
<th>O</th>
<th>Kruskal-Wallis test</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>number of patients (n, %)</strong></td>
<td></td>
<td></td>
<td></td>
<td>N-OW</td>
</tr>
<tr>
<td></td>
<td>5.460</td>
<td>911</td>
<td>445</td>
<td></td>
</tr>
<tr>
<td></td>
<td>80.1</td>
<td>13.4</td>
<td>6.5</td>
<td></td>
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</tbody>
</table>

N, normal weight; OW, overweight; O, obese; SBP\textsubscript{brach}, brachial systolic blood pressure;
## RESULTS – CHARACTERISTICS OF THE PROPENSITY SCORE MATCHED GROUPS AND CLARIFIED AFPs

<table>
<thead>
<tr>
<th>parameters</th>
<th>OW controls</th>
<th>OW patients</th>
<th>Welch t-test</th>
<th>O controls</th>
<th>O patients</th>
<th>Welch t-test</th>
</tr>
</thead>
<tbody>
<tr>
<td>number of patients (n)</td>
<td>911</td>
<td>911</td>
<td>-</td>
<td>445</td>
<td>445</td>
<td>-</td>
</tr>
</tbody>
</table>

*, parameters were significantly different between OW and O group, p<0.001
DISCUSSION

<table>
<thead>
<tr>
<th></th>
<th>Normal</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
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<tbody>
<tr>
<td>Double Product</td>
<td>9.357</td>
<td>9.998</td>
<td>10.824</td>
</tr>
<tr>
<td>(HRxSBP$_{brach}$)</td>
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</table>
CONCLUSIONS

• Overweight/obesity in children and adolescents WERE NOT ASSOCIATED with increased aortic stiffness (PWV\textsubscript{ao}) - OW/O MIGHT NOT HAVE DIRECT ADVERSE EFFECT on the aortic wall in this age range

• The effects of childhood overweight/obesity on circulation ARE COMPENSATED by decreased peripheral vascular resistance (i.e. decreased Aix\textsubscript{ao})

• Overweight/obese children and adolescents ARE AT INCREASED RISK for CV morbidity (chronic sympathetic overdrive)

• We plan to follow-up these OW/O patients in order to detect WHEN aortic wall damage - as stiffening - occurs
Thank you for your attention!

Mayfly sculpture, Szolnok, Hungary