Monitoring of vascular health in children at risk for atherosclerosis

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LIST OF ABBREVIATIONS

aIMT	Aortic intima media thickness
BMI	Body mass index
CAH	Congenital adrenal hyperplasia
CGMS	Continuous glucose monitoring system
cIMT	Carotid intima media thickness
CONGA	Continuous overall net glycaemic action
CSII	Continuous subcutaneous insulin infusion
DCCT	Diabetes Control and Complications Trial
ECG	Electrocardiogram
EDIC	Epidemiology of Diabetes Interventions and Complications Trial
FMD	Flow mediated dilatation
GTN	Glyceryl trinitrate induced dilatation
HDL	High density lipoprotein
HOMA-IR	Homeostasis model of assessment of insulin resistance
Hs-CRP	High sensitive C-reactive protein
ICC	Intra-class correlation coefficient
LDL	Low density lipoprotein
LGBI	Low glucose blood index
MAGE	Mean of glycaemic excursions

MDI	Multiple daily injections
MODD	Mean of daily difference
NO	Nitric oxide
PCOS	Polycystic ovarian syndrome
ROS	Reactive oxygen species
T1D	Type 1 diabetes
T2D	Type 2 diabetes

ABSTRACT

Adult cardiovascular disease has its origins in childhood, and adolescence is a critical period in determining lifetime risk. Early changes in arterial structure and function measured non-invasively have prognostic significance. Assessment of vascular structure and function provide an opportunity to test intervention strategies at an age when vascular damage is potentially reversible. Understanding the relative sensitivity of these markers of vascular damage is essential in identifying children at risk and enabling evaluation of clinical and public health interventions.

In a cross-sectional study, aortic and carotid intima media thickness were assessed in 66 children with type 1 diabetes and 32 healthy children. Aortic intima media thickness (aIMT) was significantly greater in the children with type 1 diabetes and related to age, glycosolated haemoglobin and low-density lipoprotein cholesterol concentrations. In contrast, there was no significant difference in carotid intima media thickness between groups, suggesting that aIMT is an earlier marker of subclinical atherosclerosis in children with type 1 diabetes.

An interventional trial of 22 children with type 1 diabetes was performed to evaluate whether reduction in glucose variability with initiation of continuous subcutaneous insulin infusion (CSII) therapy would improve vascular function. At 3 weeks post commencement of CSII, vascular function improved associated with a reduction in glucose variability; however the effects on vascular function over 6 to 12 months were not sustained, with deterioration of glycaemic control.

Finally, in a cross-sectional study, vascular function and structure was assessed in 14 children with congenital adrenal hyperplasia (CAH), a relatively novel

patient population, whose risk for atherosclerosis has not been previously investigated. The results from the children with CAH were compared to 28 obese and 53 healthy controls. The children with CAH had evidence of vascular dysfunction, comparable to the obese cohort, despite having a lower body mass index.

It was concluded that use of non-invasive ultrasound markers of preclinical atherosclerosis can allow early detection of changes in vascular structure in children at known risk for future atherosclerosis, identify novel groups of children with medical conditions not previously recognized to have future cardiovascular risk, and is a valuable tool that can be used to test interventions in a timely manner.

DECLARATION

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