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## Introduction

Patients with type 1 diabetes (T1D) are at high risk of developing vascular complications (1). Endothelial dysfunction is considered the early reversible stage in the development of diabetes related vascular disease(2). Early detection and management of endothelial dysfunction can delay or even prevent the development of vascular complications (3).

## Aim

Endothelial dysfunction is associated with poor metabolic control in adolescents with T1D. Based on this hypothesis we aimed to determine the relationship between metabolic control and endothelial function in a cohort of adolescents with T1D. We postulated that by identifying those at increased risk of cardiovascular disease, we could introduce targeted intervention to reduce the occurrence of cardiovascular complications.

## Methods

42 adolescents with T1D attending the Paediatric Diabetes and Endocrinology service at Tallaght Hospital, Dublin were recruited. Candidates attended for assessment following an overnight fast, auxology and BMI were calculated. Blood pressure was measured in the supine position followed by assessment of the Reactive hyperaemia index (RHI) by Endo-PAT. Blood samples were taken for evaluation of HbA1c, liver, renal function, lipid status and coeliac screen. Serum of 20 candidates was reserved for measurement of inflammatory markers (adiponectin, leptin, thrombomodulin, serum intravascular adhesion molecules, E-Selectin and P-Selectin). First morning urine sample was provided for estimation of microalbumin to creatinine ratio. Participants completed a physical activity questionnaire (4). Baseline data included the date of diagnosis, duration of diabetes, current insulin dose; insulin regimen; daily screen time; and relevant Family history of early cardiovascular disease.

## Results

**Table 1: Clinical and laboratory data of adolescents with T1D**

Number	42		
Gender (males/females)	19/ 23		
<b>Insulin administration</b>			
(Pump/ MDD)	22 / 20		
FHx CVS	21		
	Mean ± SDS	Min	Max
age	15.59 ± 1.48	12.29	18.44
Duration of T1D	7.01 ± 2.94	2.00	11.99
BMI Z -score	0.98 ± 0.97	-0.82	3.57
SBP z -score	-0.10 ± 0.73	-1.6	1.6
DBP z -score	0.12 ± 0.51	-0.8	1.4
HbA1c mmol	72.29 ± 15.13	48	121
Creatinine umol/L	60.95 ± 11.51	41	86
ACR mg/mmol		0.3	11.7
HDL mmol/L	1.66 ± 0.30	1.06	2.42
LDL mmol/L	2.22 ± 0.75	0.8	4.2
RHI	1.85 ± 0.50	0.92	3.37
PAS	2.31 ± 0.74	1.12	4.2
Screen time (hr/week)	24.62 ± 12.74	6	54

Data are Mean± (SDS) standard deviation, (FHx CVS) family history of early onset cardiovascular disease, (MDD) multiple daily dosing, (T1D) Type 1 Diabetes, (BMI) Body mass index, (SBP) Systolic blood pressure, (DBP) Diastolic blood pressure, (HbA1c) Glycosylated haemoglobin, (ACR) microalbumin to creatinine ratio, (HDL) High density lipoprotein, (LDL) Low density lipoprotein, (RHI) Reactive hyperaemia index, (PAS) Physical activity score.

## Results

**Table 2: Inflammatory markers**

Variable	Count	Mean	Median	SDS	25 <sup>th</sup> tile	75 <sup>th</sup> tile	Interquartile Range
Adiponectin	21		593.13		286.80	955.70	668.89
E-Selectin	20	20.67	21.46	8.62	14.94	25.94	11.00
Leptin	21		43.79		16.18	201.00	184.82
P-Selectin	20	100.4	104.56	31.30	73.40	127.33	53.94
SICAM-3	20	62.33	59.30	20.87	47.98	70.01	22.03
Thrombomodulin	20	47.17	46.80	10.13	39.77	56.45	16.68
Adiponectin/leptin ratio	21		16.67		1.67	61.62	59.95

(SDS) standard deviation, (SICAM) Serum intracellular adhesion molecule

- Reactive hyperaemia index correlated with age. Thirteen adolescents (31%) had low RHI, suggesting relatively impaired endothelial function.
- Lower RHI correlated with higher diastolic blood pressure ( $r=-0.34$ ) and P-Selectin level ( $r=-0.3$ ) suggesting impairment in vascular health.
- Poor metabolic control was associated with impaired lipid profile ( $r=0.55$ ), higher diastolic blood pressure ( $r=0.38$ ) and higher level of inflammatory markers P-selectin ( $r=0.55$ ), thrombomodulin ( $r=0.31$ ) and adiponectin ( $r=0.33$ ).
- E-Selectin, P-Selectin and thrombomodulin were associated with lower HDL ( $r=-0.34, -0.38, -0.38$ ).
- Elevated ACR correlated with E-Selectin ( $r=0.32$ ) and systolic blood pressure with thrombomodulin ( $r=0.36$ ).
- Active life style was associated with improved blood pressure ( $r=-0.35$ ) and lipid profile ( $r=-0.39$ )

## Conclusion

Reactive artery tonometry is an easy, non-invasive reliable method of assessing endothelial function. Impaired endothelial function (suggested by reduced RHI) correlated with elevated diastolic blood pressure and elevated P-selectin level. Maintaining a healthy life style improves the general health and in particular vascular health of those with T1D and should be actively encouraged.

## References

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