

# Quantitative analysis of retinal microcirculation in children with type 1 diabetes

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| <b>Submission date</b><br>17/03/2019   | <b>Recruitment status</b><br>No longer recruiting | <input type="checkbox"/> Prospectively registered<br><input type="checkbox"/> Protocol            |
| <b>Registration date</b><br>21/03/2019 | <b>Overall study status</b><br>Completed          | <input type="checkbox"/> Statistical analysis plan<br><input checked="" type="checkbox"/> Results |
| <b>Last Edited</b><br>02/03/2022       | <b>Condition category</b><br>Eye Diseases         | <input type="checkbox"/> Individual participant data  |

## Plain English summary of protocol

### Background and study aims

Diabetes mellitus is a life-long condition where a person is unable to control their blood sugar levels. There are two main types of diabetes, type 1 (around 10% of cases) and type 2. In type 1 diabetes (T1DM) the immune system attacks specialised cells in the pancreas called beta-cells (which are responsible for producing the hormone insulin). This means that the sufferer is unable to produce enough insulin to effectively control their blood sugar levels and so regularly inject insulin in order to keep their blood sugar levels in a healthy range. DM is also one of the most common chronic disease among children. This chronic disease could affect both anterior and posterior ocular structures of those children. Diabetic retinopathy (DR), which is the most common microvascular complication of type 1 DM, is still one of the leading causes of blindness even in developed countries. Recent technological advances mean that systems are now able to measure the retinal blood vessel density and flow of retina (posterior layer of eyeball that contains cells sensitive to light) in humans with a contrast-free technique. The aim of this study is to compare the retinal microcirculation in children with T1DM and healthy children to look at whether there is a link between diabetes and retinal microcirculation.

### Who can participate?

Children aged 6-18 who have T1DM and no eye problems, and healthy children of the same age.

### What does the study involve?

All participants attend a single study visit. At the visit, all participants undergo a comprehensive eye examination where optical coherence tomography angiography images are taken of the eye in order to assess retinal microcirculation. Participants who have diabetes also have a number of blood samples taken in order to assess their current blood sugar control. At the end of the study visit, the results between the two groups of participants are compared. In addition, the blood sugar control and length of time the diabetic participants have been diabetic is compared to the results from the eye exams.

### What are the possible benefits and risks of participating?

There are no direct benefits involved with participating. There is a small risk of pain or bruising from blood tests.

Where is the study run from?

1. Ulucanlar Eye Training and Research Hospital (Turkey)
2. Children's Health and Disease Training and Research Hospital (Turkey)

When is the study starting and how long is it expected to run for?

June 2017 to March 2018

Who is funding the study?

Investigator initiated and funded (Turkey)

Who is the main contact?

Merve Inanc, M.D.

mrwn88@hotmail.com

## Contact information

### Type(s)

Scientific

### Contact name

Dr Merve Inanc

### ORCID ID

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## Additional identifiers

### EudraCT/CTIS number

Nil known

### IRAS number

### ClinicalTrials.gov number

Nil known

### Secondary identifying numbers

16-1068

## Study information

### Scientific Title

Changes in retinal microcirculation precede the clinical onset of diabetic retinopathy in children with type 1 diabetes mellitus

### **Study objectives**

The abnormal glucose metabolism in type 1 diabetes mellitus (DM) affects the retinal microcirculation in children with well-controlled Type 1 DM for whom the duration of DM and glycemic control had been well documented.

### **Ethics approval required**

Old ethics approval format

### **Ethics approval(s)**

Approved 12/04/2016 by Ethics Committee of the Ankara Numune Training and Research Hospital, Talatpasa boulevard, Ulku street, number: 5, Tel: +90 (0)312 508 5910, Email: aneahetikkurul@gmail.com, ref: E-16-1068

### **Study design**

Prospective cross-sectional and case-control study

### **Primary study design**

Observational

### **Secondary study design**

Case-control study

### **Study setting(s)**

Hospital

### **Study type(s)**

Diagnostic

### **Participant information sheet**

### **Health condition(s) or problem(s) studied**

Retinal microcirculation and vessel density

### **Interventions**

All participants attend a single study visit, at which they undergo a comprehensive ophthalmic examination including best corrected visual acuity tests using the Snellen chart, intraocular pressure measurements by a pneumotonometer, slit-lamp biomicroscopy, and dilated fundus examination. High-quality colour stereoscopic fundus photographs are also taken. Refraction measurements are performed by using the same automatic refractor-keratometer device (Canon RF-K2, Japan). Moreover, blood samples are taken for the pre-prandial blood glucose and glycosylated hemoglobin (HbA1c) levels on the same day for the diabetic cases. The duration of DM and the HbA1c levels were recorded. Moreover, to quantify the vessel density and retinal microcirculation, the AngioVue device (Version 2017.1.0.151 of the RTVue XR Avanti, Opto-Vue, Inc, Fremont, CA, USA) was used in the study.

### **Intervention Type**

Other

### **Primary outcome measure**

Retinal microcirculation parameters and vessel density indexes are measured using an optical coherence tomography angiography device (the AngioVue device, Version 2017.1.0.151 of the RTVue XR Avanti, Opto-Vue, Inc, Fremont, CA, USA) at the single visit:

1. Foveal zone vessel density: the area of the small circle, with a diameter of 1 mm
2. Parafoveal zone vessel density: the area of the middle circle, with a diameter of 3 mm
3. Perifoveal zone vessel density: the area of the outer circle with a diameter of 6 mm.
4. Foveal avascular zone area
5. Foveal avascular zone perimeter
6. Acircularity index of foveal avascular zone: the ratio of the perimeter of the foveal avascular zone
7. Foveal density (FD-300): vessel density in 300 microns around the foveal avascular zone

### **Secondary outcome measures**

All measurements taken at the single visit (on the day of ocular examination):

1. Duration of diabetes mellitus (since the diagnosis of type 1 diabetes mellitus) measured using medical records
2. Pre-prandial blood glucose and glycosylated hemoglobin (HbA1c) levels measured using blood samples in the diabetic group

### **Overall study start date**

01/06/2017

### **Completion date**

30/03/2018

## **Eligibility**

### **Key inclusion criteria**

Diabetic patient inclusion criteria:

1. Aged 6-18 years
2. Male and female
3. No previous known macular or other retinal changes,
4. No ocular problem other than spherical or cylindrical refractive errors  $\leq 1.00$  diopter
5. No systemic disease except than Type 1 DM
6. The best-corrected visual acuity according to Snellen chart equal or greater than 20/20
7. A pre-prandial blood glucose level  $\leq 100$  mg/dl under insulin treatment
8. Patients who had information about the duration of diabetes mellitus.

Control participant inclusion criteria:

1. Aged 6-18 years
2. Male and female
3. No systemic disease
4. No ocular problem other than spherical or cylindrical refractive errors  $\leq 1.00$  diopter
5. Best-corrected visual acuity according to Snellen chart equal or greater than 20/20

### **Participant type(s)**

Mixed

### **Age group**

Child

**Lower age limit**

6 Years

**Upper age limit**

18 Years

**Sex**

Both

**Target number of participants**

110

**Key exclusion criteria**

All participants:

1. Strabismus
2. Nystagmus
3. History of previous ocular surgery or laser treatment
4. Trauma or uveitis
5. Corneal diseases such as corneal scar
6. Fundus abnormalities including diabetic retinopathy/maculopathy
7. Optic nerve diseases and glaucoma
8. Neurological disease or other diseases of the visual pathways
9. Ocular media opacities including cataract
10. Use of chronic topical medication
11. Those who are not sufficiently cooperative for optical coherence tomography angiography examinations

**Date of first enrolment**

15/06/2017

**Date of final enrolment**

31/12/2017

**Locations****Countries of recruitment**

Türkiye

**Study participating centre**

**Ulucanlar Eye Training and Research Hospital**

Ulucanlar Street Number:59, 06240

ankara

Türkiye

06240

**Study participating centre**

**Sami Ulus Children's Health and Disease Training and Research Hospital**  
Babur Street, Number: 44  
ankara  
Türkiye  
06230

## **Sponsor information**

### **Organisation**

Ulucanlar Eye Training and Research Hospital

### **Sponsor details**

Ulucanlar Street Number:59  
Ankara  
Türkiye  
06240  
+90 (0)312 312 62 61  
ulucanlargo@sa.gov.tr

### **Sponsor type**

Hospital/treatment centre

### **Website**

<http://ulucanlargo.gov.tr/>

### **ROR**

<https://ror.org/045d4f586>

## **Funder(s)**

### **Funder type**

Other

### **Funder Name**

Investigator initiated and funded

## **Results and Publications**

### **Publication and dissemination plan**

Planned publication in a high-impact peer reviewed journal between May 2019 and May 2020.

### **Intention to publish date**

15/04/2019

### Individual participant data (IPD) sharing plan

The datasets generated during and/or analysed during the current study are/will be available upon request from Merve Inanc M.D. (mrvn88@hotmail.com)

### IPD sharing plan summary

Available on request

### Study outputs

| Output type                     | Details | Date created | Date added | Peer reviewed? | Patient-facing? |
|---------------------------------|---------|--------------|------------|----------------|-----------------|
| <a href="#">Results article</a> |         | 01/11/2019   | 02/03/2022 | Yes            | No              |