



# What is diabetic retinopathy?

**DR Barometer Advocacy Workshop**

# ▶ start of the story

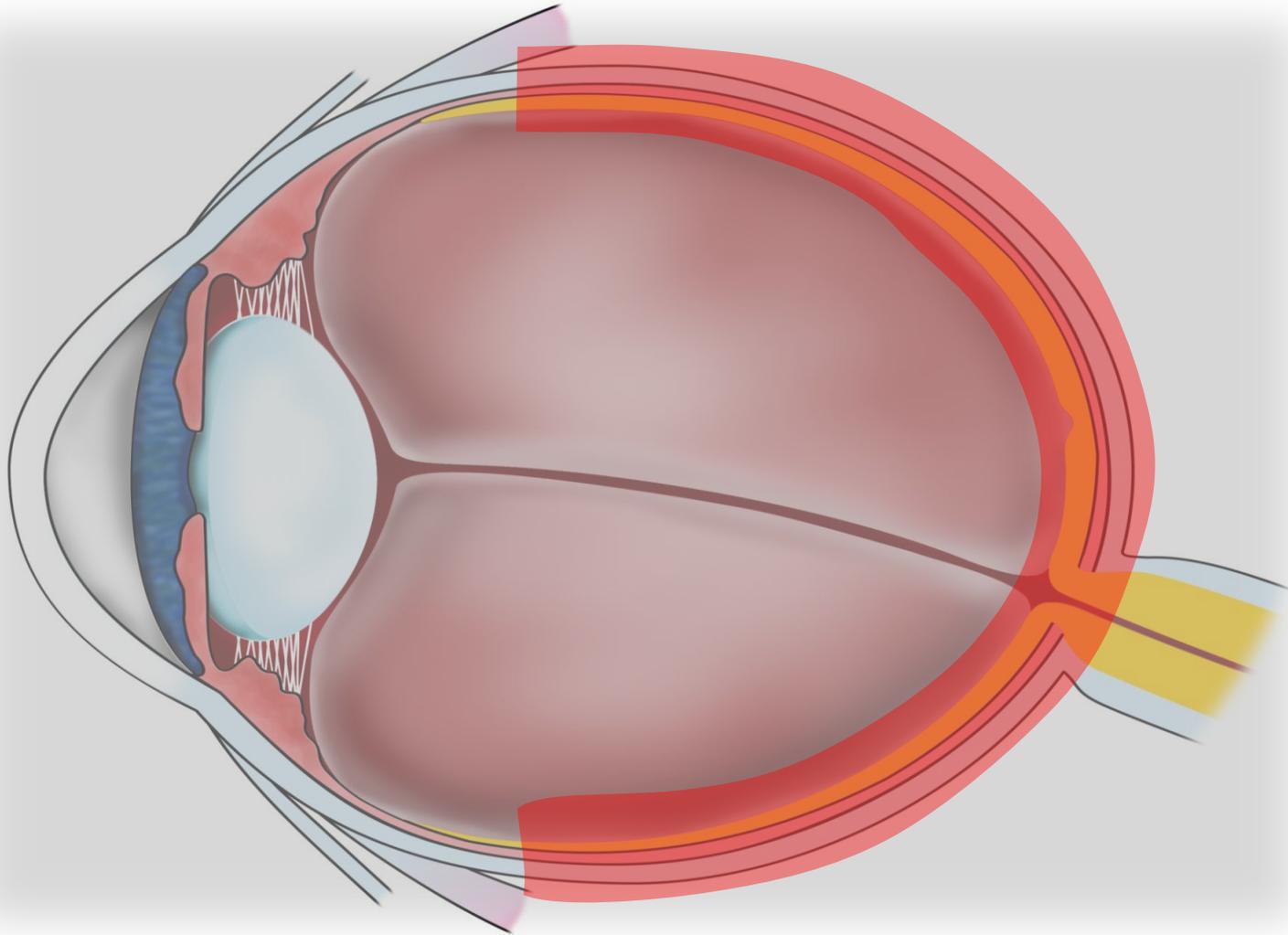


# ▶ start of the story

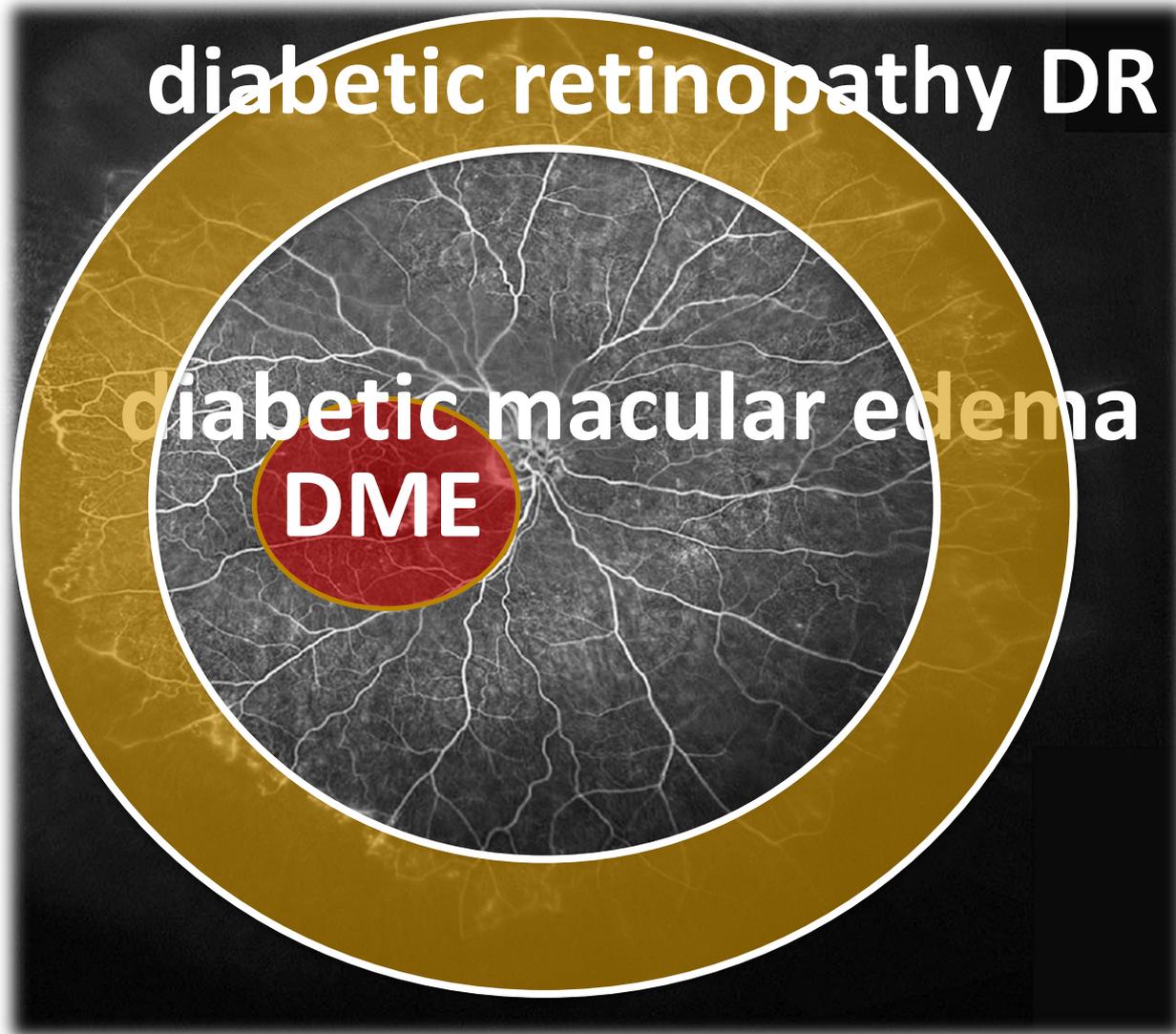


**Fear No 1: loss of vision**

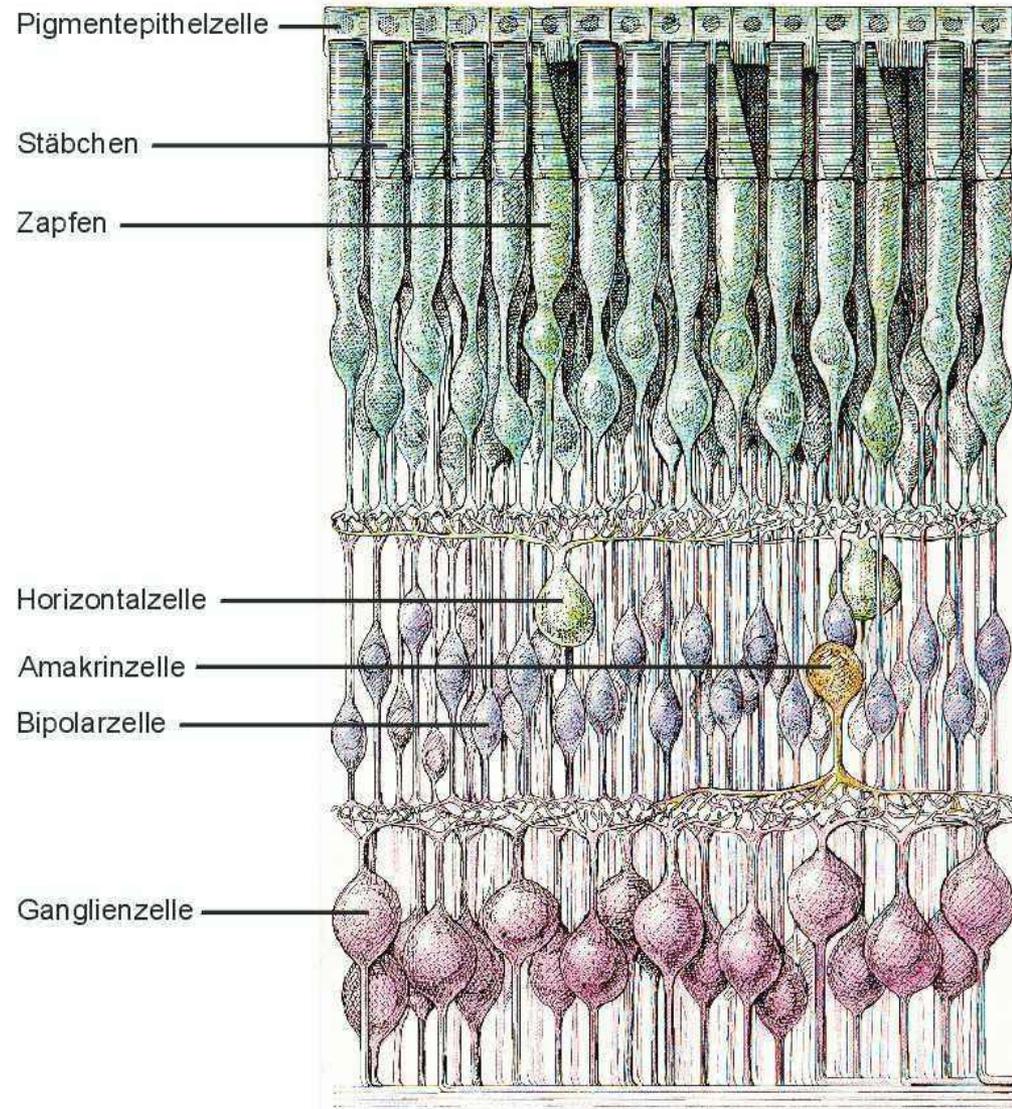
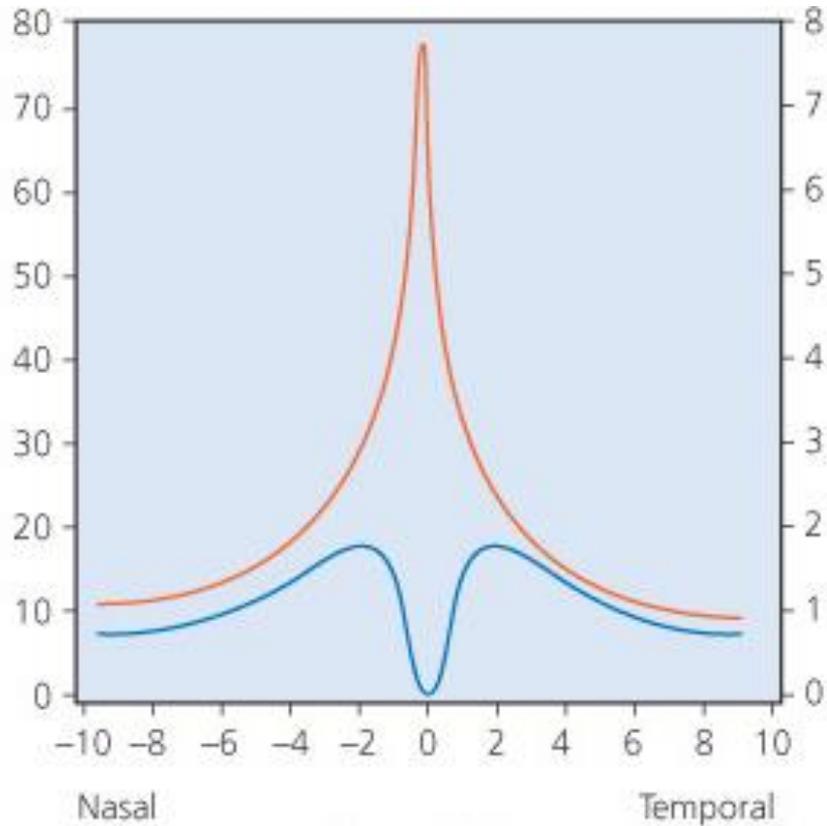
# ▶ diabetes hits the eye



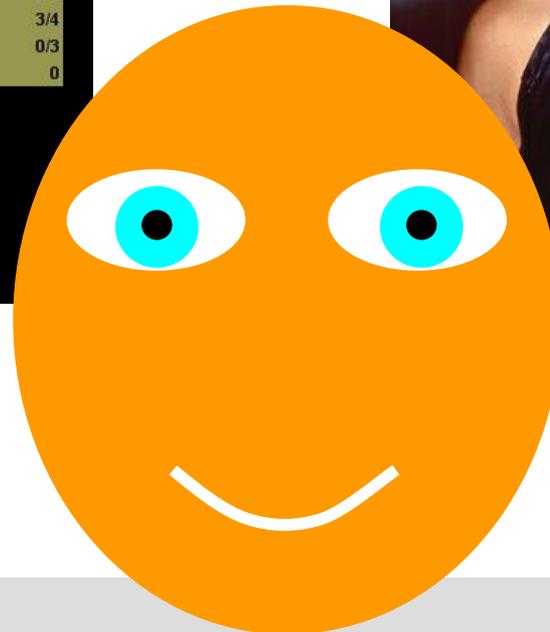
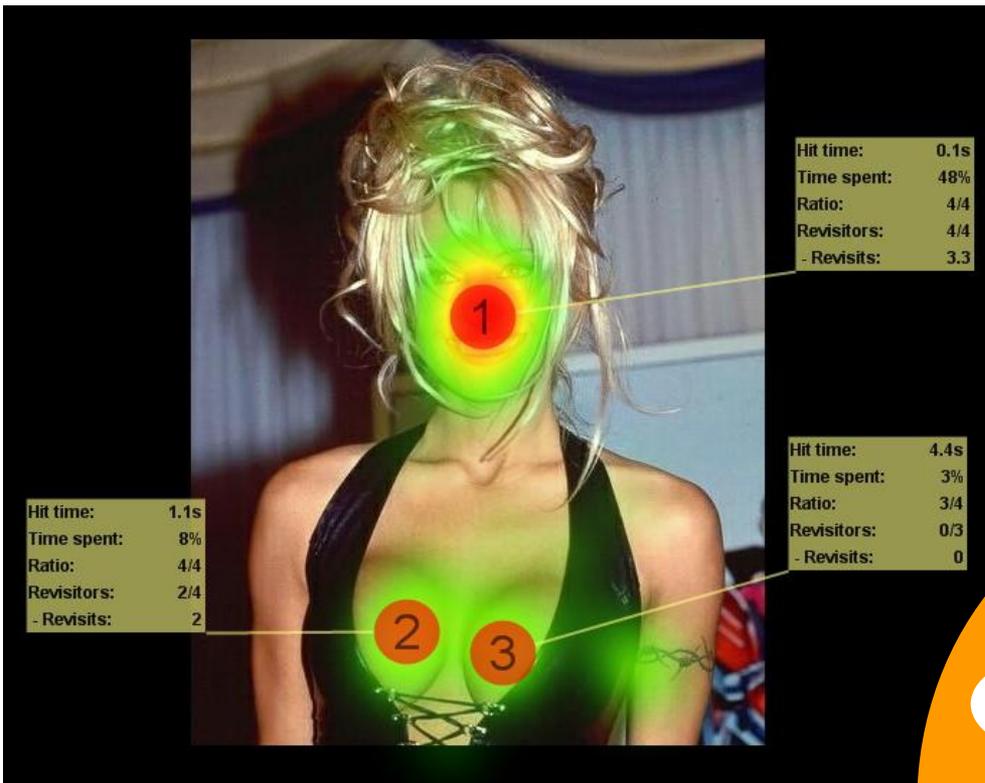
# ▶ diabetes hits the eye



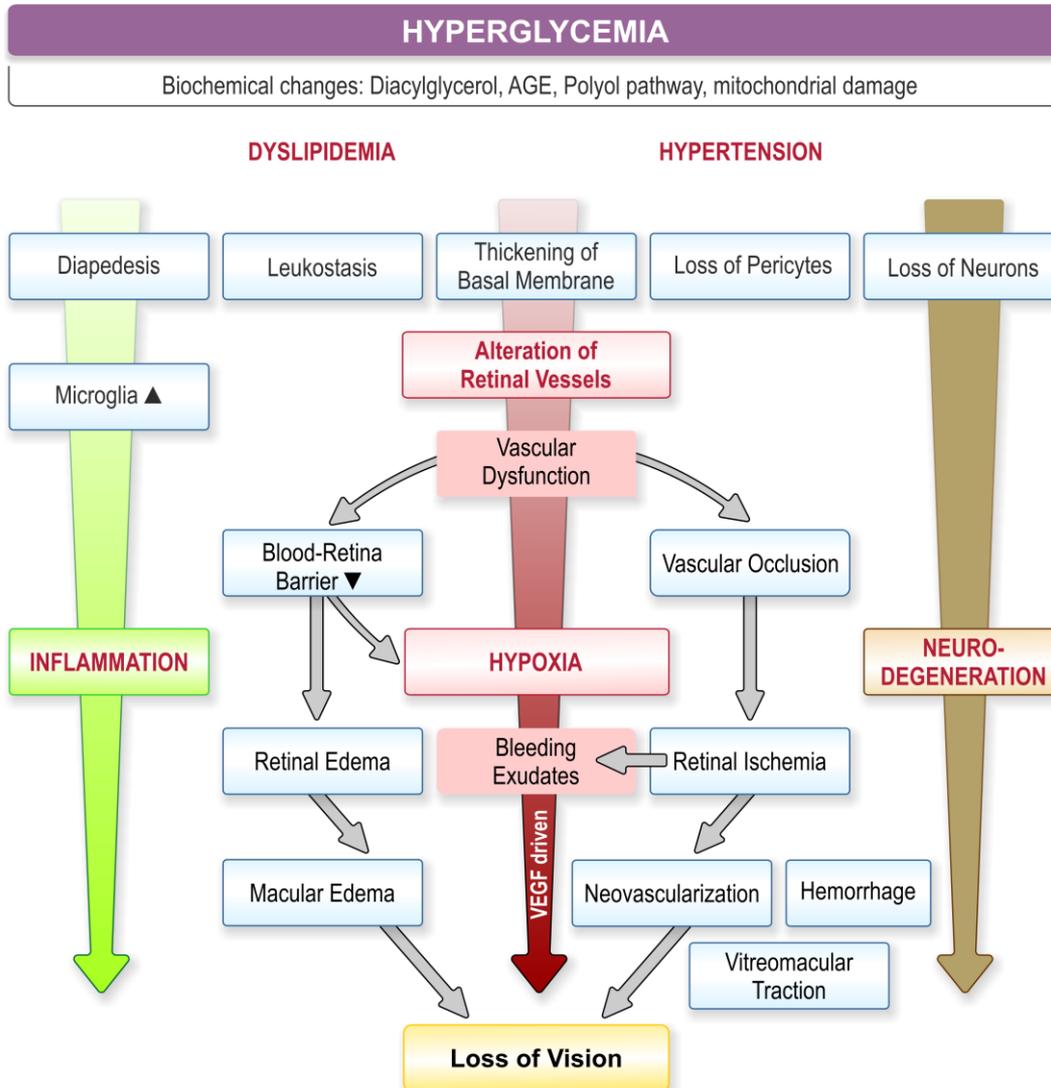
# ▶ eye: densely packed receptors



# ► fixation: central vision



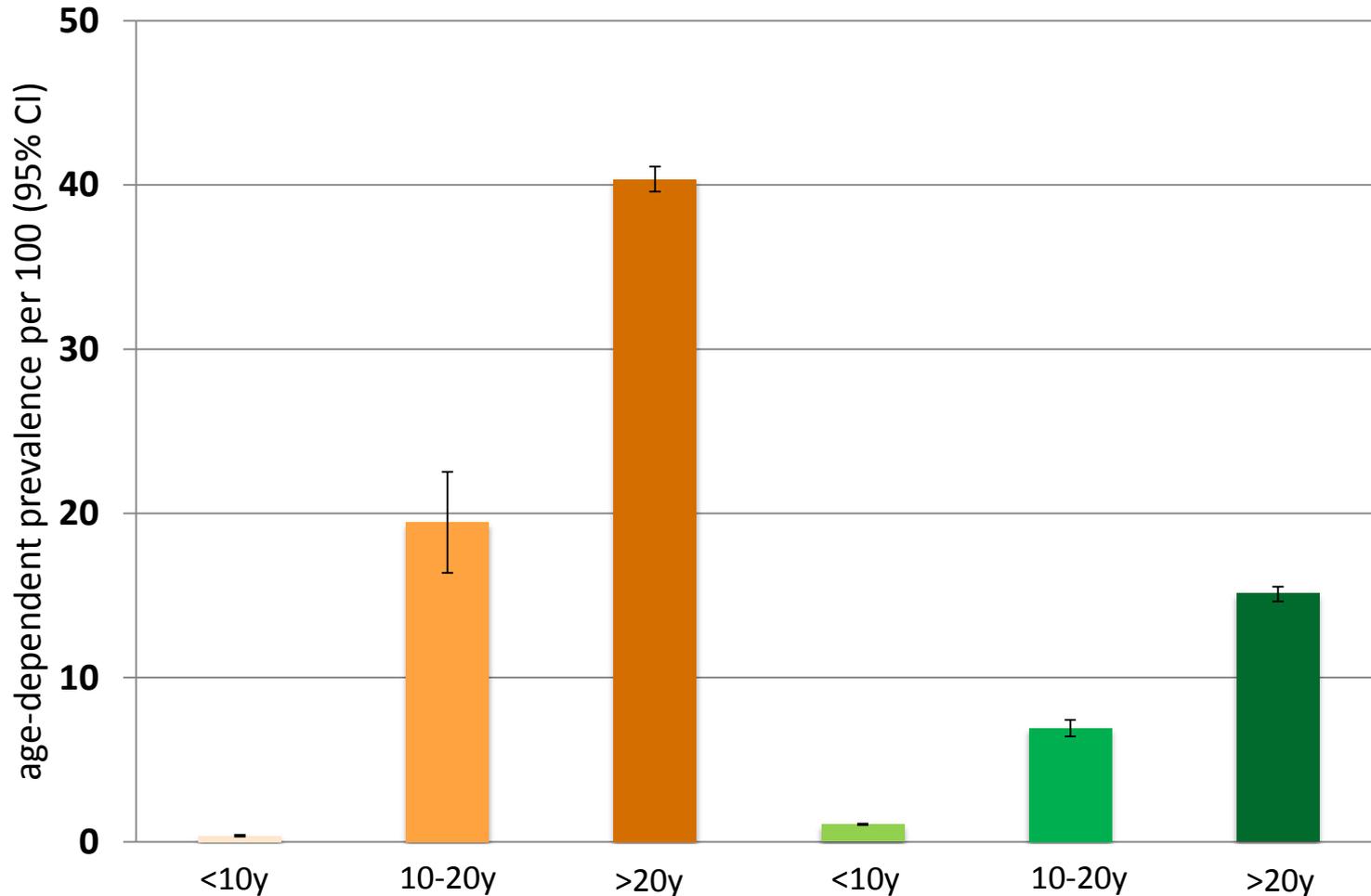
# ► DME is destructive



# ▶ type of diabetes: PDR=new vessels

## DM 1

## DM 2



▶ type of diabetes: PDR=new vessels

29 y ♀

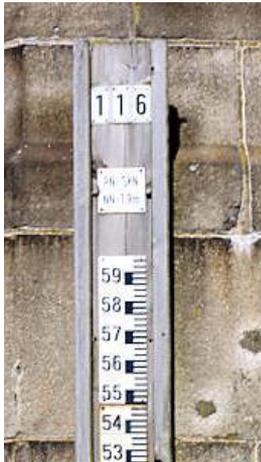


20/100



20/100

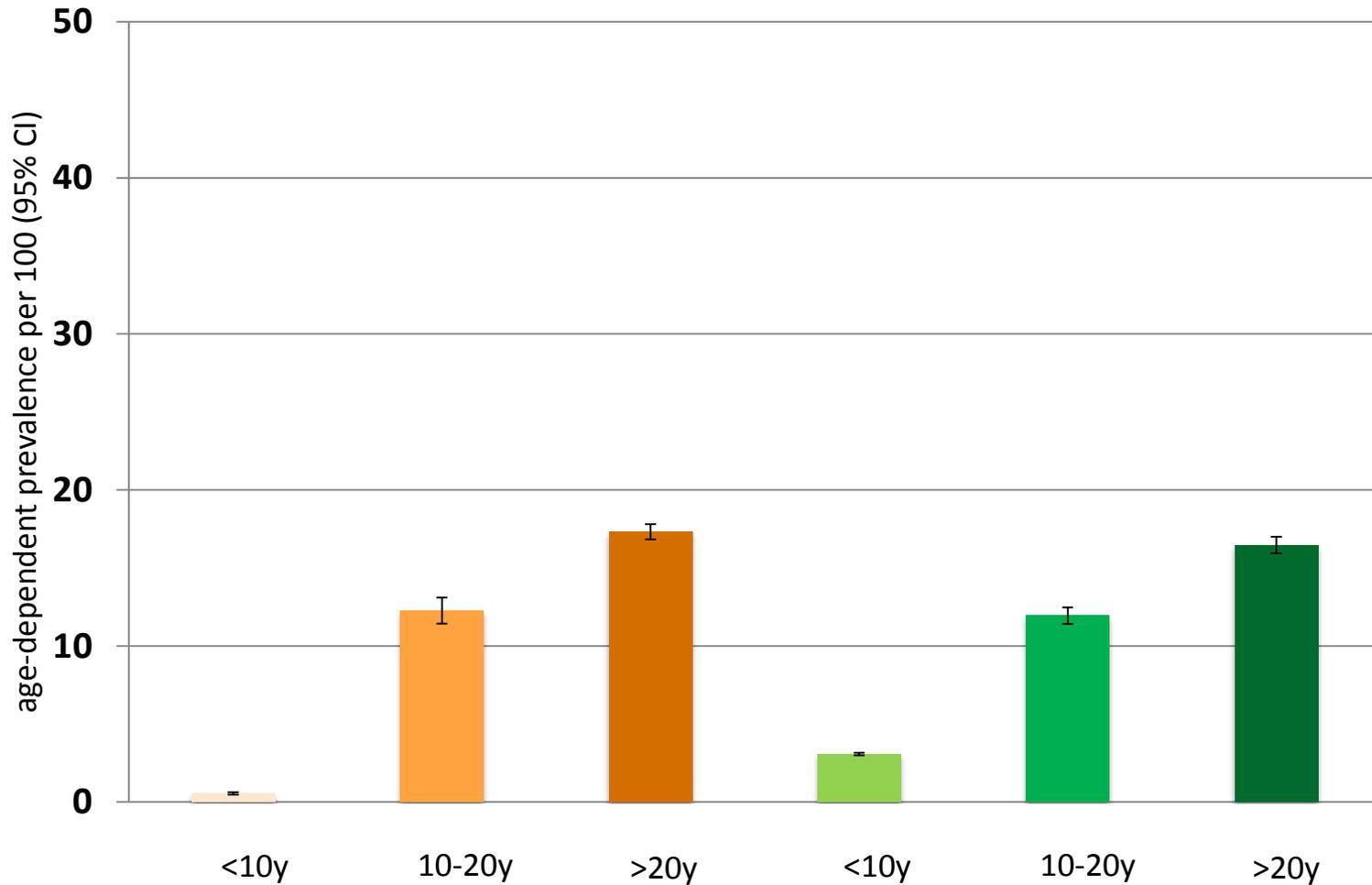
# ► DME is destructive



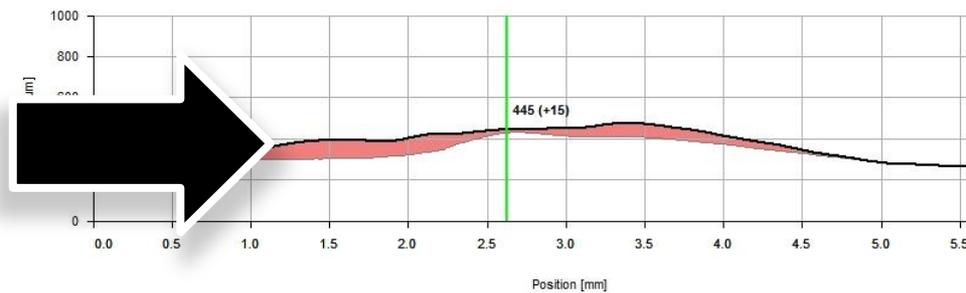
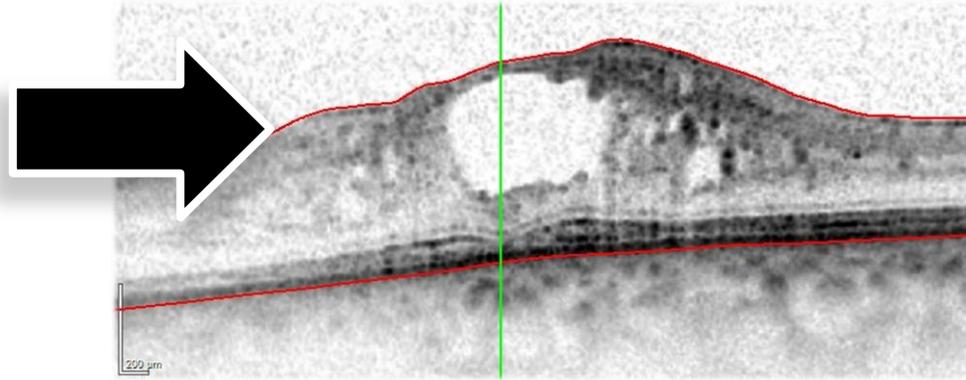
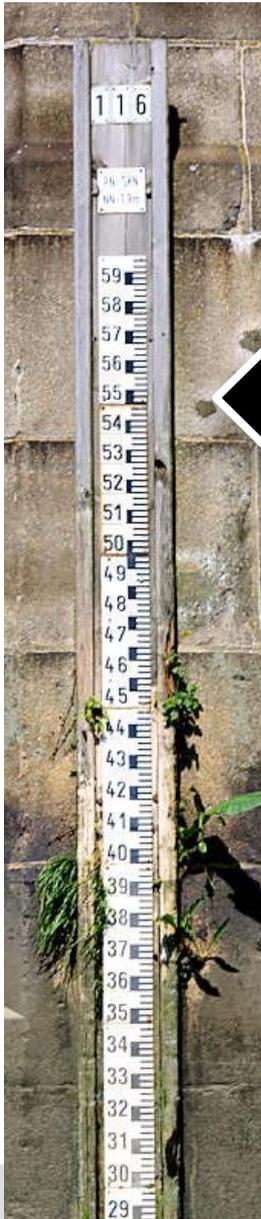
# ▶ type of diabetes: DME = fluid

## DM 1

## DM 2



# ▶ type of diabetes: DME = fluid



# ▶ progression

not necessarily early symptoms !



Mild NPDR



Mild PDR

High-Risk PDR

Advanced PDR

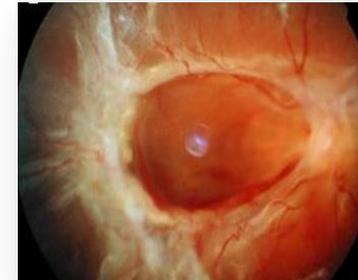
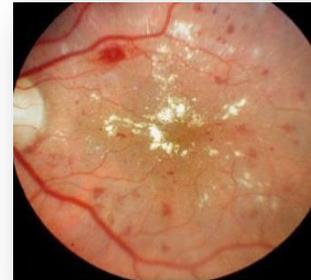


Microaneurysm

Moderate NPDR

Severe/  
Very severe NPDR

Moderate PDR



## DRSS: Diabetic Retinopathy Severity Scale

# ▶ different countries – different screenings



**ONCE YEARLY**

**RETINA SPECIALIST**



**(BI-)ANNUAL  
RISK-DEPENDENT**

**GENERAL  
OPHTHALMOLOGIST**



**YEARLY  
(UNDER DISCUSSION)**

**TECHNICIAN +  
READING CENTER**  **OUTPATIENT  
SPECIALIST**

**REFERRABLE**  
**TREATABLE**

# ▶ different countries – different screening



utilisation?

overlook

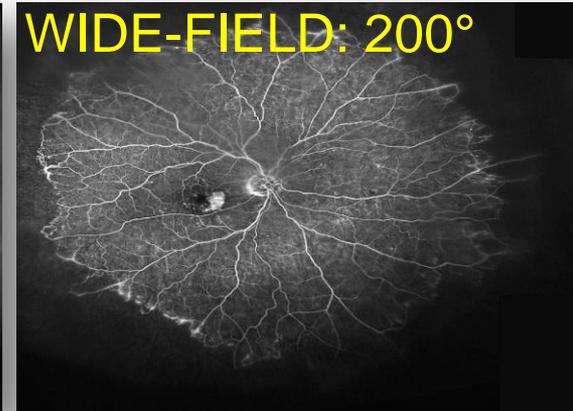
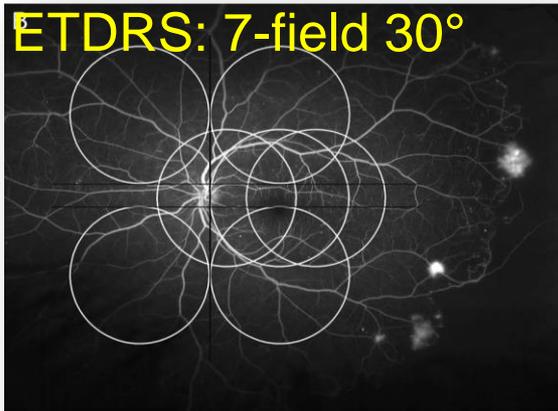


Diabetes retinopathy screening: audit of equity in participation and selected outcomes in South East London

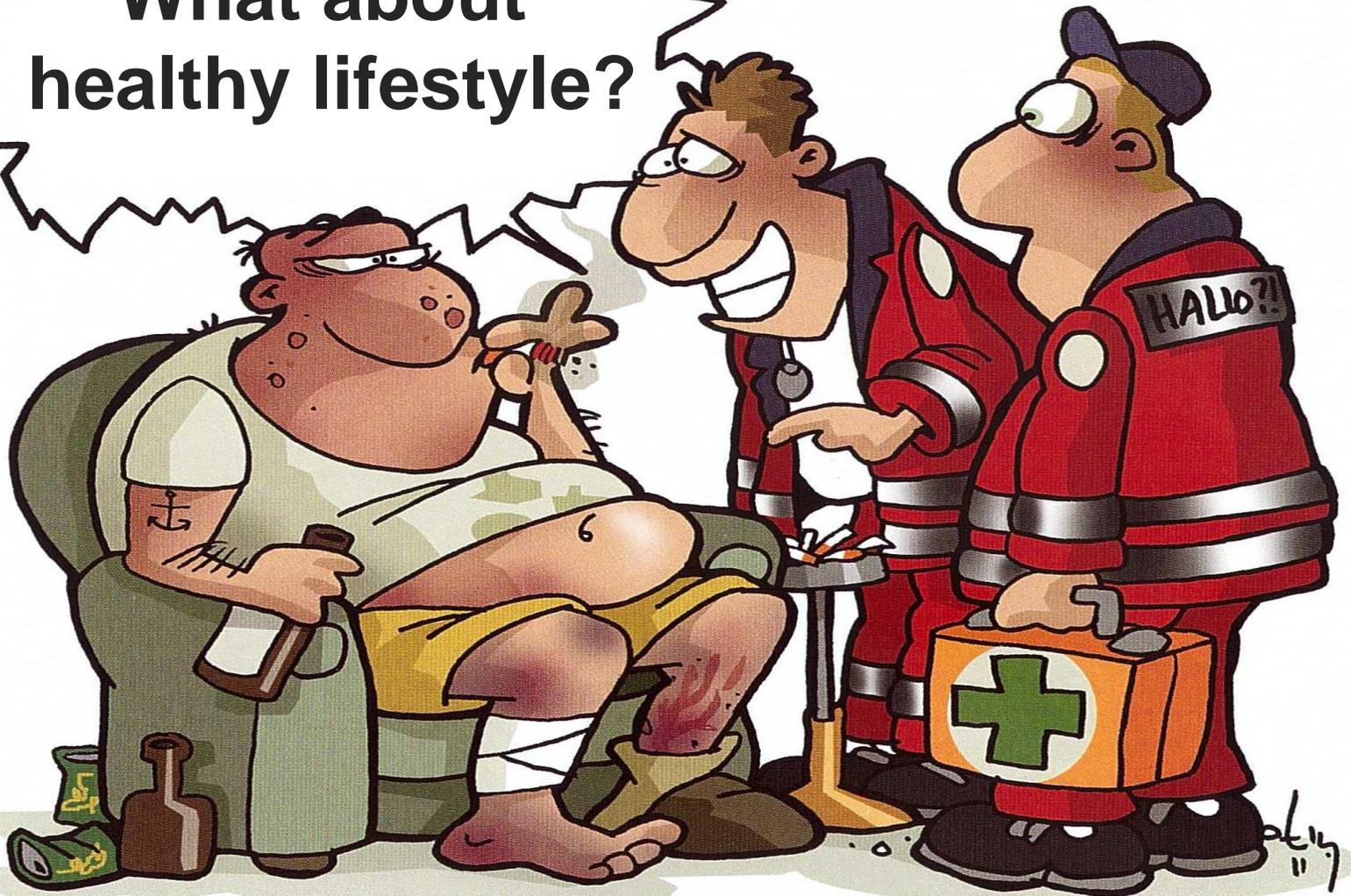
Christopher Millett and Hiten Dodhia

**Results** An estimated 46% of residents with known diabetes (9750/21,104) were offered digital retinopathy screening. **38.2% (8,066 of 21,104)** invited for screening attended. Attendance rates were significantly lower in younger patients (<40 years), in those with type 1 diabetes and in patients residing in areas with the highest levels of deprivation. A total of 28.9% of patients had background retinopathy or worse during 2003. Retinopathy was more common in older patients (>40 years) and in individuals with type 1 diabetes after adjusting for other factors. Patients born outside the United Kingdom and the Republic of Ireland were significantly more likely to present with retinopathy.

**Conclusions** This study identified considerable inequity in the delivery of a local diabetic retinopathy screening programme. **[...] considerable inequity in the delivery of screening program** monitoring of retinopathy screening programmes.



What about  
healthy lifestyle?

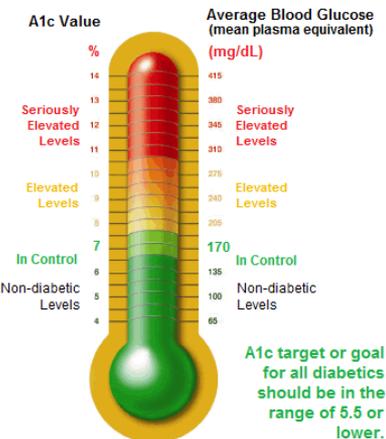


# ▶ facing challenges **INCIDENCE > PROGRESSION**

HbA1<sub>c</sub> +50% incidence ▲  
**+ 1%**

## Conventional A.D.A.-Endorsed A1c Blood Glucose Protocols

The American Diabetes Association typically considers a person with diabetes to be "well-controlled" if they are able to maintain an A1c level below 7.0. Studies show that significant long-term damage to precious cellular proteins and internal organs occurs at blood glucose levels above 120 (~A1c levels of 5.6). So why does the ADA recommend/mislead diabetics?



A1c%	60-90 days average Blood Glucose
12.0+	345
11.5	328
11.0	310
10.5	293
10.0	275
9.5	258
9.0	240
8.5	222
8.0	204
7.5	187
7.0	170
6.5	153
6.0	135
5.5	118
5.0	100
4.5	83
4.0	65

**Realistic A1c-Glucose Chart**

**Cave:** hypoglycaemia, early worsening  
 ▶ individualized target



Graphics URL Credit: <http://diabetesreversaltips.com/wp-content/uploads/2011/07/a1c-chart.gif>

## ▶ facing challenges

### DRCR.net Protocol Q

## Effect of diabetes education during Retinal Ophthalmology visits on diabetes control

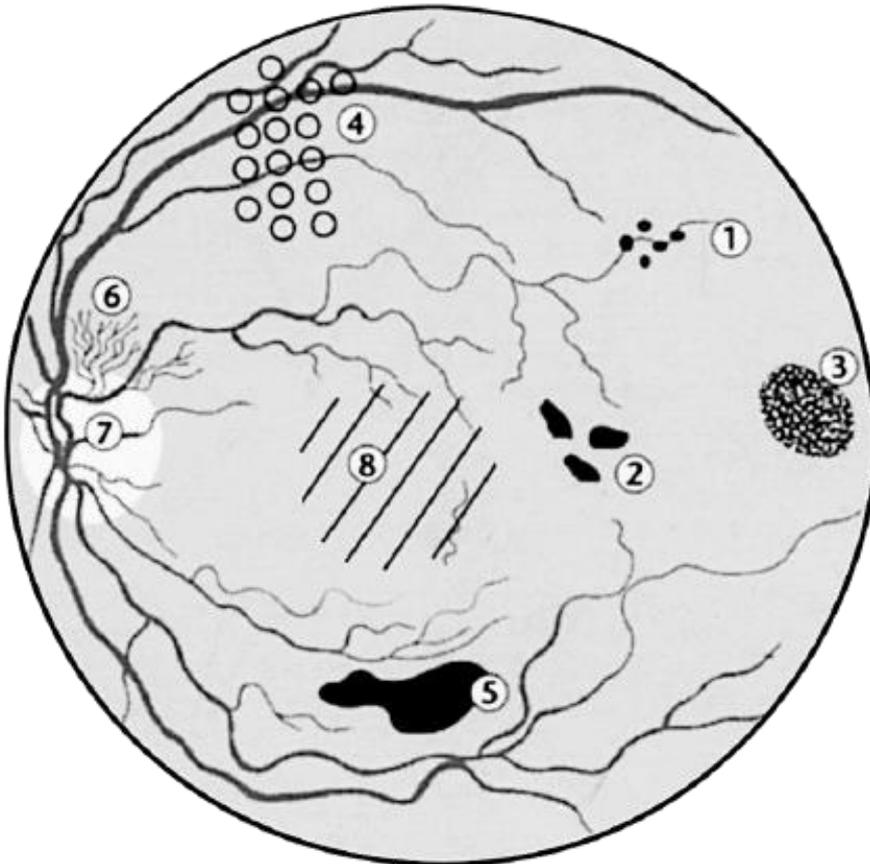
n=1.875

**INTERVENTION:**  
**personalized diabetes risk assessment**  
**with immediate feedback**



- measurement of HbA1c in office
- measurement of blood pressure
- assessment of retinopathy risk
- personalized risk assessment reports based on current HbA1c
- brief assessment of patient understanding of key issues with immediate feedback
- supplemental diabetes management educational materials (provided at baseline only)
- feedback to primary care provider
- e-mail reminder to study participants

# ▶ education: worthy of improvement



*Folgeerkrankungen vermeiden* MEDIAS 2

### Augen



**Was kann passieren?**

- Blutgefäße in den Augen werden geschädigt
- Sehfähigkeit lässt nach

**Wie erkennen?**

- Frühzeitige Probleme am Auge kann nur der Augenarzt erkennen!

**Wie behandeln?**

- Laserbehandlung
- Augenoperation

Und natürlich wichtig:  
guter Blutzucker  
guter Blutdruck  
gute Blutfette  
nicht rauchen

18. 10. 2019  
8. 1. 8. 19

# ▶ education: worthy of improvement



# ▶ facing challenges

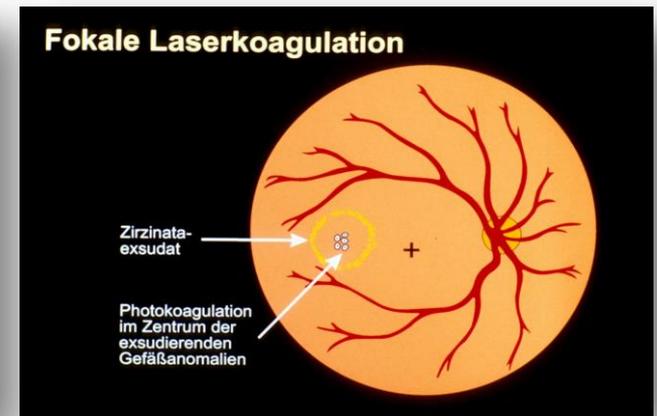
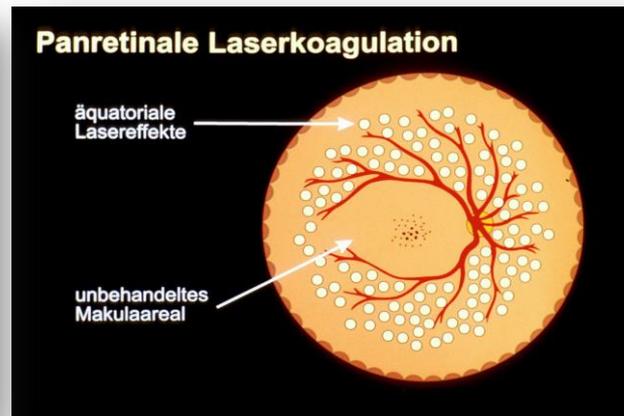
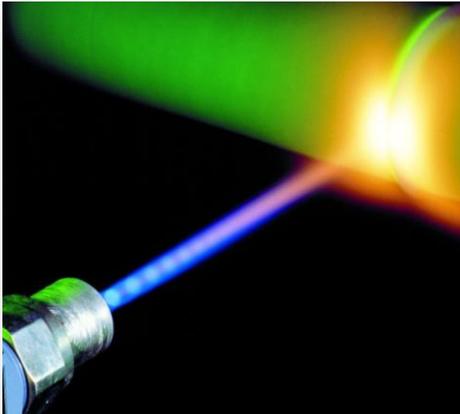


measurement of HbA1c in office  
measurement of blood pressure  
assessment of retinopathy risk  
personalized risk assessment reports based on HbA1c  
brief assessment of patient understanding of key issues with immediate feedback  
supplemental diabetes management educational materials (provided at baseline only)  
feedback to primary care provider  
e-mail reminder to study participants

**METABOLIC CONTROL (HbA<sub>1c</sub>) OF INTERVENTION GROUP NOT BETTER AT MONTH 12**

# ▶ therapeutic arsenal

## - laser

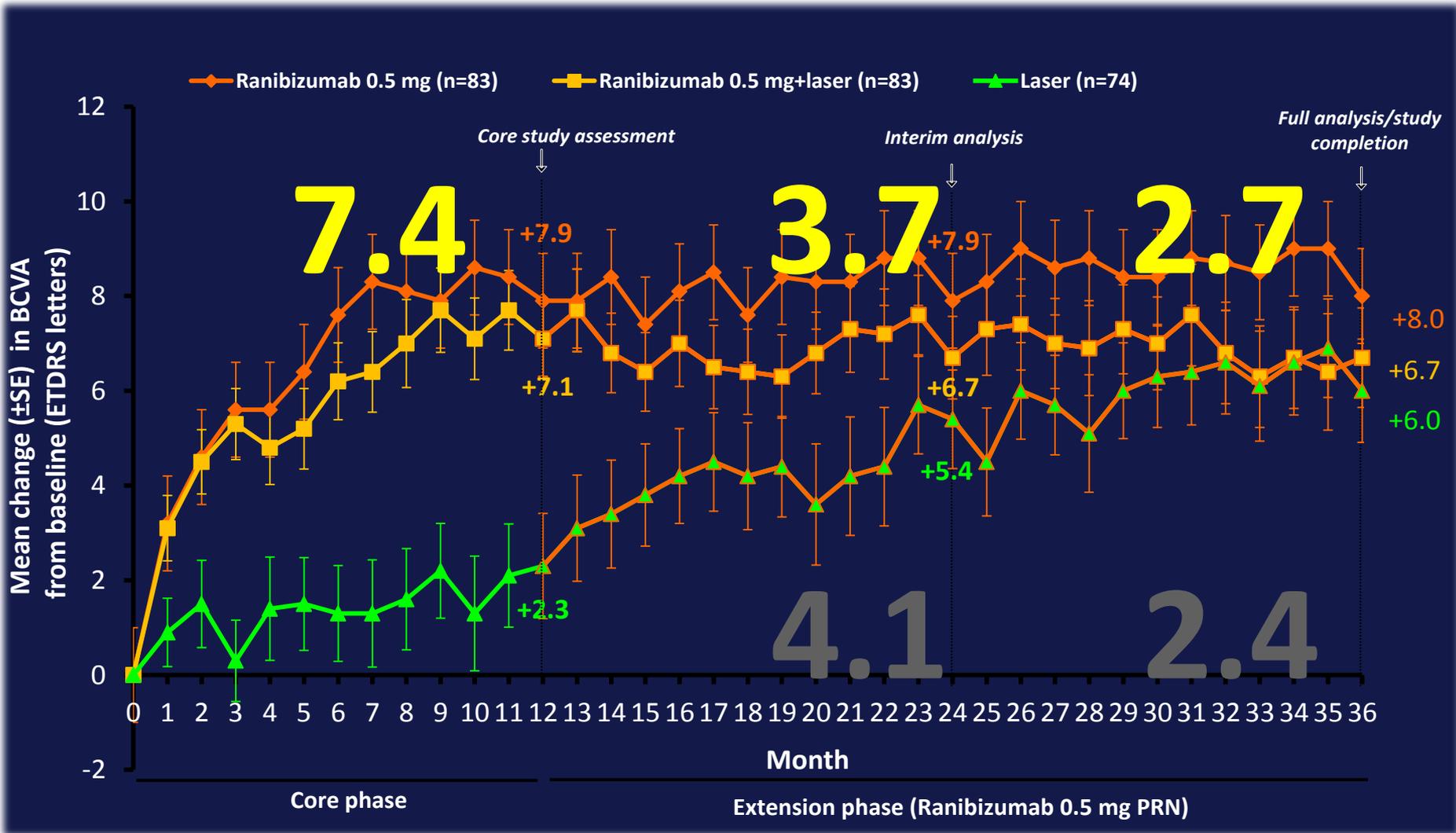


# ▶ therapeutic arsenal

- drugs

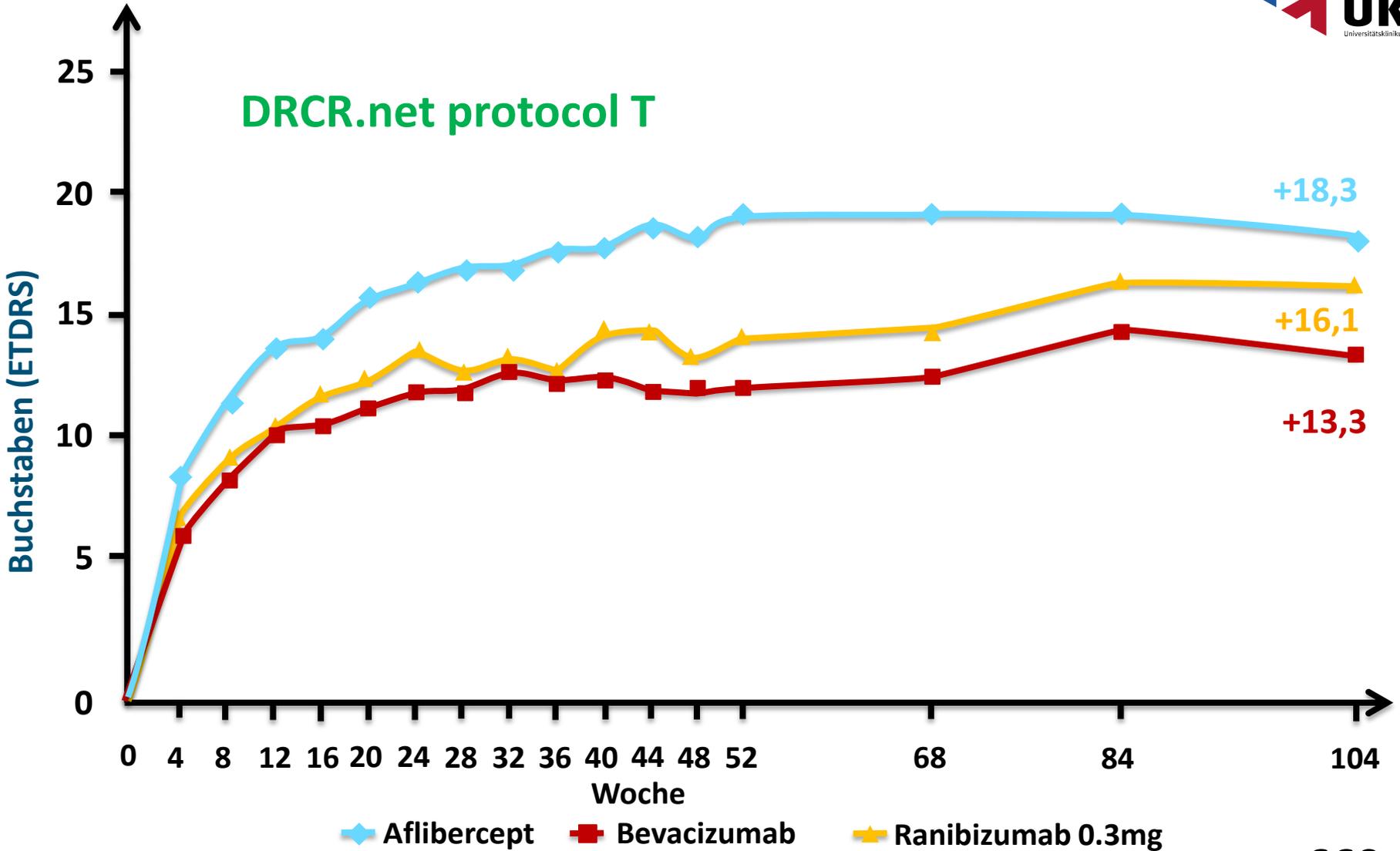


# ▶ therapeutic arsenal



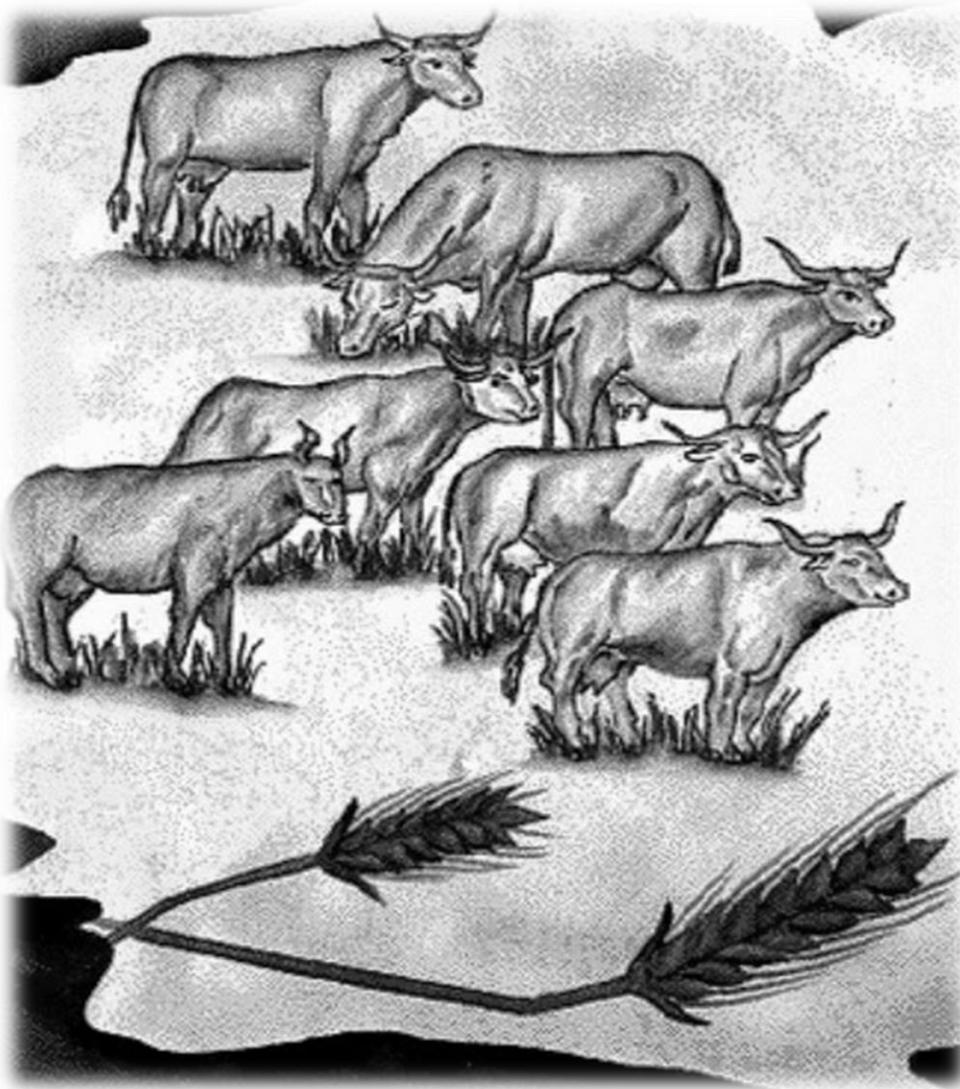


# ▶ therapeutic arsenal



n=660

# ▶ Taking action in a timely manner



▶ no ,black-and-white‘

no retinopathy



retinopathy



# ▶ Taking action in a timely manner

restraint



▶ toilet paper

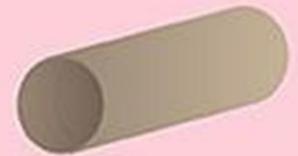
precision



creativity



panic



▶ **communication**



**„...mild sugar“**

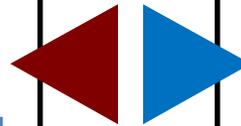
**„no need for action“**

**„everything set properly.“**

**„senile diabetes“**

**„...no changes of the retina “**

# ▶ interdisciplinary collaboration



AOK	LKK	BKK	IKK	VdAK	AEV	Knappschaft
Name, Vorname des Versicherten						
geb. am						
Kassen-Nr.		Versicherten-Nr.		Status		
Betriebsstätten-Nr.		Arzt-Nr.		Datum		

## Hausärztliche/diabetologische Mitteilung an den Augenarzt

Das Risiko für eine Netzhautkomplikation bei Diabetes setzt sich zusammen aus

- dem allgemeinen Risiko, das vom Hausarzt/Diabetologen eingeschätzt wird und
- dem ophthalmologischen Risiko, das vom Augenarzt eingeschätzt wird.

In dieser Mitteilung gibt der Hausarzt/Diabetologe seine Einschätzung des allgemeinen Risikos wieder. Das Gesamtrisiko kann erst nach der Untersuchung beim Augenarzt eingeschätzt werden.

Diabetes-Typ:	<input type="radio"/> Typ-1 Diabetes <input type="radio"/> Typ-2 Diabetes
Diabetes bekannt seit:	.....Jahren (Grenzwert*: > 10 Jahre)
HbA1c:	.....% (Grenzwert*: > 7,5 %)
Repräsentativer Blutdruckwert:	.....mmHg (Grenzwert*: > 140/85 mmHg)
Bestehende Gefäßkomplikation, insbesondere Niere:	<input type="radio"/> ja <input type="radio"/> nein
<b>Integrierende Einschätzung* des allgemeinen Risikos auf Basis oben aufgeführter Risikofaktoren und des Gesamtbildes des Patienten</b>	<input type="radio"/> eher geringes Risiko <input type="radio"/> eher erhöhtes Risiko

\* Bei den angegebenen Werten handelt es sich um Grenzwerte für ein erhöhtes Risiko. Da einzelne geringgradige Grenzwertüberschreitungen keine große Risikoerhöhung zur Folge haben, muss es immer zu einer integrativen Beurteilung aller Risikofaktoren zusammen kommen.

Weitere hausärztliche/diabetologische Diagnosen/Bemerkungen:

Für die Netzhautuntersuchung ist eine medikamentöse Pupillenerweiterung erforderlich, sodass danach zwei bis vier Stunden kein Fahrzeug geführt werden kann.

AOK	LKK	BKK	IKK	VdAK	AEV	Knappschaft
Name, Vorname des Versicherten						
geb. am						
Kassen-Nr.		Versicherten-Nr.		Status		
Betriebsstätten-Nr.		Arzt-Nr.		Datum		

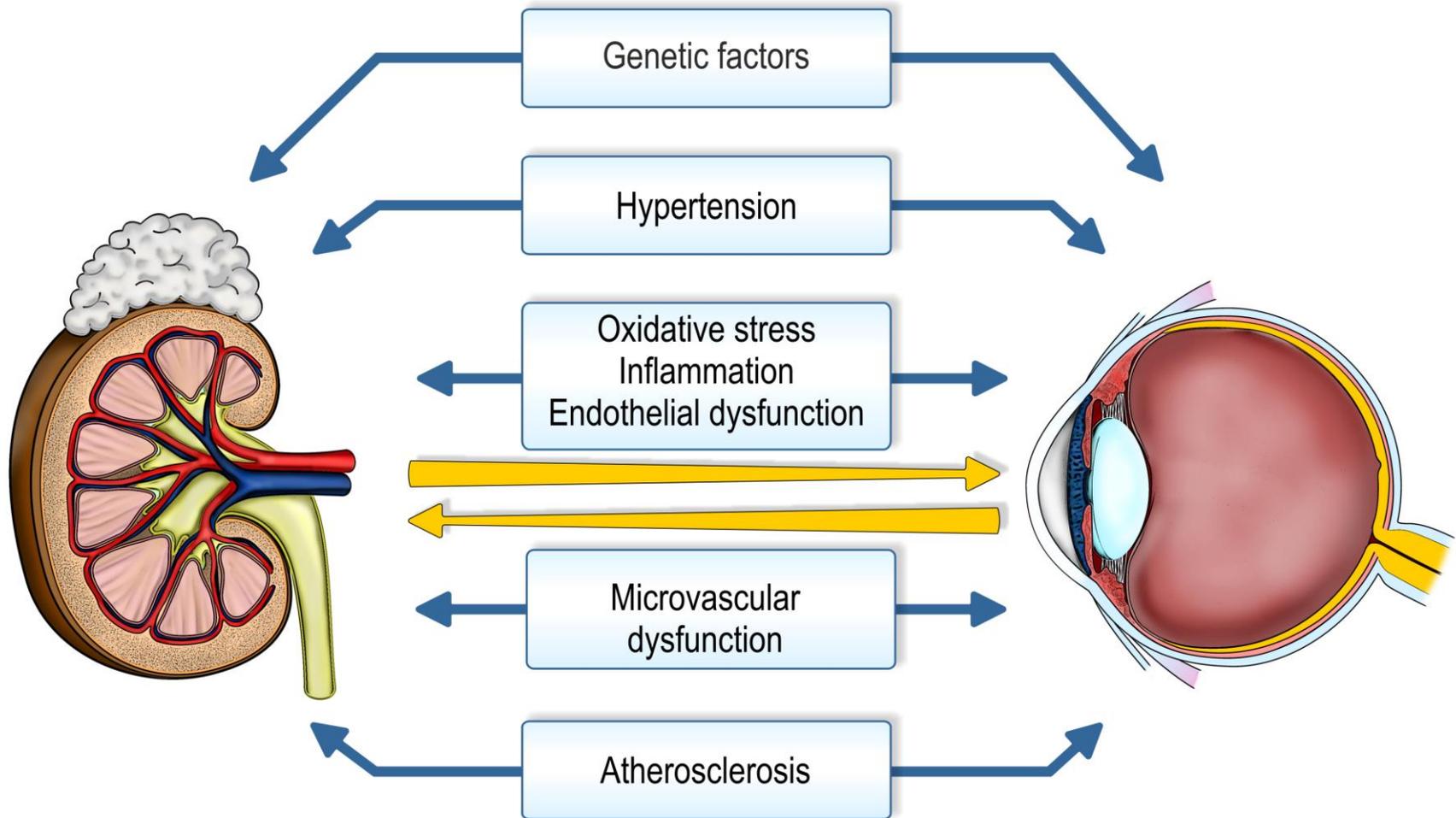
## Augenfachärztliche Mitteilung

Der Augenhintergrund soll bei erweiterter Pupille untersucht werden.

	rechtes Auge	linkes Auge
<b>Vorderabschnitte:</b> Rubeosis iridis	<input type="radio"/>	<input type="radio"/>
<b>Retinopathiestadium:</b>		
Keine diabetische Retinopathie	<input type="radio"/>	<input type="radio"/>
Milde oder mäßige diabetische Retinopathie	<input type="radio"/>	<input type="radio"/>
Schwere nichtproliferative diabetische Retinopathie	<input type="radio"/>	<input type="radio"/>
Proliferative diabetische Retinopathie	<input type="radio"/>	<input type="radio"/>
Klinisch signifikantes diabetisches Makulaödem	<input type="radio"/>	<input type="radio"/>
<b>Befund im Vergleich zur Voruntersuchung:</b>		
gleich	<input type="radio"/>	<input type="radio"/>
besser	<input type="radio"/>	<input type="radio"/>
schlechter	<input type="radio"/>	<input type="radio"/>
Vorbefund nicht bekannt	<input type="radio"/>	<input type="radio"/>
<b>Procedere:</b>		
OCT	<input type="radio"/>	<input type="radio"/>
Fluoreszeinangiographie	<input type="radio"/>	<input type="radio"/>
Panretinale Laserkoagulation	<input type="radio"/>	<input type="radio"/>
Fokale Laserkoagulation am hinteren Augenpol	<input type="radio"/>	<input type="radio"/>
Intravitreale Medikamenteneingabe	<input type="radio"/>	<input type="radio"/>
Vitrektomie	<input type="radio"/>	<input type="radio"/>
<b>Beste korrigierter Fernvisus:</b>	_____	_____
<b>Weitere augenärztliche Diagnosen/Bemerkungen:</b>		
<b>Kontrolluntersuchung bezüglich diabetischer Retinopathie:</b>	<input type="radio"/> in 2 Jahren	
	<input type="radio"/> in 1 Jahr	
	<input type="radio"/> in ..... Monaten	

Untersuchungsdatum, Unterschrift und Stempel des Augenarztes

# ▶ eye + kidney





# DIABETES

## ▶ challenges

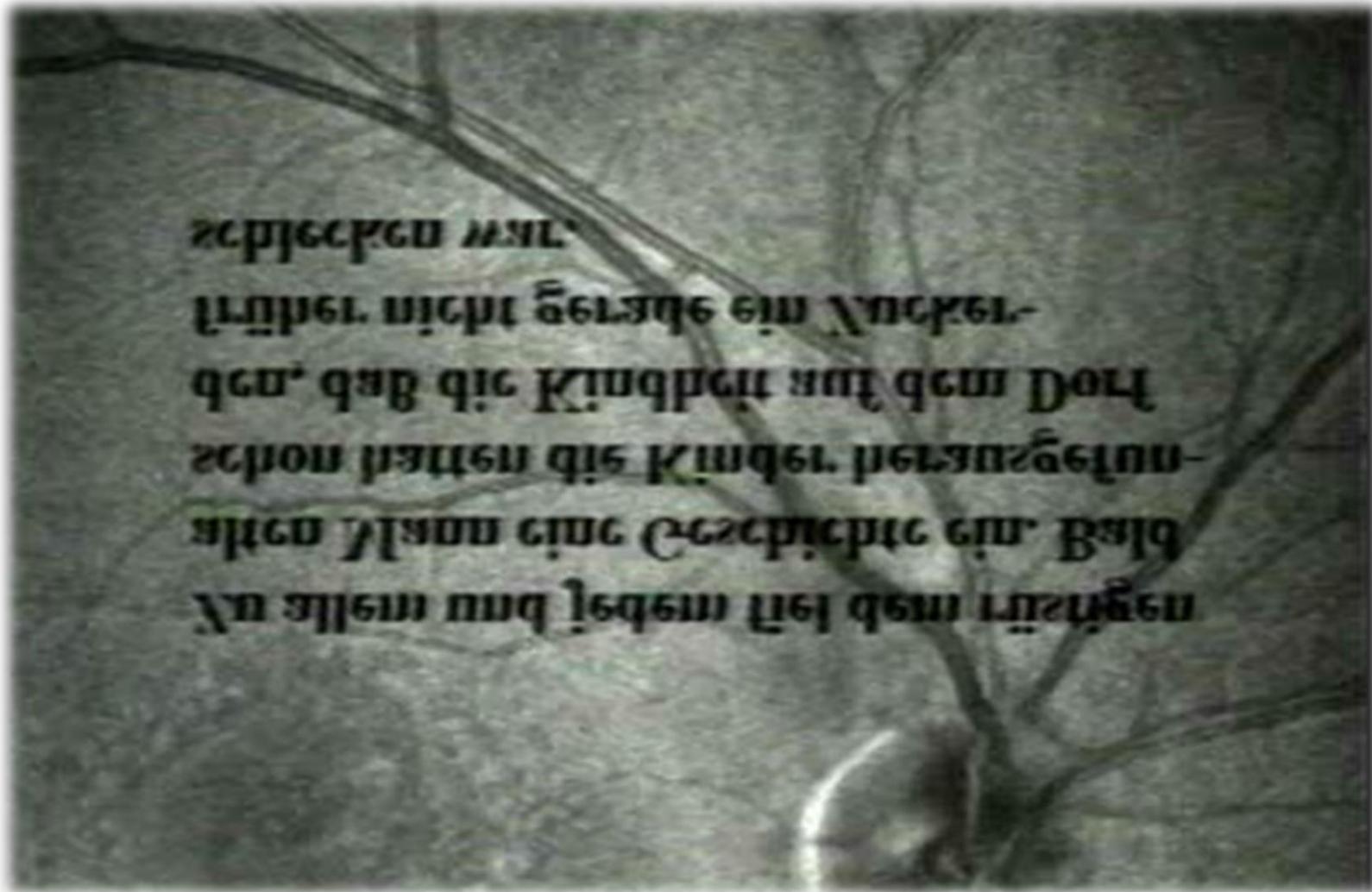
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- ▶ **risk depending on duration/stage**
- ▶ **heterogeneity/variability of screening**
- ▶ **insufficient education (adequately for patients)  
unused potential of behavioural change**

# ▶ driving



## ▶ reading





**Auge um Auge.**

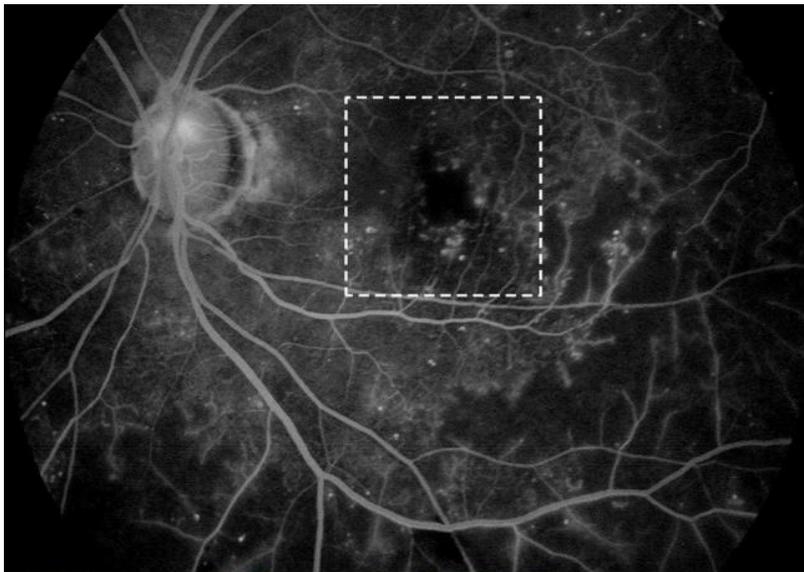
**Fuß um Fuß**



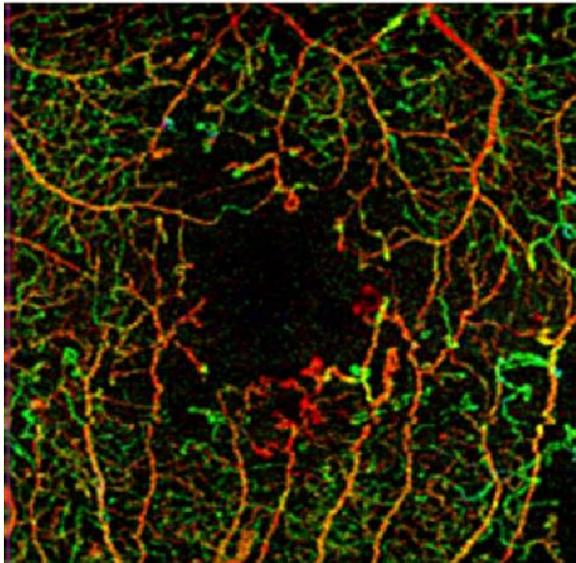
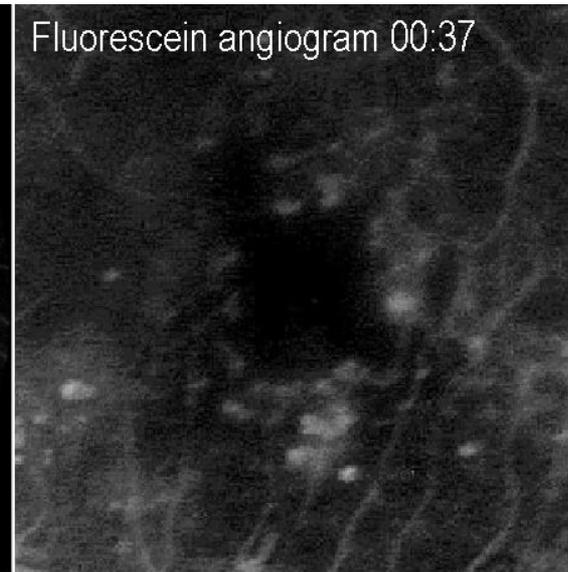
DIABETES IST  
KEIN ZUCKERSCHLECKEN !!



# angio-OCT: perfusion without dye

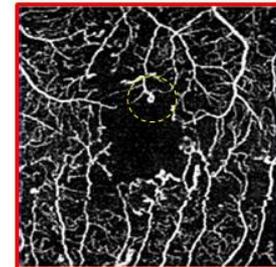


Fluorescein angiogram 00:37

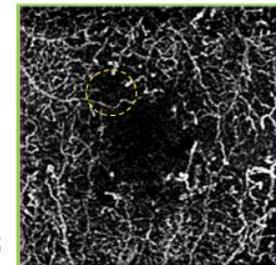


**OCT Angiography**  
Color Depth Retina

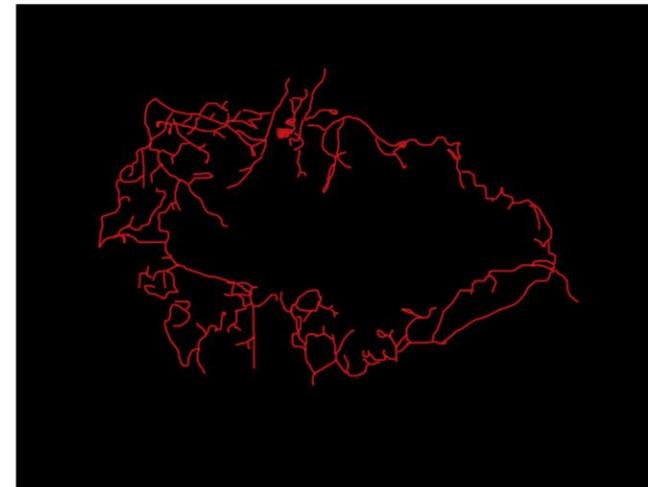
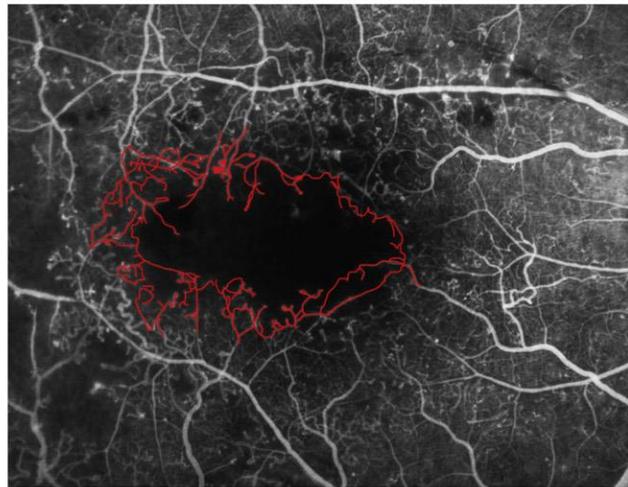
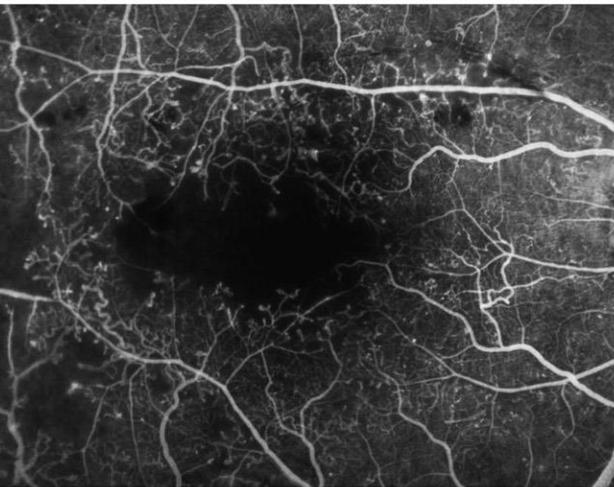
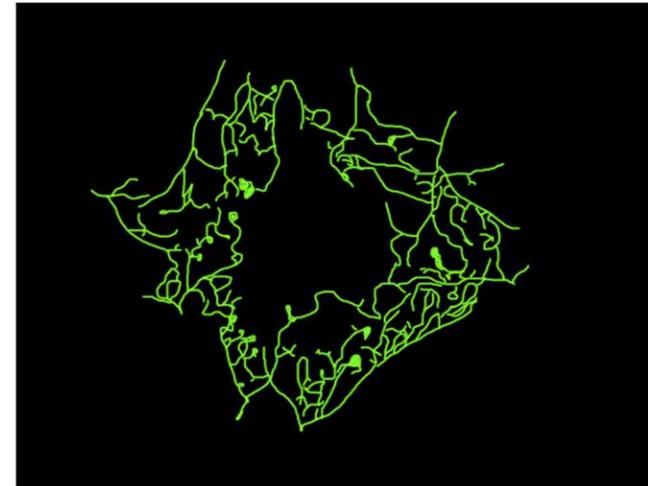
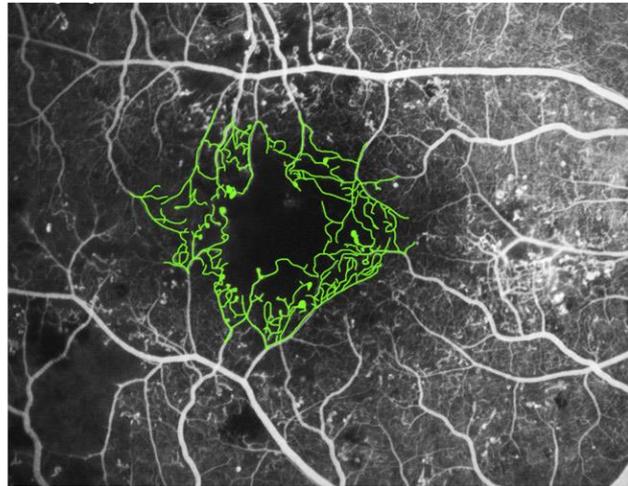
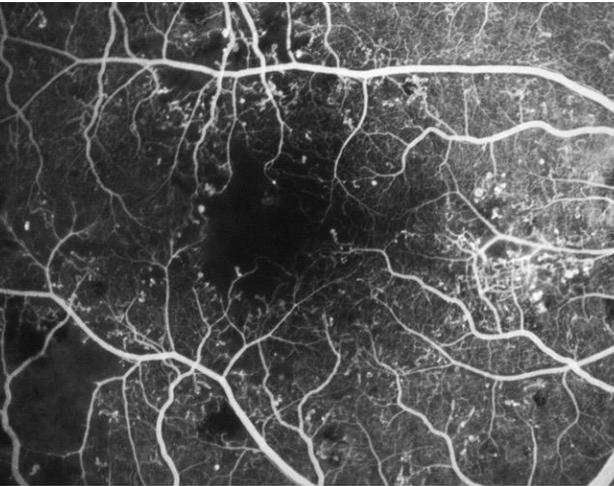
superficial layers



deep layers



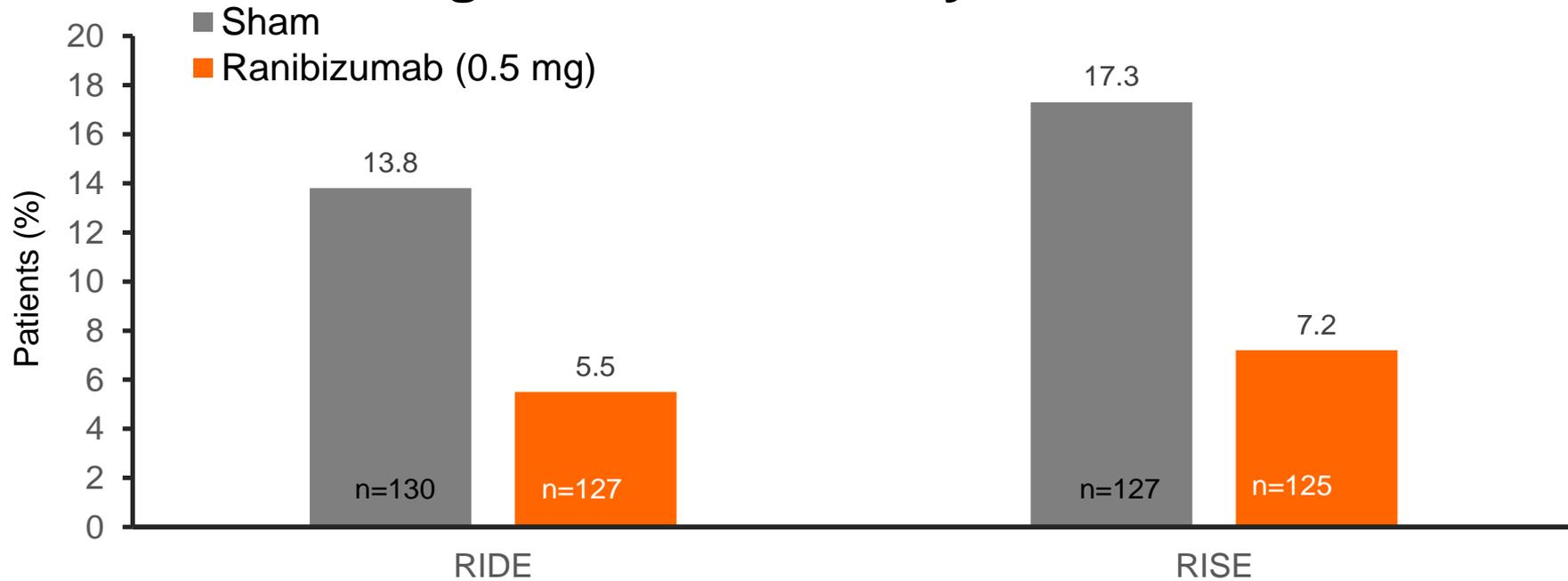
# Retinale Ischämie





# less neovascularization

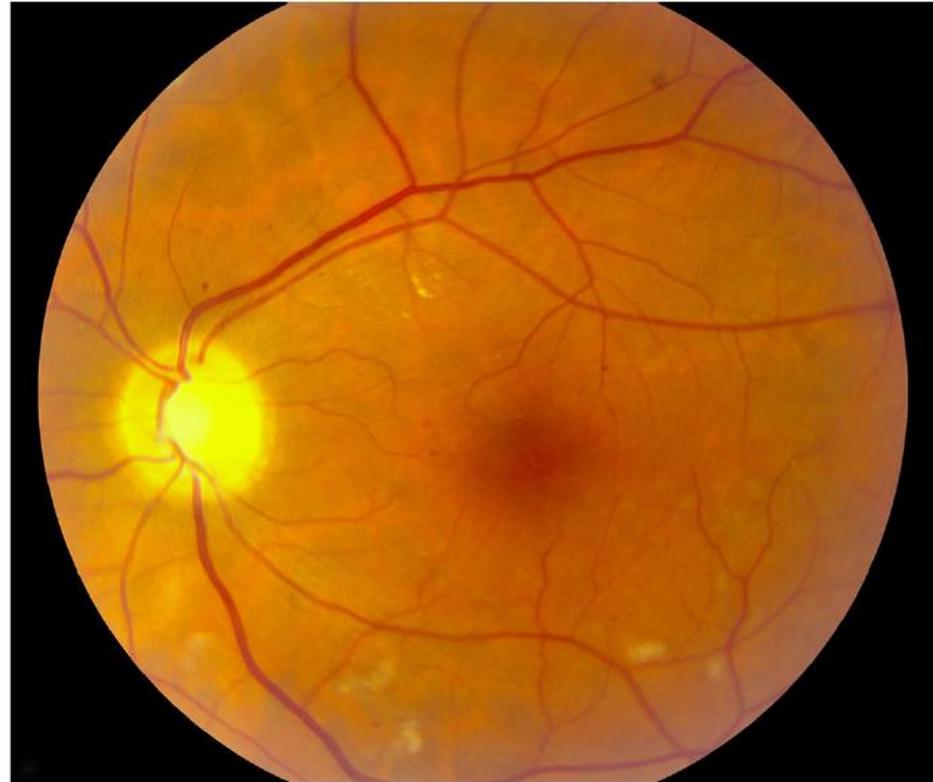
## Progression to PDR by Month 36



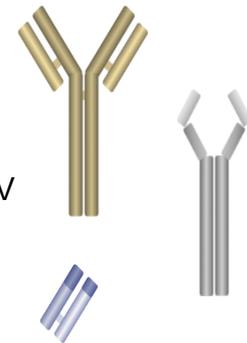
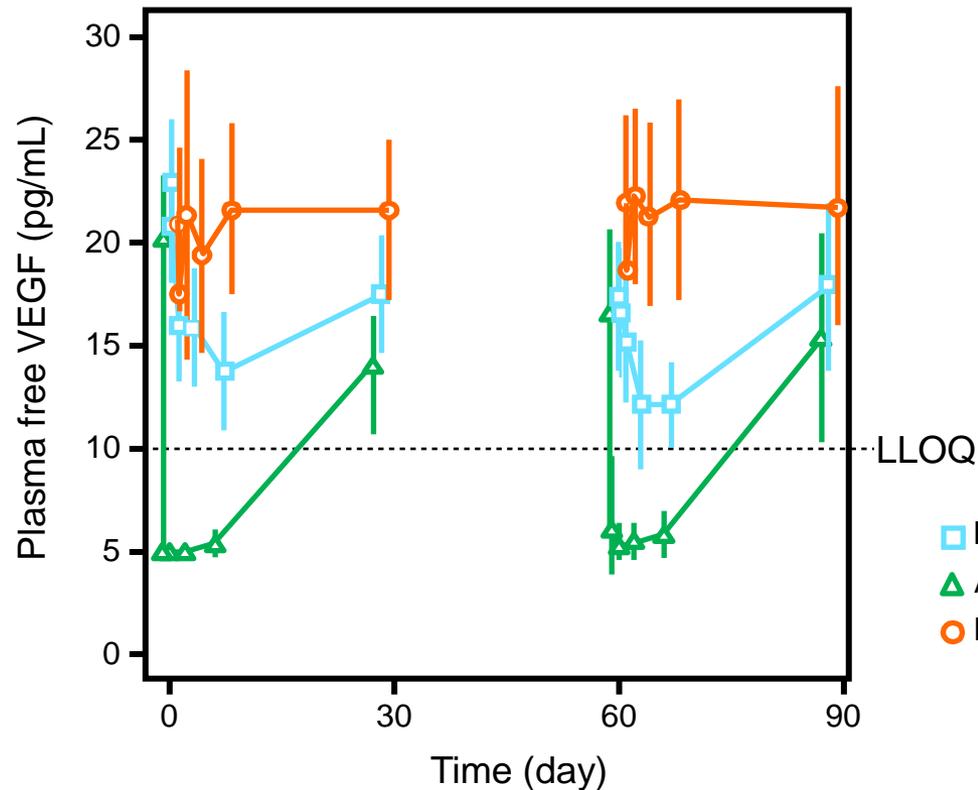
ITT population  
PDR, proliferative diabetic retinopathy



**less exudates**

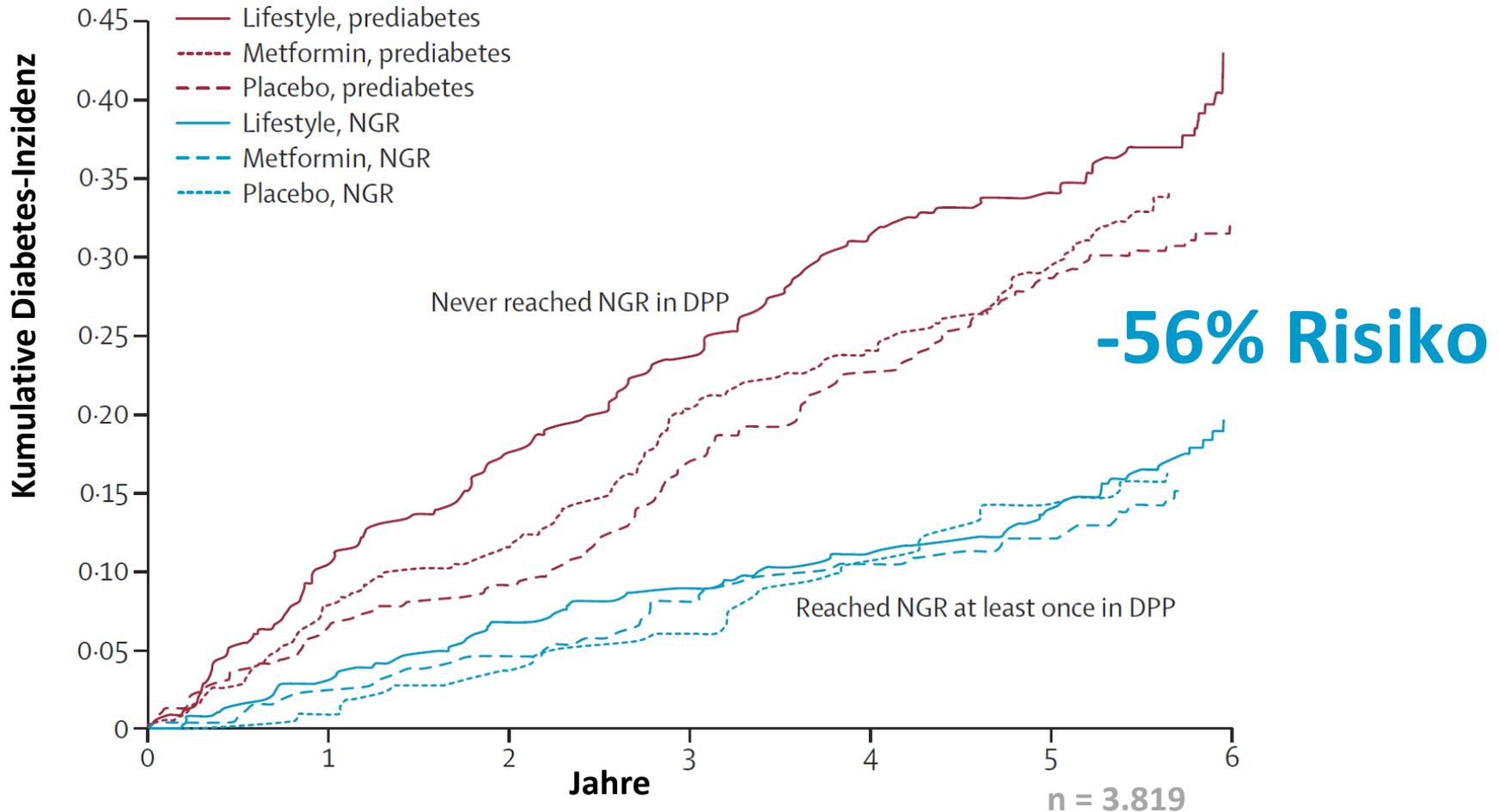


## free VEGF



\*Values below the LLOQ were given a value of 5.0 pg/mL. Vertical lines represent 95% confidence interval  
DME, diabetic macular edema; ITV, intravitreal; LLOQ, lower limit of qualification;  
VEGF, vascular endothelial growth factor

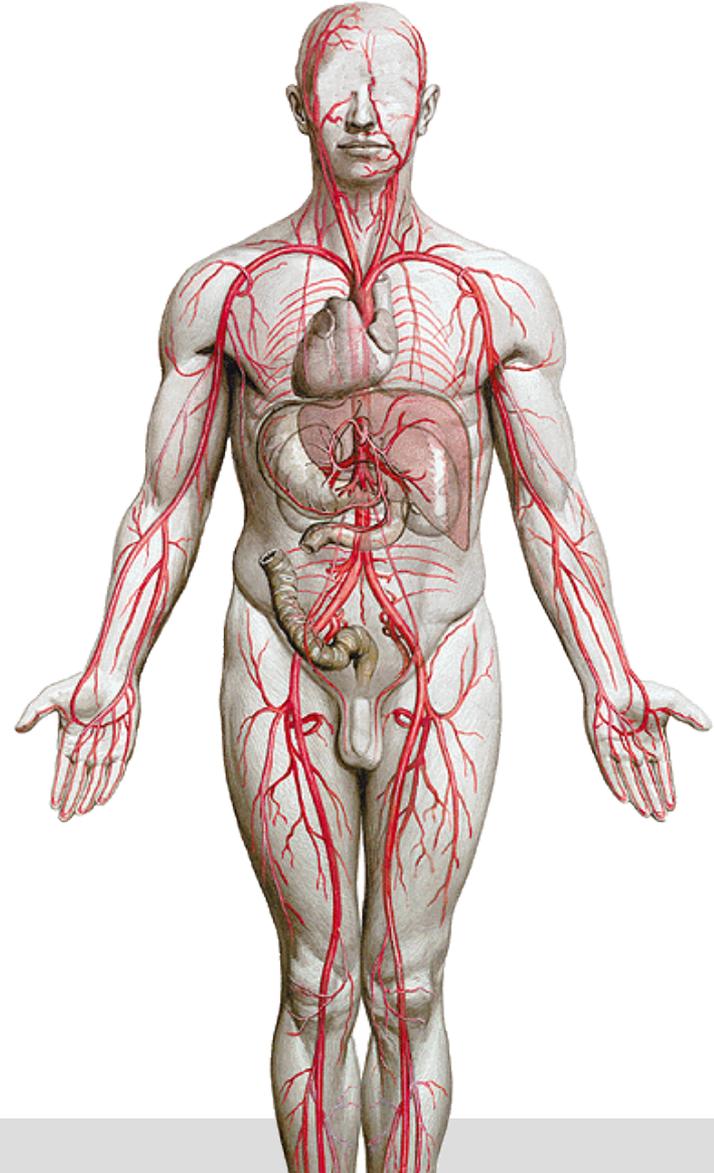
## Outcomes Study (DPPOS)



# Angiopathie

▶ **Mikro**angiopathie

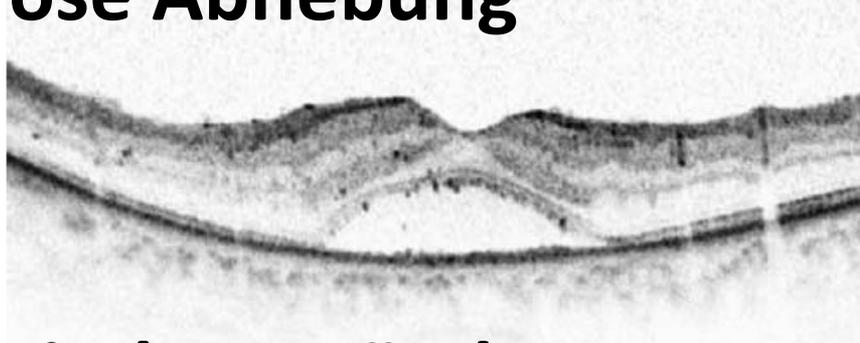
▶ **Makro**angiopathie



# Makulaödem: OCT

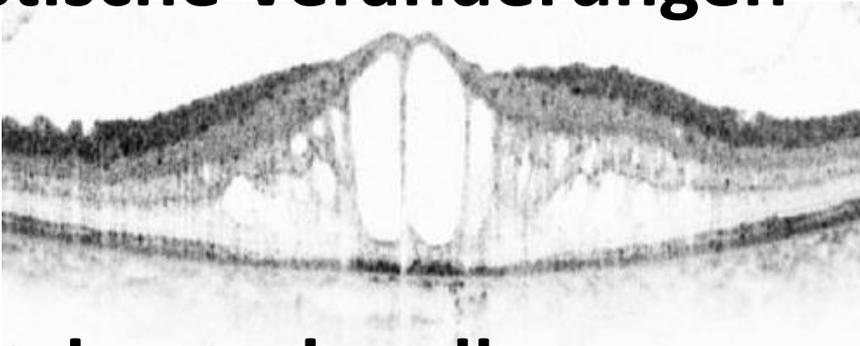
## ▶ seröse Abhebung

36.5%



## ▶ cystische Veränderungen

69.2%



## ▶ Netzhautschwellung

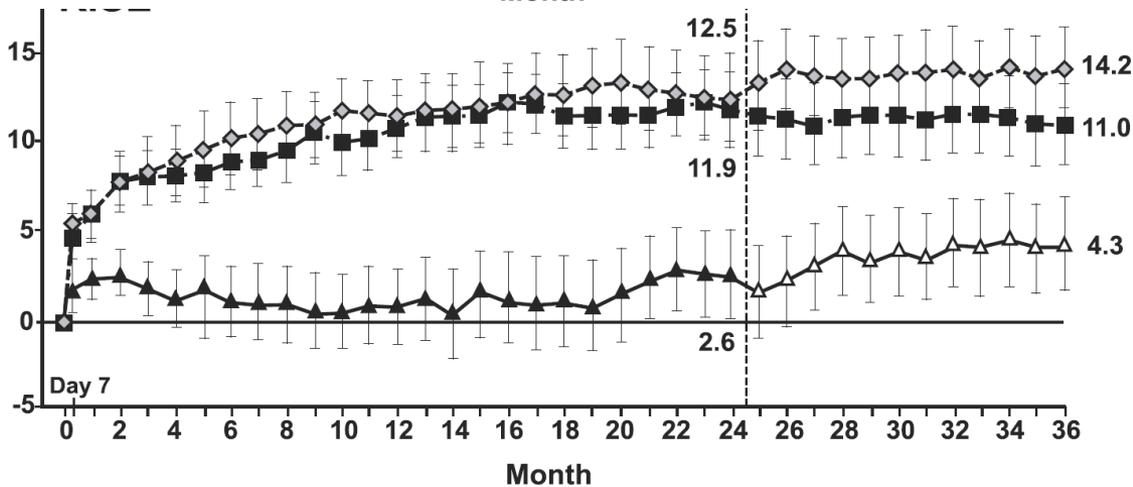
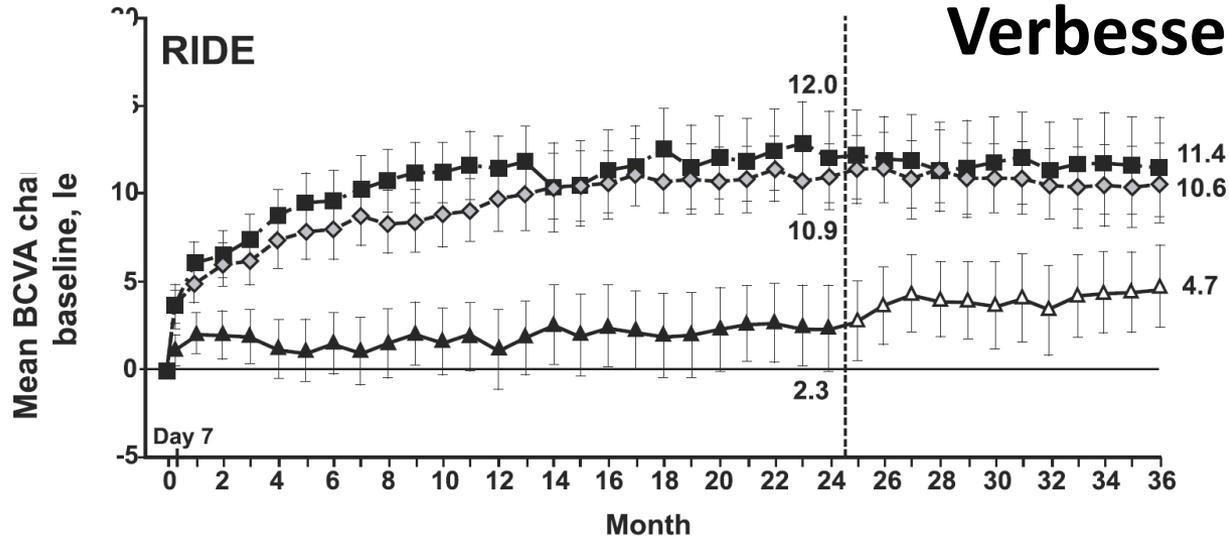
75.0%



IL 6

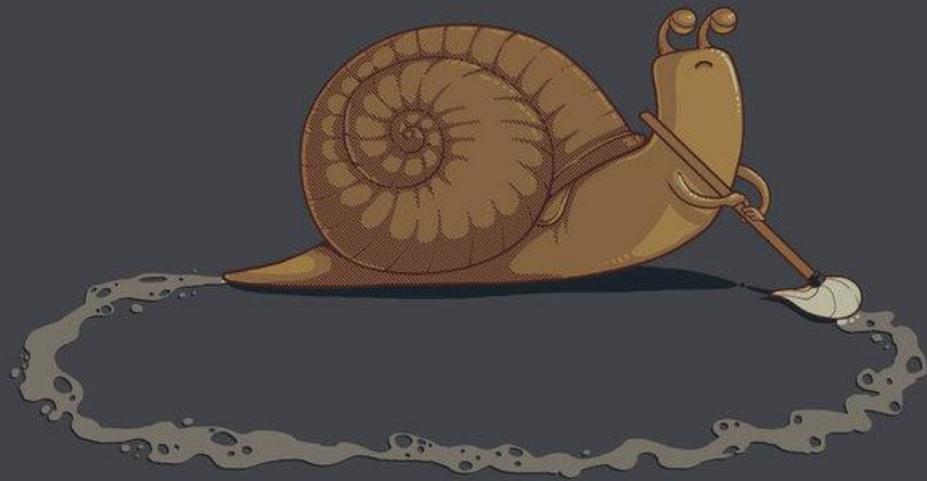
## RIDE/RISE 36M

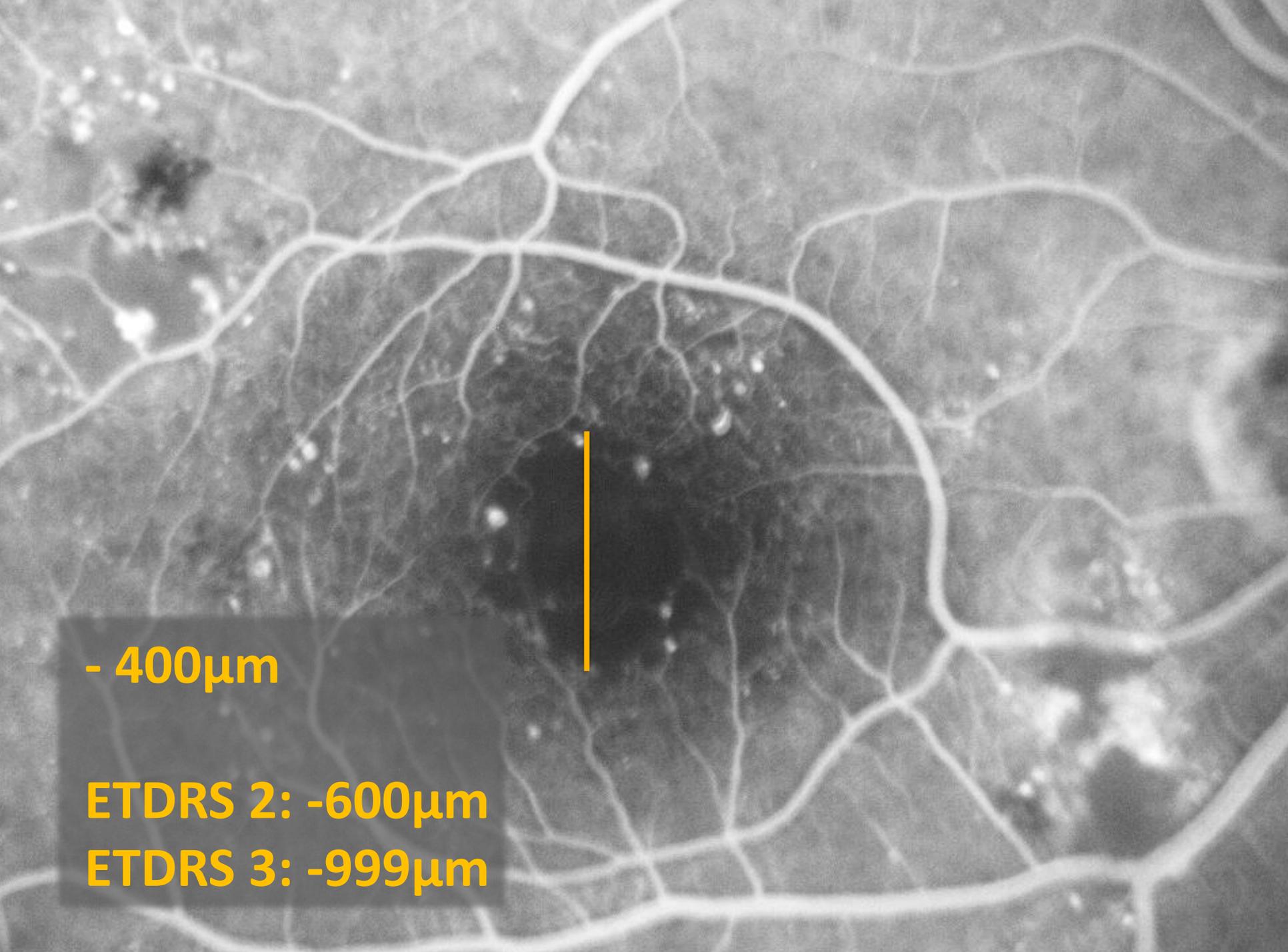
**Verbesserung  $\geq 15$  Bstb: 31%**



34







- 400 $\mu$ m

ETDRS 2: -600 $\mu$ m

ETDRS 3: -999 $\mu$ m





# Motivation

- ▶ **Bewusstsein für Kontrolluntersuchungen**
- ▶ **Wissen um Einflussfaktoren**
- ▶ **Verhaltensänderung**
  - körperliche Aktivität
  - regelmäßige Medikamentenapplikation
  - Diät



