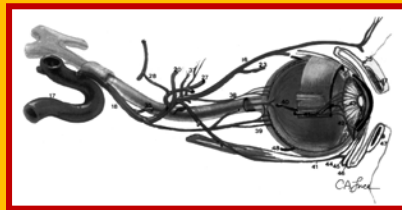


*Why are vascular optic lesions
in the focus of neuroophthalmology ?*

*Whether or / not :
NA AION is either a part of stroke
or a cerebrovascular disorder ?*

**Is the etiopathomechanism of NA-AION the same as
that of the Small Vessel Disease (SVD) of the brain?**

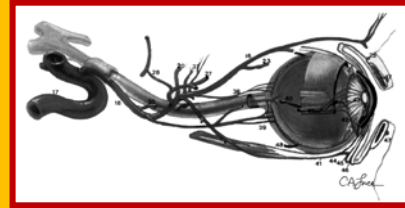


Judit Somlai

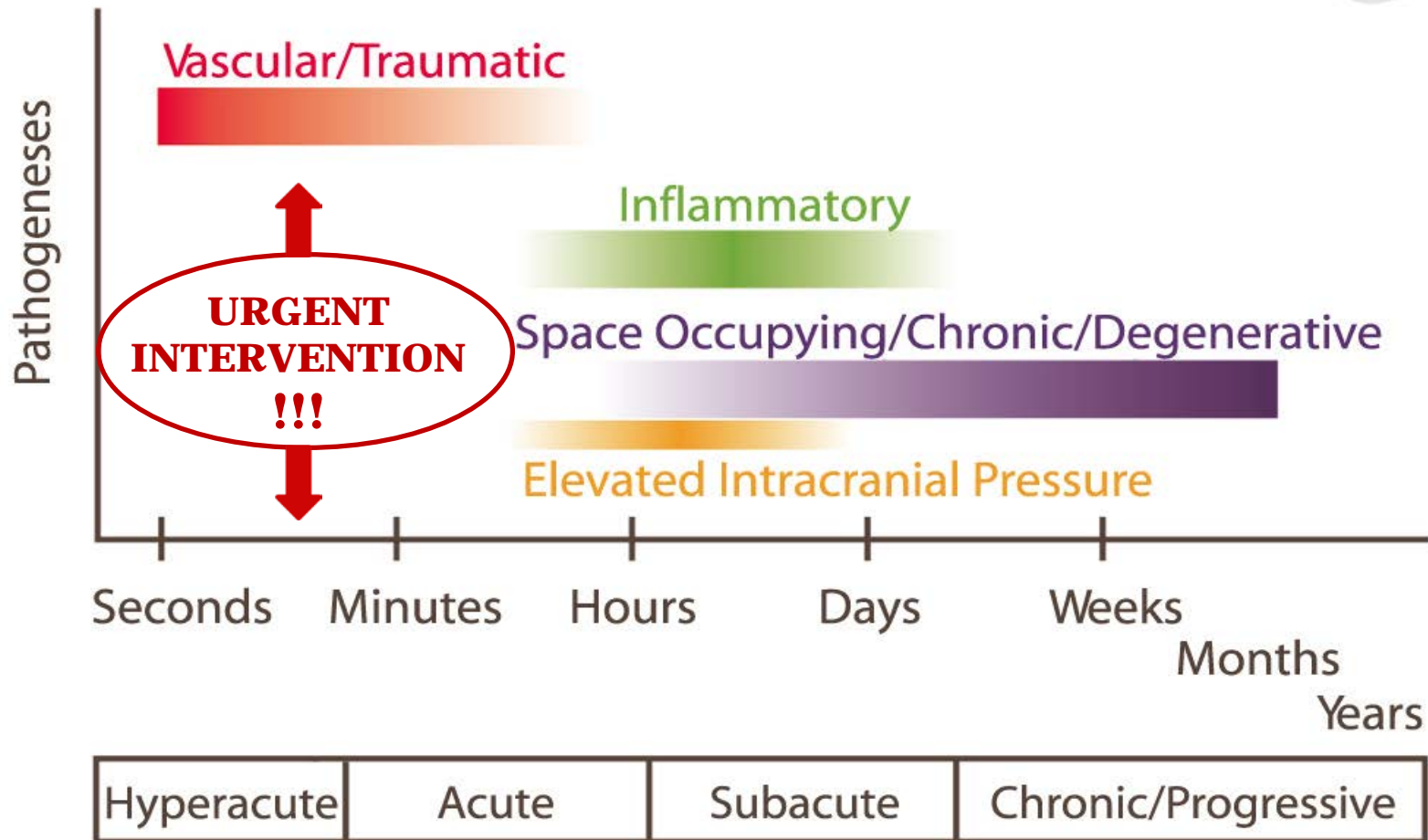
*Unit of Neuro - Ophthalmology,
Department of Neurology & Stroke
Military Hospital,
Budapest, Hungary*

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dr@SomlaiJudit.hu

What is the significance of an early recognition of NA-AION?



Onset of vision loss



STROKE - NA AION - OCULAR STROKE

Is the etiopathomechanism similar or the same?



Concepts, pathophysiology

OCULARIS STROKE: of the **retina + optic nerve** (*sensory system*)

NA-AION : of the **papilla= head of the optic nerve**

vascular disorders : **in the brain (stroke)**

in the vision system (ocular stroke)

INDIRECT EVIDENCES (*of NA-AION is a part of stroke*):

1. Anatomical and pathophysiological evidences :

Retinal hyperperfusion – *most sensitive indicator of OS*

End-arteriolas of retinal & papillar regions

- *lack of shunt mechanism*

Anatomic situation of ophthalmic artery

1st branch of ICA:

the high RISK of spreading from soft plaque of ICA

In the proximity of the heart – *as a cardiac source of microembolism*

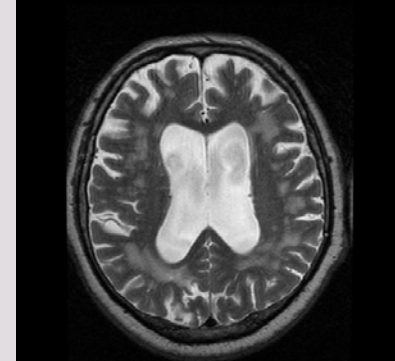
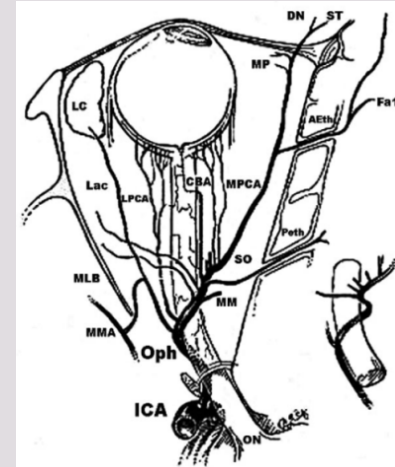
(fibrin embolism – cardiac (AF, valve insuff.))

2. PseudoFoster-Kennedy syndrome – **as a clinical ID evidence**

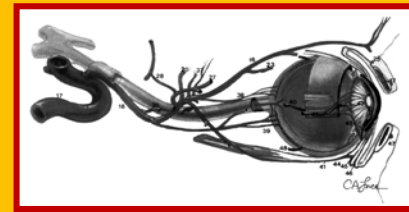
- bilateral NA-AION - not at the same time

3. Intracranial Small Vessels Disease – **MRI sign**

Ocular stroke – MR: 54,6% - (*on the basis of our data about 514 pts*)



Ocular stroke
early warning : vision loss
What could we prevent?



**OCULAR
STROKE**
vision loss

**EARLY
WARNING**

of ANGIOLOGICAL DISORDERS

as ICA atheromatosis

- *atherosclerotic –cholesterol embolism*
- *incomplete ICA stenosis*
- *disorders of the circulation*

of CARDIOLOGICAL DISEASES:

○ **anatomical situation**

pumping function of the heart

○ **atrial fibrillation, valve- insufficiency**

fibrin thrombo-embolism

(potential source of microembolism)

of THROMBOPHYLIA

(increased thrombosis disposition)

- *hereditary*
- *acquired*

Clinical importance of an early recognition of ocular stroke



**Early recognition and
adequate therapy
of ocular signs
- caused by microembolism -

can help**

- *prevention of disorders of the fellow eye*
- *prevention of complete visual loss-amaurosis*
- *slowing down the progress of cerebrovascular disorders*
- *treating thrombophilia in time*

*screening and reduction of the progress
of*

- **cardiovascular**
- **cerebrovascular**
- **hematological diseases**

STROKE EPIDEMIOLOGY - US

MORBIDITY

25 pts/

10 000 inhabitants/ year

(700 000 pts/270 million inhabitants) (2005)

MORTALITY

Cause of mortality by stroke is 5th rank
This figure might double by 2020

STROKE EPIDEMIOLOGY - UK

MORBIDITY

30,4pts/

10 000 inhabitants/ year

There are around 1.2 million stroke survivors(2015)

MORTALITY

Cause of mortality by stroke is 4th

<http://www.stroke.org.uk/resource-sheet/state-nation-stroke-statistics>

State of the Nation Stroke statistics - January 2015.

STROKE EPIDEMIOLOGY - HUNGARY

MORBIDITY

40 - 60 pts/

10 000 inhabitants/ year

(40 000 pts/10 million inhabitants)

MORTALITY

Cause of mortality by stroke 3th rank

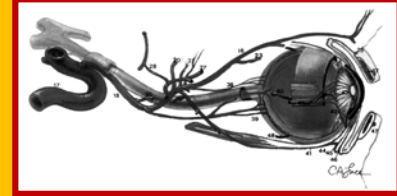
mortality: 18/10 000 inhabitants (50%)

*namely every 2nd stroke patient dies in consequence of the 1st
or the next stroke events*

*Óváry Cs. Epidemiological consideration. National Center of Stroke Diseases (OPNI) 2001., 2005
Nagy Z, Óváry Cs. Epidemiological study: The guide principle of Ministry of Health :Treatment of acute ischemic stroke. 2001)*

EPIDEMIOLOGY of NA-AION

OCULAR STROKE



US

NA-AION:

3 – 10 pts /100 000 population
(312 million total population-2011)

9,000 – 31,000 pts./year

NA-AION is the 2nd cause of blindness
(after glaucoma)

Recurring NA-AION:

on the same side: 3 - 5 %

on the fellow eye: 15 -25%

(within 5 years)

average age > 55 y.

*N. Miller: J Neuro-Ophthalmol 2011; 31: e1-e3
Current Concepts in the Diagnosis, Pathogenesis, and
management of Nonarteritic Anterior Ischemic Optic
Neuropathy*

HUNGARY

NA-AION:

3 – 10 pts/ 100 000 population
(10 million population)
(extrapolated data)

300 – 1000 pts/year

NA-AION, is the 2nd (3rd) cause of blindness
(after macular degeneration and glaucoma)

unilateral OS – bilateral OS

26.3%

73.7%

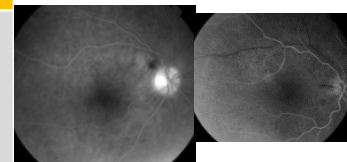
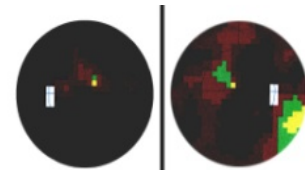
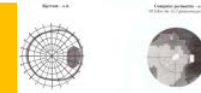
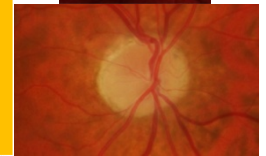
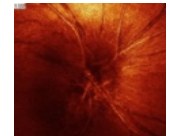
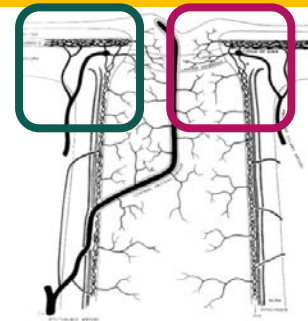
MR signs: 54.6%
(at onset of ocular signs)

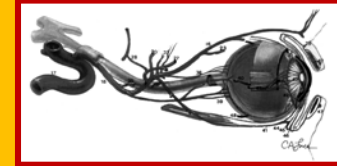
average age = 57.8% y.

*Cs. Óváry: Epidemiological consideration.
National Center of Stroke Diseases (OPNI) 2001., 2005
Z. Nagy, Cs. Óváry: Epidemiological study:
The guide principle of Ministry of Health :Treatment of acute
ischemic stroke. (2001)*

Anterior Ischemic Optic Neuropathy (AION)

	Arteritic-AION <	<Non-AION
Incidency	middle/large artery	end - arteries (SVD)
Early symptoms	headache + loss of vision bilateral	loss of vision - without pain uni - bilateral
Fundus <i>– acute period</i>	Papilla - mild papilledema +/- retinal hemorrhages	
Fundus <i>– chronic period</i>	Papilla - pale papilla	
Visual field <i>– acute period</i>	Big blind spot - consequence of papilledema	
Visual field <i>– chronic period</i>	Inferior – nasal quadrantopy - lesion of the long temporal retinal fibers	
MRI	multiple lacunar infarcts	
FLAG	delay of dye-filling in peripapillare & papillar regions	early dye leakage of papillar region
Background diseases	systemic necrotic vasculitis, GCA	hypertension, atherosclerosis, DM, anemia, polycythemia
Therapies	high-dose steroid therapy,	systemic antithrombic

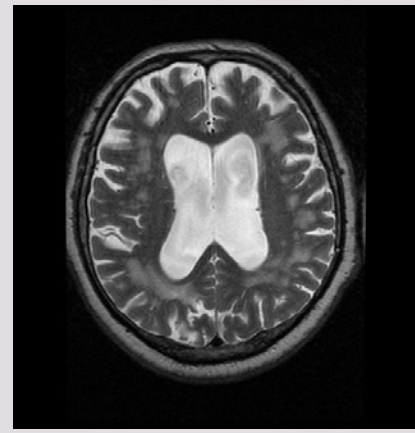
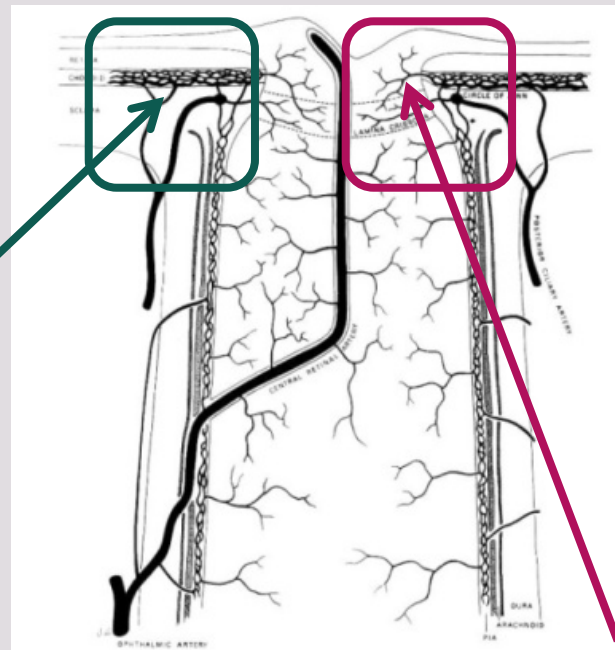




Anatomy and pathophysiology

Zs.Récsán, Zs. Szepessy: The role of fluorescein angiography (FLAG) and optical coherence tomography (OCT) in the examination of circulatory disorders of the optic nerve head. In Neuroophthalmology, 2011.

Blood supply of the PAPILLA



„intracerebralis SVD”
(54,6%)

Laminar – scleral region of the papilla

- blood supply to this papilla is provided by the **short posterior ciliary arteries (sAPC)**
- **A-AION** is caused by vasculitis developing in this vascular segments

FLAG: In case of arteritic AION: filling of the **dye is considerably late :**

- in the optic disc
- and the neighboring choroidea (30 to 70 sec)

Central part of the papilla

- **end branches of the Circle Zinn – Haller**
- vascular segments distal to the short ciliary arteries
- microembolism of these peripheral branches results in

FLAG: In non-arteritic **NA-AION** AION, dye filling:

- coming from the direction of the peripapillary choroidea will appear **simultaneously** with the filling of the retina, in the peripapillary choroidea not late
- the flow is not or only slightly different from that seen in healthy control subjects of the same age

OCULAR SIGNS – OCULAR STROKE



AMAUROSIS FUGAX, TMB (ocular TIA)

ARTERIAL CIRCULATORY DISORDERS

(athero-thrombosis, microembolism)

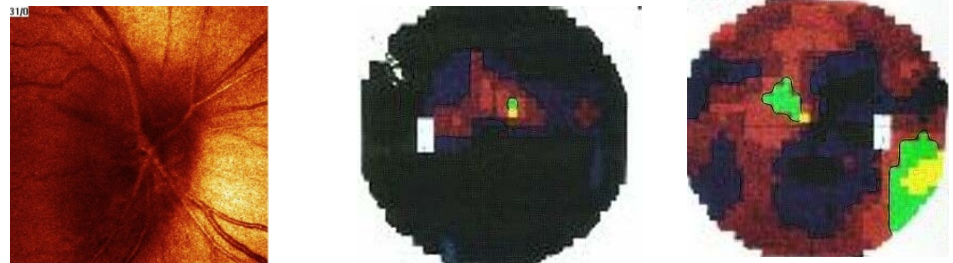
RETINAL branch, trunk EMBOLISM
(IN) COMPLETE AMAUROSIS



ARTERIAL CIRCULATORY DISORDERS
(athero-thrombosis, microembolism)

PAPILLA : NA-AION or A-AION)

VISUAL LOSS : central > paracentral regions
PAPILLEDEMA - PALE PAPILLA without decoloration

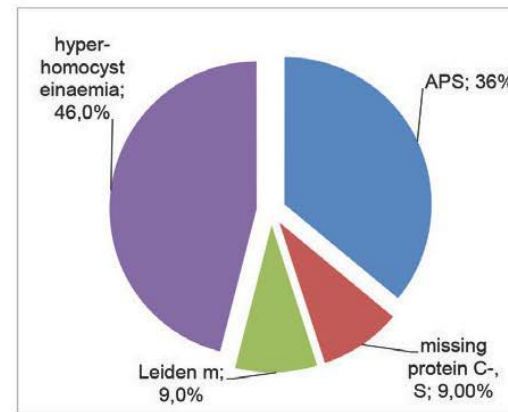
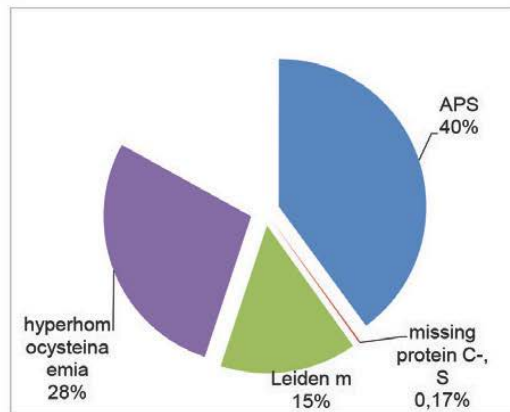
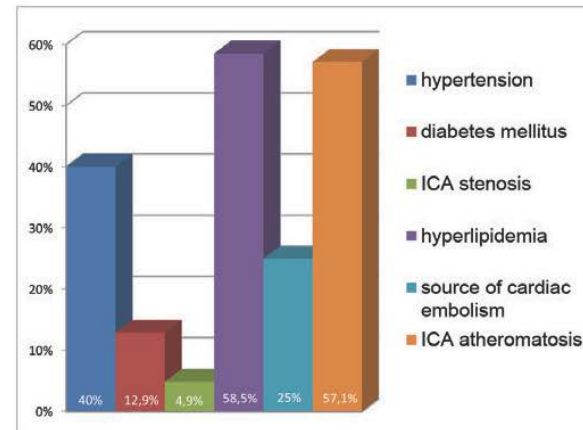
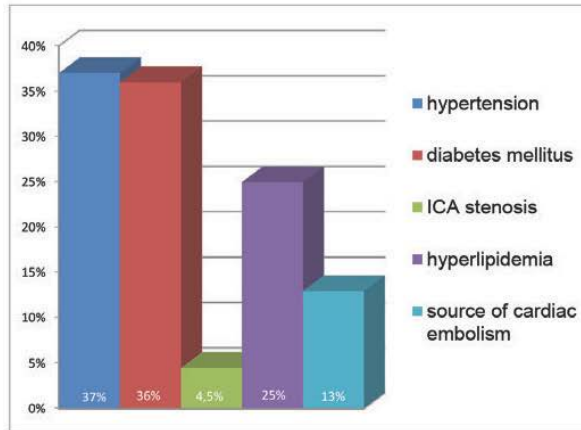


Rates of predisposing factors (RF) & background diseases



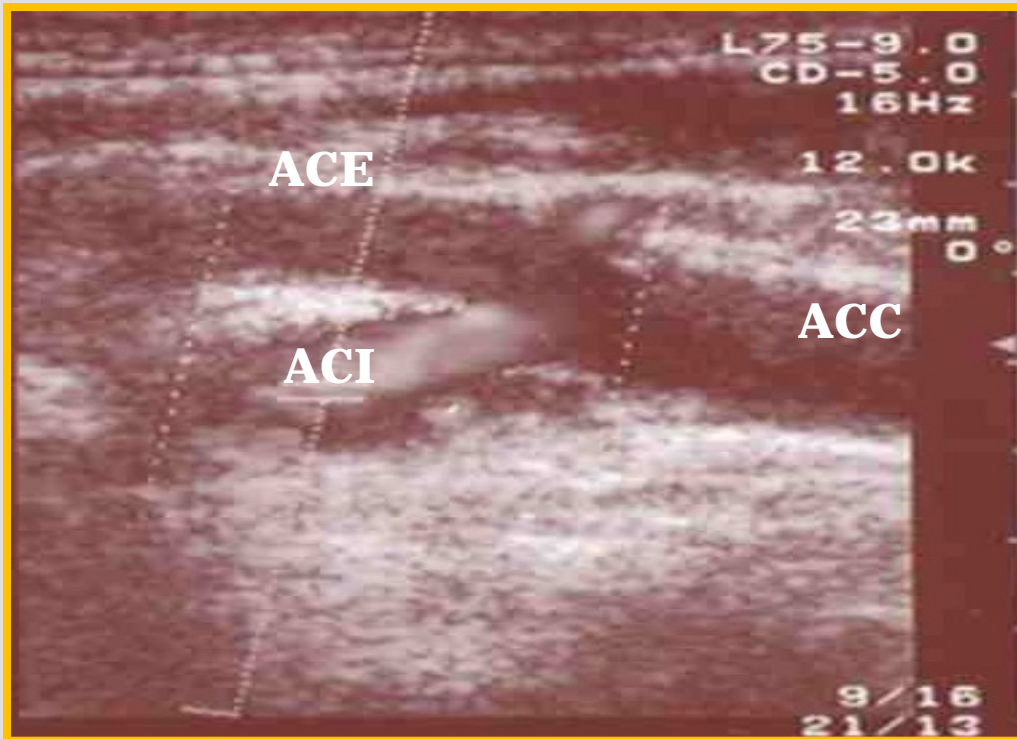
stroke

ocular stroke





Pathophysiology – soft plaque caused by stenosis with soft morphological deformation (↑) of the initial part of ICA



Characteristic features of vulnerable plaque:

- *thin fibrous cap*
- *infiltration of inflammatory cells:
higher proteolytic activity*
- *predisposed to rupture*
- *responsible for most acute events:
• spreading of microembolisms
that result in the occlusion of
small end arteries*

Diagnosis – optic nerve



The loss of vision can predict systemic disorders !!!

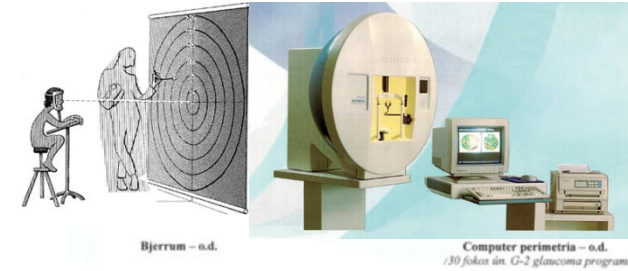
FUNCTIONAL TESTS of the optic nerve:

Basilar examinations:

- **history, visual acuity, colour vision**
- **CFF, electrophysiology: VEP**
- **afferent pupillomotoric pathway reflex**

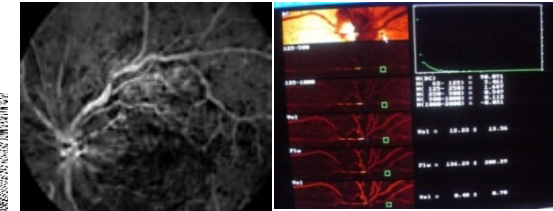
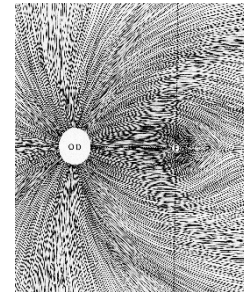
Visual field test:

- **Confrontation VFT**
- **Campimetry with tangent: Bjerrum screen**
- **Computer perimetry** (*Projection perimeter, static, kinetic*)



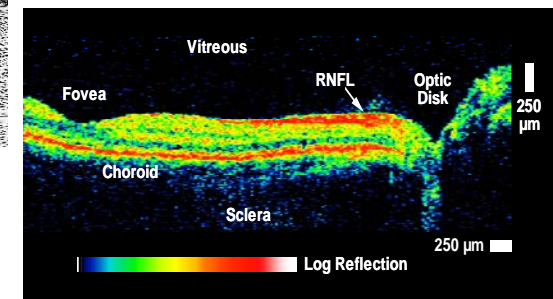
Blood flow examinations:

- **Heidelberg Retinal Flowmeter (HRF)**
- **Fluorescein angiography (FLAG)**



Ophthalmoscopy test: - morphological

- **Optical Coherence Tomography (OCT)**
- **Heidelberg Retina Tomography (HRT)**



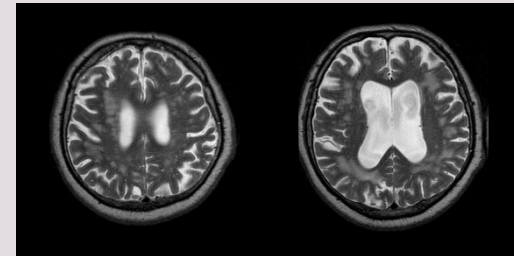
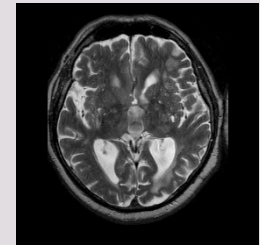
MR symptoms of Small Vessels Disease (SVD) (lacunar infarct disease)



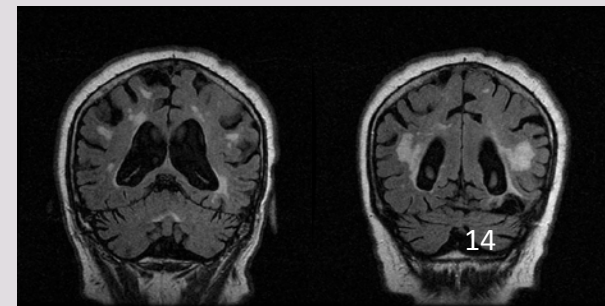
MR signs of SVD- lacunar infarcts disorders:

- **multiple lacunar infarcts** ($<1,0\text{ cm}$)
- **deep penetrating arteries**
(*arterial hypertension, cardiogenic embolism*)
- **infarcts of deep penetrating arteries**
putamen, thalamus, subcortical areas,
periventricular areas - leukoaraiosis
(*J. Bogousslavsky and L. Caplan: Stroke syndromes, 2001,*)
- **Ocular stroke & MR: 54,6%** - *at the same time*

axial T2



coronal FLAIR



amaurosis
within seconds
/minutes

The significance of **TEAM** in diagnosis and treatment of **OCULAR STROKE - NA AION**



The role of the **OPHTHALMOLOGIST**

- *establishment of the functional status*
- *differential diagnosis*
- *to refer the patients to a STROKE center*
- *frequent check-up during therapy ,*
- *care for life*

**OCULAR
STROKE**

NA AION

The task of the **STROKOLOGIST** *admission to the Stroke Center*

depending on:

- *pts cerebrovascular - neurological status*
- *risk of stroke*
- *risk of ocular stroke :*
uni or bilateral loss of vision

The role of the **CARDIOLOGIST**

- *establishment/exclusion of the cardiological source of the OS*
- *close cooperation with neuro-ophthalmologist in the treatment*

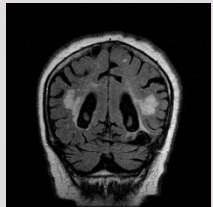


Q: NA - AION is the part of stroke disorder: YES /NO
A: YES

1./ Is the etiopathomechanism of Non-AION (ocular stroke) the same as that of intracerebral Small Vessels Disease (SVD)? – YES

- *NA-AION is the multiple microembolisations of Zinn Haller end – arteriolas of papilla by our hypothesis.*
- *This pathomechanism **might be similar to** Small Vessels Disorders (SVD) of the brain („lacunar infarcts”disease).*

MRI signs show us : more than 50% of our NA AION (OS) cases have the same symptoms as SVD cases.



2./ Is it important to recognise NA-AION in preventing a STROKE? - YES

Clinical importance of an early recognition of ocular stroke:

- *prevention of disorders of the fellow eye*
- *prevention of **complete vision loss – amaurosis***
- *screening and reduction of the progress of*
 - **cardiovascular**
 - **cerebrovascular**
 - **hematological diseases?**

We all have a role in this...



**AHA/ASA Guideline
Guidelines for the Primary
Prevention of Stroke
A Statement for Healthcare
Professionals From the American
Heart Association/American Stroke
Association**