S.I.E.T.O
Società Italiana di Ergoftalmologia e Traumatologia Oculare

30° CONGRESSO NAZIONALE

Imaging in neuroftalmologia

Studio Oculistico
dott. A. Lucente
In Oculis Salus

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Disclosure

Consulting Free

- *Carl Zeiss Meditec*
- *Alpha Intes*
- *Mesofarma*

Optical Coherence Tomography as a Biomarker for Diagnosis, Progression, and Prognosis of Neurodegenerative Diseases by Maria Satue et al. Journal of Ophthalmology, Volume 2016

Multiple Sclerosis(MS), Parkinson Disease (PD), and Alzheimer's Disease (AD)

Recent research using optical coherence tomography (OCT) has demonstrated that parameters provided by this technology **may be used as potential biomarkers for MS, PD, and AD. Retinal thinning has been observed in these patients** and new segmentation software for the analysis of the different retinal layers may provide **accurate information on disease progression and prognosis**

Current OCT analysis of **the retinal nerve fiber layer and, specially, the ganglion cell layer thickness** may be considered as a **good biomarker for disease diagnosis, severity, and progression.**

Recent literature

- Optical coherence tomography findings in Parkinson's disease

Turkoglu Sule Aydin, Dogan Umit, Ogun Muhammed Nur , Ulas Fatih ,Keles Asena , Ozturk Yavas Nefise , Yildiz Serpil

Kaohsiung Journal of Medical Sciences **2018** 34, 166e171

- Choroidal thinning: Alzheimer's disease and aging

Jo~ao Paulo Cunha, Rita Proenca, Arnaldo Dias-Santosa, Diana Melancia, Rita Almeida,Helena Aguas, Bruno Oliveira Santos, Marta Alvese, Joana Ferreira, Ana Luısa Papoila,Carlota Louro, Antonio Castanheira-Dinis

Alzheimer's & Dementia: Diagnosis, Assessment & Disease Monitoring 8 **2017** 11-17

- How strong is the relationship between glaucoma, the retinal nerve fibre layer, and neurodegenerative diseases such as Alzheimer's disease and multiple sclerosis?

E Jones-Odeh and CJ Hammond

Eye **2015** 29, 1270–1284 © 2015 Macmillan Publishers Limited All rights reserved 0950-222X/15

-The loss of macular ganglion cells begins from the early stages of disease and correlates with brain atrophy in multiple sclerosis patients

Pietroboni AM, Dell'Arti L, Caprioli M, Scarioni M, Carandini T, Arighi A, Ghezzi L, Fumagalli GG, De Riz MA, Basilico P, Colombi A, Benatti E, Triulzi F, Scarpini E, Viola F, Galimberti D

Mult Scler. **2017** Nov 1:1352458517740214. doi: 10.1177/1352458517740214.

- Patterns of Retinal Ganglion Cell Damage in neurodegenerative Disorders: Parvocellular vs Magnocellular Degeneration in Optical Coherence Tomography Studies

Chiara La Morgia, Lidia Di Vito, Valerio Carelli and Michele Carbonelli

Frontiers in Neurology | www.frontiersin.org ; 22 December **2017**

- Optical coherence tomography findings in Parkinson's disease

Turkoglu Sule Aydin et al. 2018 **(seconda malattia degenerativa più diffusa dopo Alzheimer)**

Prevalenza 0.3%
1% ≥ 60 aa
4% ≥ 80 aa

Abstract:

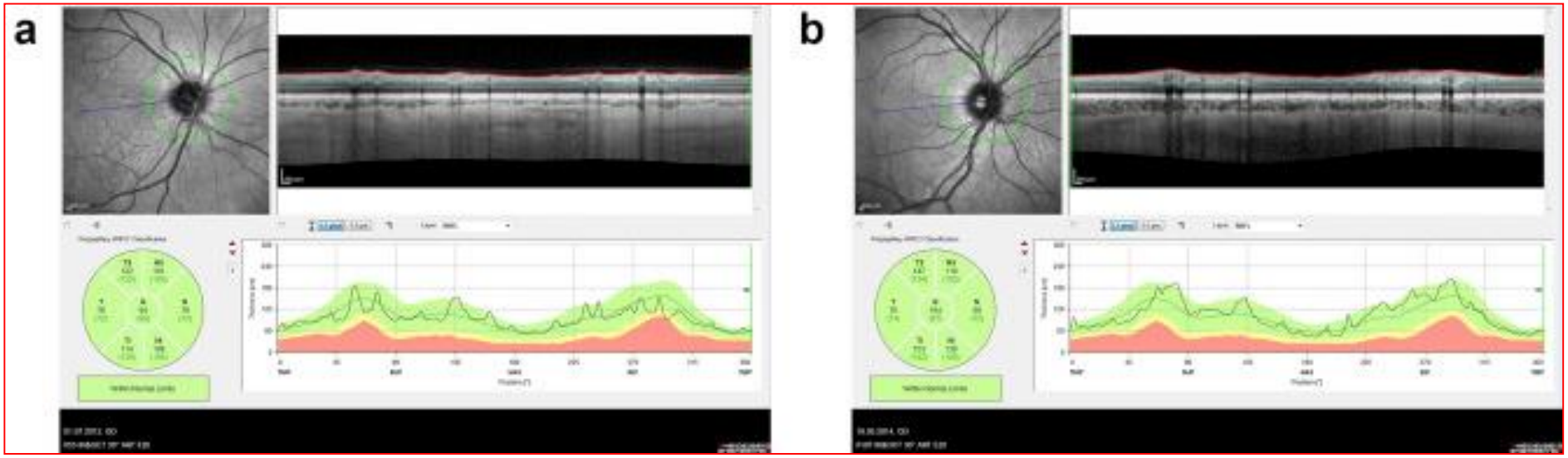
The aim of this study is **to compare** optical coherence tomography (**OCT)** findings of **retinal thickness (RT)** and **retinal nerve fiber layer thickness (RNFLT)** of **idiopathic Parkinson's disease (IPD)** patients to those of **healthy subjects**, and to investigate whether there is any **relationship between the severity of the disease and the RNFLT values**.

- Methods:

This prospective study was included **25 IPD** patients and **29 healthy controls**. Intraocular pressure **(IOP)**, visual acuity **(VA)**, spherical equivalent, axial length **(AL)**, and central corneal thickness **(CCT)** were measured **using OCT in both groups.** The **RT was measured in the central retinal (RTc), nasal (RTn), and temporal (RTt) segments. Nasal (RNFLTn), nasal superior (RNFLTns), nasal inferior (RNFLTni), temporal (RNFLTt), temporal superior (RNFLTts), and temporal inferior (RNFLTti) measurements were made and mean RTFLT was calculated (RNFLTg)** for each individual. In **the patient group, IOP and VA** values were statistically significantly **lower**. **The RTn and RNFLTg were significantly thinner in the patient group.**

-Results:

There was **no statistically significant relationship between the severity of IPD and these findings**. In our study, **RNFLTg and RTn were found to be thinner in the IPD group, which may have caused lower VA scores.** The effects of retinal dopamine depletion on RT and RNFLT, and lower IOP values in the non-glaucomatous IPD patients **should be further investigated.**



(a) The measurement of the RNFLT in the patient group.
(b) The measurement of the RNFLT in the control group.

- Choroidal thinning: Alzheimer's disease and aging

Jo˜ao Paulo Cunha et al. Kaohsiung Journal of Medical Sciences (2018) 34, 166e171

492 000 in Italia
26,6 milioni nel mondo
malattia neurodegenerativa più comune

- Introduction:

The purpose of this study was to measure and to **compare macular choroidal thickness (CT**) between patients with **mild Alzheimer's disease (AD),** patients **without AD,** and **elderly patients.**

-Methods:

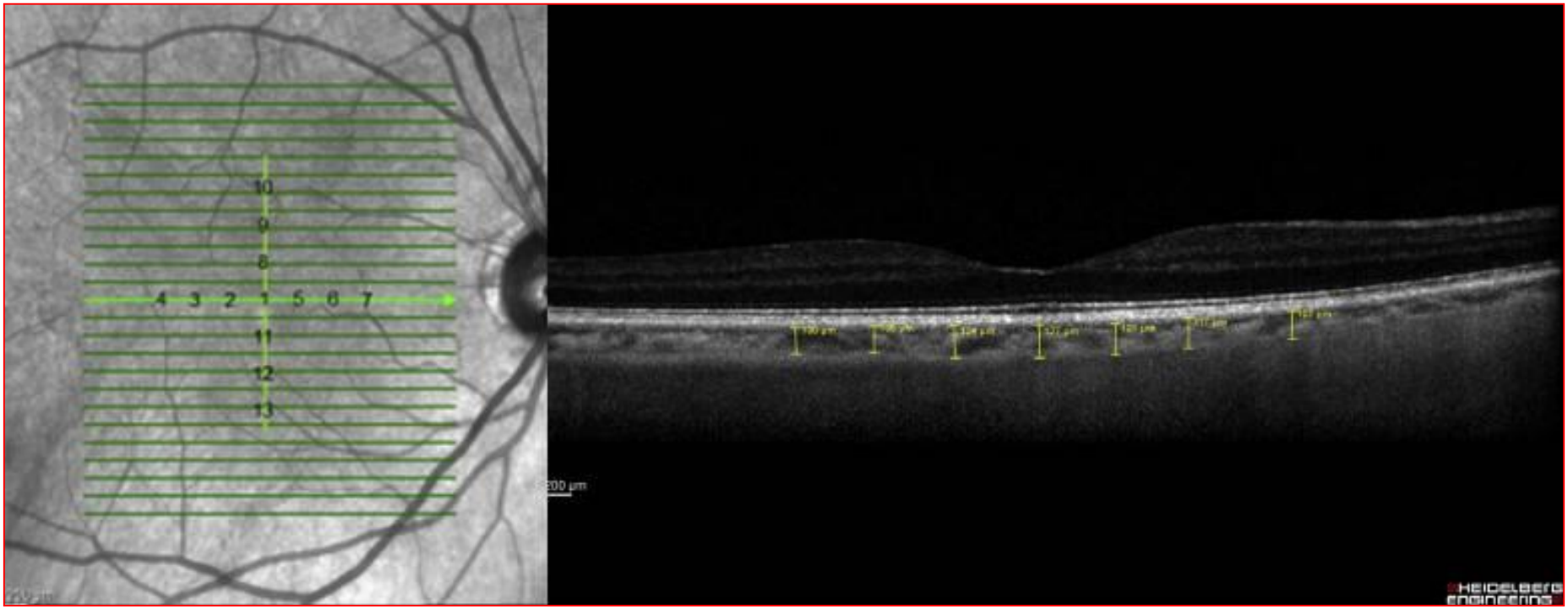
CT was measured manually in 13 locations at 500-mm intervals of a horizontal and a vertical section from the fovea. Linear regression models were used to analyze the data.

-Results:

Fifty patients with a diagnosis of mild AD (73.1 years), 152 patients without AD (71.03 years), and **50 elderly without AD (82.14 years)** were included. In the AD patients, CT was significantly thinner in all 13 locations (P,.001—comparing with age-match group), and comparing with the elderly group, a more pronounced difference was found in two locations temporal to the fovea.

-Discussion:

Patients **with AD showed a significant choroidal thinning even when compared with elderly subjects.** The **reduction of CT may aid in the diagnoses of AD,** probably reflecting the importance of vascular **factors in their pathogenesis.**



Choroidal thickness. The measurements were made in the subfoveal choroid and at 500-µm intervals from the fovea to 1500 µm nasal, 1500 µm temporal, 1500 µm superior, and 1500 µm inferior

- How strong is the relationship between glaucoma, the retinal nerve fibre layer, and neurodegenerative diseases such as Alzheimer's disease and multiple sclerosis?

E Jones-Odeh and CJ Hammond Eye (2015) 29, 1270–1284 **Review**

-Abstract :

Glaucoma is a neurodegenerative disorder with established relationships with ocular structures such as the **retinal nerve fibre layer (RNFL)** and the **ganglion cell layer (GCL**). Ocular imaging techniques such as optical coherence tomography (OCT) allow for quantitative measurement of these structures. **OCT has been used in the monitoring of glaucoma**, as well as investigating other **neurodegenerative conditions such as Alzheimer's disease (AD)** and **multiple sclerosis (MS).**

In this review, **we highlight the association between these disorders and ocular structures (RNFL and GCL), examining their usefulness as biomarkers of neurodegeneration**.

The average RNFL thickness loss in patients with AD is 11µm, and 7µm in MS patients. Most of the studies investigating these changes are cross-sectional.

Further longitudinal studies are required to assess sensitivity and specificity of these potential ocular biomarkers to neurodegenerative disease progression.

The loss of macular ganglion cells begins from the early stages of disease and correlates with brain atrophy in multiple sclerosis patients. by Pietroboni AM et al. Mult Scler. 2017 Nov ; **Milano**

Prevalenza 2-150 /100 000; 3 milioni nel mondo, mezzo milione in Europa e 68 000 in Italia

BACKGROUND:
The importance of neurodegeneration in **multiple sclerosis (MS)** is increasingly well recognized.

OBJECTIVES:
To evaluate retinal pathology using optical coherence tomography (OCT) and to investigate **possible associations between retinal layers' thickness and specific patterns of gray matter volume in patients with a new diagnosis of MS**

METHODS:
A total of **31 patients underwent OCT scans and brain magnetic resonance imaging.** In total, 30 controls underwent the same OCT procedure. The association between focal cortical volume and OCT measurements was investigated with voxel-based morphometry (VBM).

CONCLUSION:
mRNFL, mGCL, and mIPL are significantly reduced in MS patients without concomitant pRNFL thinning. These retinal changes **show a significant association with cortical regions** that are known to be important **for visuospatial performance**.

Patterns of Retinal Ganglion Cell Damage in neurodegenerative Disorders: Parvocellular vs Magnocellular Degeneration in Optical Coherence Tomography Studies

by Chiara La Morgia et al. 2017

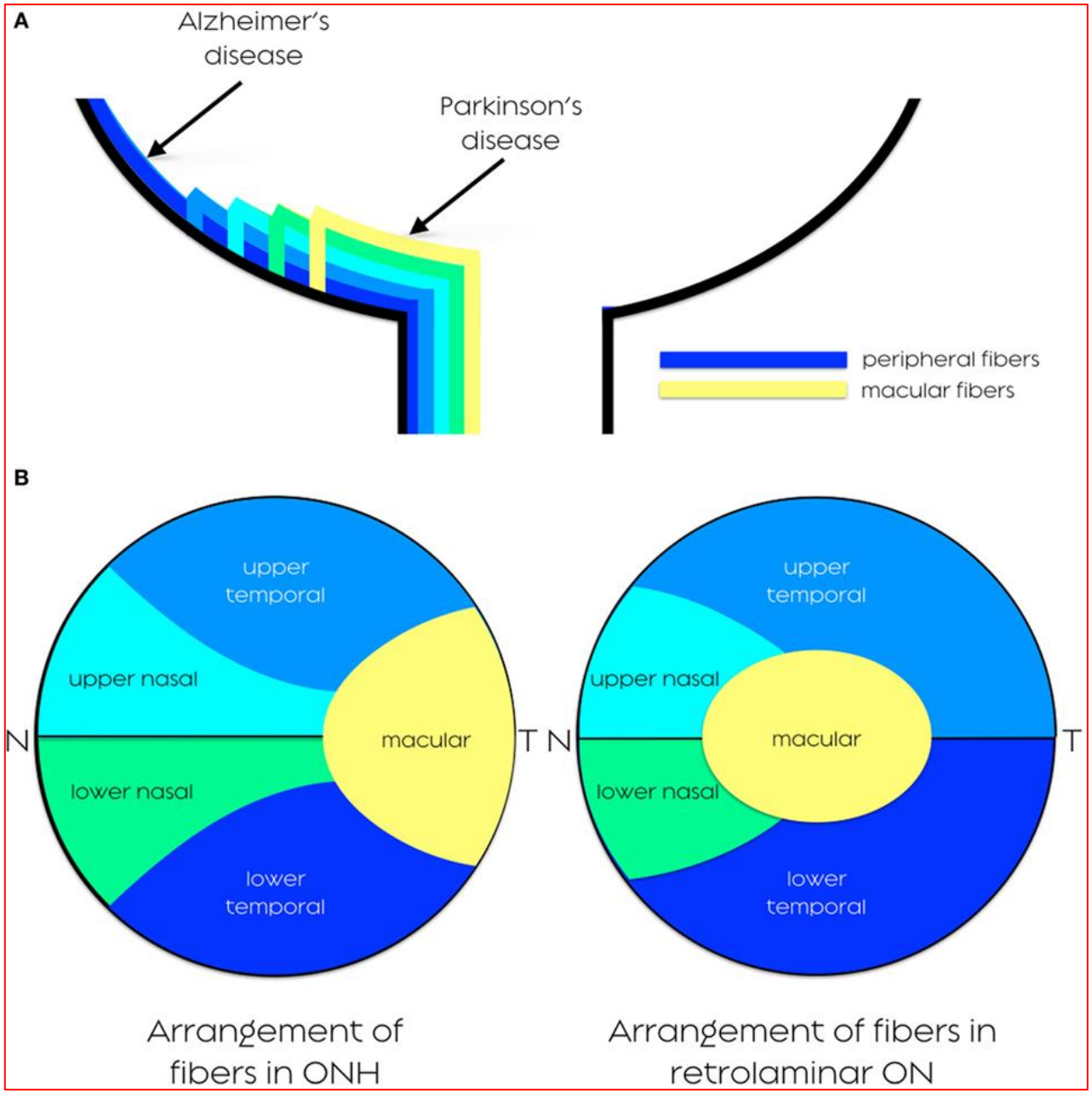
Neurodegeneration is more evident for magnocellular RGCs in AD and multiple system atrophy with a pattern resembling glaucoma.
Conversely, in PD and Huntington's disease, the parvocellular RGCs are more vulnerable.
This latter pattern closely resembles that of mitochondrial optic neuropathies, possibly pointing to similar pathogenic mechanisms.

Histological postmortem studies documented loss of retinal ganglion cells (RGCs) and their ON-forming axons in neurodegenerative disorders such as

- **Alzheimer's disease (AD),**
- **Parkinson's disease (PD),**
- **Huntington's disease (HD),**
- **Multiple system atrophy (MSA)**
- **Spinocerebellar ataxias,**
- **Spastic paraparesis ,**
- **Others.**

M-type, M cells, Pα, parasol cells	**10 %**
P-type, P β, midget cells	**70 %**
Non-P, non-M, Konio cells	

Parkinson's disease (PD) and Alzheimer's disease (AD)



By Chiara La Morgia et al. Front. Neurol., 22 December 2017 | https://doi.org/10.3389/fneur.2017.00710

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Thank you for your kind attention!

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