UNIVERSITÀ DEGLI STUDI DI PALERMO

Dipartimento Universitario di Neuroscienze Cliniche
Sezione di Oftalmologia
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STUDIO PROSPETTICO SULL'IDENTIFICAZIONE DELLA TOMOGRAFIA A COERENZA OTTICA QUALE NUOVO BIOMARKER DELL'EVOLUZIONE DELLA SCLEROSI MULTIPLA

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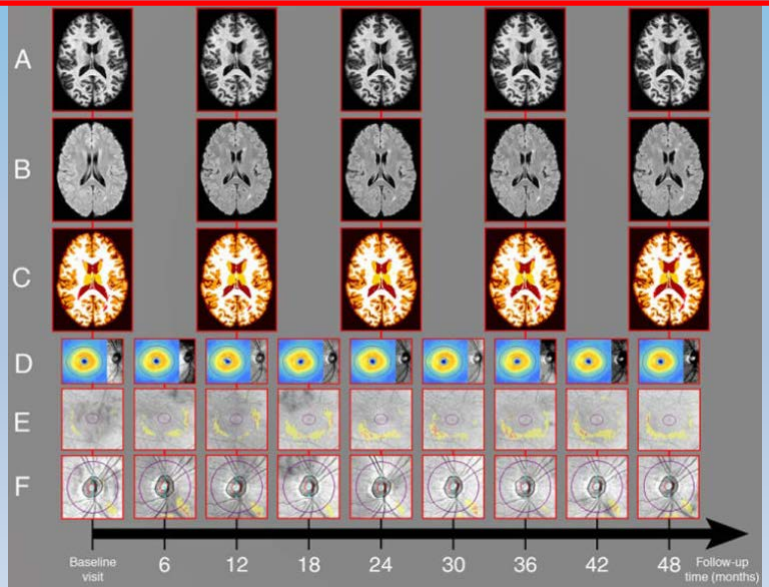
SOSi
Società Oftalmologica Siciliana

Ann Neurol. 2015 November ; 78(5): 801–813. doi:10.1002/ana.24487.

Optical Coherence Tomography Reflects Brain Atrophy in Multiple Sclerosis: A Four-Year Study

Multiple sclerosis (MS) is regarded as an immune-mediated demyelinating disorder of the central nervous system. Although magnetic resonance imaging (MRI) is regarded as the gold-standard imaging modality for monitoring MS, the association between MRI parameters of inflammation and disability progression in MS is modest.[1] Conversely, MRI estimates of neurodegeneration correlate better with disability progression.[2,3] Indeed, it is

Optical coherence tomography (OCT) is an inexpensive, reproducible, well-tolerated, high-resolution imaging technique. Recently developed segmentation algorithms (now transitioning into clinical practice) allow reliable quantification of discrete retinal layers.[13–16] Because the retina is unmyelinated, retinal axonal and neuronal measures are not confounded by myelin, making them ideal for assessing neuroaxonal degeneration. The



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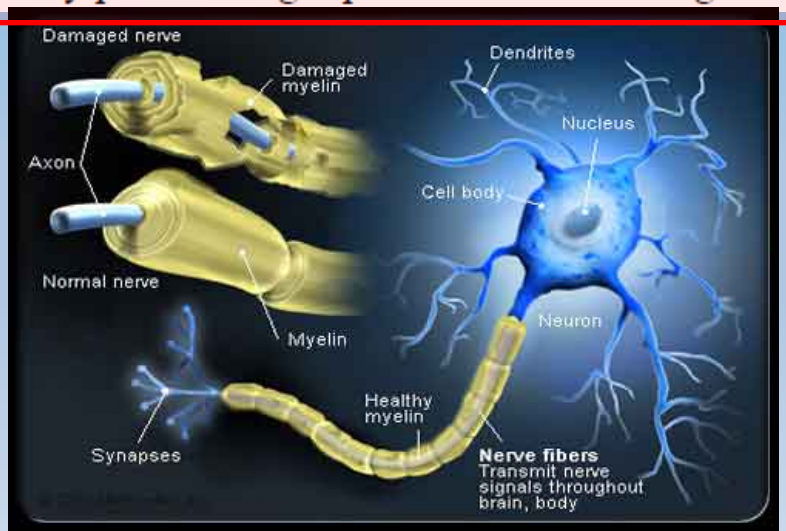
demyelinating lesions in the optic nerves.[17,18] Over time, retrograde degeneration of optic nerve axons (owing to demyelination and transection)[19–21] is captured by OCT and reflected by thinning of the peripapillary RNFL (pRNFL) and combined ganglion cell and inner plexiform layers (GCIP).[22,23] Though this suggests a utility for OCT to monitor disease

OCT also reveals abnormalities of the inner nuclear layer (INL) in MS.[13,24,25] Although postmortem analyses reveal neuronal loss in the INL of MS eyes,[20] OCT data indicate that in vivo a sizeable proportion of MS eyes have thickening of the INL, suggesting that an inflammatory process might precede this neurodegeneration.[25] Indeed, increased INL



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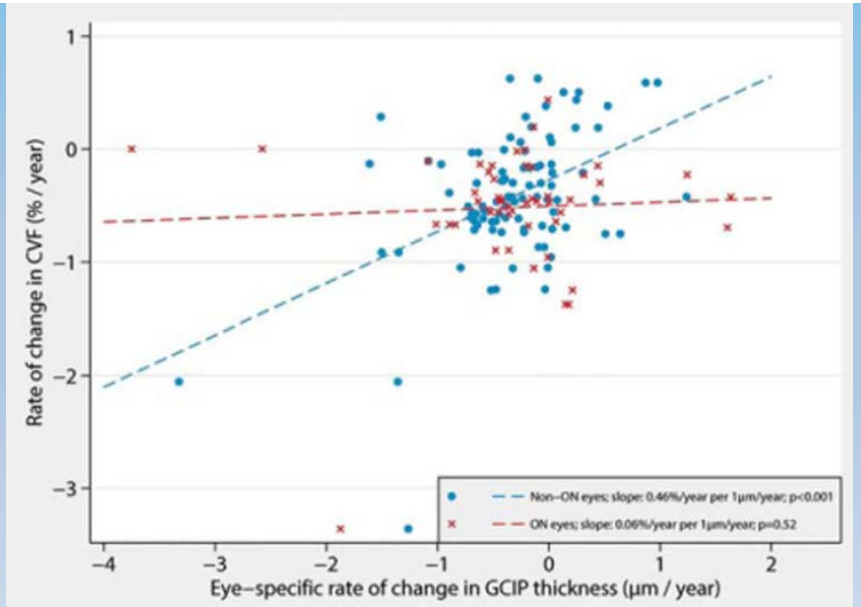
MS, as compared to RRMS. Analysis of specific brain substructures by MS subtype revealed that the longitudinal relationships between GCIP and CVF atrophy were primarily related to cortical GM and cerebral WM volume loss in both RRMS and progressive MS, as well as thalamic volume loss in the RRMS cohort (Table 4).

utilities in terms of whole-brain atrophy (Table 5 and Supplementary Table 2). An annual loss of 1μm of GCIP thickness in RRMS eyes without ON history was predictive of 0.46% annual CVF loss (95% confidence interval [CI]: 0.27, 0.64; $p < 0.001$). In contrast, a 1-μm annual loss of GCIP thickness in RRMS eyes with a history of ON was only associated with 0.06% annual CVF loss (95% CI: −0.12, 0.24; $p = 0.52$). Similar effect modification by ON



Investigating Tissue Optical Properties and Texture Descriptors of the Retina in Patients with Multiple Sclerosis

Boglárka Enikő Varga[1], Wei Gao[2], Kornélia Lenke Laurik[1], Erika Tátrai[1], Magdolna Simó[3], Gábor Márk Somfai[1,2], Delia C

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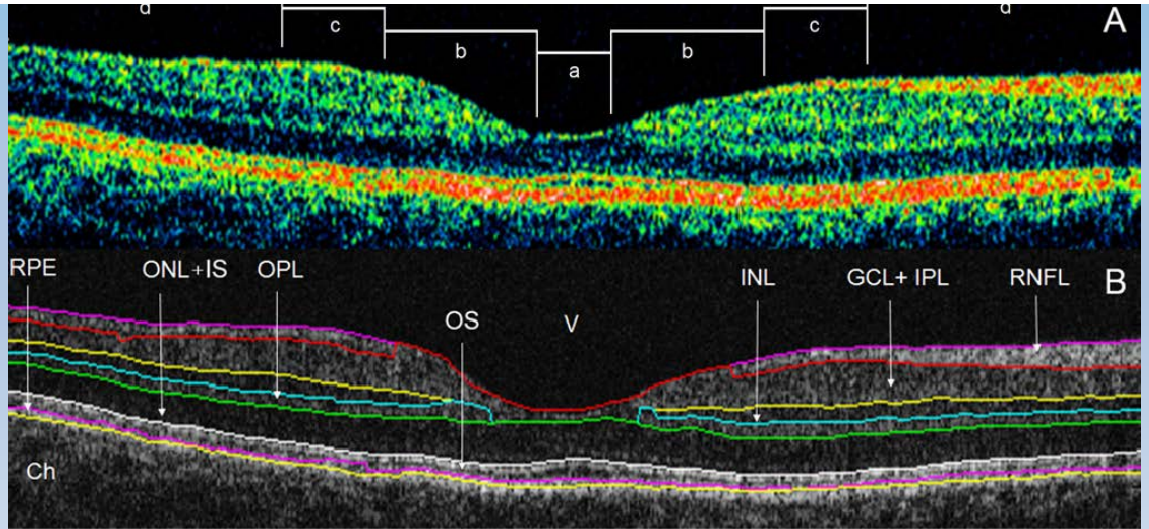
Table 2. Distribution statistics of the thickness (μm) of intraretinal layers by study group, represented as means ±SD.

Thickness	Healthy	MSON-	MSON+
	H vs. MSON+	H vs. MSON-	MSON+ vs MSON-
Across All Macular Regions			
RNFL	38.16 ± 0.55 ‡	35.44 ± 0.54 ‡	32.32 ± 0.54 ‡
GCL+IPL	76.06 ± 1.44 ‡	67.87 ± 1.40 ‡	58.1 ± 1.40 ‡
GCC	114.23 ± 1.85 ‡	103.28 ± 1.80 ‡	90.45 ± 1.95 ‡
INL	35.19 ± 0.35	35.38 ± 0.35	35.26 ± 0.36
OPL	41.70 ± 0.58 *	41.58 ± 0.55	39.92 ± 0.59 *
ONL+IS	86.23 ± 1.21 *	88.20 ± 1.11	89.62 ± 1.19
OS	16.48 ± 0.59	16.58 ± 0.57	16.28 ± 0.62
RPE	13.15 ± 0.18	13.58 ± 0.17	13.21 ± 0.19

* 0.001<p<0.05 and

‡ p<0.001 (Mixed-model analysis ANOVA) between H and MSON+ (see H column). H and MSON- (see MSON- column) and between MSON- and MSON



STUDIO CLINICO

Studio prospettico longitudinale della durata di 2 anni e attualmente in corso presso la nostra Unità Operativa di Oculistica in collaborazione con la Clinica Neurologica.

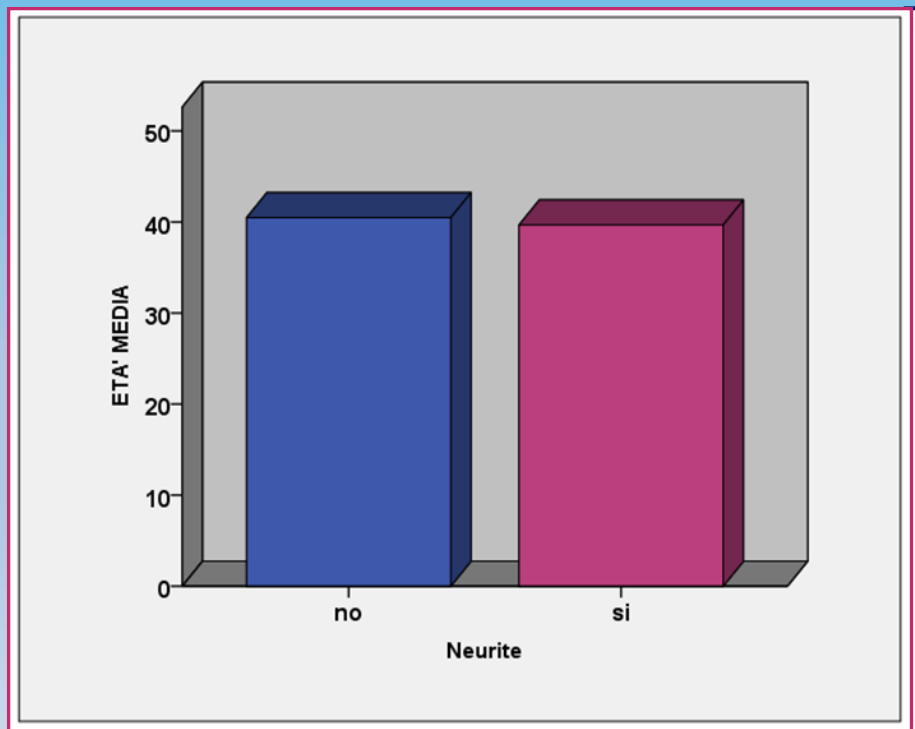
OBIETTIVO

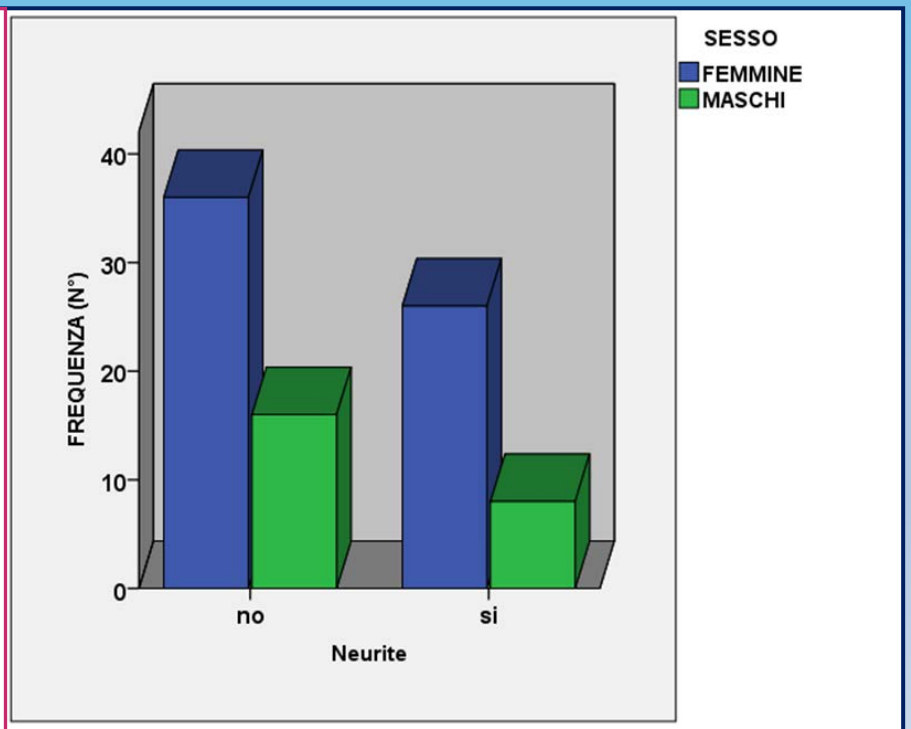
Analizzare i valori OCT quali biomarkers della perdita assonale in soggetti affetti da sclerosi multipla, con possibile correlazione predittiva con l'istaurarsi della neurite ottica

PAZIENTI E METODI

86 occhi di 43 pazienti con SM:

- 31 femmine
- 12 maschi
- Tutti >18 anni :età media 40,2 ±10 anni

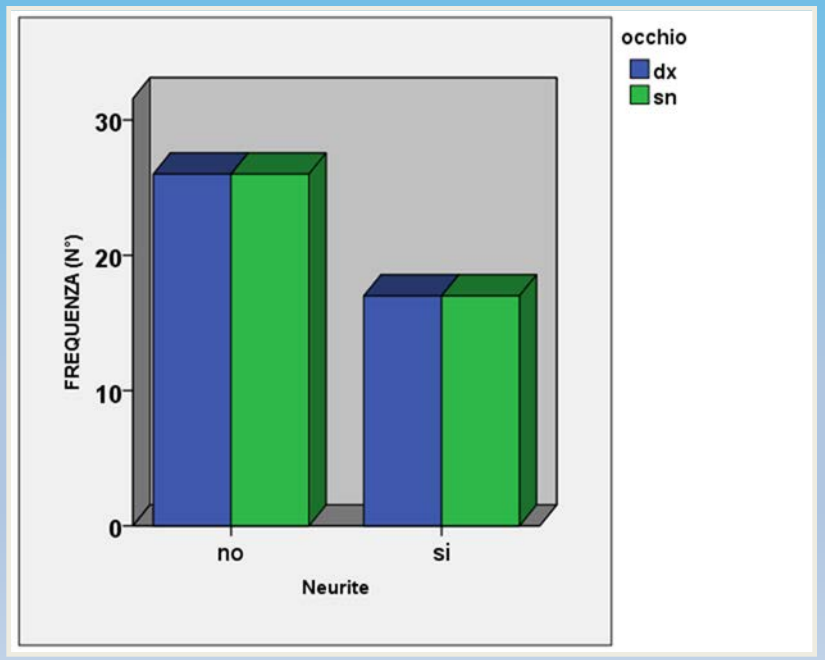


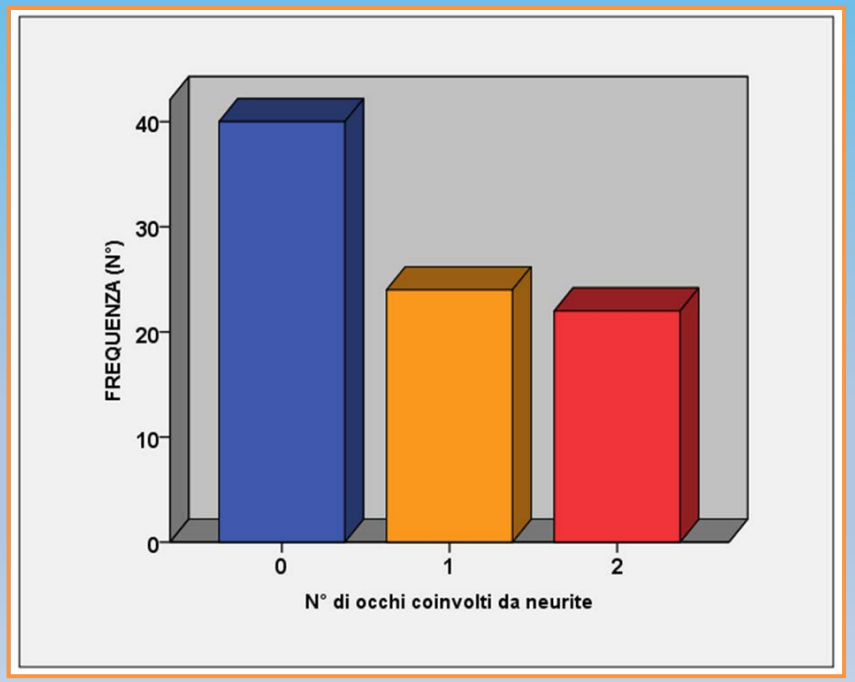


PAZIENTI E METODI

52 occhi senza storia di neurite ottica

34 occhi con storia di neurite ottica



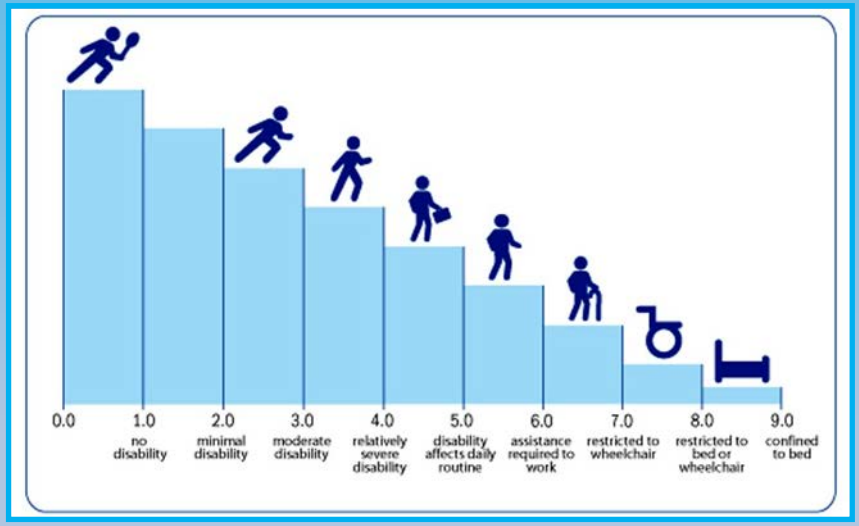


PAZIENTI E METODI

La diagnosi di SM è stata condotta secondo i criteri clinici standard e di neuroimaging.

Raccolta di info riguardanti:

- età,
- esordio della malattia
- forma clinica (recidivante, progressiva)
- grado di disabilità neurologica (EDSS)
- numero ricadute
- terapia



Criteri di esclusione: patologie oculari concomitanti

PAZIENTI E METODI

Tutti i pazienti sono stati sottoposti a:

- Valutazione acuità visiva
- Esame biomicroscopico a lampada a fessura
- Esame del Fundus Oculi
- Tomografia a coerenza Ottica (OCT)
  in entrambi gli occhi.

Tutti i dati raccolti sono stati inseriti in un database per la successiva valutazione statistica

PAZIENTI E METODI

STRUMENTO:

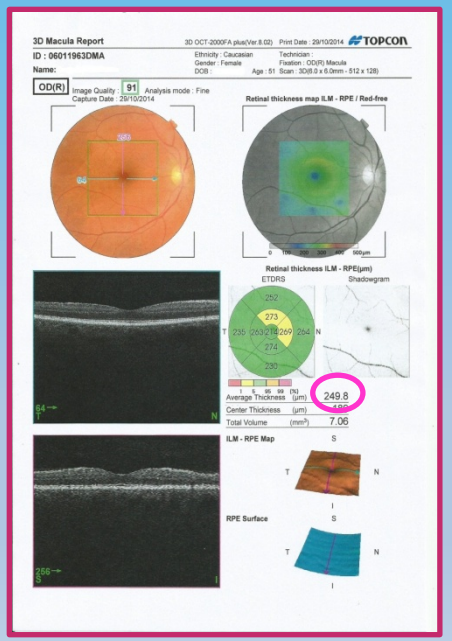
3D OCT Spectral Domain Topcon

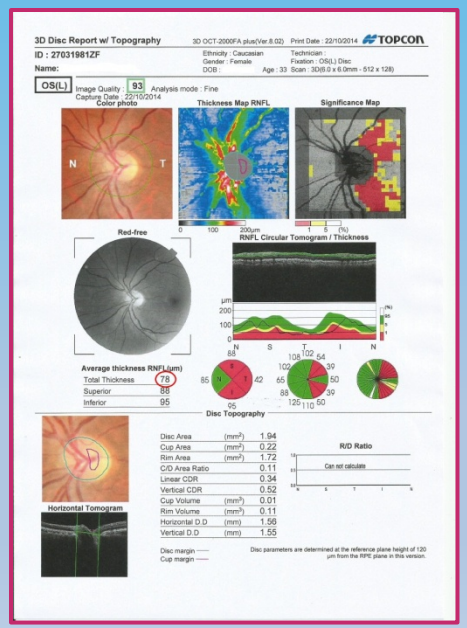
ESAME OCT:

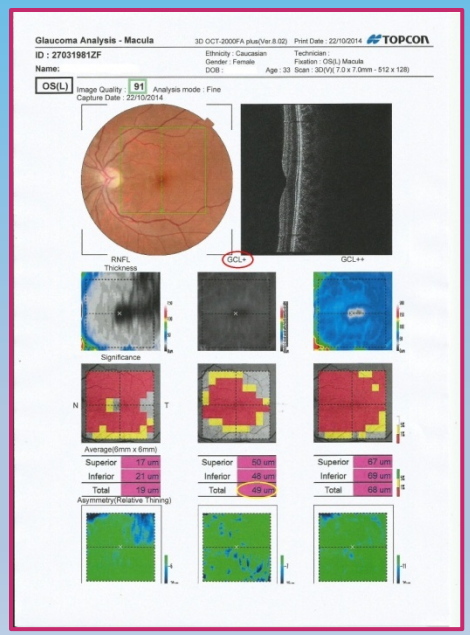
Protocollo ''3D MACULA'

3D DISC

7X7 MACULA







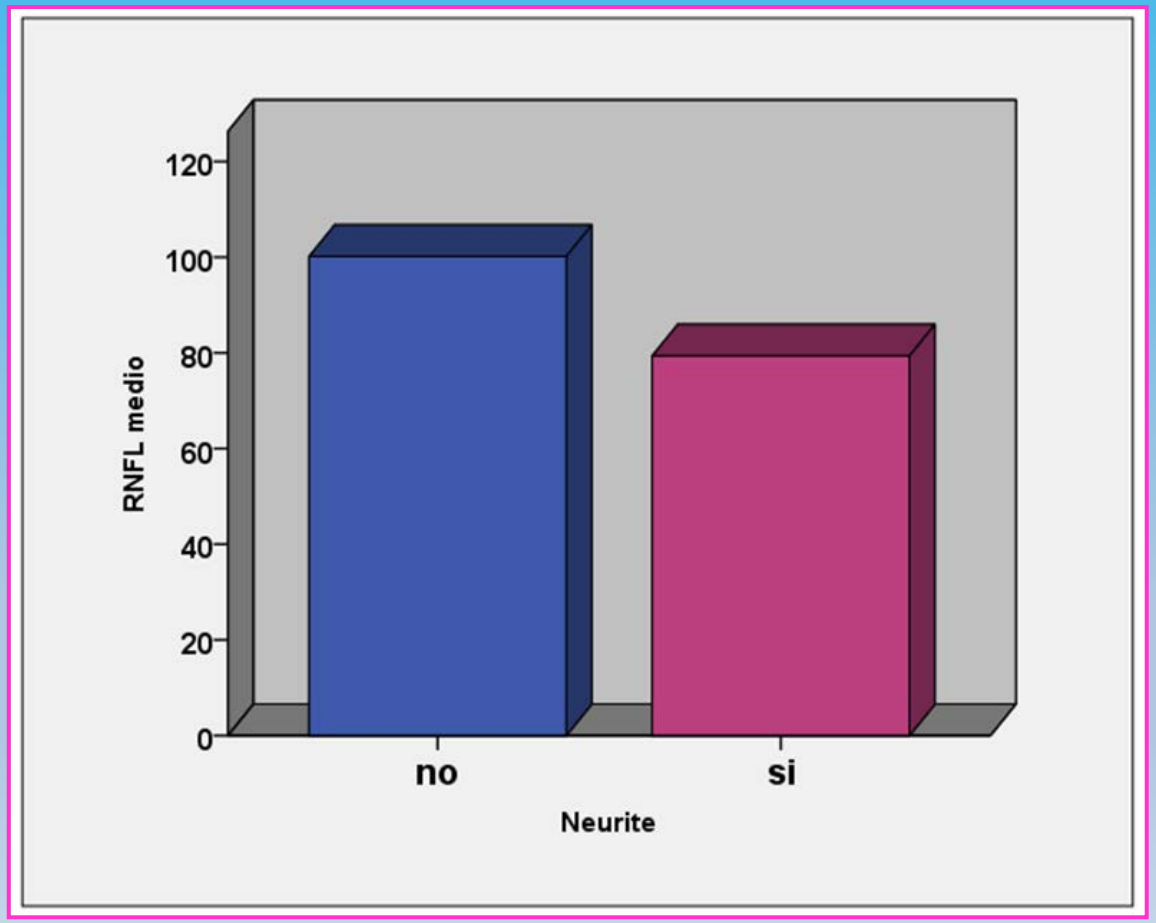
FOVEAL THICKNESS

RNFL

GCC

RISULTATI

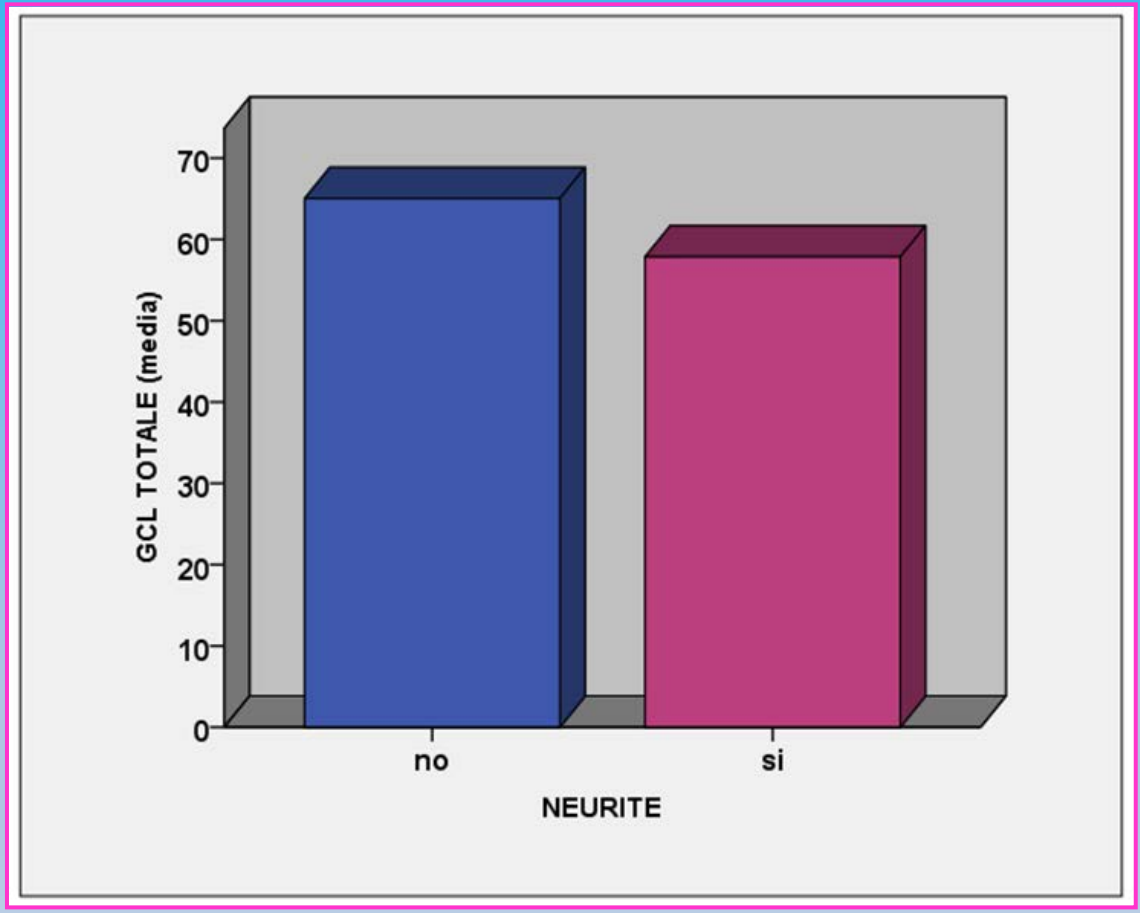
Neurite vs RNFL medio



p < 0,001

RISULTATI

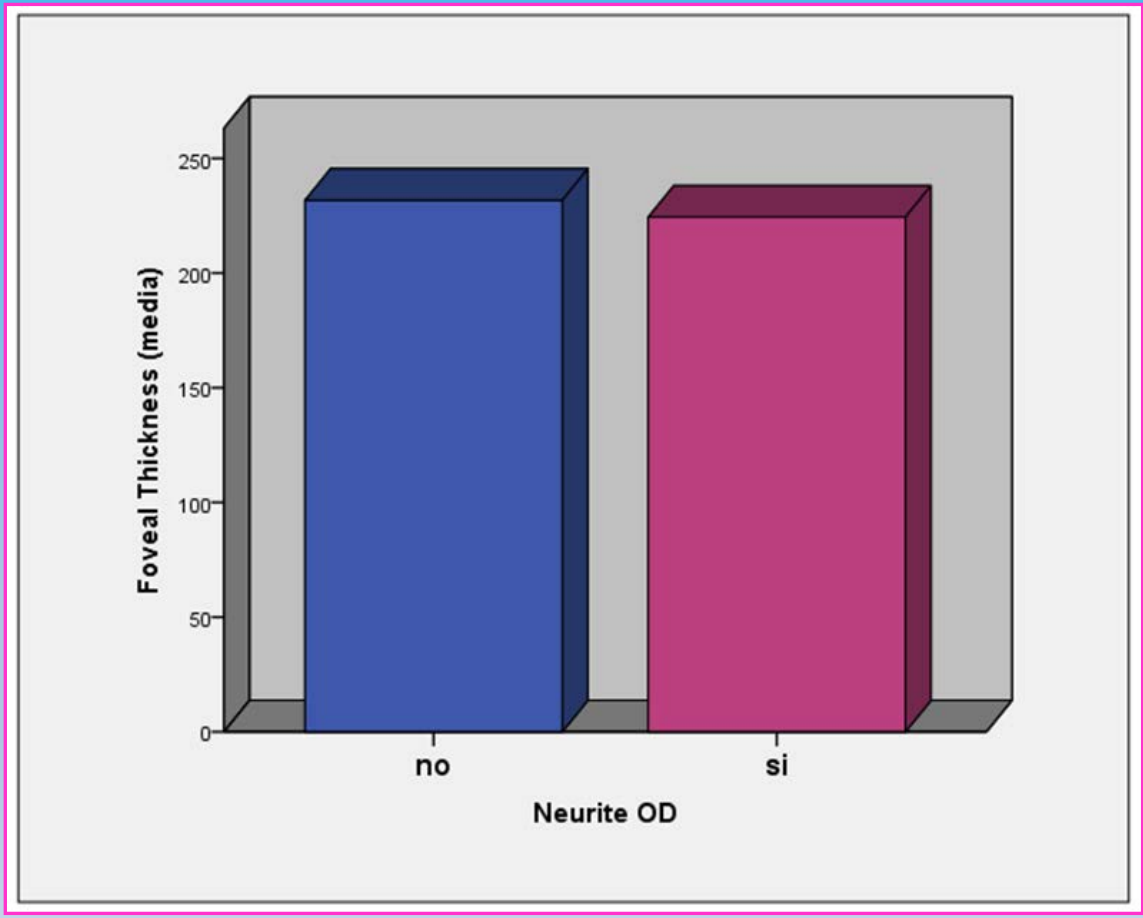
Neurite vs CGL Totale



p < 0,001

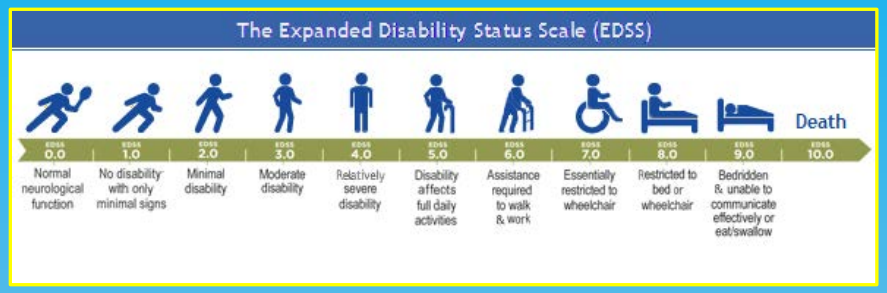
RISULTATI

Neurite vs Foveal Thickness



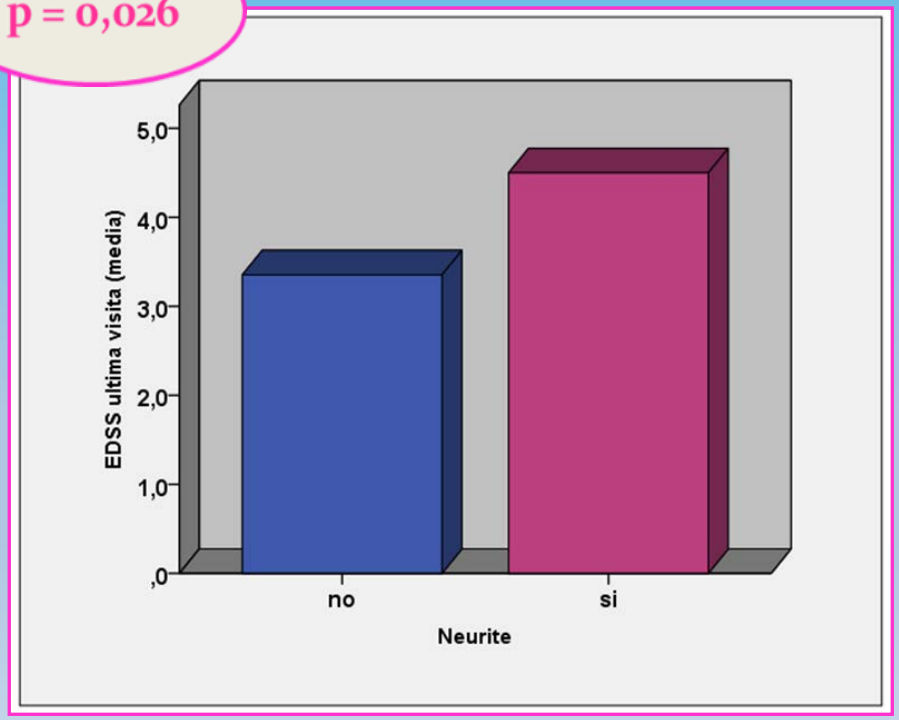
p = 0,529

RISULTATI



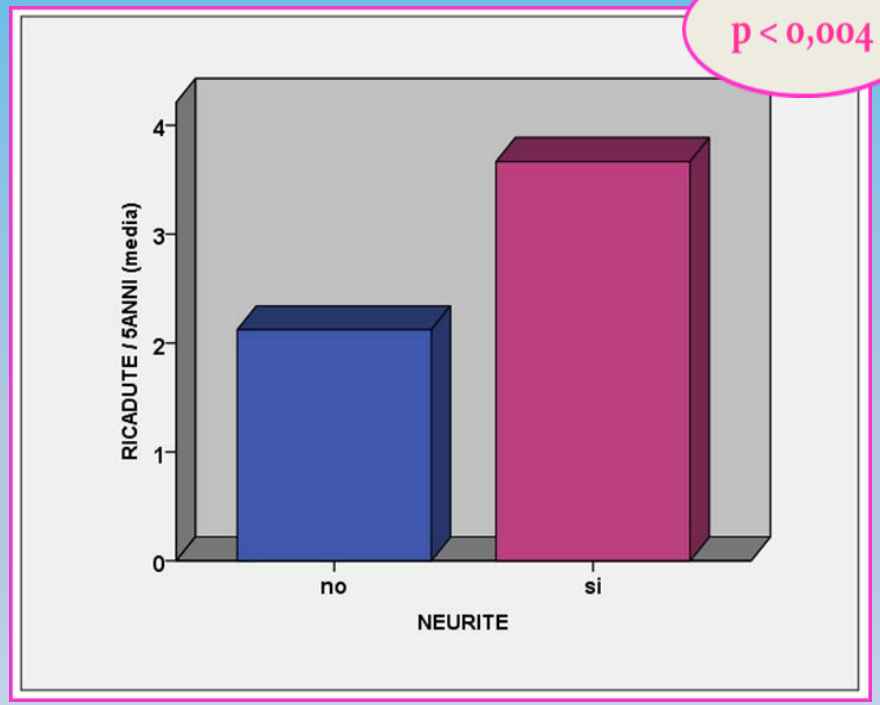
Neurite vs EDSS

p = 0,026

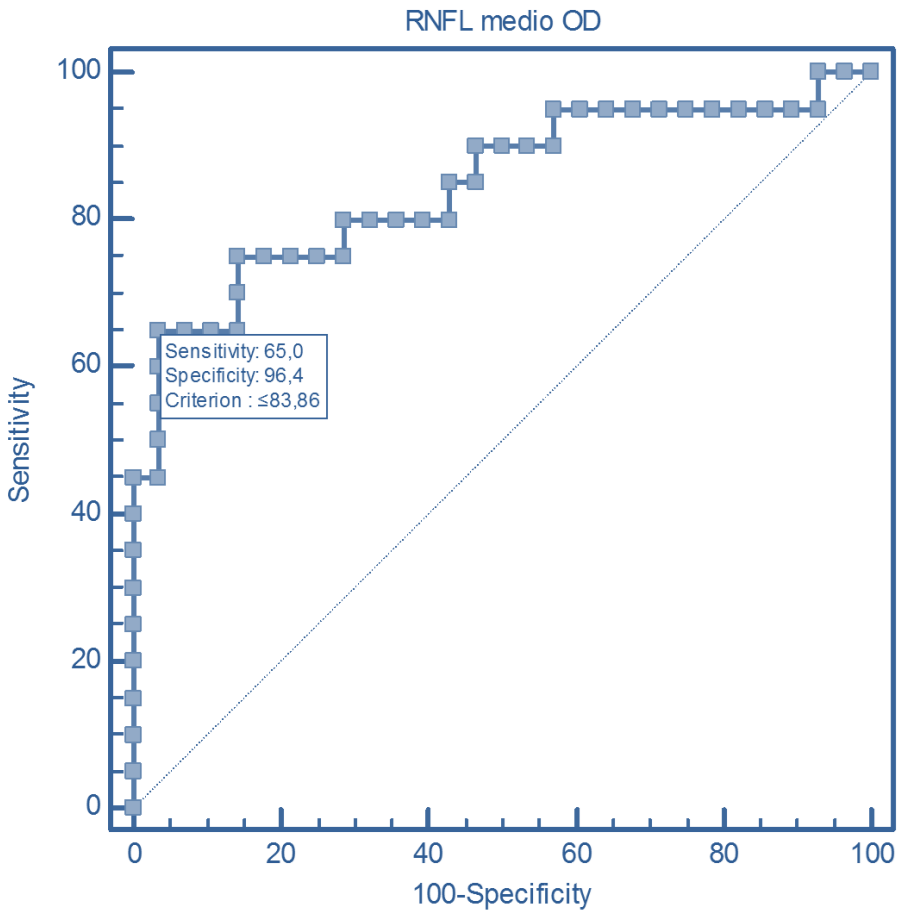


Neurite vs N.ricadute

p < 0,004

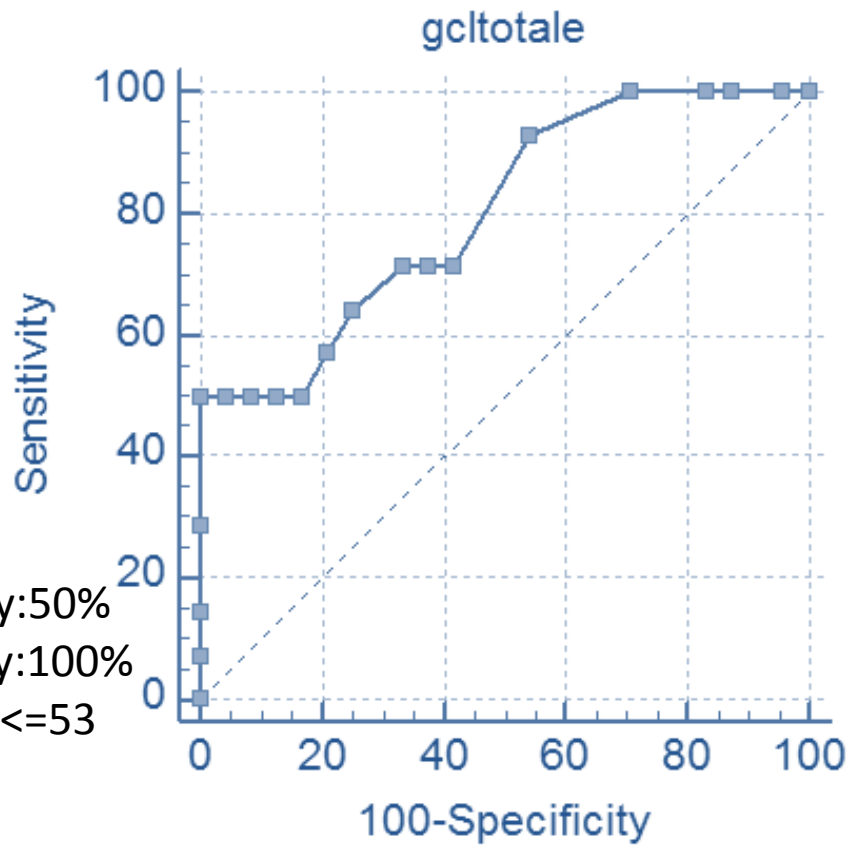


Risultati



p < 0.0001

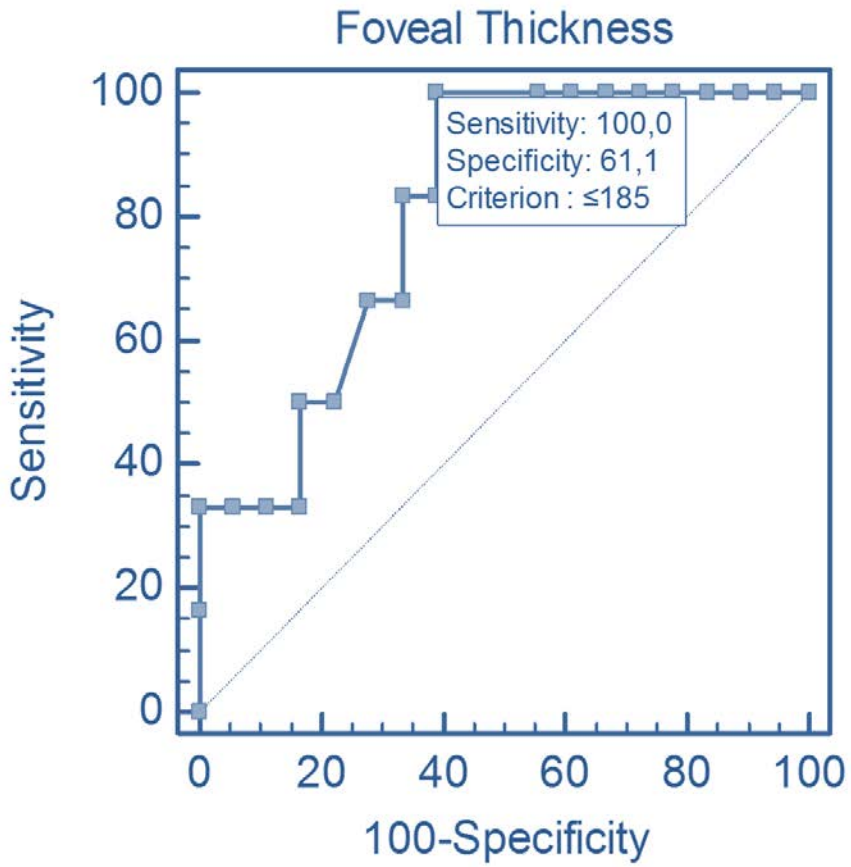
Risultati



Sensitivity:50%
Specificity:100%
Criterion:<=53

p < 0.0001

Risultati



p = 0.0008

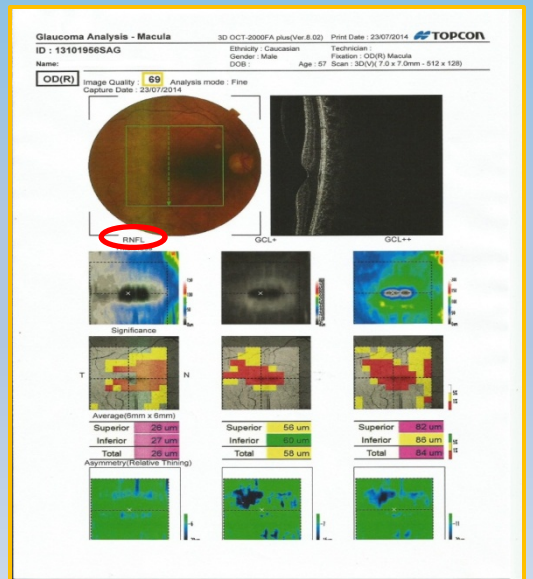
CONCLUSIONI

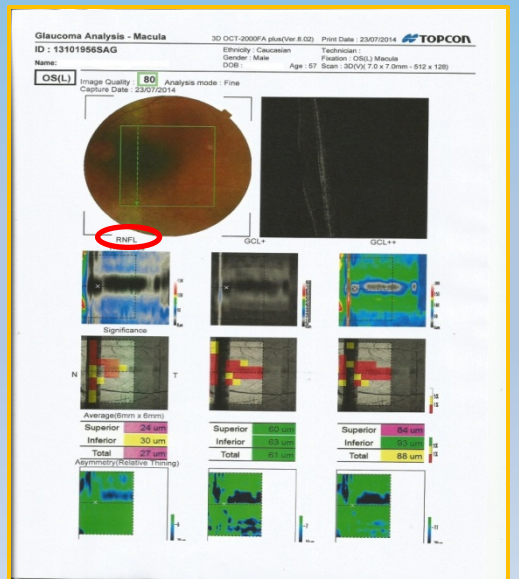
RNFL *e* ***GCL:***

- *risultano assottigliati nel gruppo di pazienti con storia di neurite ottica.*

- *sono altamente predittivi del verificarsi della neurite ottica.*

- *sono espressione della perdita assonale progressiva nella Sclerosi Multipla come dimostrato dalla significatività del dato Edss, anni di malattia e numero di ricadute.*





CONCLUSIONI

L'OCT potrebbe rappresentare un ideale **biomarker** sensibile nel rilevare i cambiamenti subclinici nei pazienti affetti da SM attraverso il monitoraggio delle alterazioni a livello retinico, ed estremamente utile nel monitorare la neurodegenerazione e gli effetti neuroprotettivi di nuovi agenti terapeutici.