

# OCT and NfL: anticipating neurodegeneration in a non-invasive way



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## Objectives

Inflammation and neurodegeneration in multiple sclerosis (MS) lead to progression and disability. Serum neurofilament light chain (NfL) reflects neuronal damage, while optical coherence tomography (OCT) and OCT-angiography (OCT-A) non-invasively capture retinal structural and vascular changes linked to central neurodegeneration. This study explores the relationship between NfL and OCT/OCT-A measures to assess their combined value in detecting subclinical neurodegeneration and inflammatory activity in MS.

## Materials and methods

**Population:** 316 relapsing-remitting patients  
→ 303 with no evidence of disease activity (NEDA) and 13 with clinico-radiological activity (EDA) in the past twelve months

**Clinical assessment:** EDSS

**NfL:** quantified with Lumipulse™ and log-transformed

**OCT / OCT-A parameters:**

**Structural:** Ganglion Cell Complex (GCC), Retinal Nerve Fiber Layer (RNFL)

**Vascular:** Vessel Density (VD) in superficial, deep, choriocapillaris, and radial peripapillary plexuses

**Exclusion criteria:** event of optic neuritis

**Analysis:** multilevel mixed-effect models; adjusted for demographics, smoking, cardiovascular risk.

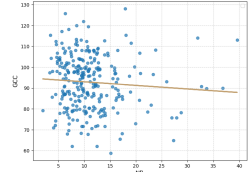
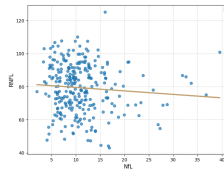
## Results

### NEDA patients

Higher NfL ↔ lower RNFL

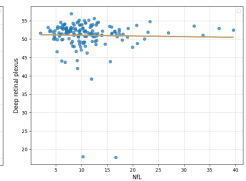
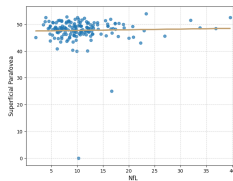
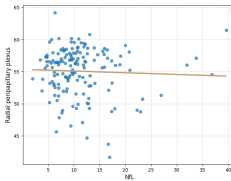
Higher NfL ↔ lower GCC

No OCT-A associations



### EDA patients

Higher NfL ↔ higher VD in radial peripapillary plexus, superficial parafovea and deep retinal plexus



## Conclusion

OCT and OCT-A provide distinct yet complementary insights into MS. Structural OCT detects neuroaxonal damage correlating with long-term disability, while OCT-A assesses the retinal microvasculature, appearing more sensitive to dynamic –and potentially transient– changes associated with active inflammation.

The combined use of structural OCT, OCT-A, and NfL offers a multidimensional, integrative approach that enhances our understanding of MS pathophysiology and improves the detection of subclinical disease activity, particularly in patients experiencing silent progression.



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