

# Visual pathway abnormalities in dementia with Lewy bodies: an Optical Coherence Tomography (OCT) and <sup>18</sup>F-FDG-PET/MRI study

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## Background

The visual system may be involved in several core features of dementia with Lewy bodies (DLB), however, very few data on retinal and visual system abnormalities are available. Aim: To identify structural and metabolic features alongside the visual pathway (i.e. from retina to primary/secondary visual cortex) that may be specific of DLB.

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## Methods

**Study 1:** 35 DLB patients and 30 healthy subjects (HS) underwent a Spectral Domain retinal Optical Coherence Tomography (OCT) scan; peripapillary RNFL (pRNFL) and macular layers thicknesses and volumes were compared. Exclusion criteria for all subjects were presence of retinopathy, severe glaucoma and age-related macular degeneration. DLB patients underwent clinical interview, neurological and neuropsychological evaluations.

**Study 2:** 31 DLB patients and 18 control subjects underwent <sup>18</sup>F-FDG-PET/MRI scan. Cortical thickness (Cth), subcortical volumes and <sup>18</sup>F-FDG SUVR of visual system structures were compared.

**Study 3:** data from 16 DLB patients with both OCT and <sup>18</sup>F-FDG-PET/MRI were combined to identify associations between retinal thickness and brain metabolism of the visual pathway.

## Results

**Study 1:** pRNFL thickness was not significantly different in DLB patients and HS; as for macular layers, parafoveal ganglion cells and inner plexiform layer (pGCIPL) was significantly thinner in DLB patients ( $p=0,03$ ), mostly in nasal and temporal quadrant ( $p=0,02$ ), as well as the inner nuclear layer (INL) inner temporal quadrant ( $p=0,003$ ). The thickness of pRNFL temporo-superior sector was associated with disease duration ( $Rho=-0,4$ ,  $p=0,01$ ), while visuo-spatial abilities were associated with the thickness of pRNFL temporal sector and papillomacular bundle (QPST "opening/closure" item:  $Rho=0,5$ ,  $p=0,004$  and  $Rho=0,4$ ,  $p=0,01$ , respectively; QPST "closing in" item:  $Rho=0,5$ ,  $p=0,002$  and  $Rho=0,5$ ,  $p=0,001$ , respectively).

**Study 2:** DLB patients had significantly thinner Cth in secondary visual areas, i.e. right precuneus ( $p=0,003$ ) and bilateral fusiform gyrus ( $p=0,02$ , both); and lower SUVR in parieto-temporo-occipital regions.

**Study 3:** pGCIPL thickness and volumes of macular GCIPL (GCIPLv), RNFL (RNFLv) and INL (INLv) had a negative association with level of glucose metabolism in the fusiform gyrus (FG) and pulvinar (FG: pGCIPL thickness  $r=-0,6$ ,  $p=0,03$ ; GCIPLv  $r=-0,6$ ,  $p=0,03$ ; RNFLv  $r=-0,7$ ,  $p=0,003$ . Pulvinar: INLv  $r=-0,6$ ,  $p=0,01$ ; GCIPLv  $r=-0,5$ ,  $p=0,04$ ).

## Conclusion

in DLB patients parafoveal macular GCIPL and Cth in secondary visual areas are thinner than in control subjects and glucose metabolism lower in temporo-parieto-occipital cortical regions. Thicknesses of macular layers in DLB group were negatively associated to secondary visual cortex metabolism, suggesting a relative preservation of synaptic activity in secondary visual cortex in response to degraded afferent visual stimuli.

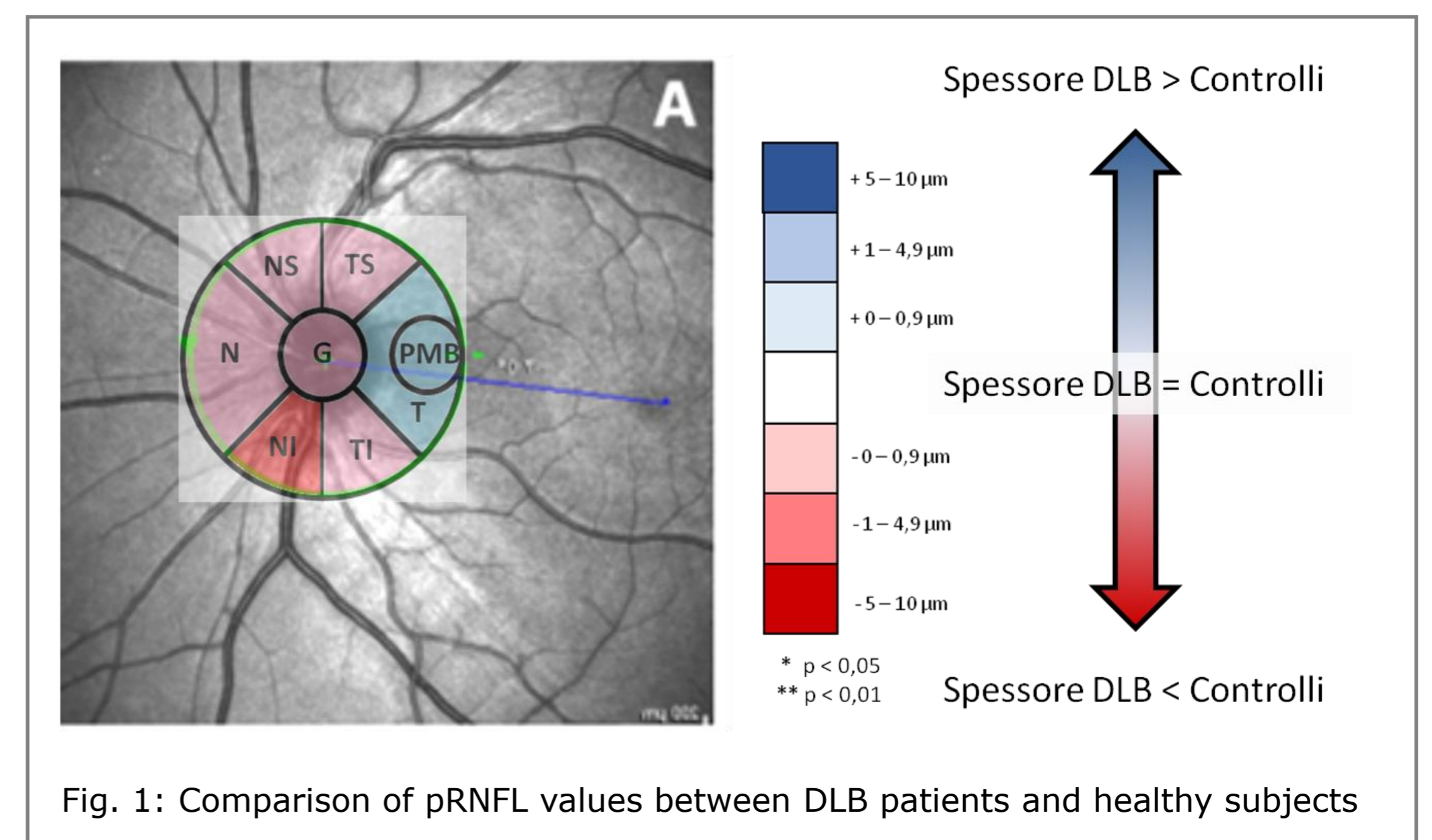


Fig. 1: Comparison of pRNFL values between DLB patients and healthy subjects

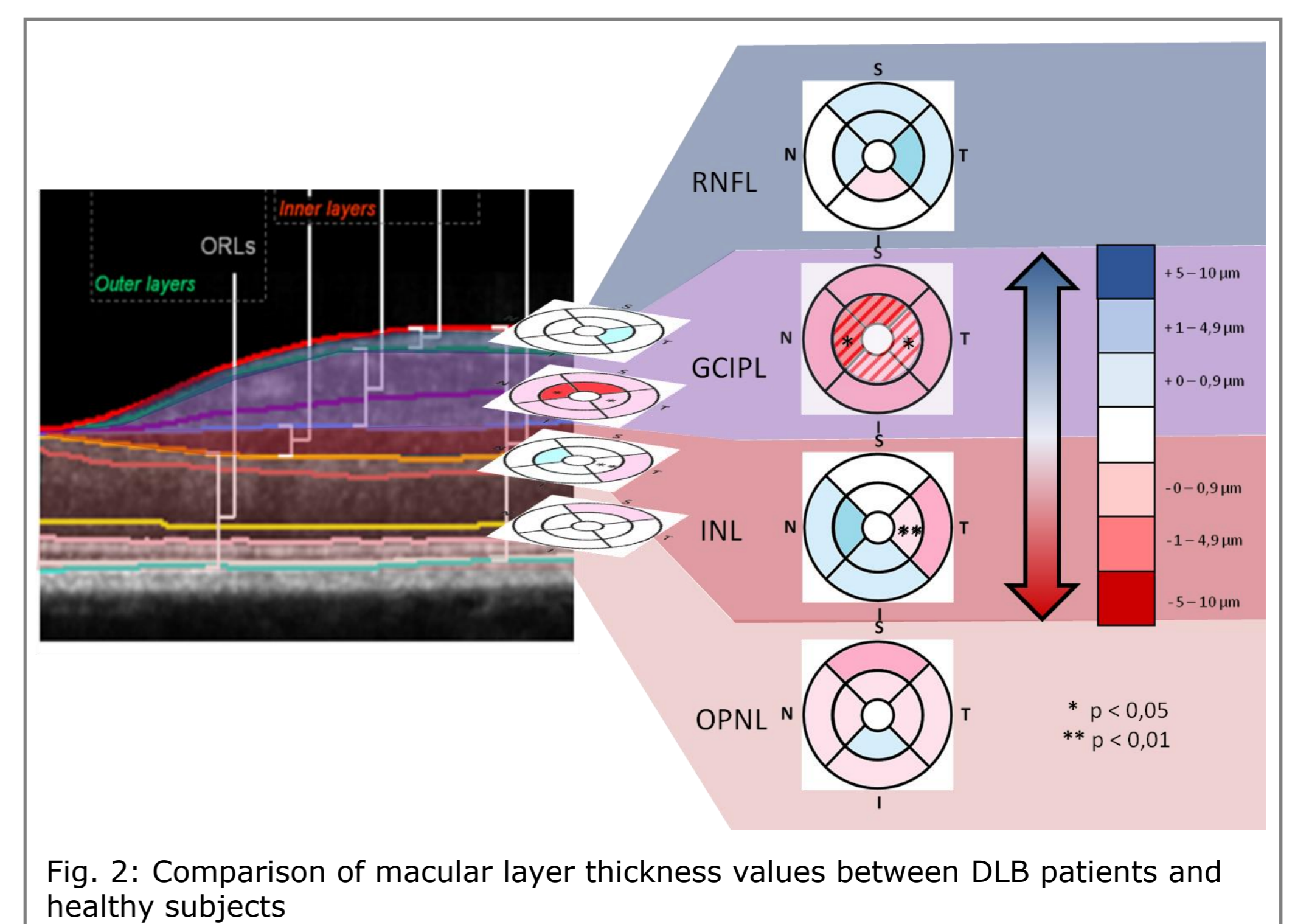


Fig. 2: Comparison of macular layer thickness values between DLB patients and healthy subjects

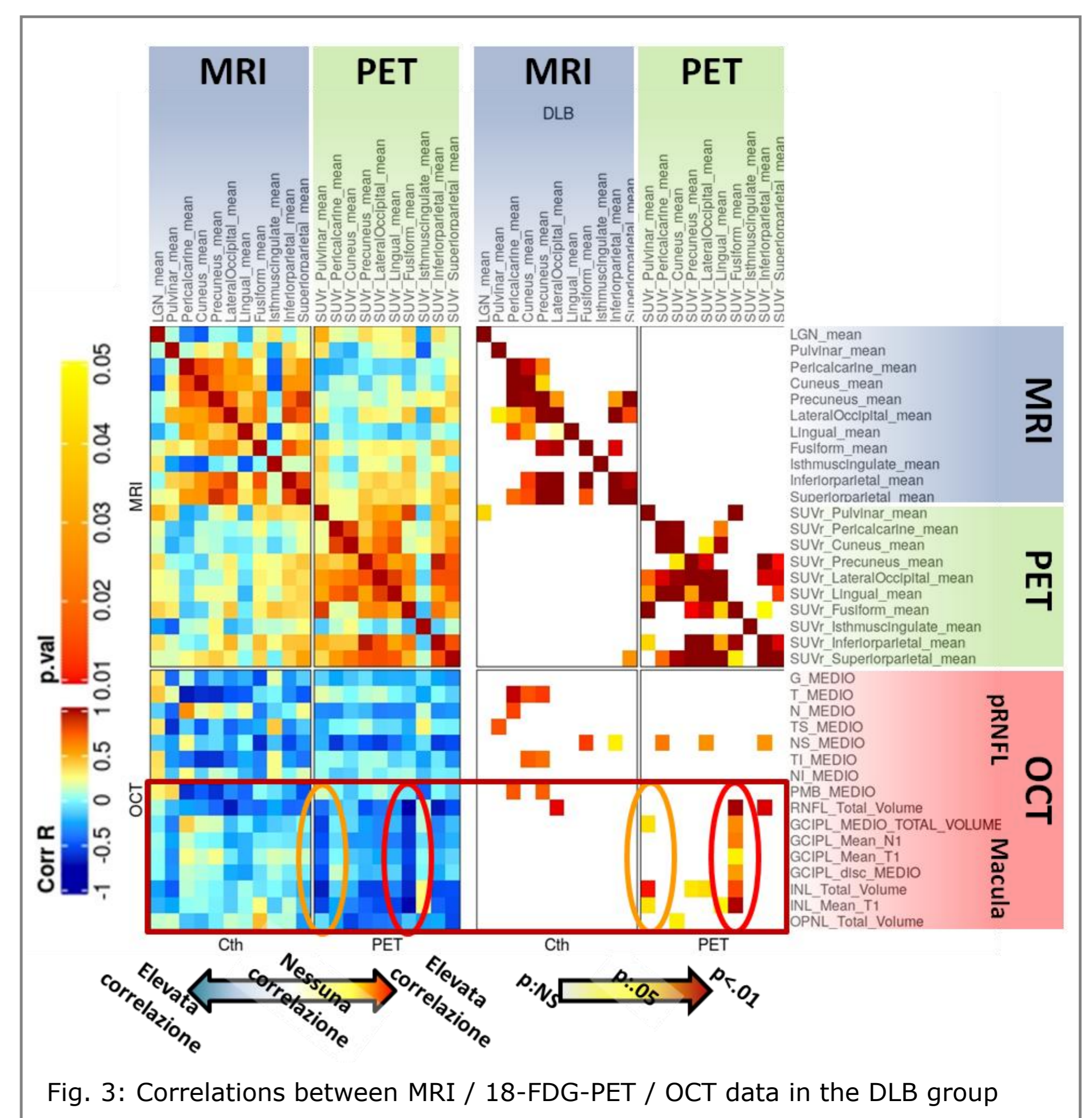


Fig. 3: Correlations between MRI / 18-FDG-PET / OCT data in the DLB group