Advanced brain white matter assessment of trigeminal neuralgia secondary to multiple sclerosis using myelin mapping

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Results

MS-TN Cohort Demographics

Age (years, mean ± SD)	55 ± 10
Sex (M : F)	20 : 28
Duration of MS (years, mean ± SD)	15 ± 9
Duration of TN pain (years, mean ± SD)	5 ± 3
Surgical response rate (responder : non-responder)	32 : 16

Healthy controls were age and sex matched.

Myelin Map External Validity

Two-one-sided t-tests (TOST) demonstrated equivalence between MMs of local and external HCs (all regions $p < 0.05$), confirming cross-scanner generalizability.

TOST:
Determines whether the means of two populations are equivalent based on two independent samples from these populations.

Myelin Map Internal Validity

MM differences between MS-TN patients and healthy controls ($p < 0.0001$) in the 29/48 JHU regions, predominantly demonstrating demyelination in MS-TN.

Figure 2:
Univariate analysis identified regional white matter differences between MS-TN and HCs in 29/48 JHU regions (p<0.0001).
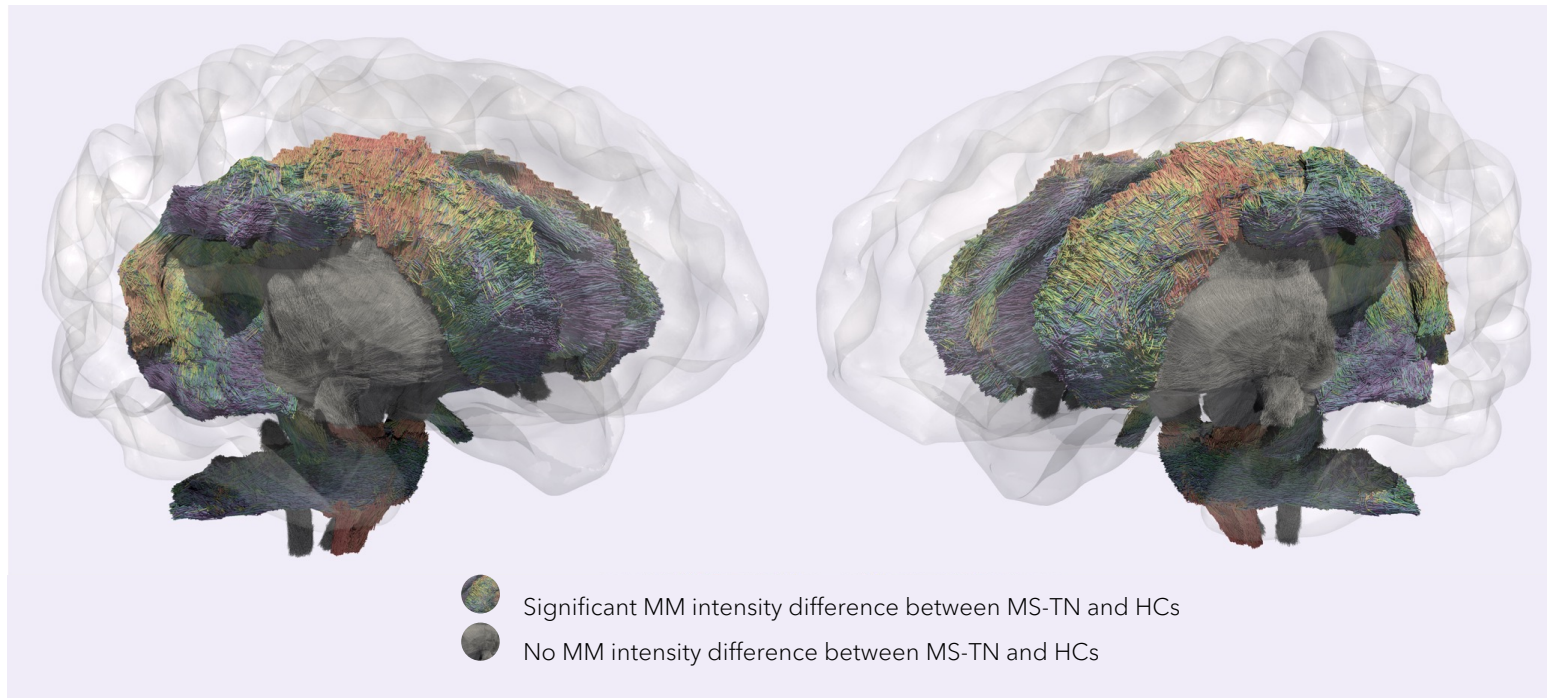
Figure 2a. Proportion of JHU regions demonstrating significant MM intensity differences between MS-TN and HCs

- Superior fronto-occipital fasciculus (ipsi + contra)
- Superior longitudinal fasciculus (ipsi + contra)
- Cingulum-hippocampus (ipsi + contra)
- Cingulum-cingulate gyrus (ipsi + contra)
- Sagittal stratum (ipsi + contra)
- Posterior thalamic radiation (ipsi + contra)
- Posterior corona radiata (ipsi + contra)
- Superior corona radiata (ipsi + contra)
- Anterior corona radiata (ipsi + contra)
- Retrolenticular part of internal capsule (ipsi + contra)
- Corticospinal tract (ipsi + contra)
- Corpus callosum (splenium, genu, body)
- Pontine crossing tract part of MCP
- Middle cerebellar peduncle

- Medial lemniscus (ipsi/contra)

Decreased MM intensity (myelin content) in MS-TN

Increased MM intensity (myelin content) in MS-TN

29/48 JHU regions demonstrated significant differences (p<0.0001).
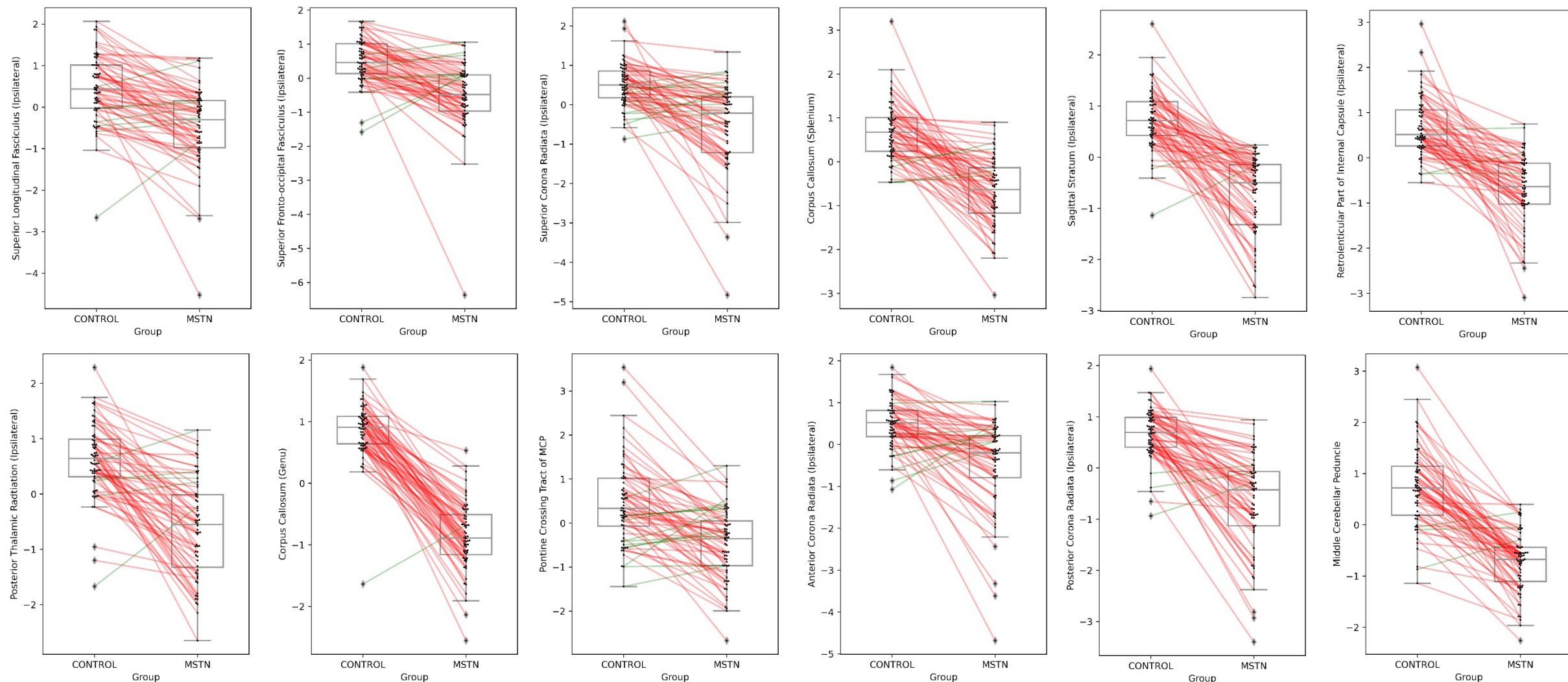
Figure 2b. Region based univariate analysis of myelin maps. Vertical axis displays intensity of MM (higher intensity represents higher myelin content). Lines connect each MS-TN patient to the corresponding age and sex matched HC (only ipsilateral and bilateral regions shown).
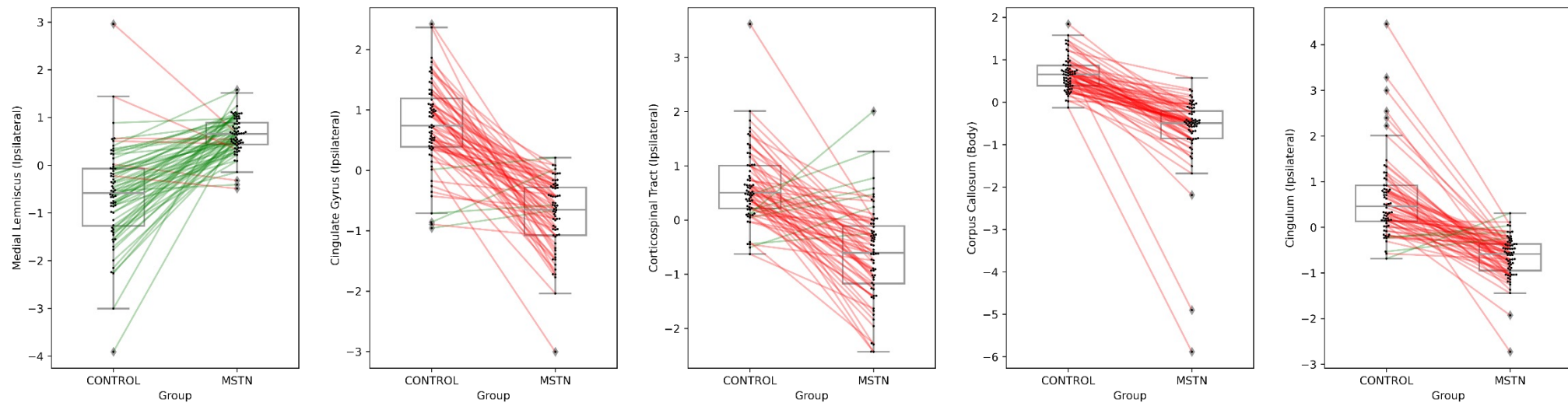
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Figure 3:

MM intensity distribution demonstrated demyelination in the right fornix-stria terminalis in a left-symptomatic vs right-symptomatic analysis of MS-TN patients (p<0.05)

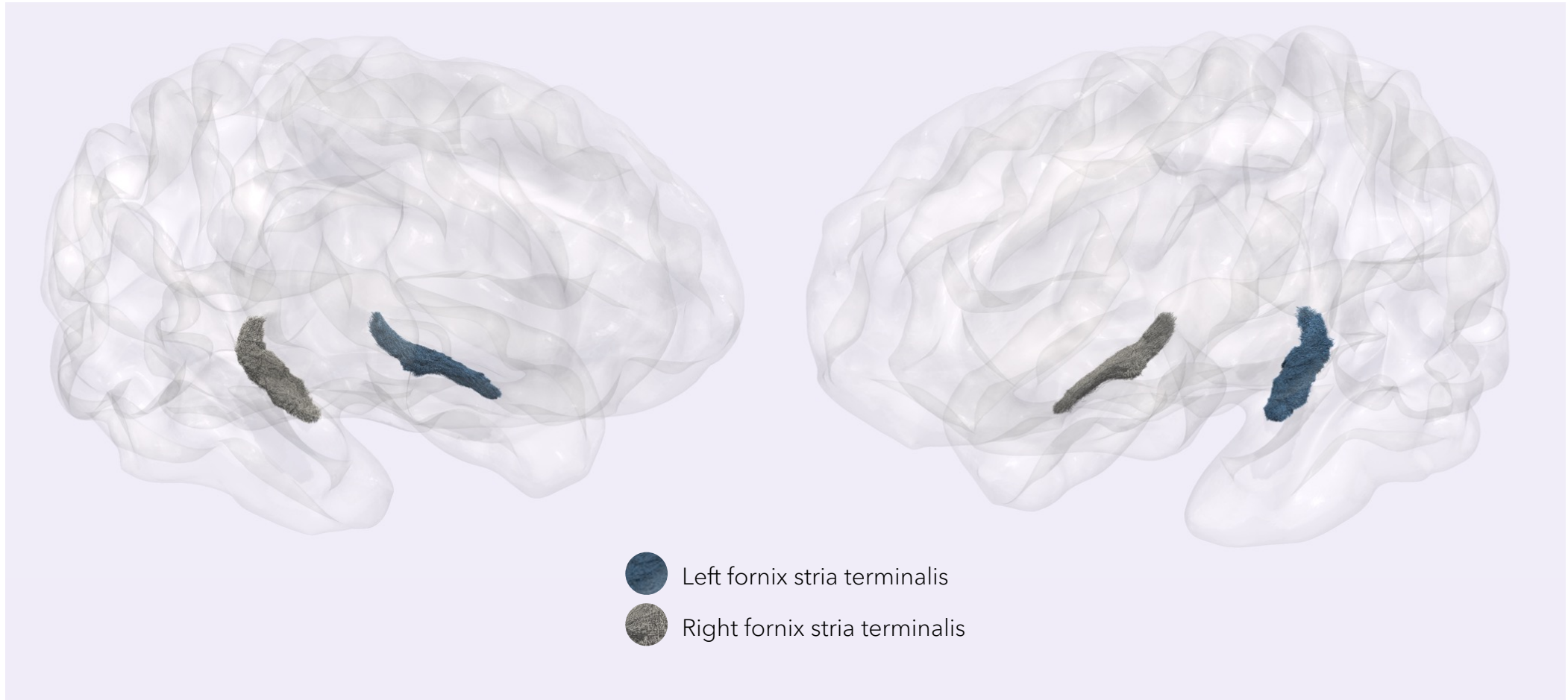**Figure 3a.** Right and left fornix stria terminalis indicated.
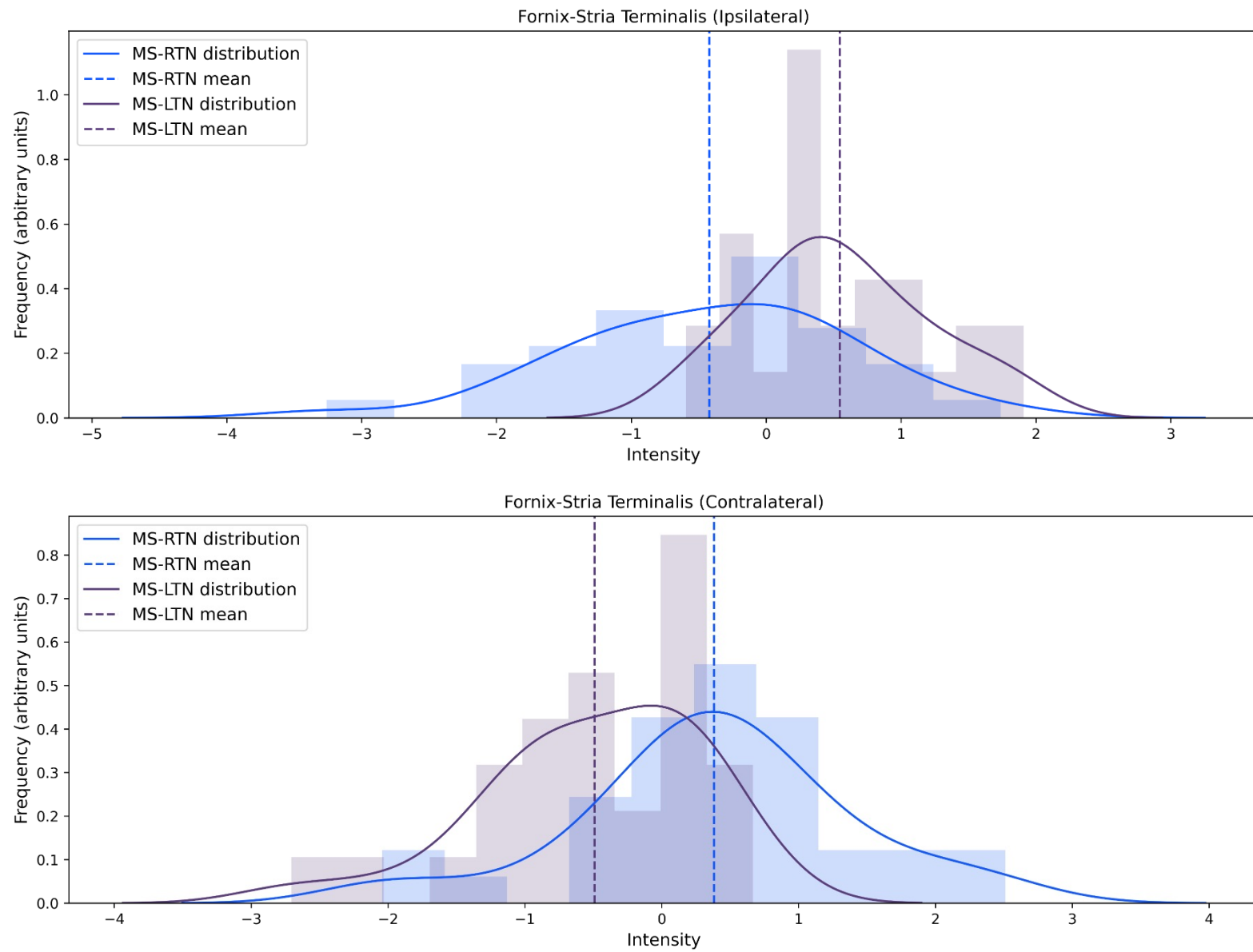
Figure 3b. MM intensity distribution in the ipsilateral and contralateral fornix-stria terminalis in MS-RTN and MS-LTN patients.

Next Steps

- Study left-right asymmetry of the fornix stria terminalis in a cohort of healthy patients to assess if demyelination in the right fornix stria terminalis is a MS-TN specific observation.
- Combine myelin map method and machine learning to study white matter signatures of trigeminal neuralgia in MS (MS vs MS-TN classifier).

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Thank you!

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