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MLF lesions in MS patients diagnosed with internuclear ophthalmoplegia

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Question

What does a well defined clinical phenotype, INO, tell us about the clinico-radiological paradox?

Background

- Internuclear ophthalmoplegia (INO) is common in MS [1,2] and represent a delay of the movement of the adducting eye
- It is caused by a lesion in the medial longitudinal fasciculus (MLF) in the brainstem
- The INO-MLF model permits to interrogate the clinico-radiological paradox

Methods

- Eye movement measurement

Fig 1. Set-up infrared oculography

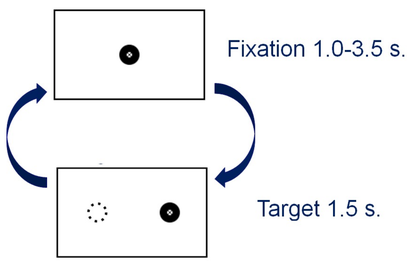


Fig 2. DEMoNS protocol, pro-saccadic task [3]

- Eye movement analysis
  - Filtering, quality control, detection
  - Calculation of versional dysconjugacy index (VDI), Area under the curve (AUC), Peak velocity divided by amplitude (Pv/Am) [3]
  - Detection of INO [2]

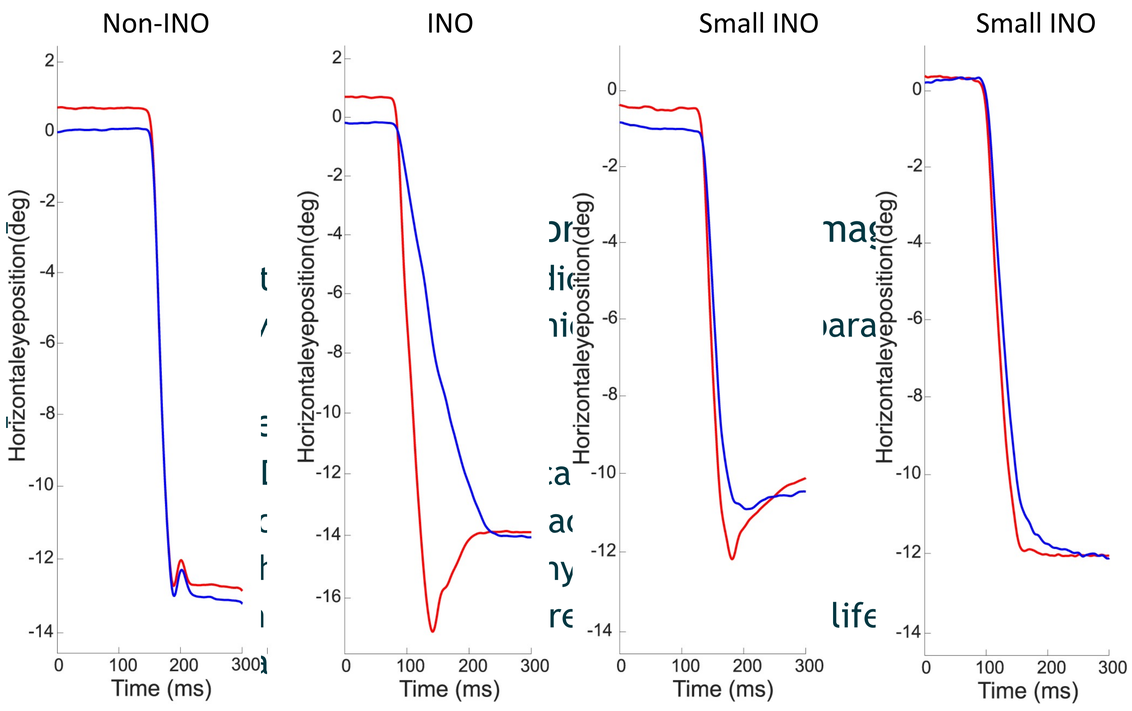


Fig 3. Infrared oculography records of a leftward saccade of four different MS patients. The blue line represents the right eye, the red line represents the left eye

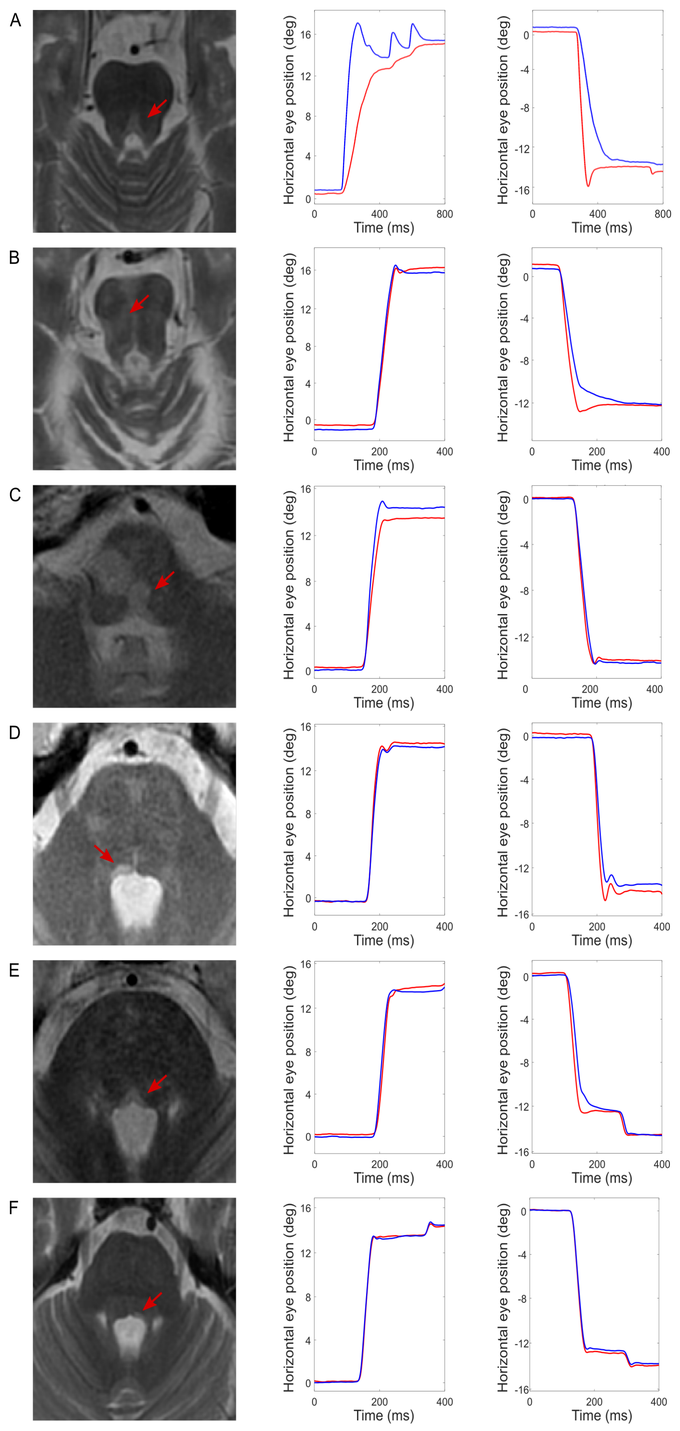
References: [1] Frohman et al Neurology ..., [2] Nij Bijvank et al. Neurology 2019, [3] Nij Bijvank et al. PloS One

Results

202 MS patients and 58 healthy controls included

- Clinico-radiological paradox in 50 MS patients (25%) (fig 4)
  - Mainly caused by an absence of MLF lesion on MRI in 45 INO patients and thought to be related to pure demyelination, pure axonal degeneration or technical factors among others.
  - INO's with MLF lesion: more bilateral INO and higher VDI (fig 5)

- Comparison with clinical characteristics
- Presence of INO was closely related to symptoms of double vision (p=0.009) and vision-related quality of life (p=0.01)
- Paradox cases showed a longer disease duration, more progressive disease and higher EDSS than non-paradox cases (p<0.05)



← Fig 4. MLF lesions (arrow) on MRI with corresponding recordings of the patient of a rightward (left graph) and a leftward (right graph) saccade measured with infrared oculography. The blue line represents the right eye, the red line represents the left eye.

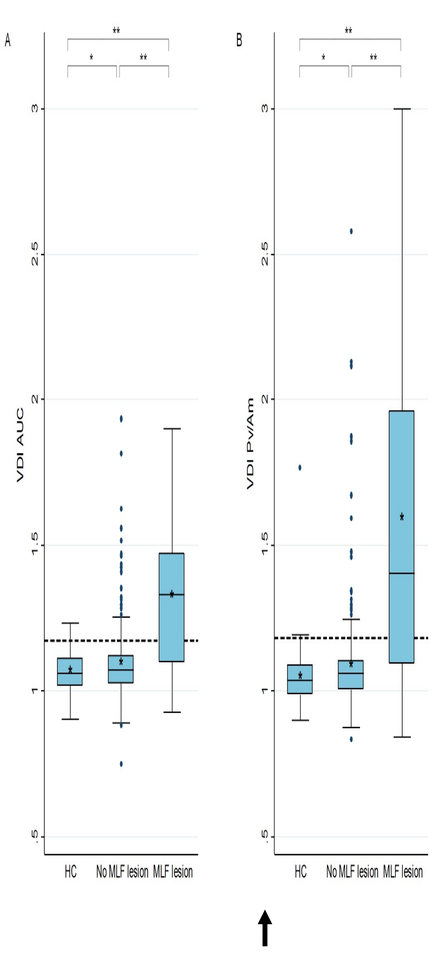


Fig 5 Box-and-whisker plots of the versional dysconjugacy index (VDI) of the healthy control group, MS patients without a MLF lesion on MRI and MS patients with a MLF lesion. The dashed line indicates the INO detection threshold the VDI (1.174). *: p<0.05; **: p<0.001

Conclusions

- INO and MLF provide a suitable in vivo model to interrogate the clinico-radiological paradox in MS
- INO detection might be more sensitive and more clinically relevant than MLF rating on MRI

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Authors' disclosures
J.A. Nij Bijvank: receives research support from the Dutch MS Research Foundation, grantnumber 18-1006. E. Sanchez: reports no disclosures. L.J. Balk: reports no disclosures; L.J. van Rijn: reports no disclosures. D. Coric: reports no disclosures. H.S. Tan: reports no disclosures. B.M.J Uitdehaag: has received consultancy fees from Biogen Idec, Genzyme, Merck Serono, Novartis, Roche and Teva. A. Petzold: member of the steering committee for the OCTiMS study (Novartis), no consulting fees. Performs OCT QC for the Passos study (Novartis), receives consulting fees. Dr Petzold is supported by the National Institute for Health Research (NIHR) Biomedical Research Centre based at Moorfields Eye Hospital National Health Service (NHS) Foundation Trust and University College London Institute of Ophthalmology.