Application of MRI diagnostic criteria in clinical practice

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Disclosures

M Tintoré has received compensation for consulting services and speaking honoraria from

- Almirall, Bayer-Schering, Biogen, Genzyme, Merck-Serono, Novartis, Sanofi-Aventis, Roche and Teva

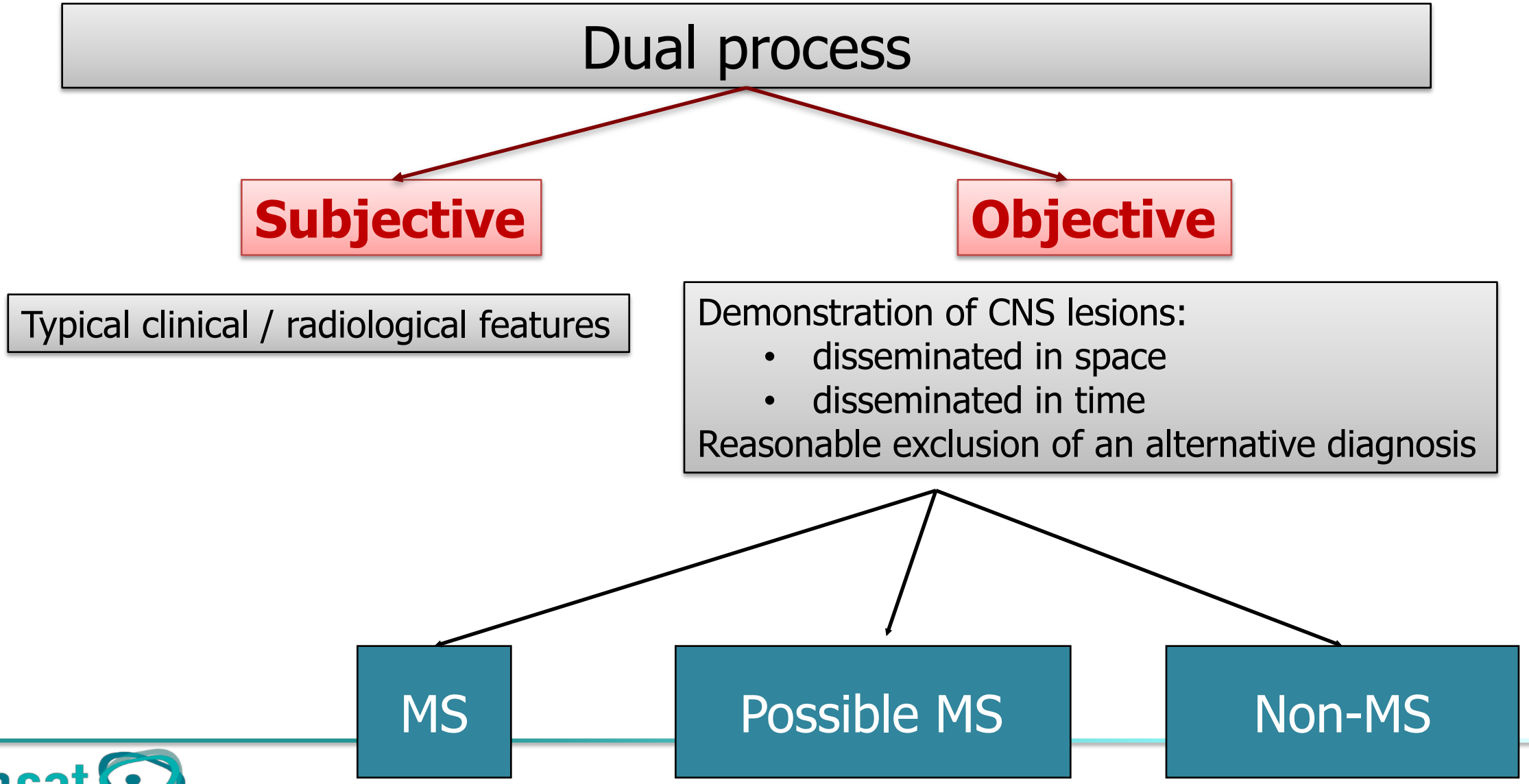
Diagnostic criteria: 2017

Diagnosis of multiple sclerosis: 2017 revisions of the McDonald criteria

Alan J Thompson, Brenda L Banwell, Frederik Barkhof, William M Carroll, Timothy Coetzee, Giancarlo Comi, Jorge Correale, Franz Fazekas, Massimo Filippi, Mark S Freedman, Kazuo Fujihara, Steven L Galetta, Hans Peter Hartung, Ludwig Kappos, Fred D Lublin, Ruth Ann Marrie, Aaron E Miller, David H Miller, Xavier Montalban, Ellen M Mowry, Per Soelberg Sorensen, Mar Tintoré, Anthony L Traboulsee, Maria Trojano, Bernard M J Uitdehaag, Sandra Vukusic, Emmanuelle Waubant, Brian G Weinshenker, Stephen C Reingold, Jeffrey A Cohen

Thompson AJ et al. Lancet Neurol 2018;17:162-173

Diagnostic criteria



Interactive question

Adam is a 26-year-old man presents with symptoms and signs consistent with mid-thoracic partial myelitis and MRI evidence of
12 cerebral white matter lesions (PV and JC) in addition to an enhanced lesion at T4 on imaging of the spinal cord

Based on these data, it is reasonable to conclude that…

A …he is at high risk of developing NMO

B …a new MRI with new T2 lesions is required to reach a diagnosis of MS

C …he has MS

D …CSF examination is required to reach a diagnosis of MS

CSF, cerebrospinal fluid; JC, juxtacortical;
MRI, magnetic resonance imaging; NMO, neuromyelitis optica; PV, periventricular

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MRI, magnetic resonance imaging; NMO, neuromyelitis optica; PV, periventricular

Patients like Adam have benefitted from earlier diagnosis following 2017 revisions to the McDonald criteria

Dissemination in space (DIS)

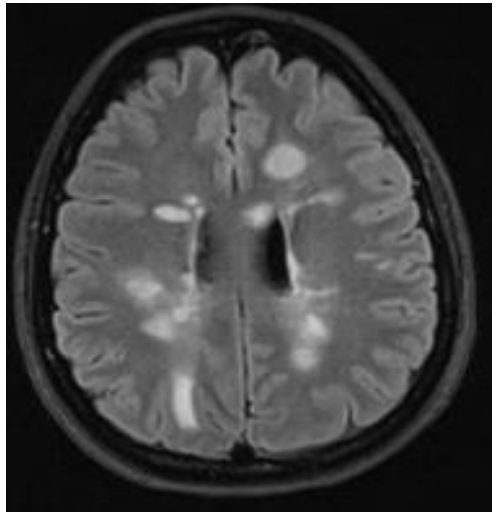
≥1 T2 lesion in ≥2 topographies

Symptomatic lesions included

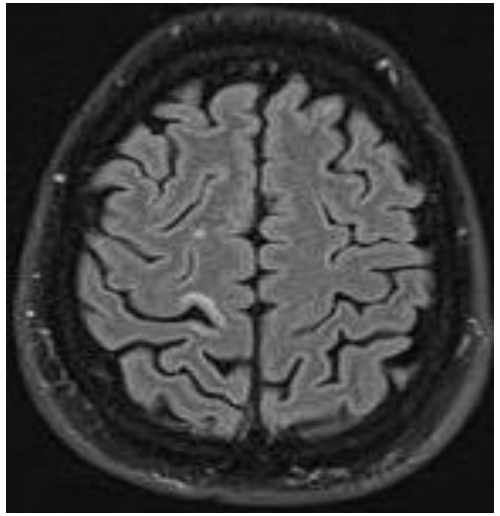
Dissemination in time (DIT)

Simultaneous presence of Gd-enhancing and non-enhancing lesions at any time **or** a new T2 lesion on a follow-up MRI*

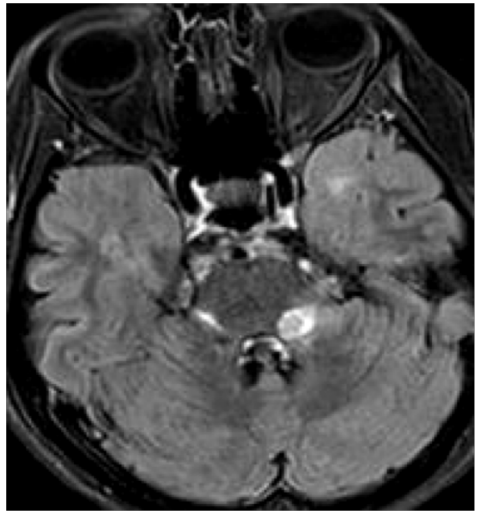
Symptomatic lesions included



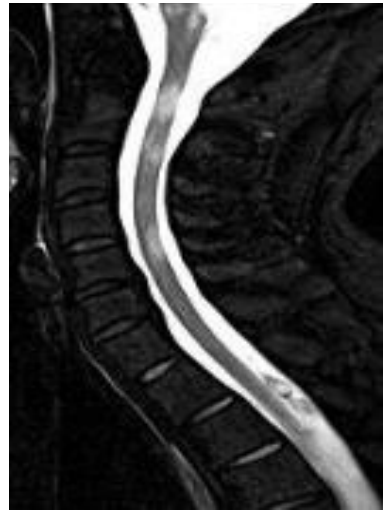
Periventricular



Cortico / juxta (equivalent)



Infratentorial

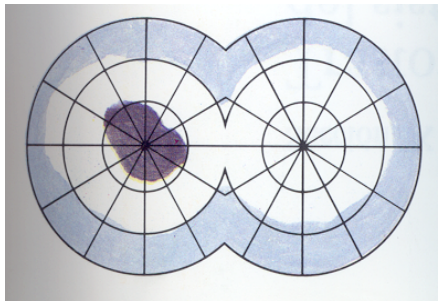


Spinal cord

*With reference to a baseline scan, irrespective of the timing of the baseline MRI
Gd, gadolinium; MRI, magnetic resonance imaging

Thompson AJ, *et al. Lancet Neurol* 2018;17:162–73. Images courtesy of A Rovira

Laura's journey

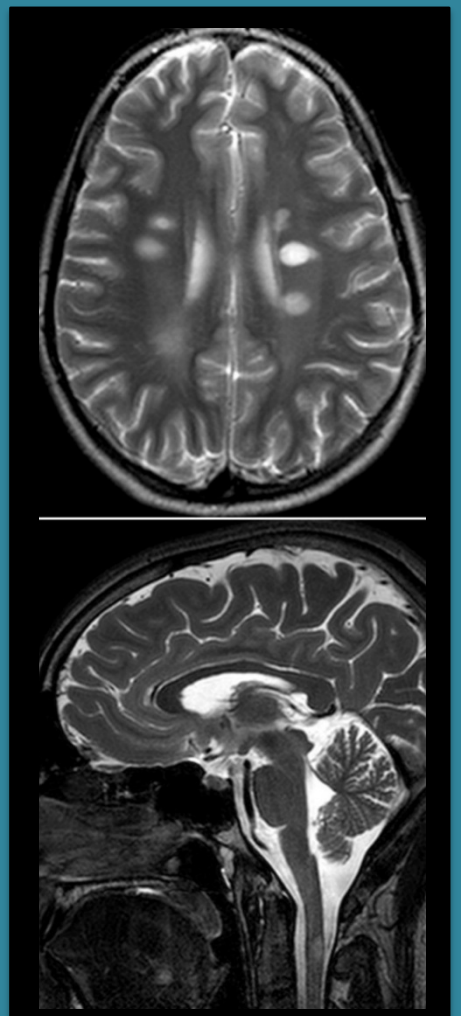


Central scotoma

Abnormal color vision

- Laura
  - 38 years of age
  - Normal birth, normal development
  - No history of migraine or other diseases
- Family history
  - Father: diabetes mellitus type 2
  - Mother: hypertension
- Social history
  - Lives with his partner
  - Researcher in social sciences at a university
- Presentation
  - Pain when moving the eye
  - Abnormal colour vision and central scotoma

Interactive question



MRI: T2 lesions in characteristic topographies[1,2]

- Laura made a full recovery after IV methylprednisolone
- MRI was performed
- IgG oligoclonal bands: positive

Which is your diagnosis?

A Inflammatory optic neuritis

B CIS with DIS

C MS

D NMOSD

E Other

CIS, clinically isolated syndrome; DIS, dissemination in space; IgG, immunoglobulin G; IV, intravenous; NMOSD, neuromyelitis optica spectrum disorder

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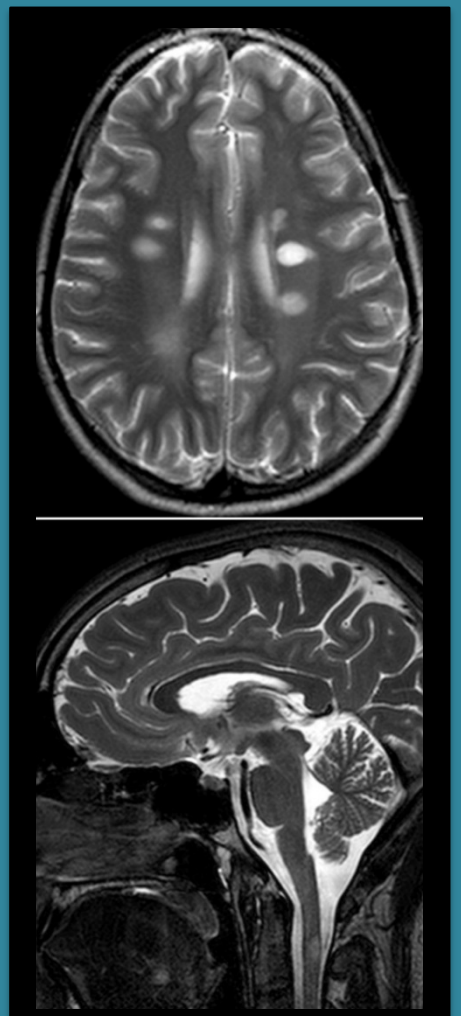

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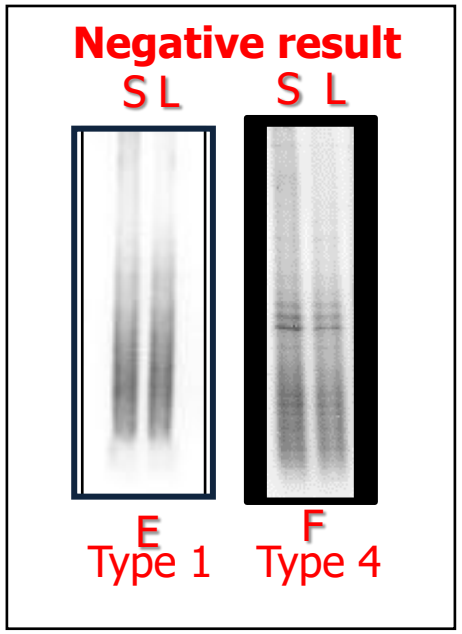
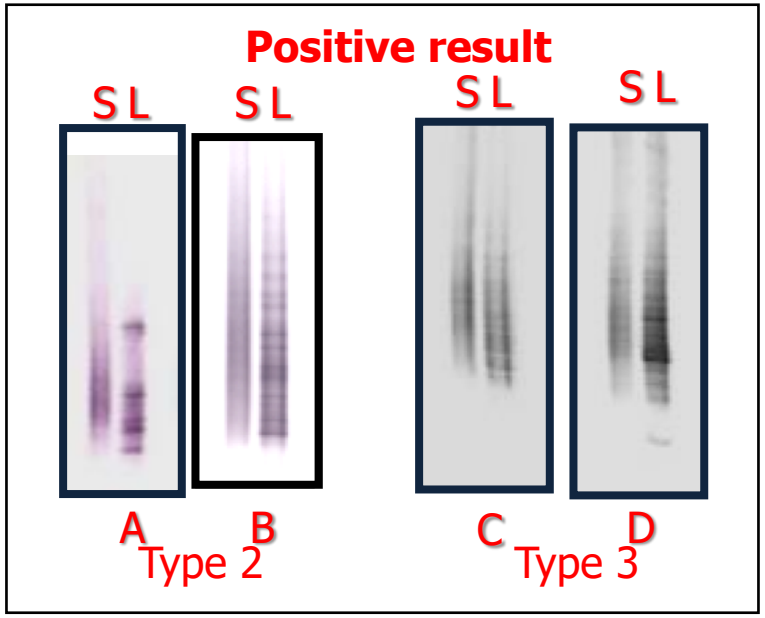
Patterns of IgG oligoclonal bands





Negative polyclonal **Negative mirror** **Positive oligoclonal** **Positive more than**

Recommended technique: agarose gel electrophoresis with isoelectric focusing and immunoblotting or immunofixation for IgG

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Villar LM et al. Arch Neurol 2005;62:574-577

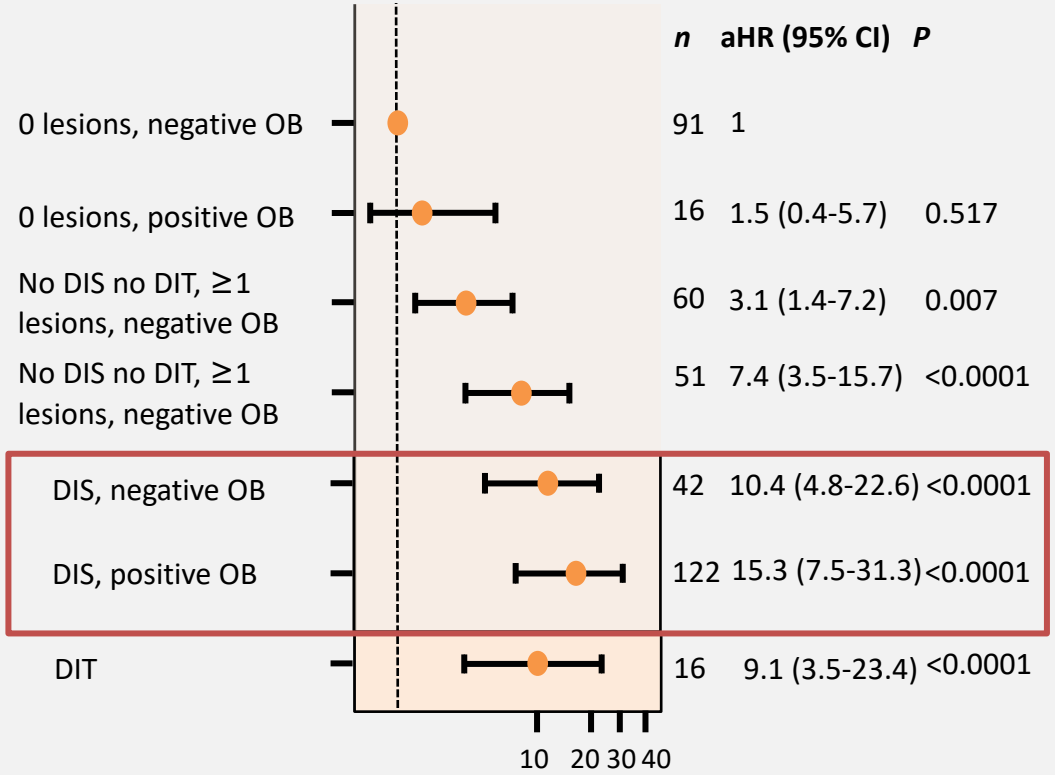
Adding oligoclonal band criteria to DIS, increases diagnostic specificity

Typical CIS + clinical/MRI demonstration of DIS + CSF-specific oligoclonal bands allows a diagnosis of MS[1]

Improved specificity with addition of oligoclonal bands as a diagnostic criteria[2]:

n = 314	n	McDonald MS at 3 years n (%)	Sensitivity (95% CI)	Specificity (95% CI)	Accuracy (95% CI)
All DIS	137	111/137 (81.0)	61.7 (54.1-68.8)	80.6 (72.9-86.9)	69.7 (64.3-74.8)
DIS with +OB	101	85/101 (84.2)	47.2 (39.8-54.8)	88.1 (81.3-93.0)	64.6 (59.1-69.6)

Adjusted hazard ratios for meeting 2010 McDonald criteria over time[2]:

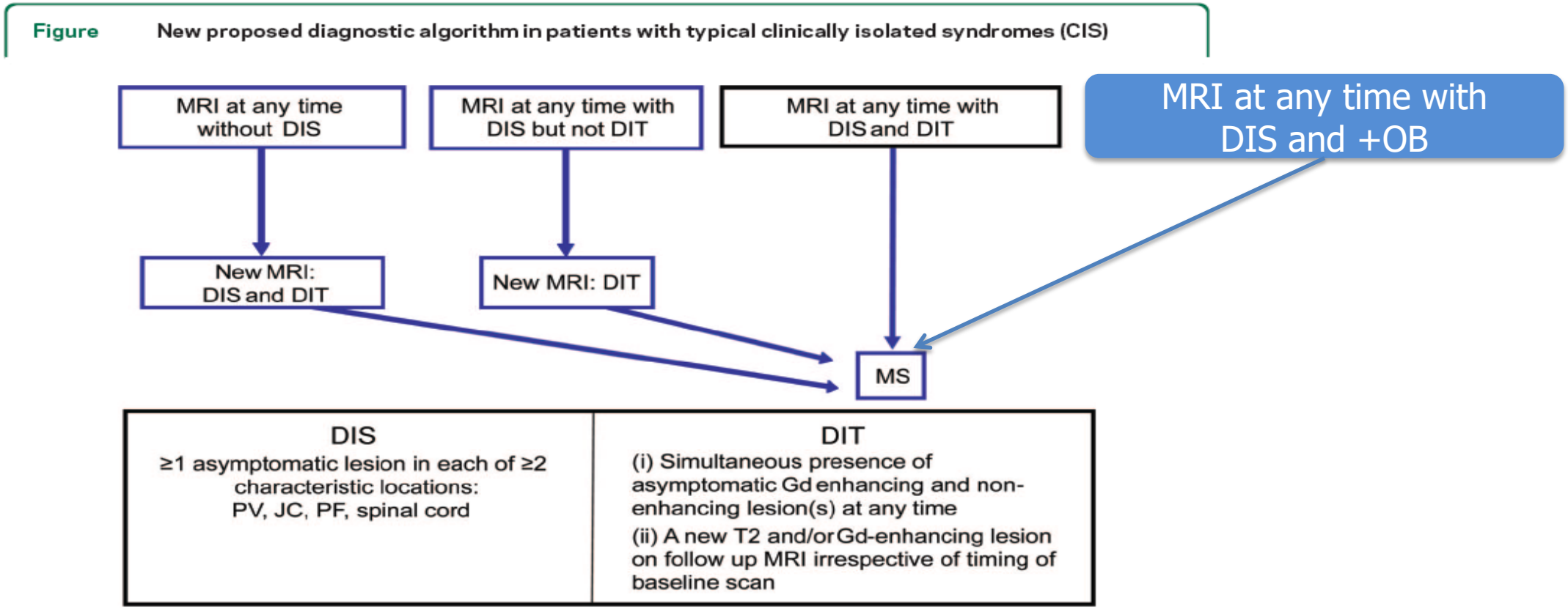


CI, confidence interval; CIS, clinically isolated syndrome; CSF, cerebrospinal fluid; DIS, dissemination in space; DIT, dissemination in time; HR, hazard ratio; MRI, magnetic resonance imaging; MS, multiple sclerosis; OB, oligoclonal band.

- 1. Thompson AJ, *et al. Lancet Neurol* 2018;17:162–73;
- 2. Arrambide G, *et al. Brain* 2018;141:1075–84.

Relapsing forms: oligoclonal bands contribution

2017 revisions proposal



OB, oligoclonal bands; DIT, dissemination in time; PF, posterior fossa

Montalban X et al. Neurology. 2010;74:427-434; Arrambide G et al. Brain 2018;141:1075-1084; Thompson AJ et al. Lancet Neurol 2018;17:162-173

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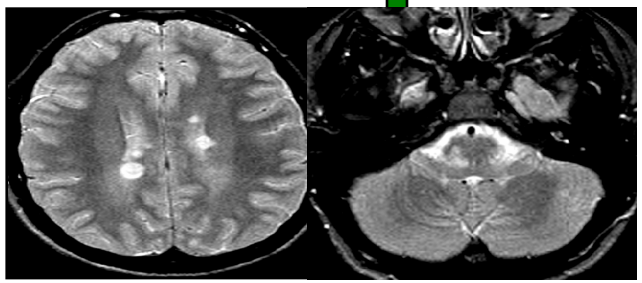
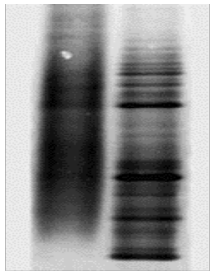
DIS + OB

Clinical threshold





* Similar to Poser laboratory-supported definite MS

Thompson AJ et al. Lancet Neurol 2018;17:162-173

Applying the 2017 McDonald diagnostic criteria for multiple sclerosis

Axel Petzold www.thelancet.com/neurology Vol 17 June 2018

- The patterns of bands can be challenging to interpret
- OBs can de found in at least 30 diseases

reinforces the responsibility of clinical neurologists to request state-of-the-art CSF analyses[5] and to encourage their laboratories to participate in schemes designed to ensure high analytical standards.[2]

It is your responsibility as clinician to confirm that your lab is performing OB with the higher standards

Applying the 2017 McDonald diagnostic criteria for multiple sclerosis

Masoud Etemadifar, www.thelancet.com/neurology Vol 17 June 2018

- OBs can de found in other diseases
  - Paraesthesia: 18%
  - Cerebrovascular disease: 11%
  - Polyneuropathy: 13%
  - Vertigo: 8%
  - Sarcoidosis: 51%
  - SLE: 25%
  - Behcet's disease: 8%
  - Lymbic encephalitis: 33%
  - AntiNMDA encephalitis: 50%

studies showing that the presence of CSF oligoclonal bands is not specific to multiple sclerosis, extreme caution should be taken when using oligoclonal bands as evidence for a diagnosis of multiple sclerosis.

Extreme caution when using OB to confirm MS diagnosis

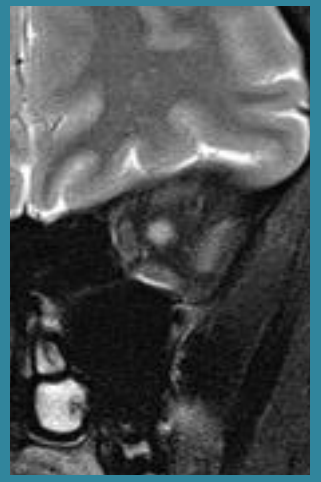
Applying the 2017 McDonald diagnostic criteria for multiple sclerosis

can have fatal consequences.[5] Because CSF findings are not an essential part of the 2017 criteria, the need for evidence of inflammation is missing.

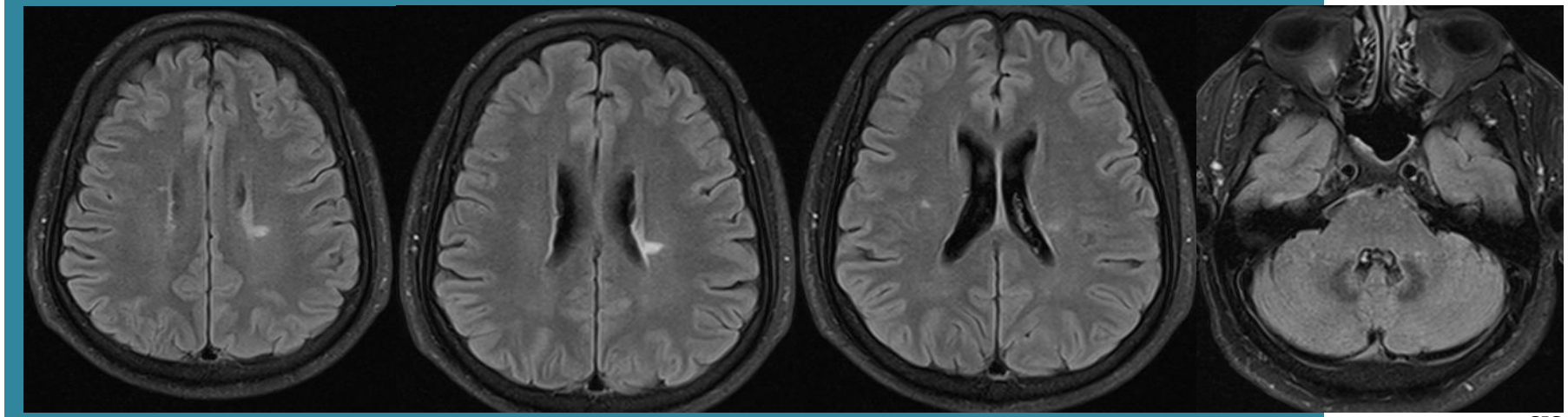
CSF has gained more importance in the revised criteria, but in our opinion not enough. CSF testing should be part of the diagnostic criteria for proof of inflammation and for the exclusion of alternative diagnoses. Abnormal CSF findings and correct interpretation of them might lead to increased diagnostic accuracy and patient

CSF testing should be part of the diagnostic criteria

Interactive question



- 48 years old lady
- Optic neuritis
- IgG oligoclonal bands: positive



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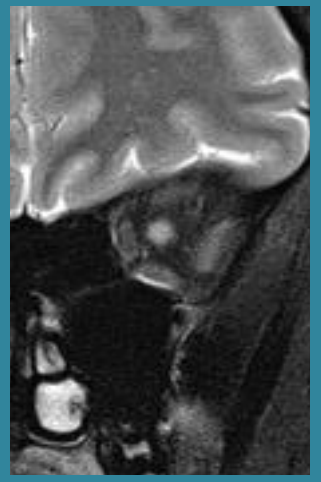

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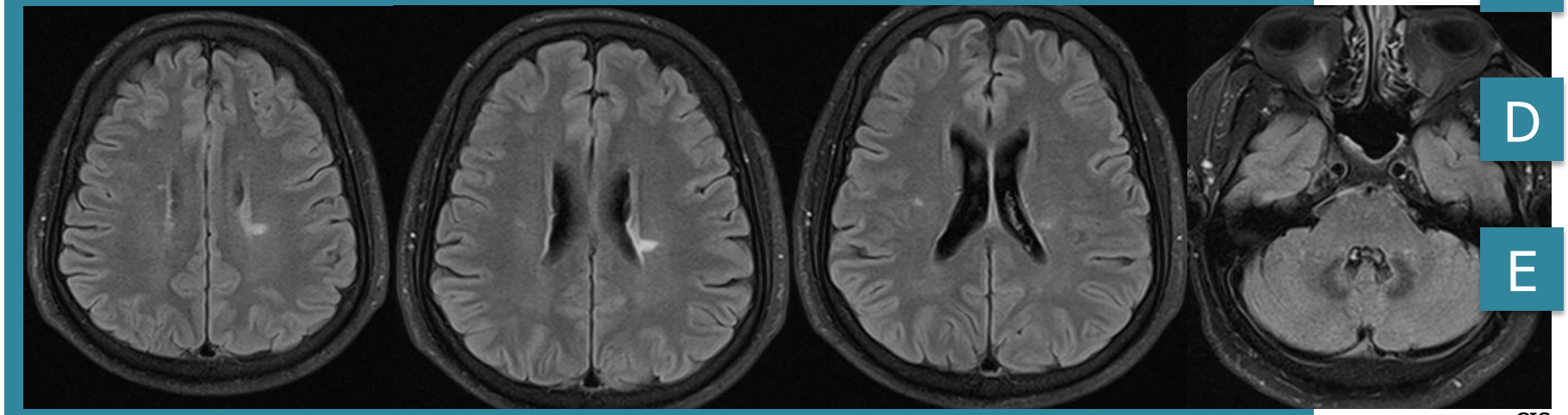

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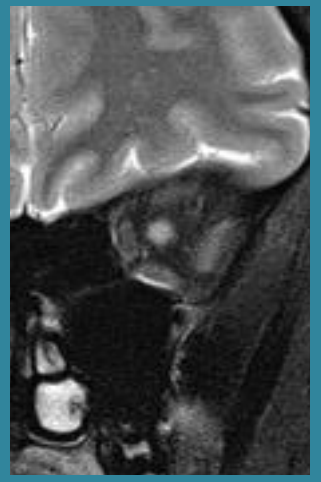

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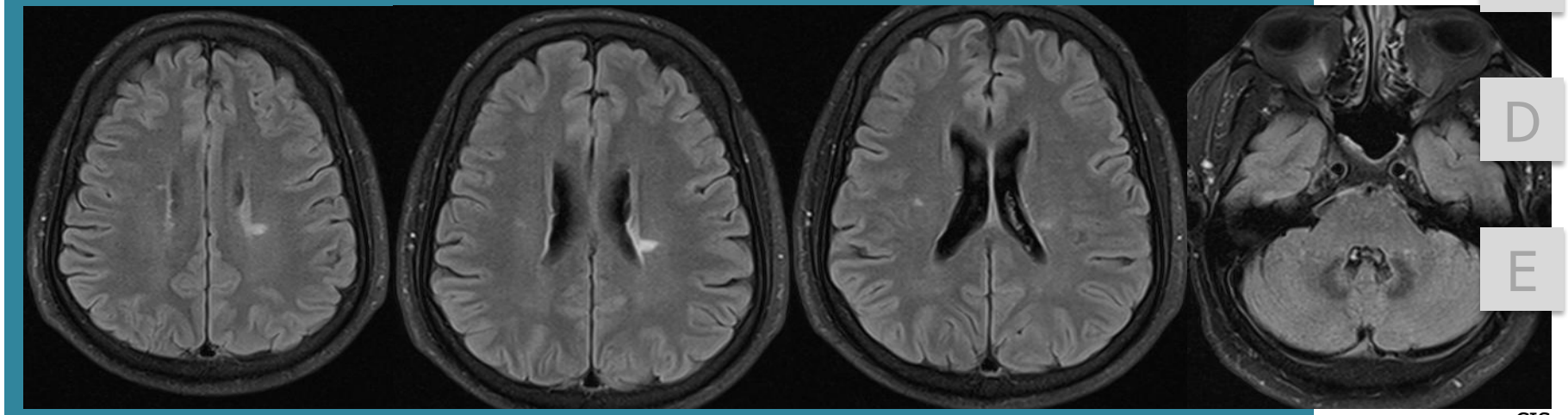

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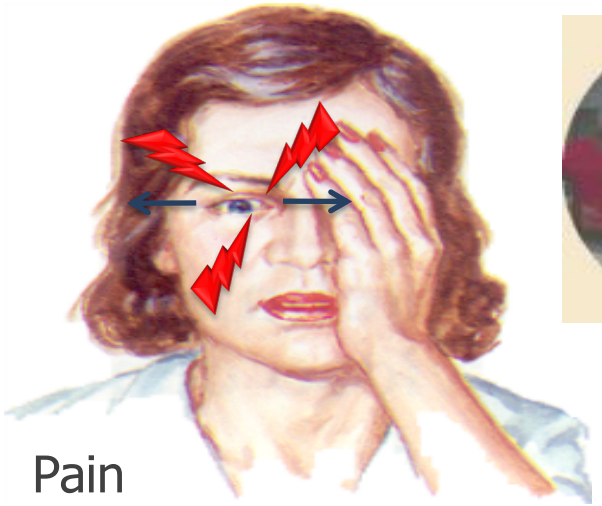
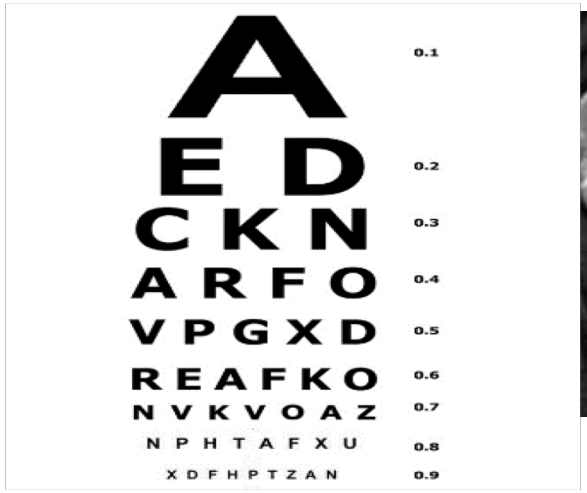
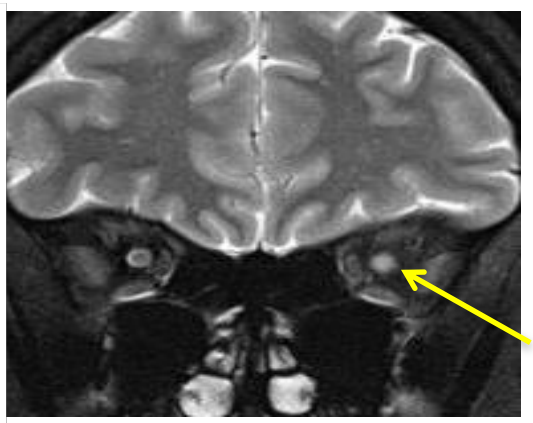
Optic nerve is a relevant topography in MS

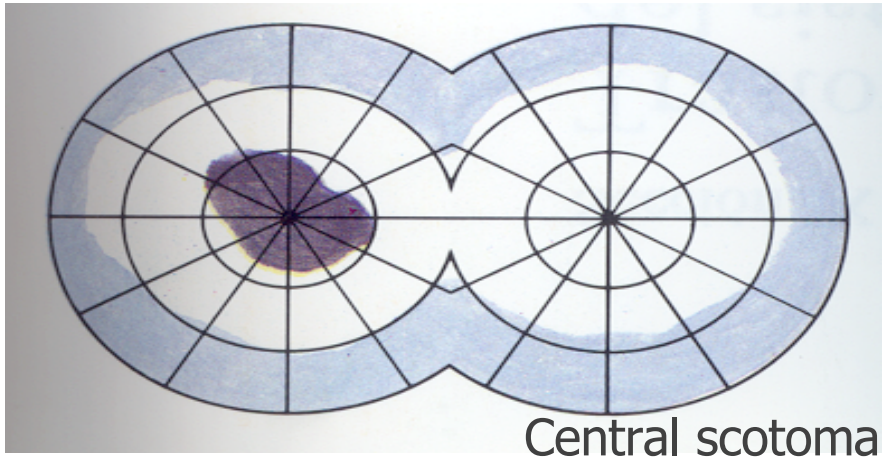


Pain

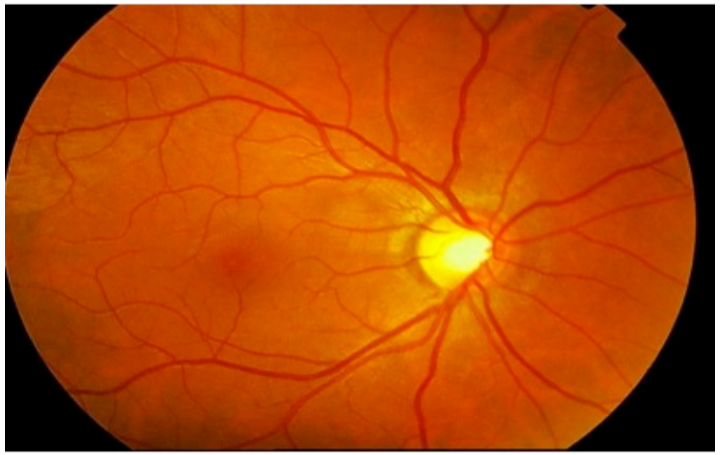
Monocular blurred vision and impaired colour vision





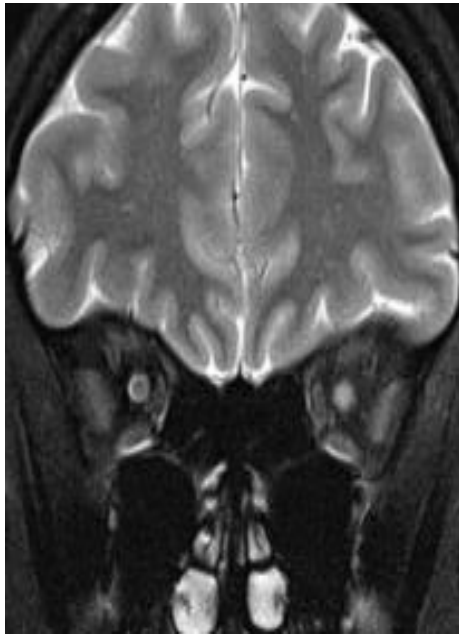


Central scotoma

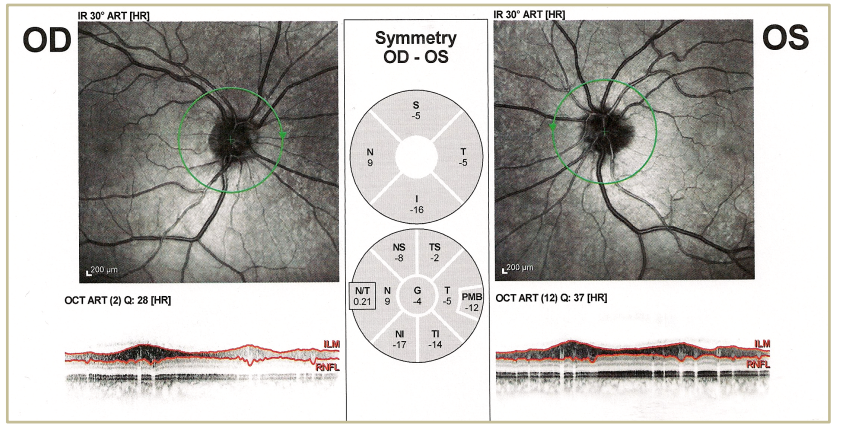


McAlpine D & Compston A. McAlpine's Multiple Sclerosis, Fourth Edition. Churchill Livingstone: Edinburgh, Scotland, 2005
Images from Netter F. Neurología Esencial. Elsevier Masson

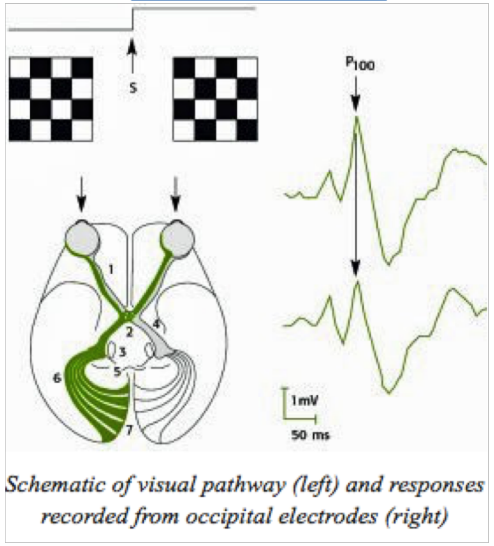
Optic nerve can be assessed



ON MRI



OCT



Schematic of visual pathway (left) and responses recorded from occipital electrodes (right)

VEP

Some of them may prove very difficult to fully implement **in clinical practice** such as the appropriate scanning of the optic nerve and thus introducing variability in their application

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Lancet Neurol 2016

The optic nerve should be included as one of the typical CNS regions for establishing dissemination in space when diagnosing MS – No

Mar Tintoré and Xavier Montalban

simply don't know. So, 'The optic nerve should be included as one of the typical CNS regions for establishing dissemination in space when diagnosing MS': not yet!!

Tintoré M & Montalban X. Mult Scler 2018;24:123-125

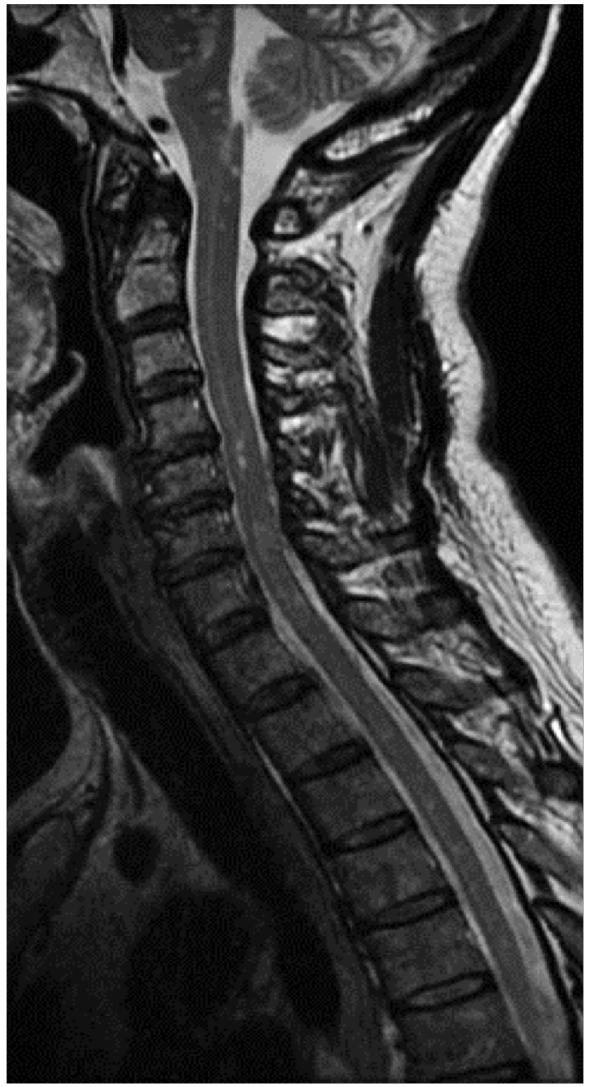
57-year-old male
No previous history of disease

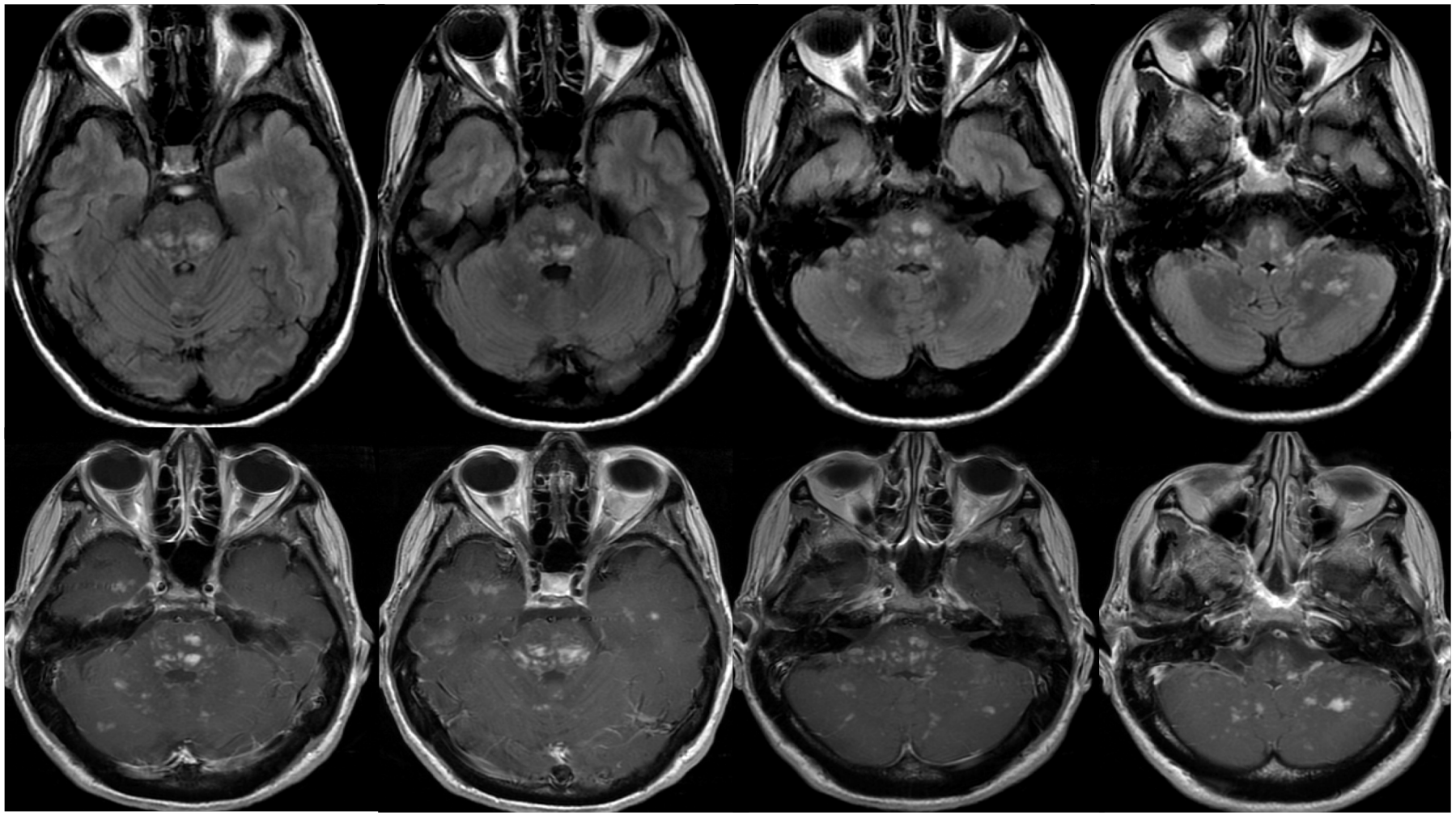
Present illness

Progressive symptoms during the last 3 weeks, characterized by diplopia, dysarthria, cognitive decline, gait ataxia, and right motor weakness.

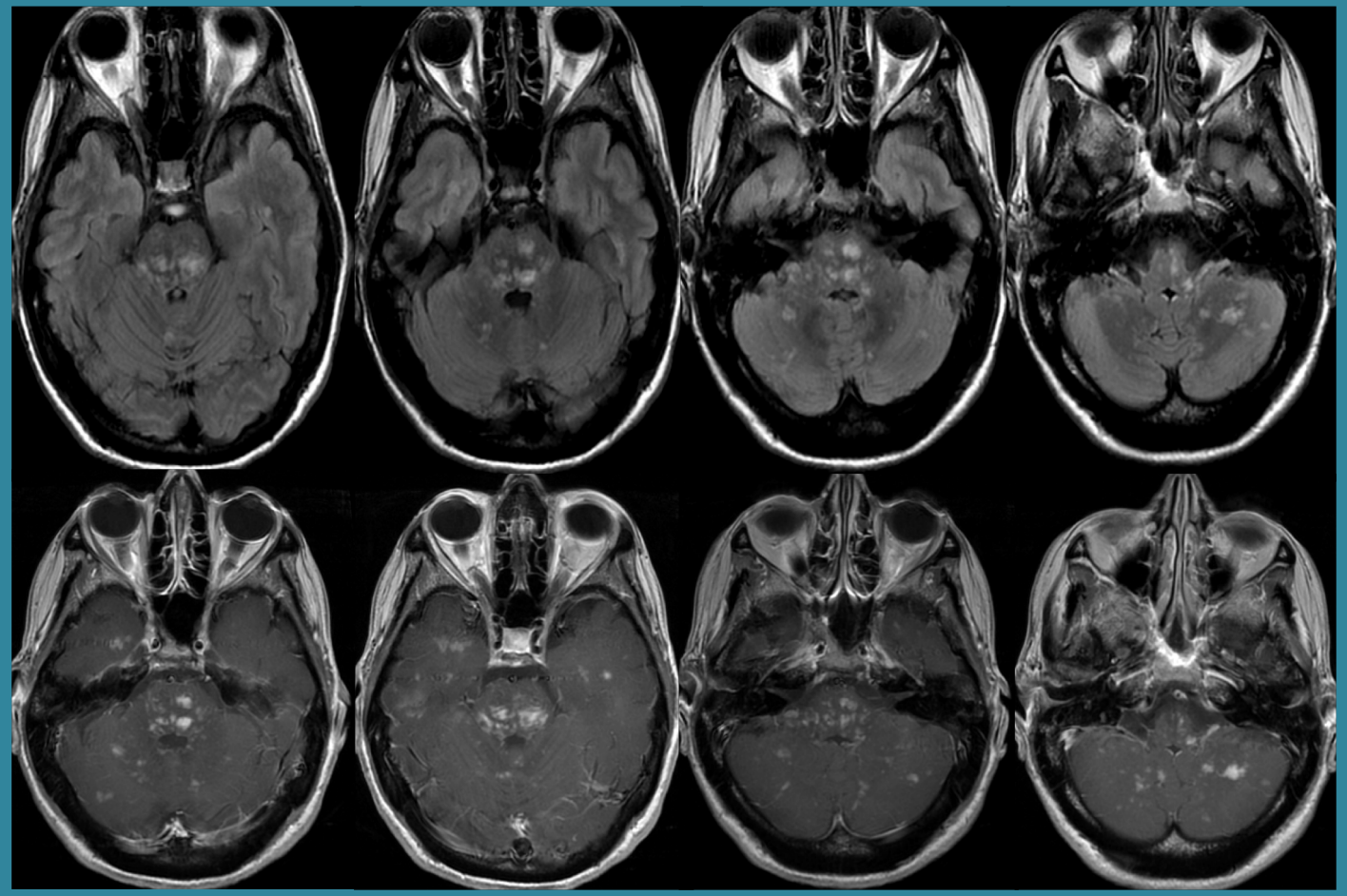
Neurological examination

Dysarthria, third and sixth cranial nerves palsies. Mild hemiparesis of right limbs. Hyperactive tendon reflexes, Babinski sign. Decrease in vibratory sensitivity. Gait ataxia.





Interactive question



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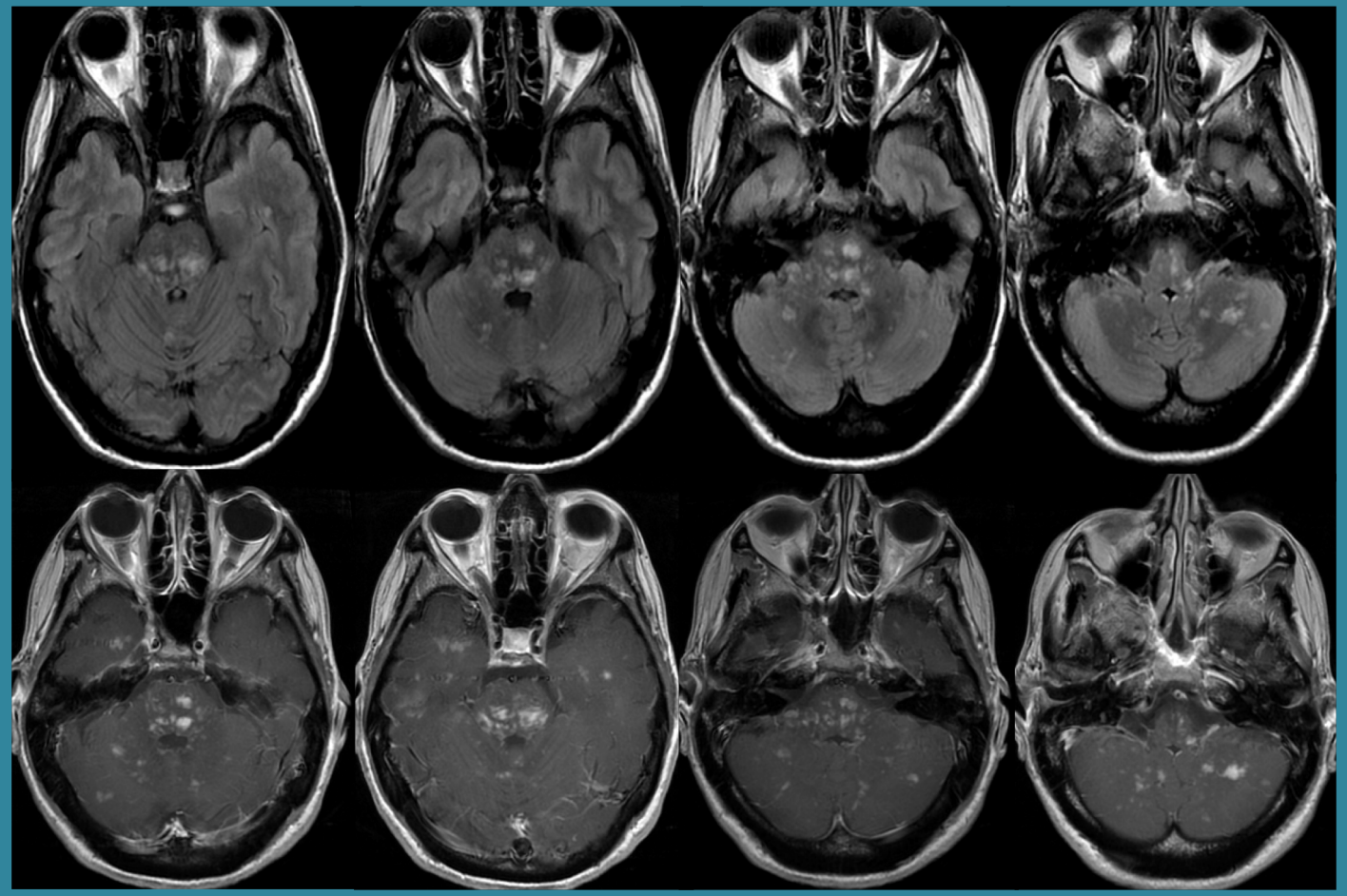

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1. **Chronic lymphocytic inflammation with pontine perivascular enhancement responsive to steroids (CLIPPERS)**
2. Behçet's disease
3. Sarcoidosis
4. Posterior Reversible Encephalopathy Syndrome (PRES)
5. Primary angiitis of central nervous system (PACNS)

Diagnostic criteria 2017

"…the Panel stressed that the McDonald Criteria should only be applied in those patients who present with a typical clinically isolated syndrome suggestive of MS or symptoms consistent with a CNS inflammatory demyelinating disease…"

"Correct interpretation of symptoms and signs is a fundamental prerequisite for diagnosis."

"…A monophasic clinical episode with patient-reported symptoms and objective findings reflecting a focal or multifocal inflammatory demyelinating event in the CNS, developing acutely or subacutely, with a duration of at least 24 h, with or without recovery, and in the absence of fever or infection"

Polman CH *et al. Ann Neurol.* 2011 Feb;69(2):292-302
Thompson AJ et al. Lancet Neurol 2017

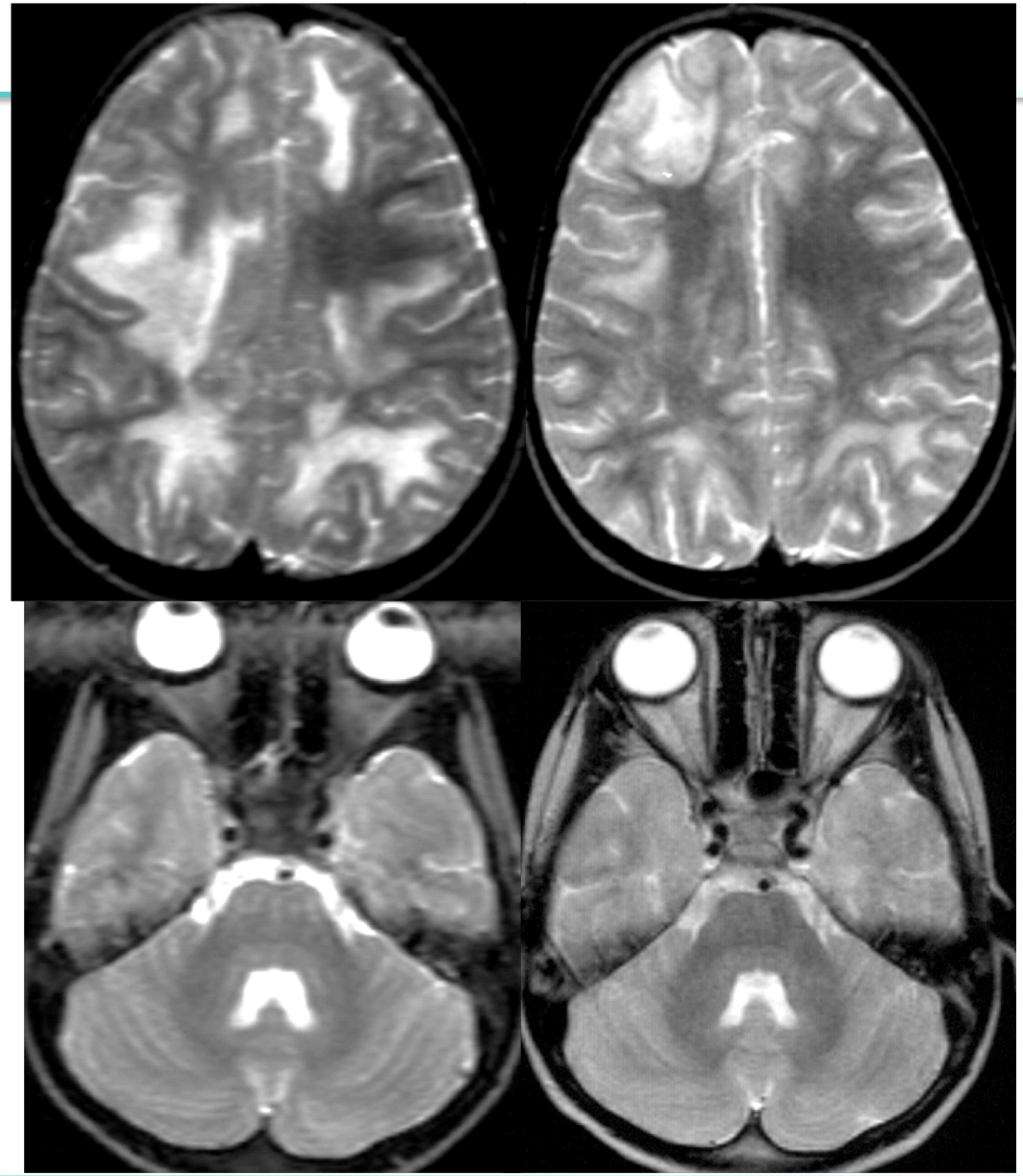
Interactive question

March 2000

A 4 years-old girl is admitted to the paediatric emergency ward:

Viral upper respiratory tract infection with fever (38ºC)

- 48h later: cephalea and irritability
  - CT: normal
- 48h later: increasing drowsiness
  - MRI scan
  - No CSF analysis was performed
- Treated with 6-IVMP: resolution of symptoms

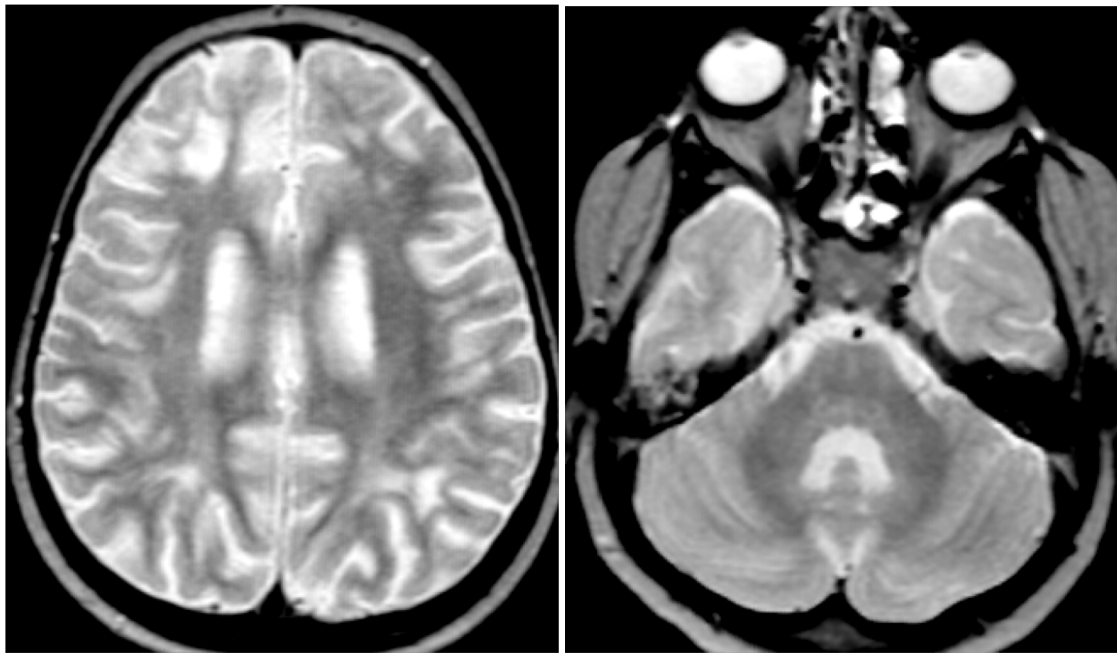


CSF, cerebrospinal fluid; JC, juxtacortical;
MRI, magnetic resonance imaging; NMO, neuromyelitis optica; PV, periventricular

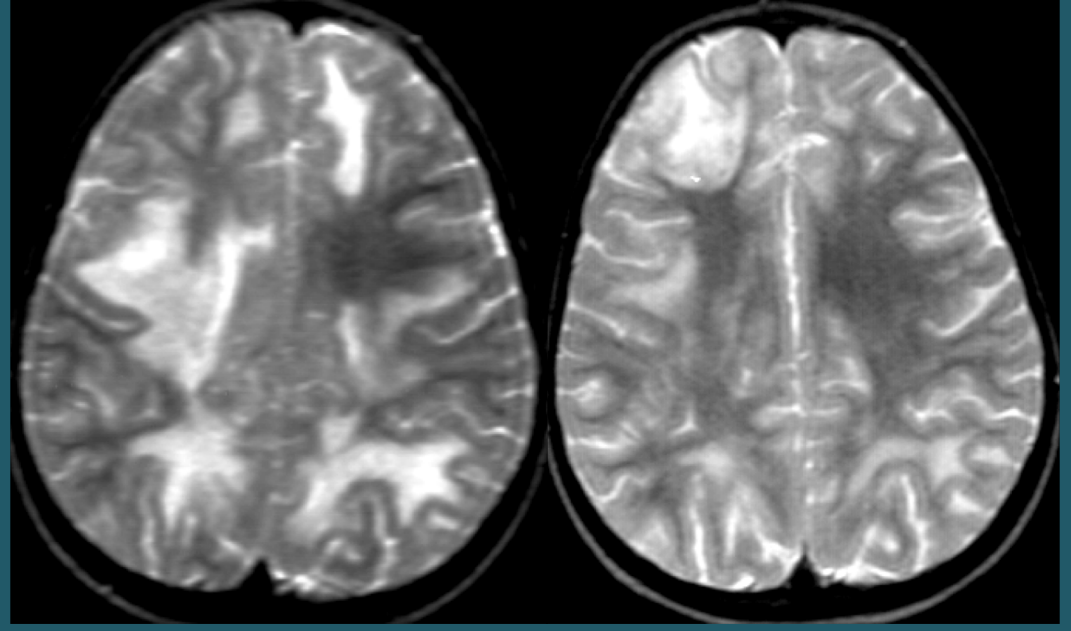
Interactive question

June 2000

- Bilateral optic neuritis
- She was treated with IV 6-MP: resolution of symptoms



13/06/00



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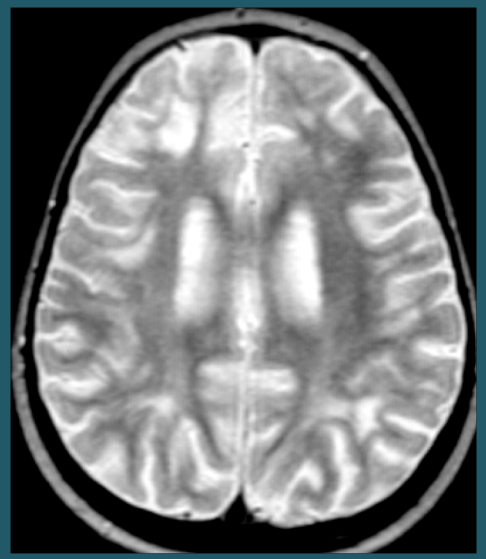


13/06/00

Which is your diagnosis?

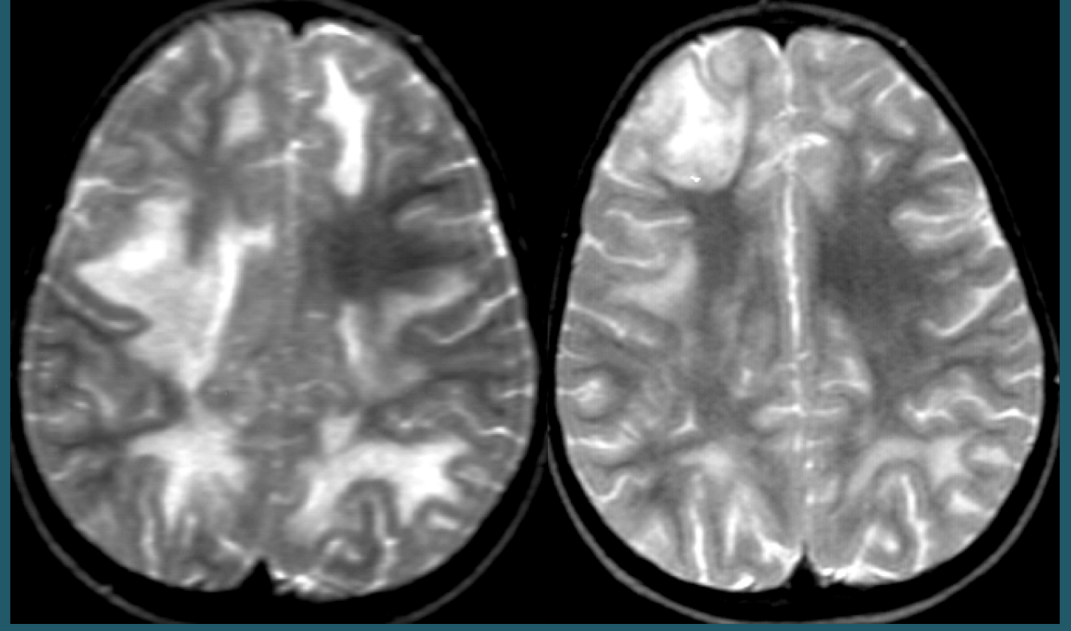
A ADEM-NO

B CIS with DIS

C MS

D NMOSD

E Other



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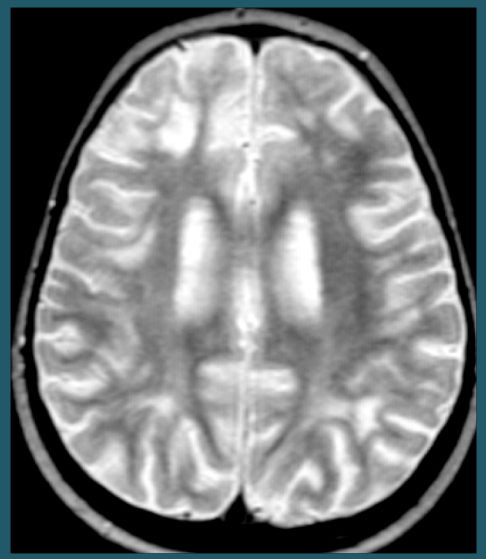

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E Other

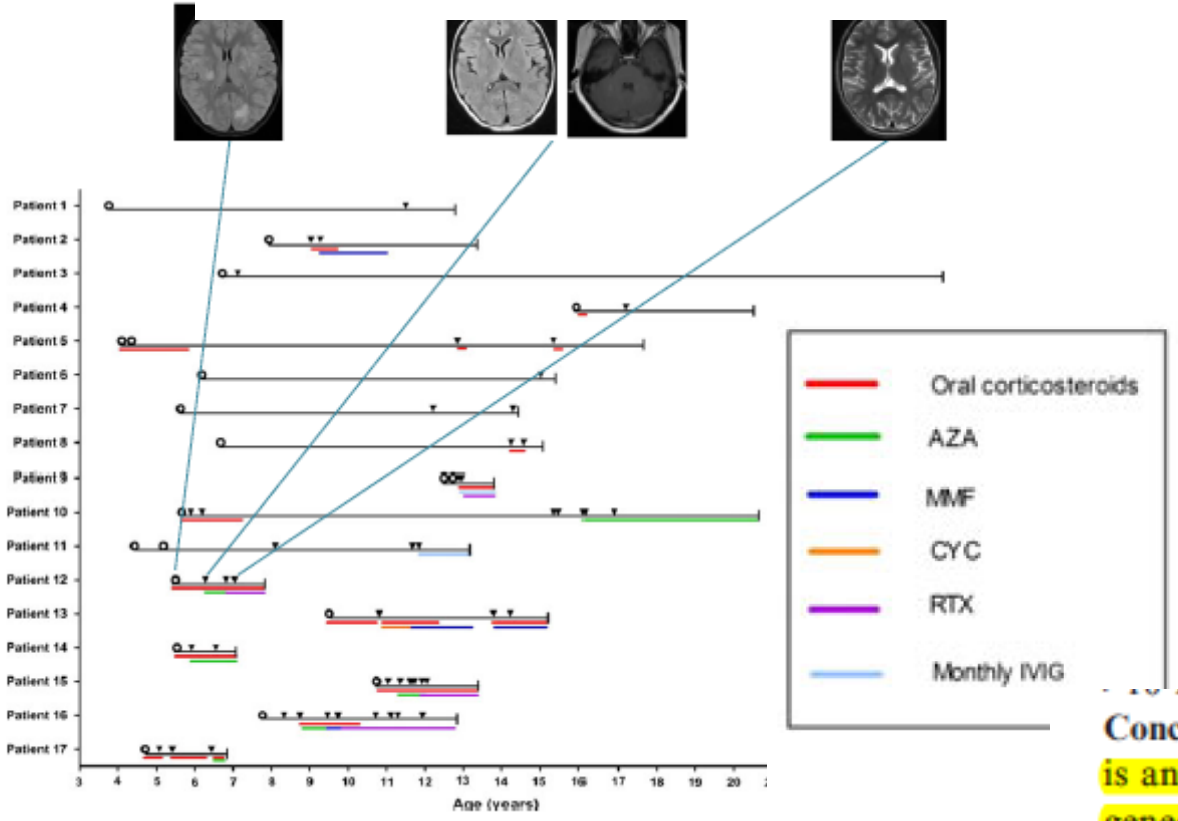
ORIGINAL ARTICLE

European Journal of Neurology 2018, 25: 782–786

EUROPEAN JOURNAL OF NEUROLOGY

Paediatric acute disseminated encephalomyelitis followed by optic neuritis: disease course, treatment response and outcome

Y. Y. M. Wong[a], Y. Hacohen[b,c], T. Armangue[d,e], E. Wassmer[f], H. Verhelst[g], C. Hemingway[c], E. D. van Pelt[a], C. E. Catsman-Berrevoets[h], R. Q. Hintzen[a], K. Deiva[i,j,*], M. J. Lim[k,l,*], K. Rostásy[m,*] and R. F. Neuteboom[h,*]

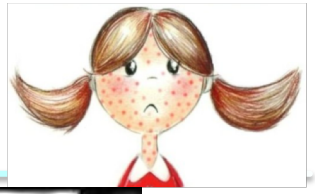


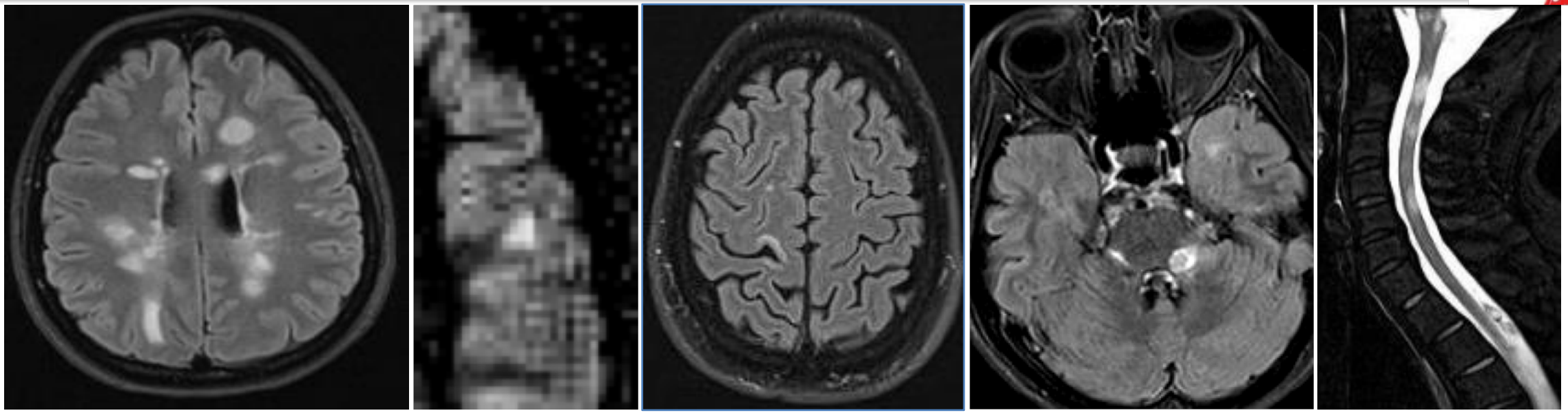
Anti MOG + 16/17

Conclusions: Acute disseminated encephalomyelitis followed by optic neuritis is an anti-MOG antibody-associated relapsing disorder that can have a heterogeneous disease course. Patients were refractory for maintenance immunosup-

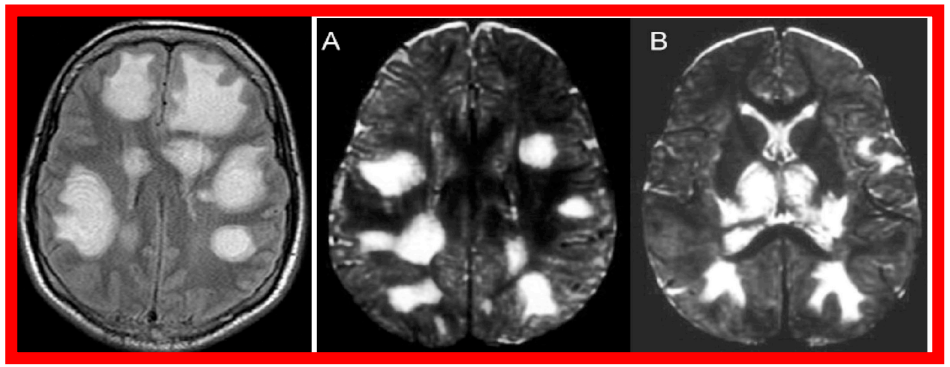
Cemcat

Diagnostic criteria: paediatric population





1 PV	Cortico / Juxta	Infratentorial	Spinal cord



ADEM

Tardieu M et al Neurology 2016; Polman CH et al Ann Neurol 2011, Thompson AJ et al. Lancet Neurol 2017

2010 McDonald Criteria for Diagnosing Pediatric Multiple Sclerosis

Yair Sadaka, MD,[1] Leonard H. Verhey, BSc,[2] Manohar M. Shroff, MD,[3]
Helen M. Branson, MBBS,[3] Douglas L. Arnold, MD,[4] Sridar Narayanan, PhD,[4]
John G. Sled, PhD,[5] Amit Bar-Or, MD,[6] A. Dessa Sadovnick, PhD,[7,8]
Melissa McGowan, MHK,[2] Ruth Ann Marrie, MD, PhD,[9] and Brenda Banwell, MD[1,2]
on behalf of the Canadian Pediatric Demyelinating Disease Network

ANN NEUROL 2012;72:211–223

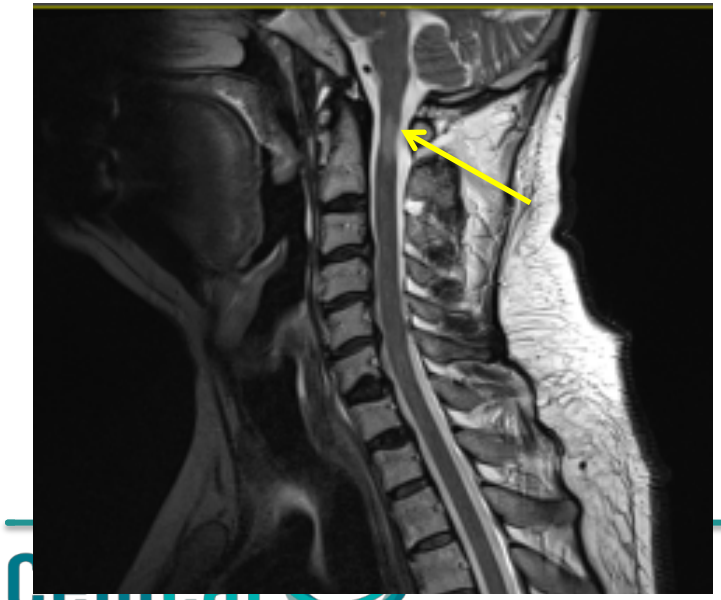
- 2010 McDonald criteria identify children with RRMS, although caution is suggested when applying these criteria in younger children.
- 2010 McDonald criteria are not suitable for application in the context of ADEM-like presentations

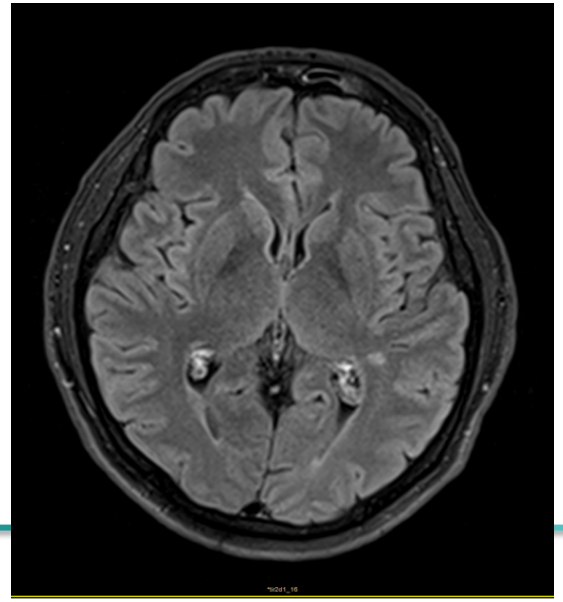
- Episode dystonic position right arm
- Hypoaesthesia right arm
- L' Hermitte sign
- Urinary urgency

2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017

Feb 11

Brain and spinal cord MRI
23.02.11





- Episode dystonic position right arm
- Hypoaesthesia right arm
- L' Hermitte sign
- Urinary urgency

May 11

- L' Hermitte sign
- Hypoesthesia first and second finger right arm

- Brain and SC MRI: no further changes
- VEP normal
- SEP: abnormal for cervical right arm
- Blood test normal
- OB negative

Cemcat

- Episode dystonic position right arm
- Hypoaesthesia right arm
- L' Hermitte sign
- Urinary urgency

- Paroxistic sensory symptoms right arm

- L' Hermitte sign
- Hypoesthesia first and second finger right arm

- Paresis of right arm

- Brain and SC MRI: no further changes
- Anti NMO and Anti MOG negative
- OB positive

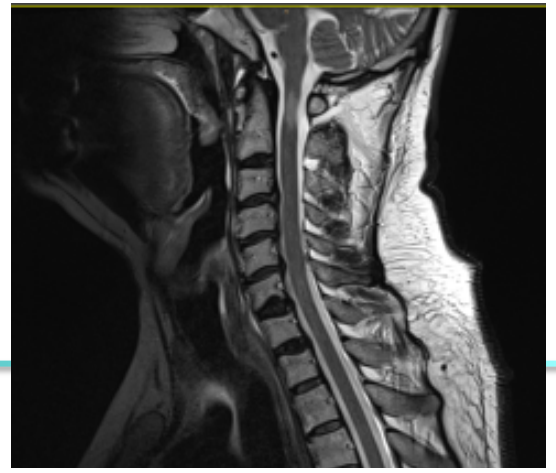
- Episode dystonic position right arm
- Hypoaesthesia right arm
- L' Hermitte sign
- Urinary urgency

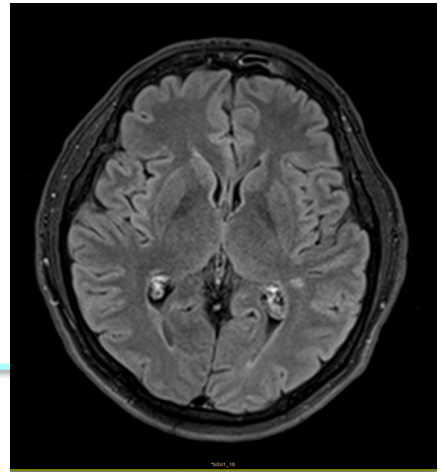
- Paroxistic sensory symptoms right arm

2011 2012 2013 2014 2015 2016 2017 **Feb 17**

- L' Hermitte sign
- Hypoesthesia first and second finger right arm

- Paresis of right arm
- Hemiparesis right limbs
- EDSS 4.0





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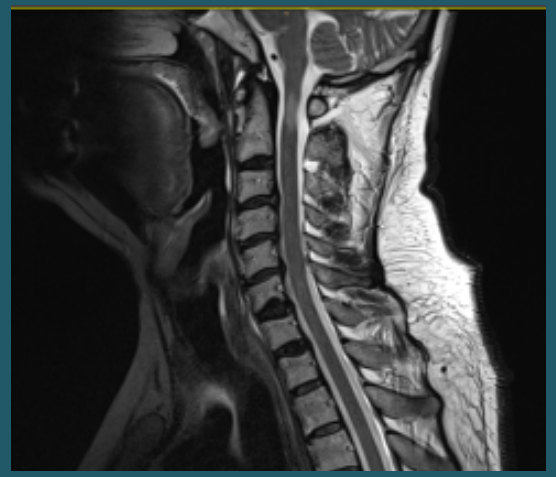
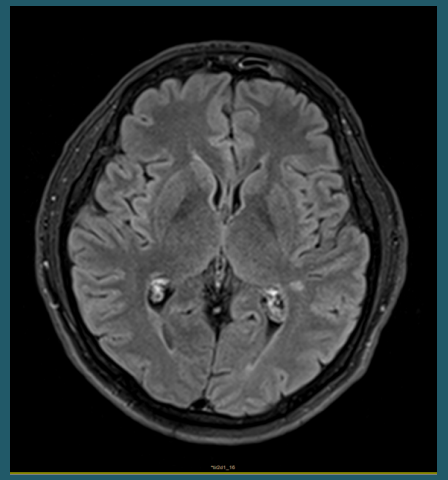




Which is your diagnosis?

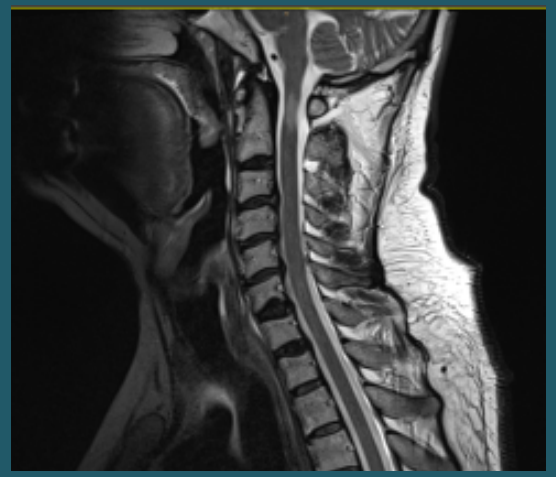
A PPMS

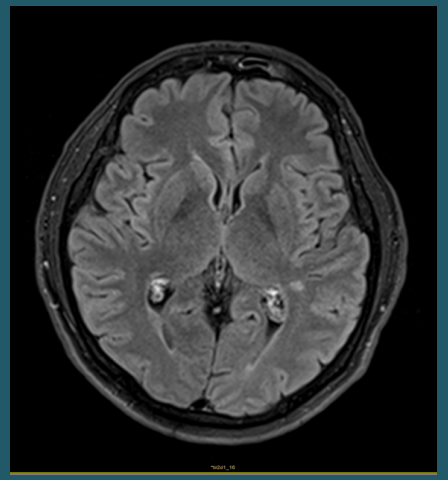
B NMOSD

C Solitary Sclerosis

D Inflammatory myelitis

E Other





Which is your diagnosis?

A PPMS

B NMOSD

C Solitary Sclerosis

D Inflammatory myelitis

E Other

Solitary lesion

Solitary sclerosis

Progressive myelopathy from solitary demyelinating lesion

William F. Schmalstieg, MD
B. Mark Keegan, MD
Brian G. Weinshenker, MD

Correspondence & reprint requests to Dr. Weinshenker: weinb@mayo.edu

ABSTRACT

Objective: To present a case series of patients with progressive myelopathy in the setting of a solitary demyelinating lesion.

Methods: We describe 7 patients evaluated over a 6-year period. All had progressive motor impairment attributable to an MRI lesion compatible with a demyelinating plaque in the brainstem or upper cervical spinal cord. At the time of evaluation, none met the International Panel imaging criteria for dissemination in space, and none described clinical symptoms consistent with relapses affecting other portions of the CNS.

Results: Lesions identified were in the ventral cervicomedullary junction in 4 patients, the ventral spinal cord in 2 patients, and the pons in 1 patient. Median age at onset was 43 years (range 33–51 years). Median follow-up interval was 3 years (range 2–27 years). Six patients reached an Expanded Disability Status Scale (EDSS) score of 6.0 or worse. Median time to EDSS score of 6.0 was 7.5 years (range 1.5–26 years). Four had CSF findings characteristic of multiple sclerosis (MS). None had CSF, imaging, or serologic evidence of an alternative etiology of progressive myelopathy. In 3 patients, serial MRI scans of the brain and spinal cord demonstrated no accumulation of lesions. Postmortem examination of a fourth patient demonstrated an isolated pontine demyelinating lesion.

Conclusions: Solitary demyelinating lesions may produce a progressive myelopathy similar to primary progressive MS. Demyelinating disease should be in the differential diagnosis of progressive myelopathy despite absence of dissemination in space. *Neurology*® 2012;78:540–544

Table Clinical, laboratory, and neuroimaging features of 30 patients with progressive solitary sclerosis

	No. (%) patients or median (range)
Demographics	
Age at onset, y	48.5 (23–71)
Female sex	15 (50)
Caucasian ethnicity*	24 of 26 (92)
Family history of MS in first-degree relative	4 (13)
Clinical syndrome	
Spastic (face-sparing) hemiparesis	16 (53)
Spastic monoparesis	8 (27)
Spastic quadriparesis	5 (17)
Spastic paraparesis	1 (3)
Follow-up and disability	
Time from symptom onset to last follow-up, mo	100 (15–343)
EDSS at last follow-up	6 (2–10)
CSF findings	
Elevated IgG index (>0.85) or oligoclonal bands (≥4)	13 of 26 (50)
Elevated leukocyte count (>5/μL)	2 of 24 (8); 9 (7–11)
Elevated protein (>45 mg/dL)	10 of 21 (48); 72 (54–108)
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Cervical spinal cord	18 (60)
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Subcortical white matter	2 (7)

* The remaining 2 patients were African American and of Asian descent; ethnicity of 6 patients was not documented

30 cases

Keegan BM et al. Neurology 2016;87:1713-1719

Learning objectives

- Describe the new diagnostic criteria for MS
- Application in clinical practice
- Consider the next steps

Application on the 2017 McDonald criteria in clinical practice

McDonald criteria

n=566	Criteria fulfillment n (%)
DIS and DIT 2010	**159 (28.1)**
DIS and DIT 2017	**168 (29.7)**
DIS and +OB 2017	**263 (46.5)**
Complete 2017 McDonald criteria	**291 (51.4)**

The 2017 revisions to the McDonald criteria increase the proportion of patients diagnosed with MS by 23 % at the time of the CIS.

Cemcat

Abbreviations: DIS: dissemination in space; DIT: dissemination in time.

Arrambide G, Tintore M, Espejo C et al 34th ECTRIMS Berlin 2018

Applying the 2017 McDonald diagnostic criteria for multiple sclerosis

www.thelancet.com/neurology Vol 17 June 2018

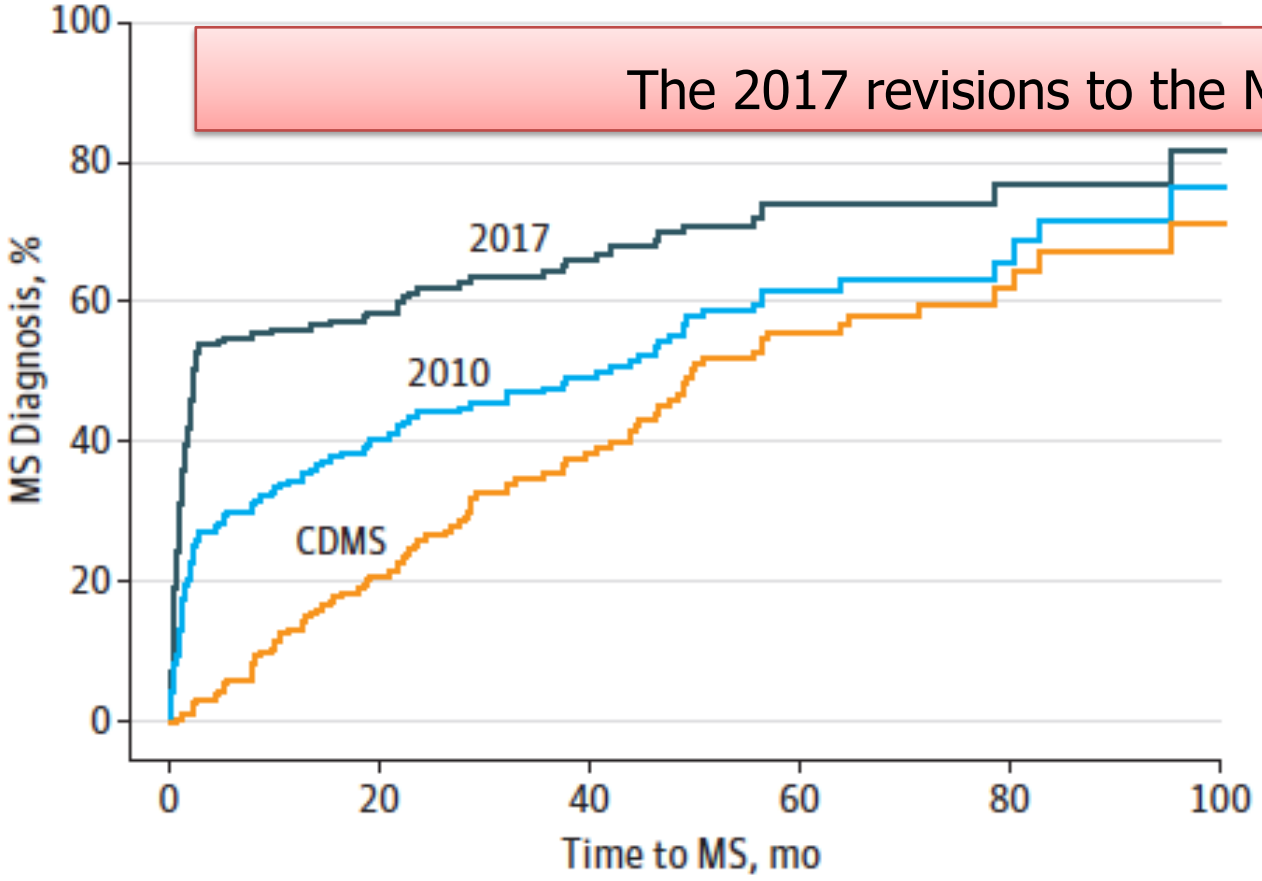
*Philipp Schwenkenbecher, Ulrich Wurster, Kurt-Wolfram Sühs, Martin Stangel, *Thomas Skripuletz*
Skripuletz.Thomas@MH-Hannover.de

- 325 patients with a CIS:
  - 2005 McDonald criteria: 22%
  - 2010 McDonald criteria: 42%
  - 2017 McDonald criteria: 66%
    - Symptomatic lesion: 20%
    - OB+: 97%

The 2017 revisions to the McDonald criteria increase the proportion of patients diagnosed with MS by **24%** at the time of the CIS.

Application of the 2017 Revised McDonald Criteria for Multiple Sclerosis to Patients With a Typical Clinically Isolated Syndrome

Figure. Time From Clinically Isolated Syndrome (CIS) to Clinically Definite Multiple Sclerosis (CDMS) Using McDonald 2010 and 2017 Criteria



The 2017 revisions to the McDonald criteria: EARLIER Dx

JAMA Neurol. doi:10.1001/jamaneurol.2018.2160
Published online August 6, 2018.

MULTIPLE SCLEROSIS JOURNAL | MSJ

Nuala McNicholas, Andrew Lockhart, Siew M Yap, Karen O'Connell, Niall Tubridy, Michael Hutchinson and Christopher McGuigan

accepted: 12 March 2018

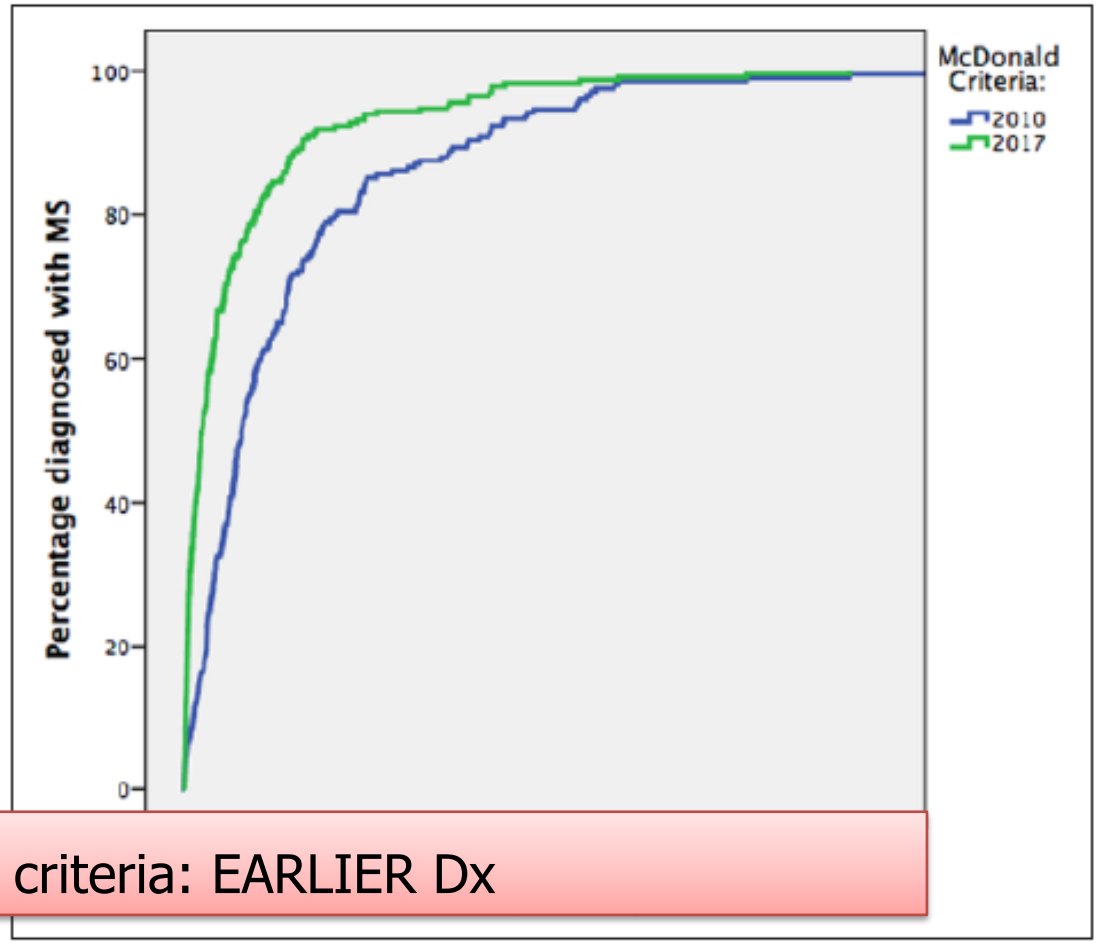
DOI: 10.1177/1352458518770088

New versus old: Implications of evolving diagnostic criteria for relapsing–remitting multiple sclerosis

250 RRMS patients: Retrospective analysis

- 2010 McDonald criteria: median time to dx: 7.4 months

- 2017 McDonald criteria: median time to dx: 2.3 months



The 2017 revisions to the McDonald criteria: EARLIER Dx

Cemcat

Application of the 2017 Revised McDonald Criteria for Multiple Sclerosis to Patients With a Typical Clinically Isolated Syndrome

JAMA Neurol. doi:10.1001/jamaneurol.2018.2160
Published online August 6, 2018.

Table 2. Test Characteristics for the 2010 and 2017 McDonald Criteria

Characteristic	DIS (n = 229)	DIT (n = 180)	DIS+DIT (n = 180)
2010			
Sensitivity (95% CI)	66 (56-74)	36 (27-47)	36 (27-47)
Specificity (95% CI)	57 (47-66)	85 (76-92)	85 (76-92)
Accuracy (95% CI)	52 (45-58)	61 (54-68)	61 (54-68)
Hazard ratio (95% CI)	2.0 (1.3-2.9)	1.9 (1.2-2.9)	1.9 (1.2-2.9)
2017			
Sensitivity (95% CI)	79 (70-86)	84 (74-90)	68 (57-77)
Specificity (95% CI)	48 (39-58)	44 (34-55)	61 (50-71)
Accuracy (95% CI)	44 (38-51)	64 (57-71)	64 (57-71)

The 2017 revisions to the McDonald criteria: higher sensitivity and accuracy but lower specificity

MULTIPLE SCLEROSIS JOURNAL | MSJ

Application of the 2017 McDonald diagnostic criteria for multiple sclerosis in Korean patients with clinically isolated syndrome

HJ Kim

accepted: 5 June 2018

163 with CIS from seven Korean hospitals: Retrospective analysis, follow up 63 months

Table 4. The validity of the 2017 McDonald criteria for multiple sclerosis in patients with a full data set (brain and spinal cord MRI with CSF-OCB results).

	TP (*n*)	FP (*n*)	FN (*n*)	TN (*n*)	Sensitivity	Specificity	PPV	NPV	Accuracy
2017 McDonald criteria (*n*=66)									
DIS+DIT	40	16	2	8	95.2 (83.8–99.4)	33.3 (15.6–55.3)	71.4 (65.1–77.0)	80.0 (48.1–94.5)	72.7 (60.4–83.0)
2017 McDonald criteria after excluding patients treated with DMT (*n*=27)									
DIS+DIT	23	1	2	1	92.0 (74.0–99.0)	50.0 (1.3–98.7)	95.8 (85.1–98.9)	33.3 (6.8–77.3)	88.9 (70.8–97.7)

TP: true positive; FP: false positive; FN: false negative; TN: true negative; PPV: positive predictive value; NPV: negative predictive value; DIS: dissemination in space; DIT: dissemination in time; DMT: disease-modifying treatment.
Values given within parentheses represent 95% confidential intervals.

The 2017 revisions to the McDonald criteria: higher sensitivity and accuracy but lower specificity

In Korean CIS

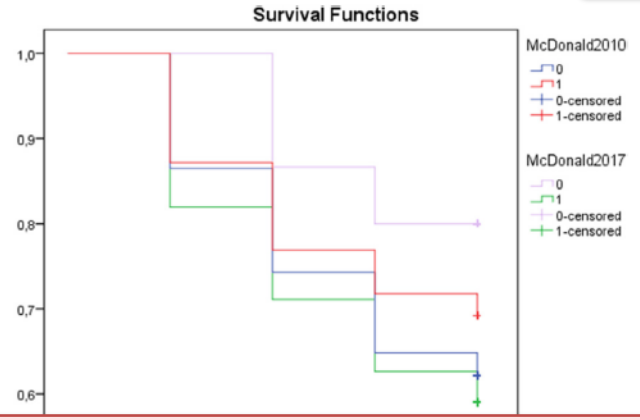
Establishing the diagnosis of multiple sclerosis in Croatian patients with clinically isolated syndrome: 2010 versus 2017 McDonald criteria

Multiple Sclerosis and Related Disorders 25 (2018) 99–103

Table 3
Sensitivity, specificity, predictive value and accuracy of the 2010 and 2017 revisions to the McDonald criteria.

Conversion to MS

	TP	FP	TN	FN	Sensitivity (95% CI)	Specificity (95% CI)	PPV (95% CI)	NPV (95% CI)	Accuracy (95% CI)
2010	35	4	23	51	0.41 (0.30–0.52)	0.85 (0.66–0.96)	0.90 (0.77–0.96)	0.31 (0.26–0.36)	0.51 (0.42–0.61)
2017	73	10	17	13	0.85 (0.76–0.92)	0.63 (0.42–0.81)	0.88 (0.82–0.92)	0.57 (0.42–0.70)	0.80 (0.71–0.87)



The 2017 revisions to the McDonald criteria: higher sensitivity and accuracy but lower specificity

In Croatian patients

Learning objectives

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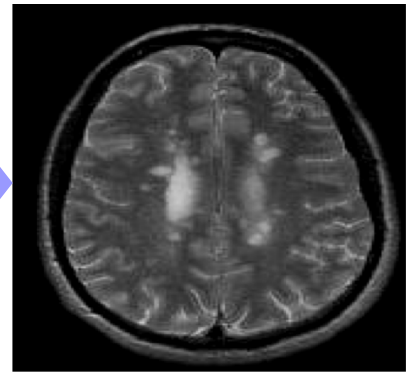
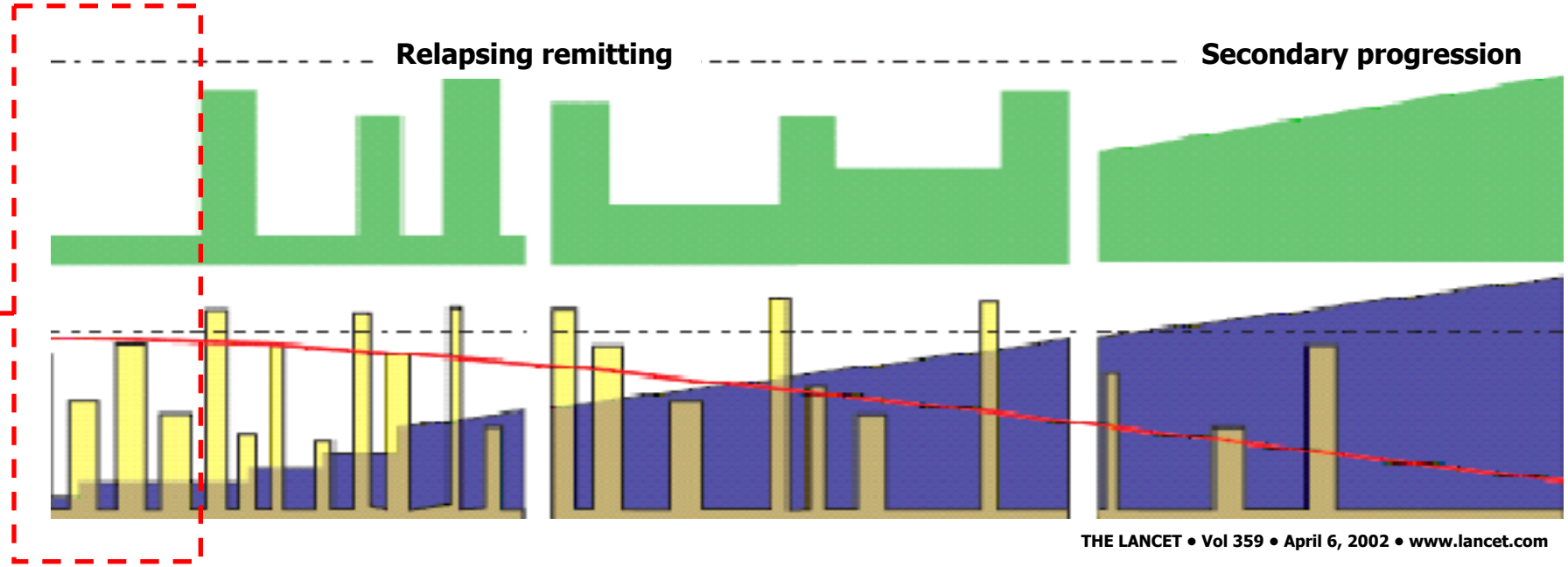
Diagnostic criteria: 2017

Radiologically isolated syndrome



RIS can be defined as the presence of asymptomatic lesions typical of MS

Preclinical phase



RIS, radiologically isolated syndrome

Adapted from Compston A & Coles A. Lancet 2002;359:1221-1231; Okuda DT et al. Neurology 2009;72:800-805

The optic nerve should be included as one of the typical CNS regions for establishing dissemination in space when diagnosing MS –

Yes

Mar Tintoré and Xavier Montalban

simply don't know. So, 'The optic nerve should be included as one of the typical CNS regions for establishing dissemination in space when diagnosing MS': not yet!!

Tintoré M & Montalban X. Mult Scler 2018;24:123-125

Solitary lesion

Solitary sclerosis

Progressive myelopathy from solitary demyelinating lesion

William F. Schmalstieg, MD
B. Mark Keegan, MD
Brian G. Weinshenker, MD

Correspondence & reprint requests to Dr. Weinshenker: weinb@mayo.edu

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30 cases

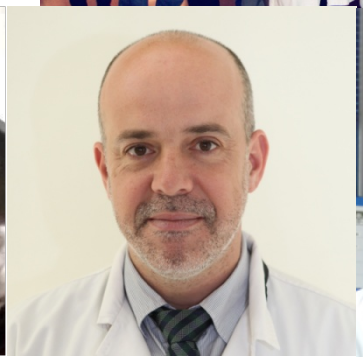
Keegan BM et al. Neurology 2016;87:1713-1719

Take-home messages

Diagnosing multiple sclerosis: art and science

- For establishing DIS and DIT, symptomatic lesions should be accounted for
- In patients not fulfilling DIS plus DIT, DIS plus +OB establishes the diagnosis of MS
- In PPMS, symptomatic lesions should be accounted for

Bove RM & Hauser SL. Lancet Neurol 2018;17:109-111



Cemcat

Vall d'Hebron Barcelona Hospital Campus

UAB Universitat Autònoma de Barcelona

FEM Fundació Esclerosi Múltiple

IDI INSTITUT DE DIAGNÒSTIC PER LA IMATGE