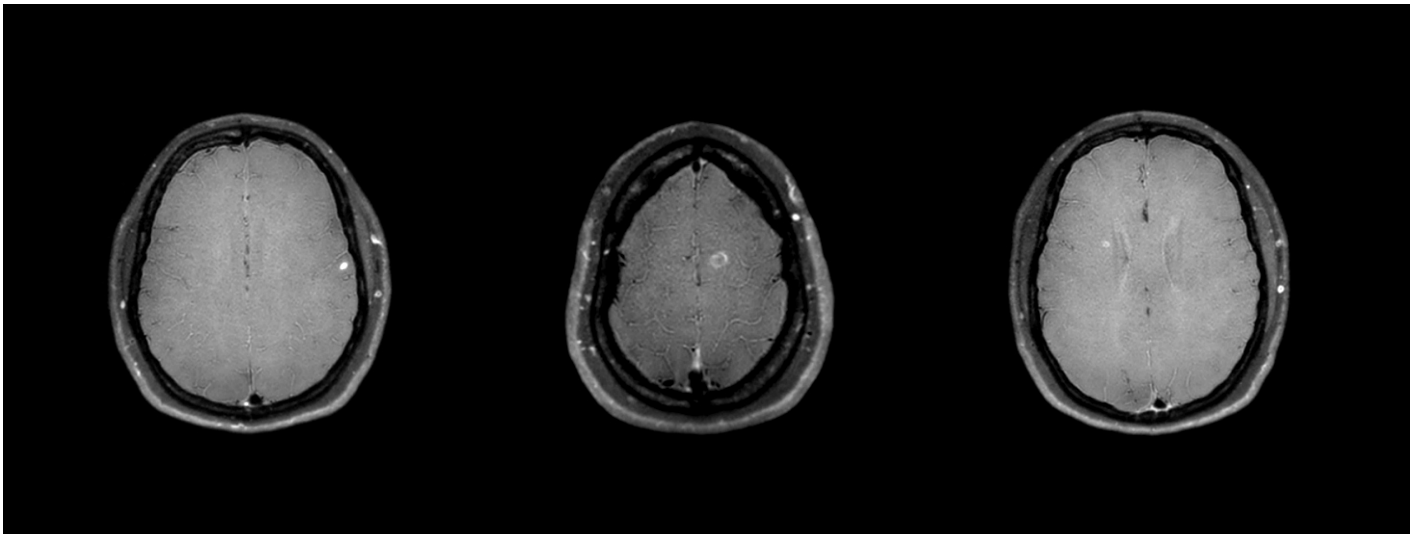
GE HealthCare

CASE STUDY

# MRI of the central nervous system (CNS)



Images and content are courtesy of:
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CASE STUDY

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## Medical history of the patient

Patient in her late 20s presented to the ophthalmology department with right-side blurry vision and pain associated with eye movement starting 5 days previously. Additionally, right peri-orbital pain was noticed by the patient 2 days after the first symptoms occurred. No specific risk factors associated with smoking or substance abuse; no previous drug treatment or history of pain.

### Preliminary diagnostics

The initial ophthalmological examination showed papilloedema and a partial central scotoma of the right eye. The patient's visual acuity on the right eye was 0.40, respectively 1.0 on the left eye.
The neurological examination showed no further abnormalities.
A non contrast-enhanced computed tomography of the brain did not show signs of an acute ischaemic stroke, intracranial haemorrhage, an intraorbital or intracranial mass. A lumbar puncture was performed to collect cerebrospinal fluid. The results of this laboratory test were still pending at the time of the MRI examination. The patient was placed on intravenous methylprednisolone in the emergency room.

### Indication for MRI

The indication for magnetic resonance imaging was to exclude or confirm the presence of intracranial hypertension or changes consistent with a chronic inflammatory demyelinating disease of the central nervous system. The requested examination was the patient's first MRI examination.

### Scan protocol includes

**MRI: 3T**

1. Coronal T2 SPIR
2. Axial contrast-enhanced (CE) 3D T1 GE
3. Axial CE 3D T1 GE black blood
4. Coronal CE 3D T1 GE black blood
5. Axial T2w FLAIR

### Injection protocol

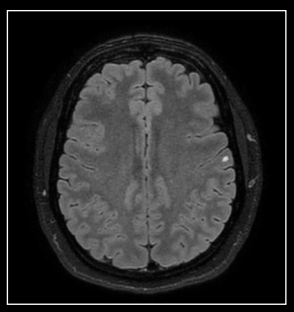
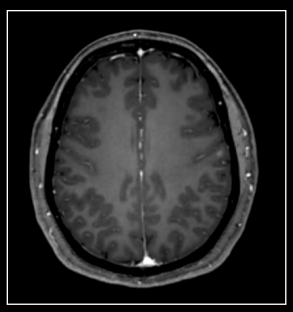
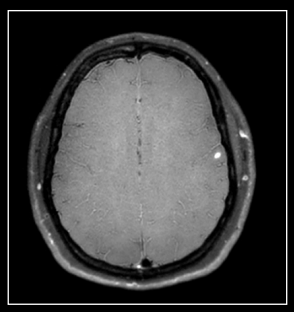
Patient weight 145 kg

| GBCA injection | |
|---|---|
| Gadobutrol 0.1 mmol/kg | 14.5 mL |
| 0.9 % NaCl | 10mL |
| Administration mode | Manual |

*Please refer to the full Summary of Product Characteristics (SmPC) before prescribing.*

# Findings of the MRI examination

On the MRI images, presence of 3 specific FLAIR/T2w hyperintense lesions with individual contrast enhancement, and of a right-sided optic neuritis. An additional T2 hyperintense, non contrast-enhancing lesion in the occipital periventricular white matter can be seen on the axial FLAIR sequence.

| Axial T2w FLAIR | Conventional axial CE 3D T1w | Black blood axial CE 3D T1w |
|---|---|---|
|  |  |  |

**Axial T2w FLAIR, conventional CE 3D T1w, CE 3D T1w black blood sequences:**
Showing a subcortical hyperintense (on the T2w FLAIR sequence), contrast-enhancing white matter lesion located in the left inferior fronto-temporal gyrus.
Please note that the contrast enhancement in the 3D T1w black blood sequence is much clearer than in the conventional 3D T1w sequence.

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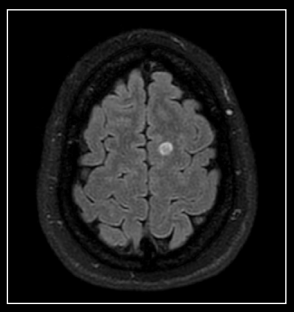
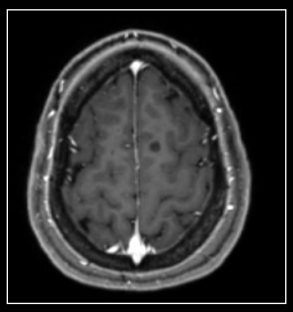
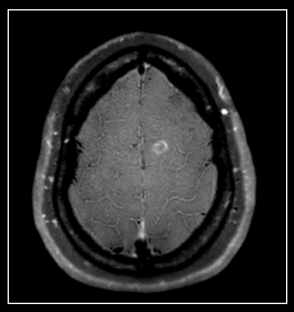
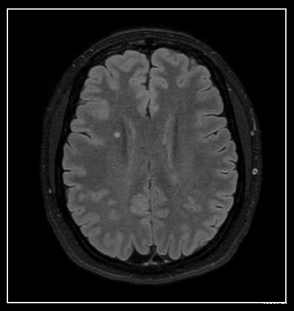
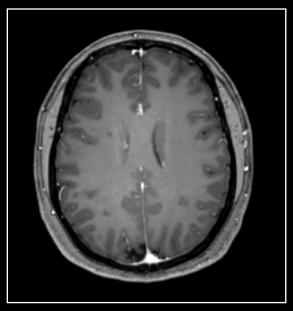
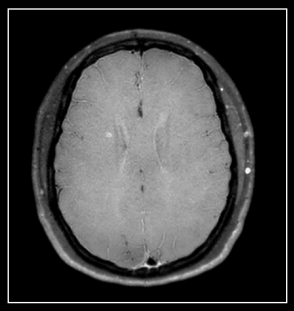
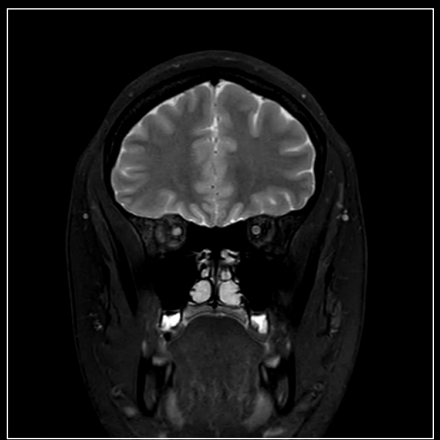
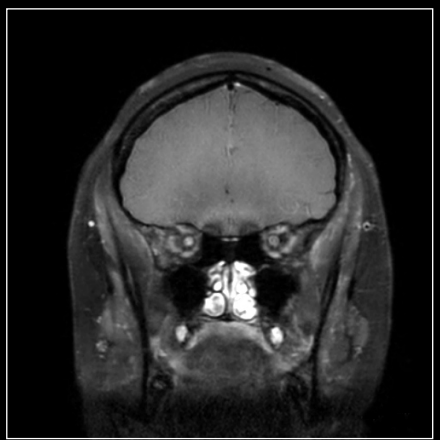
|  |  |  |

**Axial T2w FLAIR, conventional CE 3D T1w, CE 3D T1w black blood sequences:**
Showing a hyperintense (on the T2w FLAIR sequence), incomplete ring contrast-enhancing white matter lesion located in the left superior fronto-temporal gyrus.
Please note that the contrast enhancement in the conventional 3D T1w sequence is not visible, but very well visible in the 3D T1w black blood sequence.

| | | |
|---|---|---|
|  |  |  |

**Axial T2w FLAR, conventional CE 3D T1w, CE 3D T1w black blood sequences:**
Showing a hyperintense (on the T2w FLAIR sequence), incomplete ring contrast-enhancing lesion located in the right frontal periventricular white matter
Please note that the contrast enhancement in the conventional 3D T1 weighted sequence is not visible, but subtle enhancement can be seen in the 3D T1w black blood sequence.

| Coronal T2w SPIR | Coronal black blood CE 3D T1w |
|---|---|
|  |  |

**Coronal T2w SPIR sequence**
shows a focal T2w hyperintensity and mild enlargement of the right optic nerve.
Coronal, contrast-enhanced 3D T1w black blood sequence shows a diffuse enhancement of the right optic nerve corresponding to the T2w hyperintensity.

## Diagnosis and therapy or follow-up:

The lesions and changes to the optic nerve are possible characteristics of multiple sclerosis (MS) on MR imaging. The MR criteria for spatial and temporal dissemination are met. A MRI of the spine did not show any additional lesion characteristic of MS. The day after the MRI examination, i.e. the second day after hospital admission, the results of the CSF test were already showing the presence of IgG and IgM oligoclonal bands as a laboratory indicator of CNS inflammation consistent with MS. Meanwhile on the same day, the patient reported that she no longer had pain when she moved her eyes. Other clinical symptoms, which would have been consistent with the intracranial MS-typical lesions, were not found in a renewed neurological examination.

A repeated ophthalmological examination on day 4 after hospital admission showed a significant improvement in visual acuity to 0.8 of the right eye with the same good vision of the left eye (VA 1.0) and the papilloedema had almost completely resolved.

The treatment with i.v. methylprednisolone was switched to oral glucocorticoids during the hospital stay. The patient was subsequently discharged home. Regular clinical and imaging follow-ups in an outpatient clinic for chronic inflammatory CNS diseases are scheduled.

**Abbreviations:**
CE: contrast-enhanced
CNS: central nervous system
CSF: cerebrospinal fluid
FLAIR: FLuid-Attenuated Inversion Recovery
GE: gradient echo
IgG: immunoglobulin G
IgM: immunoglobulin M
i.v.: intravenous
MR: magnetic resonance
MRA: MR angiography
MRI: magnetic resonance imaging
SPIR: Spectral Presaturation with Inversion Recovery

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