

Clinical neuroradiological exams using 7T Terra.X MRI

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BACKGROUND & AIMS

Since a year ago, the Neuroradiology division of HUG has been using the **7T Terra.X MRI scanner** (Siemens Healthineers) with a 8Tx/32Rx head coil (Nova Medical) for clinical exams. Thanks to enhanced signal-to-noise ratio and spatial resolution, the ultra-high field scanner has proven to be a **valuable tool for the diagnosis of specific neurological disorders**, such as multiple sclerosis, cerebral amyloid angiopathy, epilepsy and aneurysm characterisation.

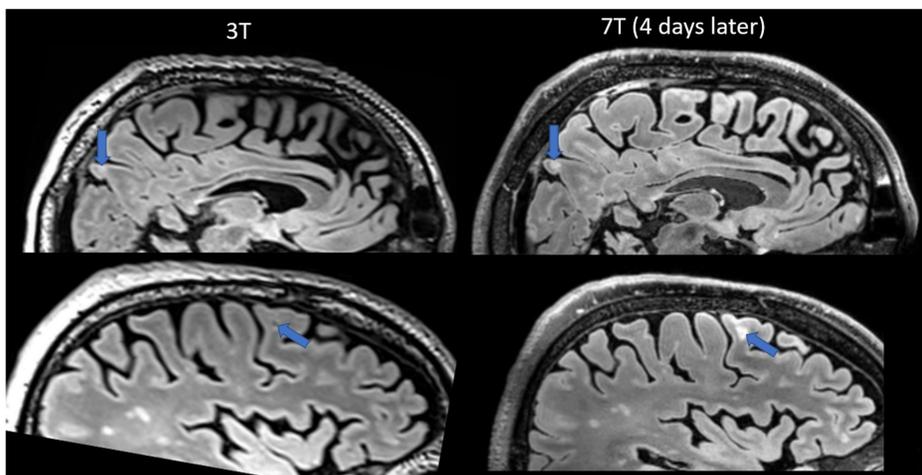
Here, we present the **sequences that we developed for clinical neuroradiological exams** and illustrate the **benefits of the 7T in a few clinical cases**.

METHODS

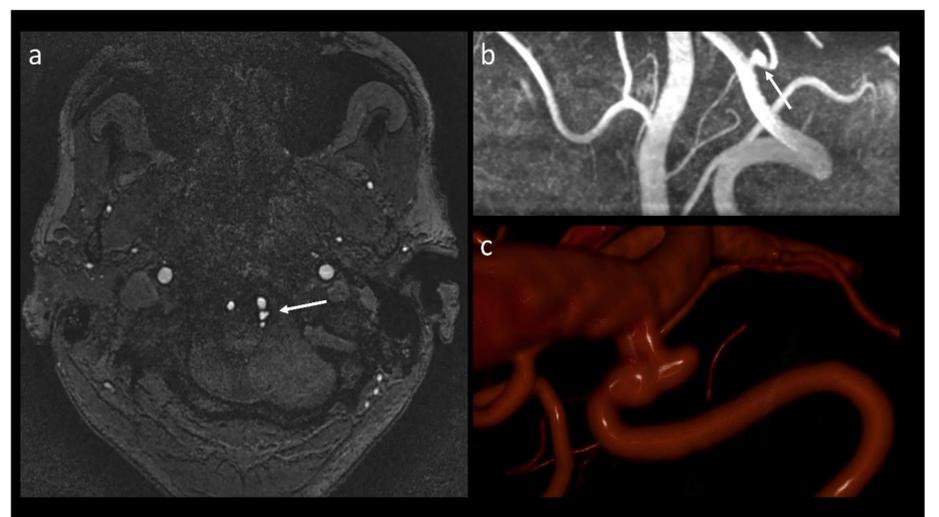
Sequence	TR (ms)	TE (ms)	In-plane resolution (mm ²)	Slice thickness (mm)	TA (min:s)	Acceleration
3D MP2RAGE	6000	3.08	0.6 x 0.6	0.66	7:34	CS 5
2D T2W TSE	8440	62	0.22 x 0.22	2.0	3:58	GRAPPA 4, DL recon
3D T2W FLAIR SPACE	8000	264	0.7 x 0.7	0.7	8:18	CAIPIRINHA 6
3D T1W SPACE	1010	13	0.6 x 0.6	0.6	8:17	CAIPIRINHA 6
2D SWI	25	7	0.15 x 0.15	1.6	6:34	GRAPPA 3
3D TOF	110	3.29	0.3 x 0.3	0.4	7:37	CS 7.2

▲ Table 1. Sequences optimised for 7T clinical brain exams

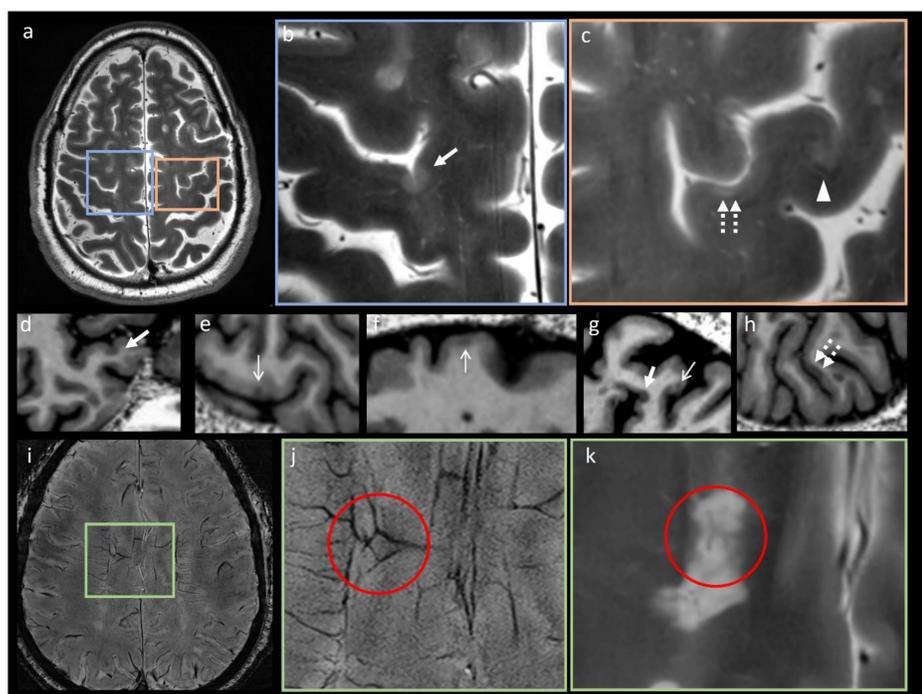
RESULTS



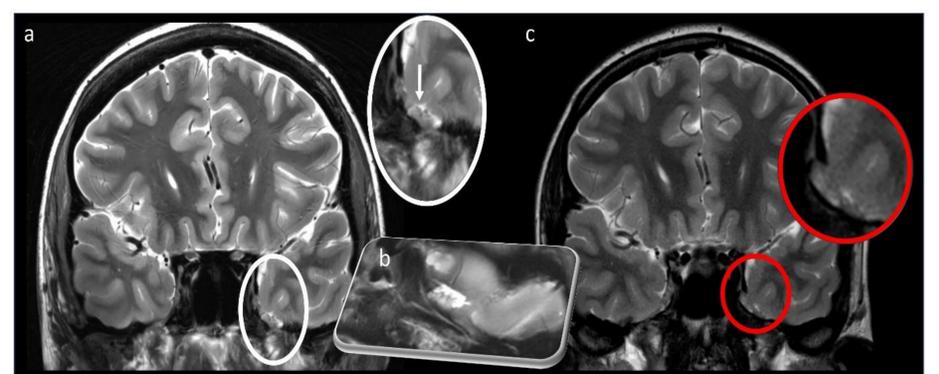
▲ Figure 1. Comparison of lesion detection between 3T and 7T using T2W FLAIR in a patient with multiple sclerosis.



▲ Figure 2. Detection of an aneurysm of the left posterior cerebellar inferior artery (white arrow) using (a) TOF image, (b) maximum-intensity projection and (c) 3D reconstruction.



▲ Figure 3. Lesions and venous abnormalities in patients with multiple sclerosis. (a-c) Lesion detection with T2W TSE image. (d-h) Lesion detection with MP2RAGE. (i-k) Venous abnormalities detection with SWI. Legend: cortico-juxtacortical (white arrow), subpial (dashed arrows) and irregularly shaped juxtacortical lesion (arrow head), venous abnormality (red circle).



▲ Figure 4. Encephalocele in temporal lobe on T2W TSE in patient with epilepsy. The encephalocele (white circle) was detected using (a) coronal and (b) transversal T2W TSE at 7T. (c) It was missed on preceding T2W TSE image at 3T (red circle).

- 7T offers **high precision radiological imaging**
- Advances in acceleration techniques and AI are expected to further enhance protocol efficiency and image quality

CONCLUSION