Online supplemental data:

Diagnostic Accuracy of High-Resolution 3-Dimensional T2-SPACE in Detecting Cerebral Venous Sinus Thrombosis

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Online supplemental data 1: Scanning parameters for T2- sampling perfection with application optimized contrasts using different flip angle evaluations (T2-SPACE) and "contrast-enhanced"- Magnetization Prepared RApid Gradient Echo (CE-MPRAGE) in 1.5T and 3T

	T2-SPACE		CE-MPRAGE*	
	1.5T	3T	1.5T	3T
TR	3200	3200	2160	2020
TE	383	285	4.79	3.49
Slice thickness	1 mm	1mm	1mm	1mm
FOV	256 × 256	256 × 256	256 × 256	256 × 256
Matrix	512 × 512	512 × 512	512 × 512	256 × 256
Acquisition time	5:16	4:03	4:25	4:08

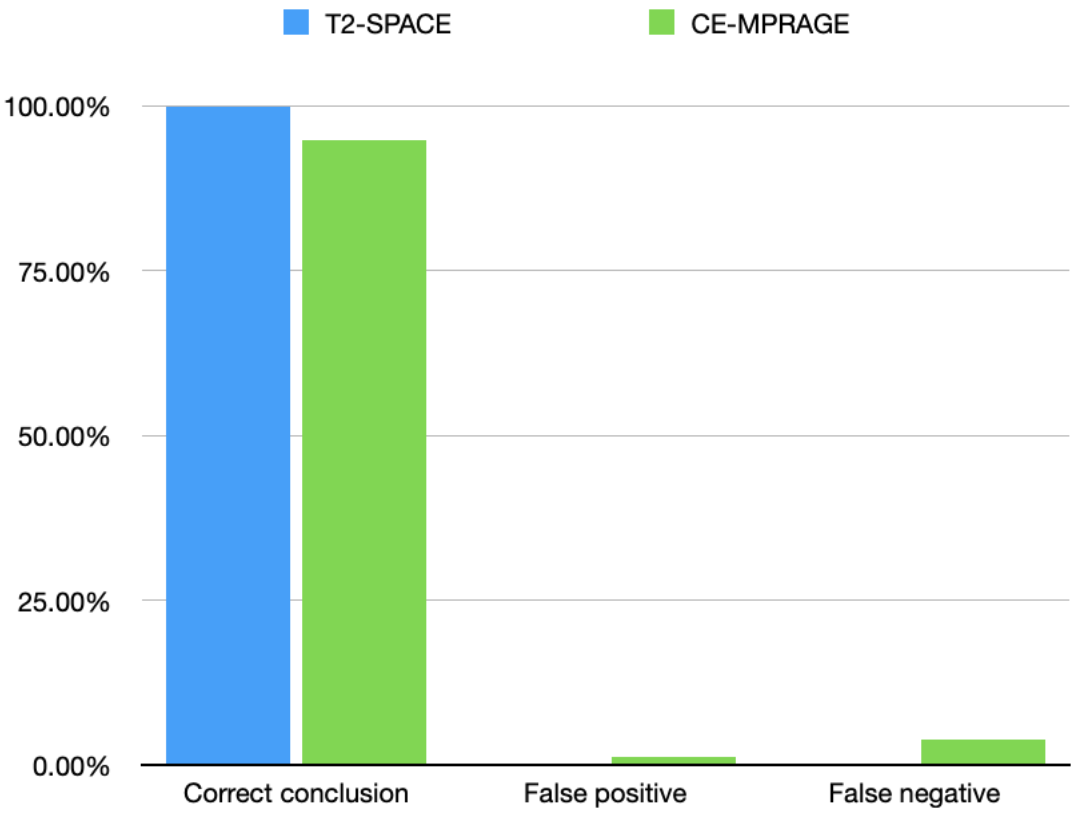
* CE-MPRAGE was acquired directly after administration of 0.1mmol/kg gadobutrol (Gadovist, Bayer Healthcare, Berlin, Germany), flushed by 20 ml saline.

Online supplemental data 2: Summary of clinical characteristics of the patients' group, the treatment and the degree of neurological disability at 3 months follow-up

Clinical characteristics of patients with cerebral venous sinus thrombosis (CVST) patients	
Presentation (n)	Headache (24), nausea (8), vomiting (8), aphasia (5), hemiparesis (4), seizure(s) (4), asymptomatic (3), neck pain (3), vertigo (3), syncope (2), presyncope (1), paresthesia (2), fever (2), tinnitus (2), photophobia (1), double vision (1), ocular motor paresis (1), ataxia (1), hemianopia (1), agitation (1), mental changes (1)
Risk factors (n)	Hormonal contraception (10), no risk factors (9), smoking (4), recurrent thromboembolic events (3), antiphospholipid (3), heterozygote factor V mutation (2), overweight (2), birth (2), neoplasia (2), steroids (2), family history (2), thrombophilia (1), cutaneous lupus (1), radiosurgery for AVM (1), essential thrombocythemia (1), Behcet disease (1), traumatic brain injury (1), brain surgery (1), glial fibrillary acidic protein-meningoencephalitis (1), infection (1), brain abscess (1), autoimmune disease (1), retropharyngeal abscess (1), immobilization (1), lumbar puncture (1)
Parenchymal lesions (n)	Hemorrhage (15), cytotoxic edema (6), vasogenic edema (9)
Treatment (n)	Vitamin K antagonist (19), heparin (11), no treatment (2), apixaban (1), dabigatran (1), Xarelto (1)
Modified Rankin Scale (mRS) at 3 months (n)	mRS 0 (3), mRS 1 (10), mRS 2 (4), mRS 3 (14), mRS 4 (1), mRS 5 (1), mRS (6), unknown (1)

Online supplemental data 3: Stage of the thrombus, location of the thrombi and the accompanying parenchymal lesions in the patient group.

Thrombus characteristics (exam based)	
Number of MRI exams per patient	Minimum: 1, maximum: 4, average: 1.8, interquartile range (IQR):1-2
Duration (onset-MRI)	Range: 0-700 days, average 110.8days, median 21 days, IQR 174-5
Stage of thrombus (n)	Acute (16), subacute (13), chronic (23), late chronic (10), uncertain (1)
Location of thrombus (n)	Superior sagittal sinus (24), torcular herophili (37), right transverse sinus (26), right sigmoid sinus (20), right jugular vein (17), left transverse sinus (33), left sigmoid sinus (35), left jugular vein (32), straight sinus (9), vein of Galen (4), right internal cerebral vein (1), left internal cerebral vein (1), right cortical veins including the vein of Trolard(16), left cortical veins including the vein of Trolard(13), right vein of Labbé (0), left vein of Labbé (7)
Subtype (n)	Dural venous thrombosis (36), dural and cortical veins thrombosis (17), dural and deep venous thrombosis (7), dural, cortical venous and deep venous thrombosis (2), isolated cortical venous thrombosis (1)



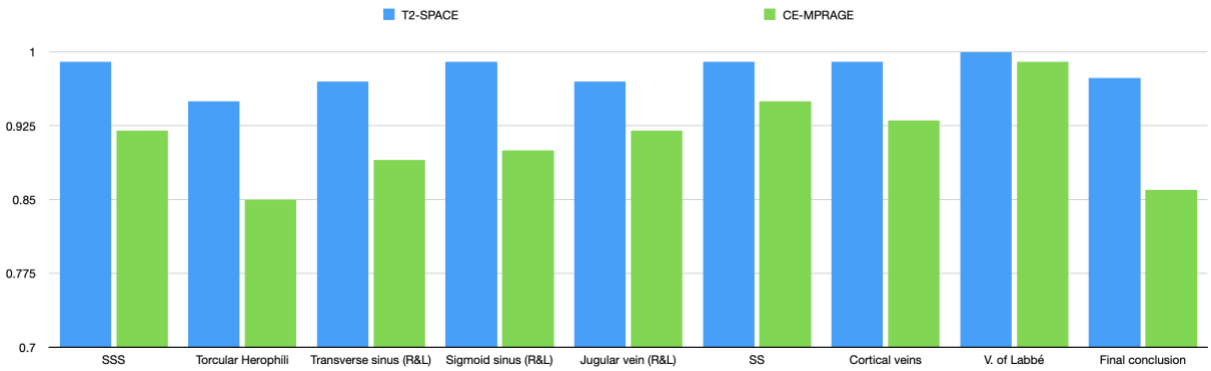
Online supplemental data 4: Bar chart comparing the results of T2-SPACE and CE-MPRAGE based on the baseline MRI.

Online supplemental data 5: Interrater reliability calculated by Cohen's kappa

	T2-SPACE	CE-MPRAGE
Based on baseline MRI	0.92 (almost perfect)	0.87 (strong)
Based on all MRIs	0.88 (strong)	0.89 (strong)
Acute	0.81 (strong)	0.93 (almost perfect)
Subacute	0.79 (moderate)	0.8 (strong)
Chronic	0.82 (strong)	0.9 (strong)
Late chronic	0.67 (moderate)	0.74 (moderate)

Online supplemental data 6. Sub-analysis according to the involved venous segment involved comparing the results of T2-SPACE and CE-MPRAGE based on all available MRIs including follow-ups.

		Superior sagittal sinus	Torcular herophili	Transverse sinus (R & L)	Sigmoid sinus (R & L)	Jugular vein (R & L)	Straight sinus	Vein of Galen	Internal cerebral veins (R & L)	Cortical veins including the vein of Trolard	Vein of Labbé	Final diagnosis
Number of segments with a thrombus		24	37	59	55	49	9	4	2	29	7	63
T2-SPACE	Sensitivity	0.96	0.86	0.93	0.98	0.94	1.00	0.50	0.00	0.93	1.00	0.95
	Specificity	1.00	0.99	0.99	0.99	0.98	0.99	0.99	1.00	0.99	1.00	1.00
	Accuracy	0.99	0.95	0.97	0.99	0.97	0.99	0.97	0.99	0.99	1.00	0.97
	PPV	1.00	0.97	0.96	0.98	0.94	0.90	0.67	0	0.96	1.00	1.00
	NPV	0.99	0.94	0.98	0.99	0.98	1.00	0.98	0.99	0.99	1.00	0.94
CE-MPRAGE	Sensitivity	0.71	0.62	0.68	0.75	0.73	0.56	0.25	0.50	0.45	0.57	0.78
	specificity	0.98	0.96	0.97	0.95	0.97	0.98	1.00	1.00	1.00	1.00	0.96
	Accuracy	0.92	0.85	0.89	0.90	0.92	0.95	0.97	1.00	0.93	0.99	0.86
	PPV	0.89	0.88	0.89	0.82	0.88	0.71	1.00	1.00	1.00	1.00	0.96
	NPV	0.93	0.84	0.90	0.92	0.93	0.96	0.97	1.00	0.93	0.99	0.78



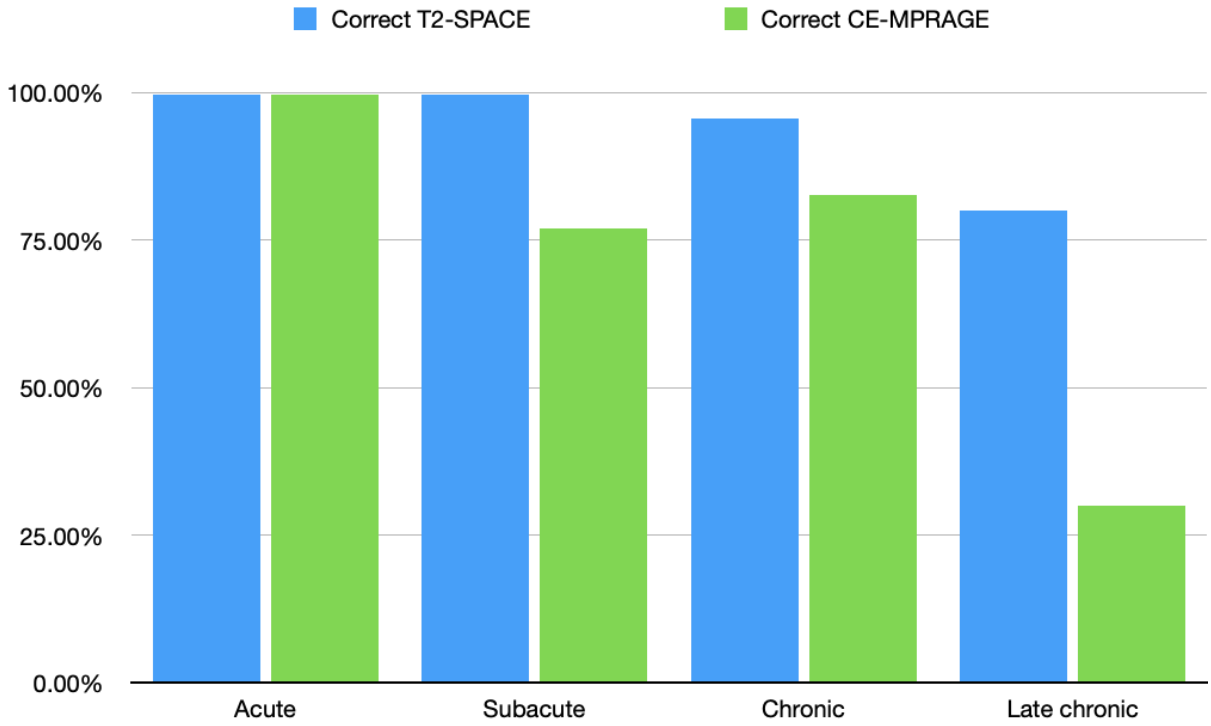
Online supplemental data 7:

Sub-analysis according to the involved venous/ dura segment, comparing the accuracy of T2-SPACE versus CE-MPRAGE, based on all available MRI exams. SSS: superior sagittal sinus, SS: straight sinus,

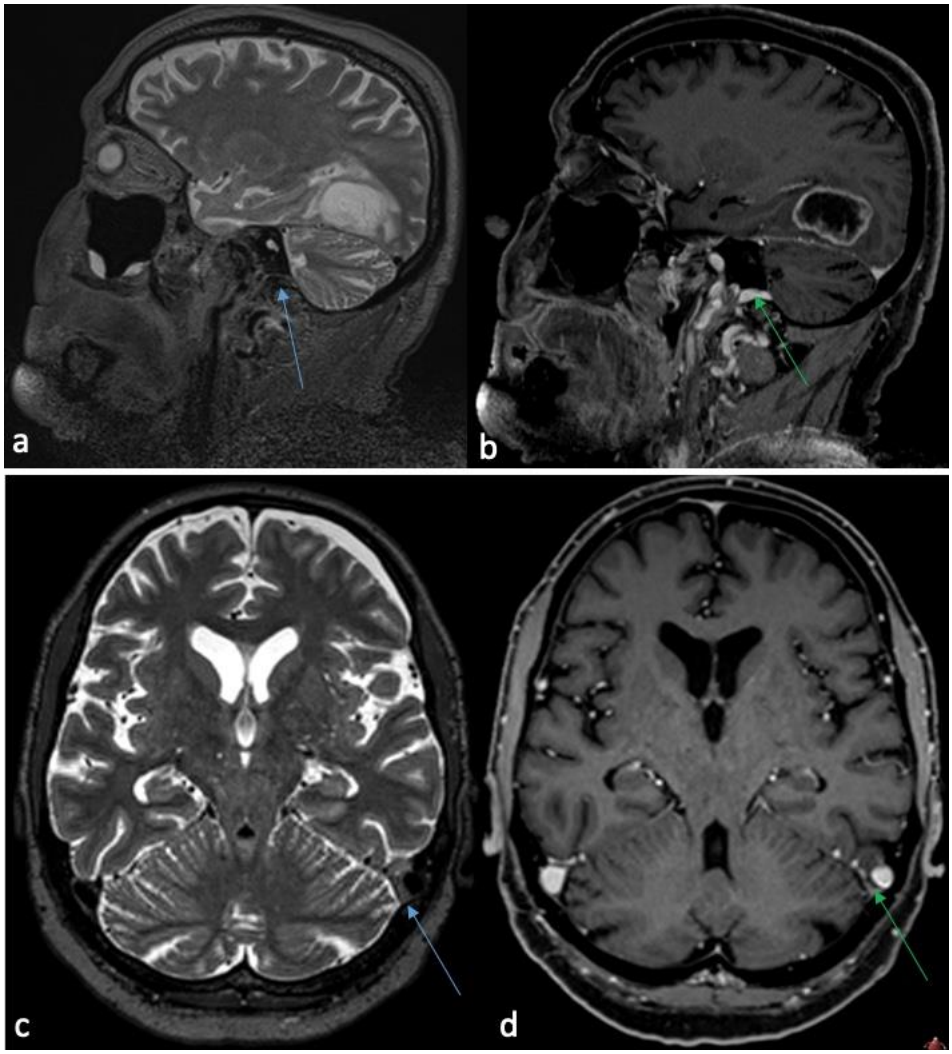
N.B: Cortical veins analysis included the vein of Trolard. The vein of Galen and internal cerebral veins were excluded (because there were only a few positive cases, 4 and 2 respectively).

Online supplemental data 8: Table comparing the results of T2-SPACE and CE-MPRAGE based on all available exams on the different clinical stages.

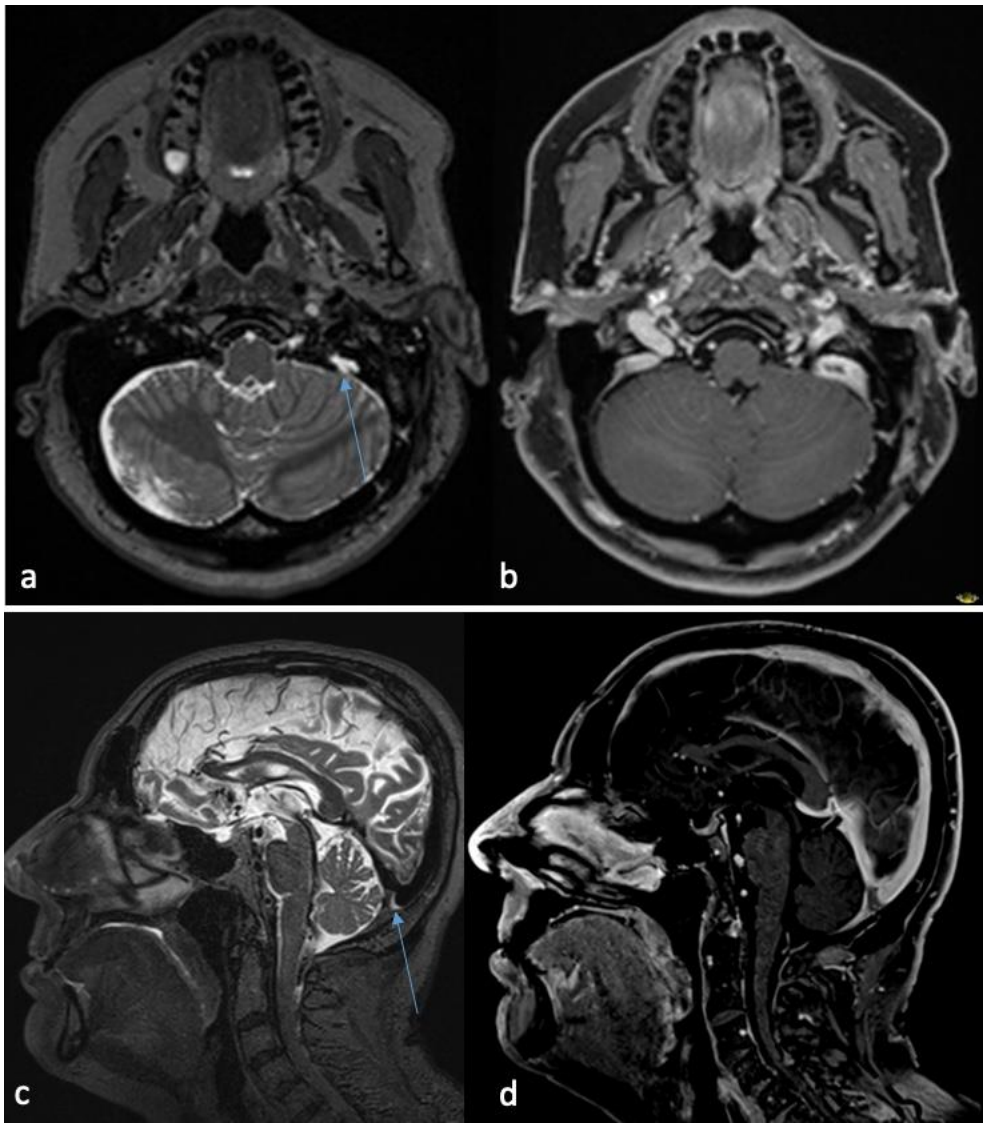
Clinical stage		Acute	Subacute	Chronic	Late chronic
Number of cases		16	13	23	10
T2-SPACE	Sensitivity	1	1	0.96	0.80
	Specificity	1	1	1	1
	Accuracy	1	1	0.99	0.97
	PPV	1	1	1	1
	NPV	1	1	0.98	0.96
	Cohen's kappa	0.81	0.79	0.82	0.67
CE-MPRAGE	Sensitivity	1	0.77	0.83	0.30
	Specificity	0.96	0.96	0.96	0.96
	Accuracy	0.97	0.92	0.92	0.85
	PPV	0.89	0.83	0.9.0	0.60
	NPV	1	0.94	0.92	0.88
	Cohen's Kappa	0.93	0.80	0.90	0.74



Online supplemental data 9: bar chart comparing the correct conclusion from T2-SPACE and CE-MPRAGE according to the clinical stage of the thrombus.



Online supplemental data 10: 2 examples of false-positive results in T2-SPACE (a and c), in correlation with CE-MPRAGE (b and d). The first row shows images from a 79-year-old male. T2-SPACE was interpreted as a possible adherent thrombus in the jugular vein, but interpreted as a flow artifact by the senior reader. There was no thrombosis evident in correlation with other sequences. Notice glioblastoma in the temporal lobe. The second row is from a 67-year-old male. From T2-SPACE, it was thought there was an absent flow void on the medial part of the sigmoid sinus by one of the readers; however, by anatomical correlation this was shown to be medial to the vessel, i.e., extravascular. This was correctly rated by the senior reader.



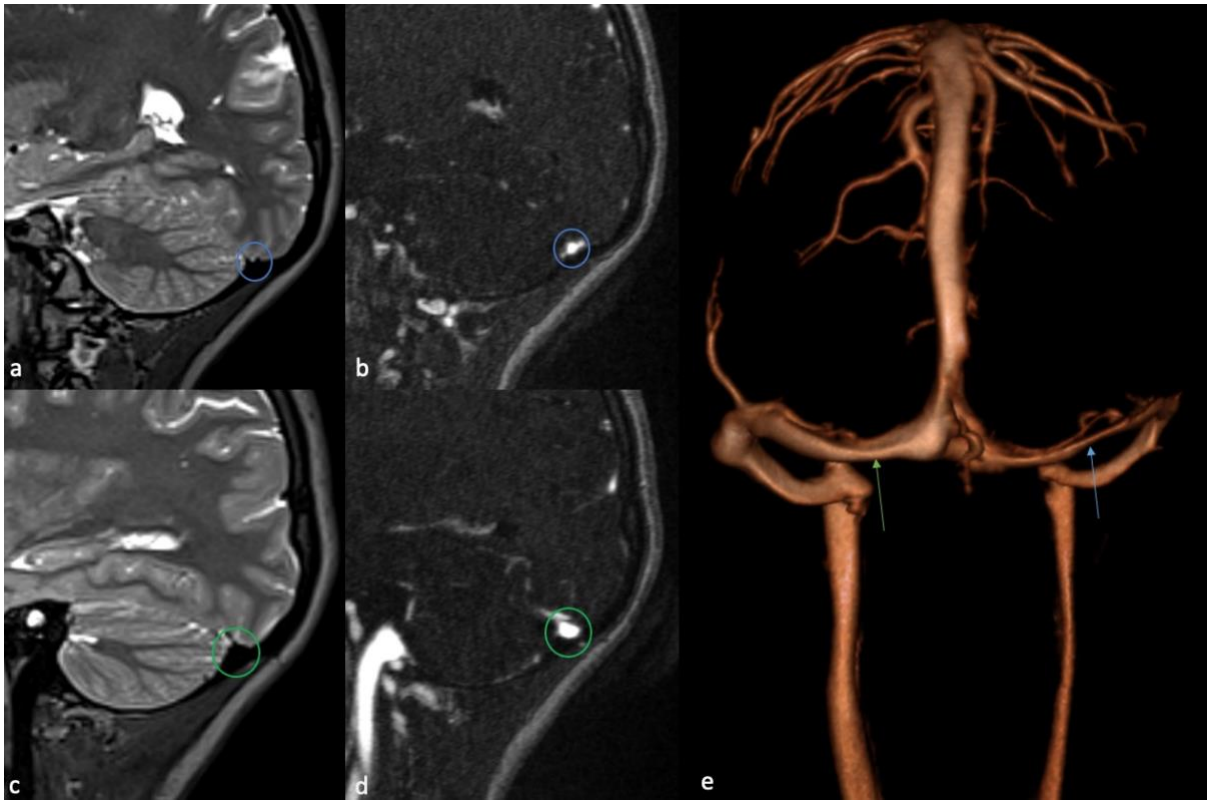
Online supplemental data 11: 2 different examples of false-negatives in T2-SPACE. The first row (a and b) is from a 54-year-old female patient. This hyperintensity on T2 was thought to be a postoperative collection (note the occipital craniotomy); however, this hyperintensity was intravascular, as seen on the CE-MPRAGE due to thrombosis. The second row (c and d) shows the example of an 84-year-old male. No thrombus was seen on T2-SPACE; however, a filling defect was seen on MPRAGE. Due to involvement of other segments, the final diagnosis didn't change in these two cases.

Online supplemental data 12:

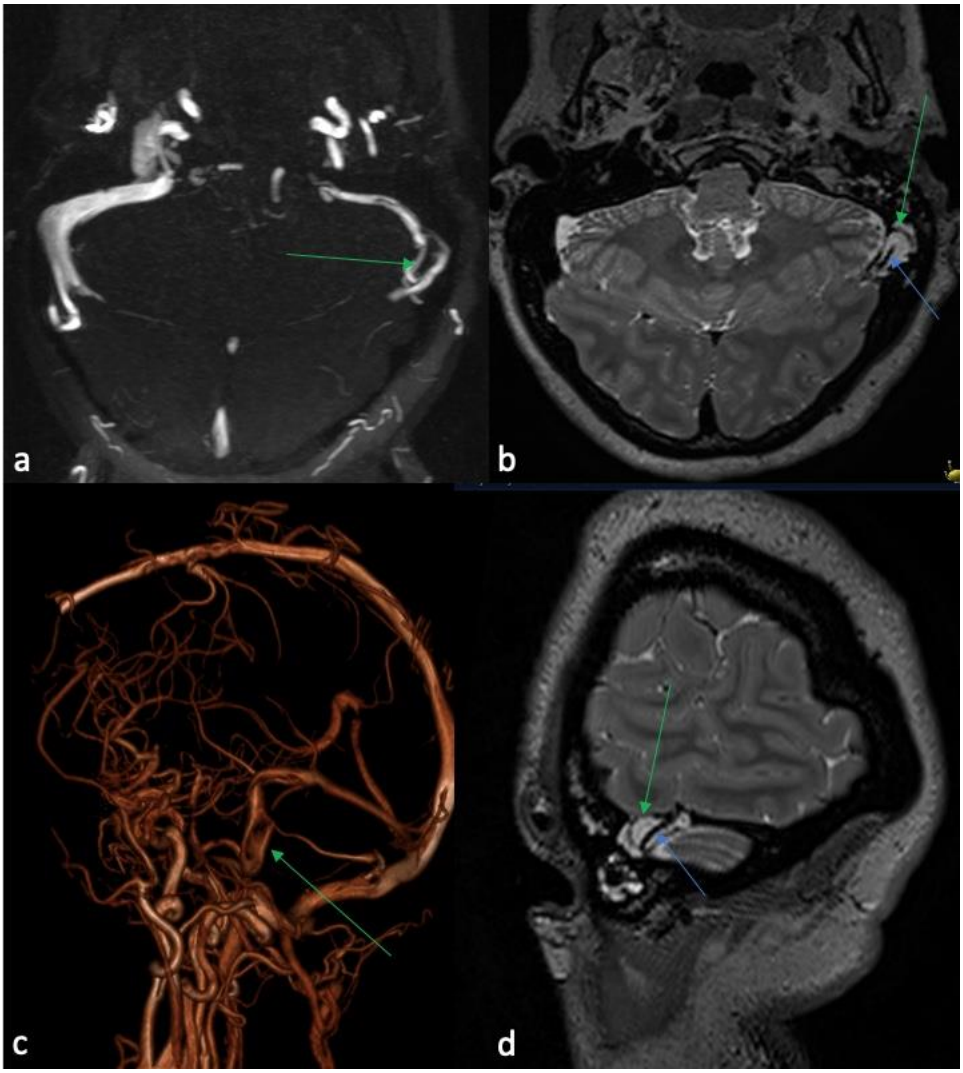
Results of T2-SPACE and CE-MPRAGE Based on The Baseline MRI Exams, classified by field strength.

	T2-SPACE		CE-MPRAGE	
	1.5T	3T	1.5T	3T
Sensitivity	1 (0.8–1)	1 (0.8–1)	0.85 (0.6–0.9)	1 (0.8–1)
Specificity	1 (0.9–1)	1 (0.8–1)	0.96 (0.8–1)	1 (0.8–1)
Accuracy	1 (0.9–1)	1 (0.9–1)	0.91 (0.8–1)	1 (0.9–1)
Positive predictive value	1 (0.8–1)	1 (0.8–1)	0.94 (0.7–1)	1 (0.8–1)
Negative predictive value	1 (0.9–1)	1 (0.8–1)	0.90 (0.7–1)	1 (0.8–1)

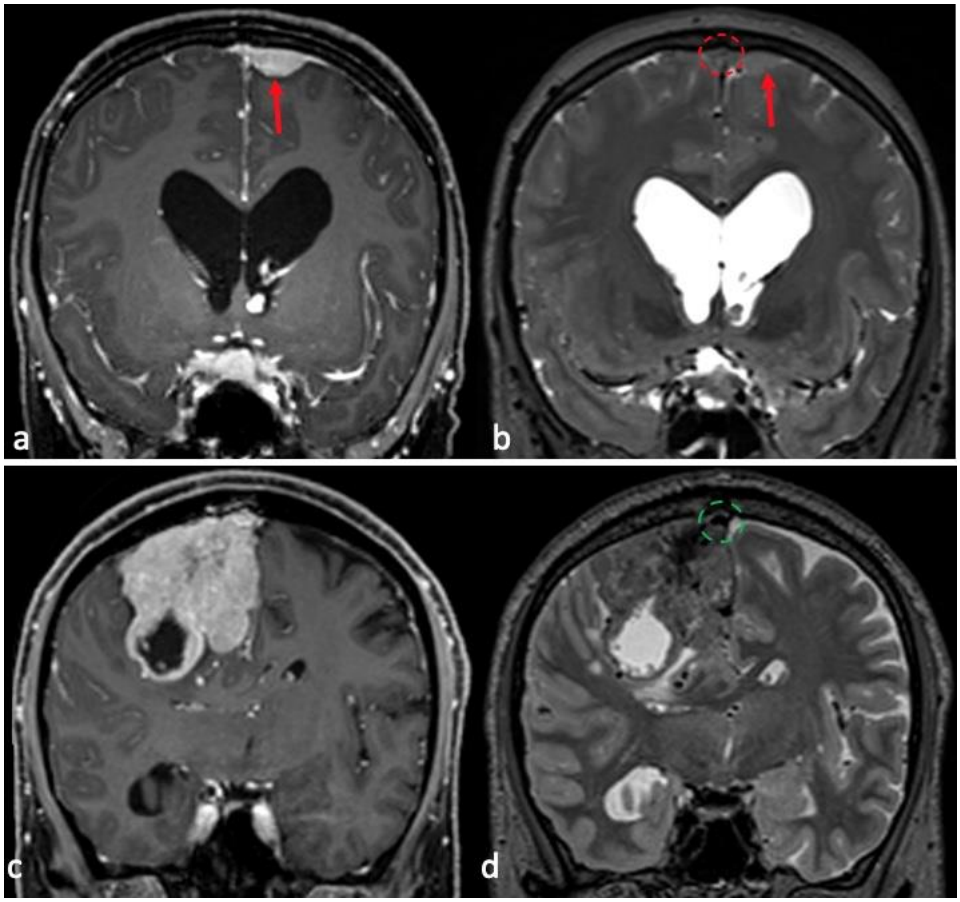
Data in parentheses are 95% confidence interval



Online supplemental data 13: Sagittal T2 SPACE (a and c) and CE venous MRA (b and d) showing a hypoplastic transverse sinus (upper row) and normal sinus (lower row). The MR venous angiography shows lumen narrowing, which could be due to hypoplasia, but also due to wall-adherent thrombus. In correlation with T2-SPACE, the physiological flow void is present and the sinus is narrower than the contralateral side, thus supporting the possibility of a hypoplasia.

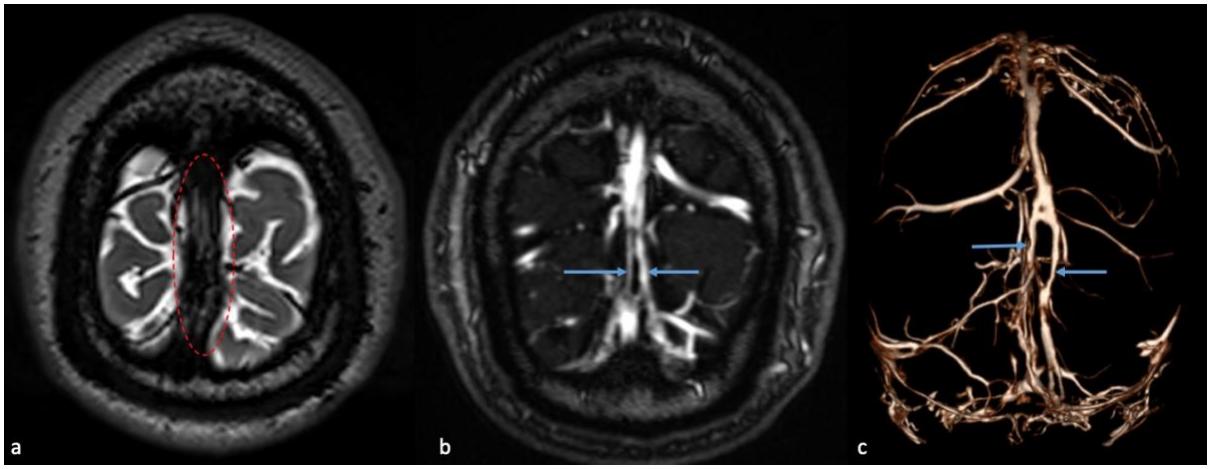


Online supplemental data 14: 42-year-old female. On the phase contrast MRV and 3D surface rendering reconstruction (a and c) there is a filling defect on the left sigmoid sinus (green arrows). In correlation with T2-SPACE (b and d) there is a smooth lesion with CSF isointense signal (green arrows) and a blood vessel within the lesion (blue arrow), which is a typical finding for Pacchionian granulation.

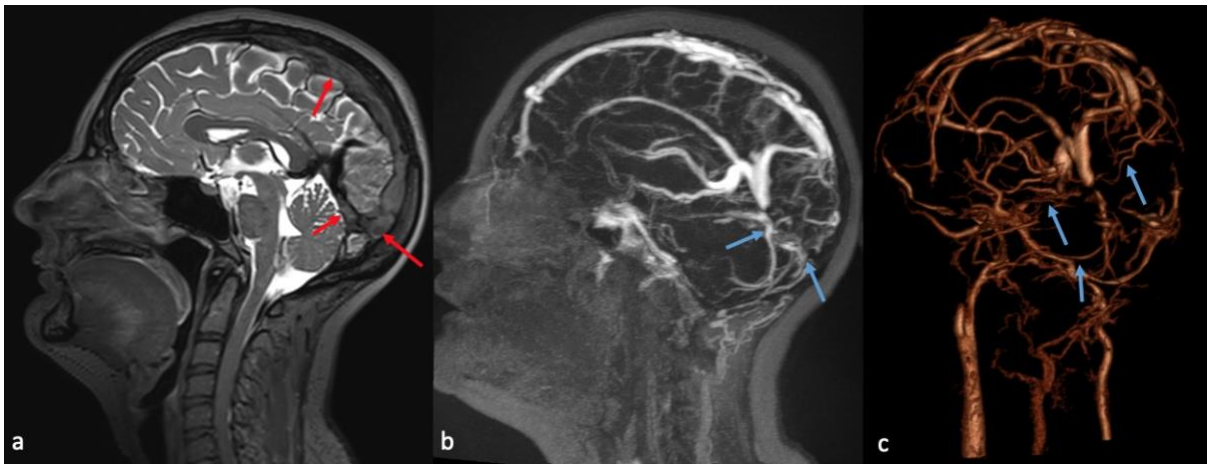


Online supplemental data 15: CE-MPRAGE (a and c) and T2-SPACE (b and d) from 2 different patients with extra-axial tumors (neither patient is from the study cohort). The upper row images are from a 51-year-old female patient with left parafalcine meningioma WHO I (red arrow). In the CE-MPRAGE, the tumor has similar intensity to the sinus; here, the differentiation between tumor infiltration, compression, or normal sinus is not possible. The T2-SPACE, however, shows sinus infiltration, with absent flow void (red circle).

The images in the lower row are from a 58-year-old patient with hemangiopericytoma, WHO III. On the CE-MPRAGE it is difficult to differentiate between compression or infiltration of the superior sagittal sinus. On the T2-SPACE there is narrowing of the sinus due to compression by the tumor, but the sinus is patent with intact flow void (green circle). This is important information for preoperative planning.



Online supplemental data 16: A 28-year-old male patient with thrombosis of the superior sagittal sinus. Follow-up in the clinical chronic phase with axial T2-SPACE (a) and axial reconstruction of the venous MRA (b) as well as 3D surface rendering reconstruction. In the T2-SPACE there is an inhomogeneous signal in the thrombus (red oval); here recanalization is difficult to differentiate from the inhomogeneous signal of the thrombus. The recanalization, however is better detected on the CE MRA and the 3D visualization (blue arrows).



Online supplemental data 17: A 44-year-old female patient with thrombosis of the superior sagittal sinus, straight sinus, and torcular herophili as seen on the sagittal T2-SPACE by absent flow voids and expansion of the sinus (arrows in a). The collateral vessels are better depicted on the sagittal MIP CE MRA (b) and the surface rendering (c) (blue arrows).