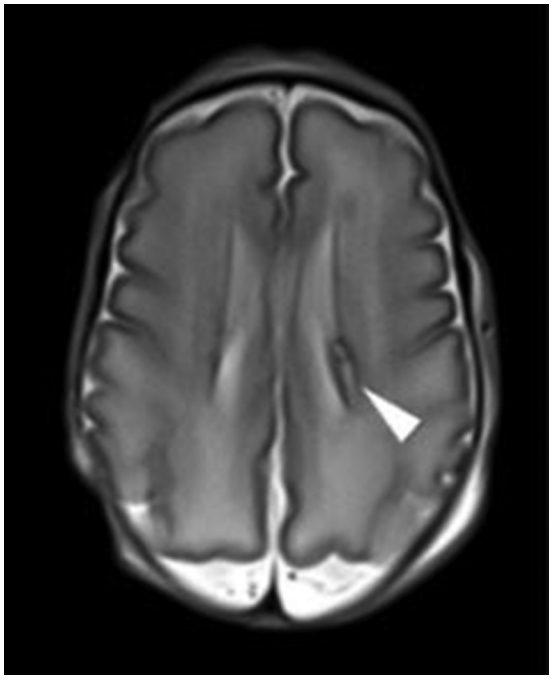
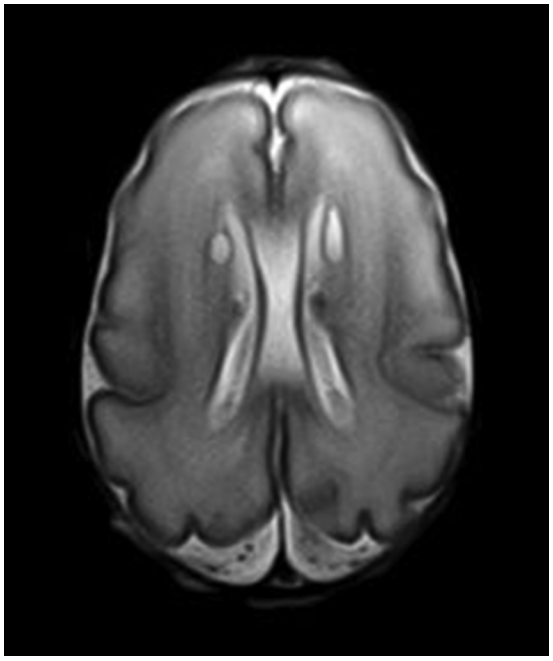
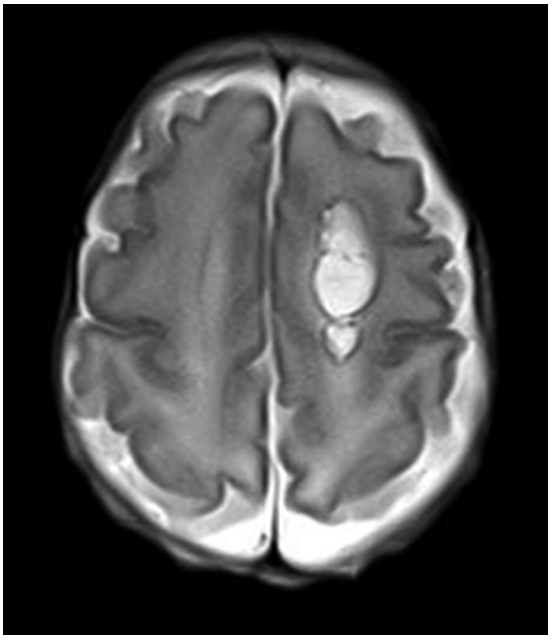


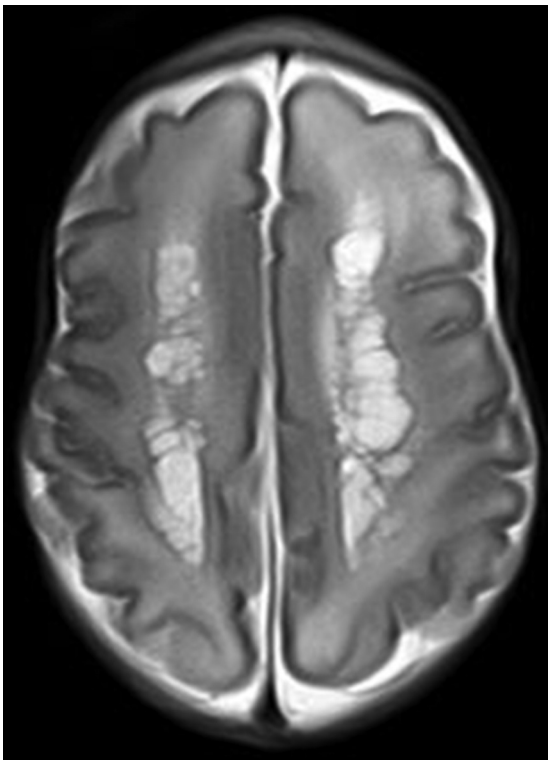
ON-LINE FIG 1. Cerebral WM, cystic lesion, focal unilateral, score 1 (axial T2).



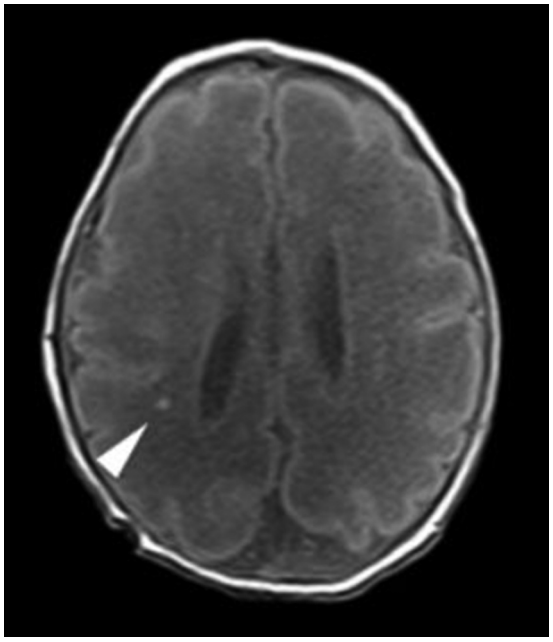
ON-LINE FIG 2. Cerebral WM, cystic lesion, focal bilateral, score 2 (axial T2).



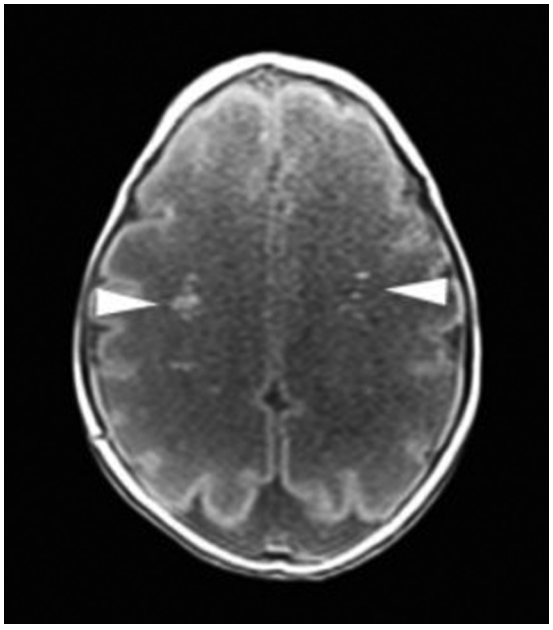
ON-LINE FIG 3. Cerebral WM, cystic lesion, extensive unilateral, score 3 (axial T2).



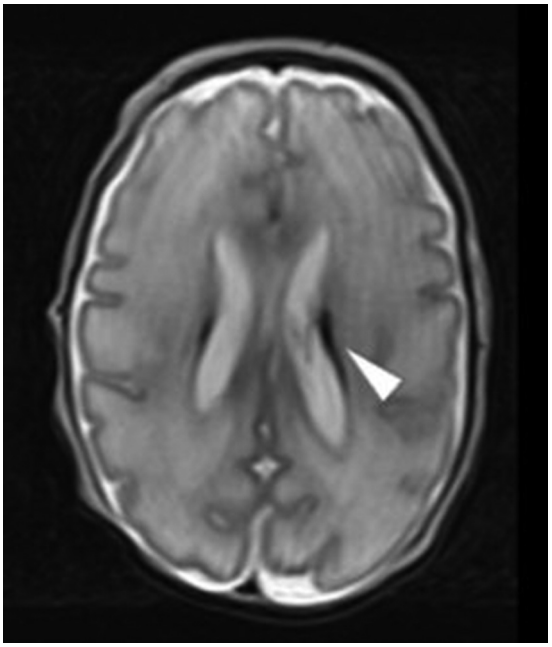
ON-LINE FIG 4. Cerebral WM, cystic lesion, extensive bilateral, score 4 (axial T2).



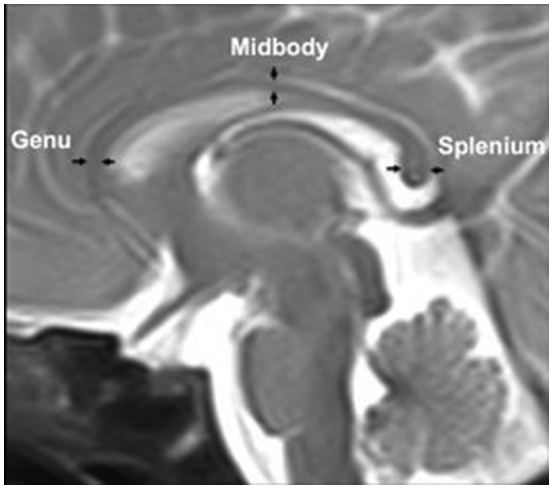
ON-LINE FIG 5. Cerebral WM, focal signal abnormality, focal punctate, score 1 (axial T1).



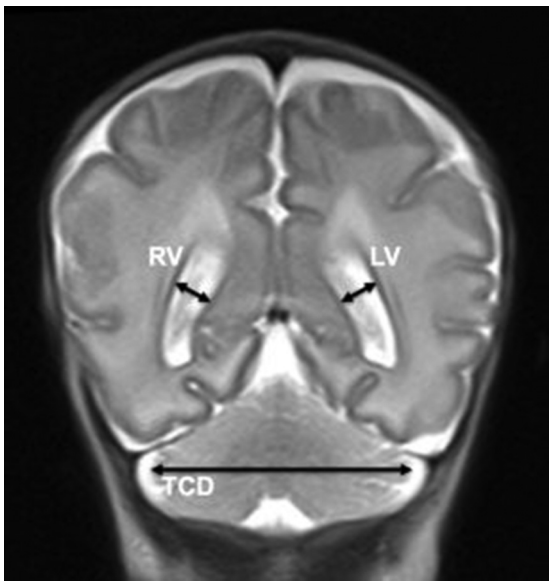
ON-LINE FIG 6. Cerebral WM, focal signal abnormality, extensive punctate, score 2 (axial T1).



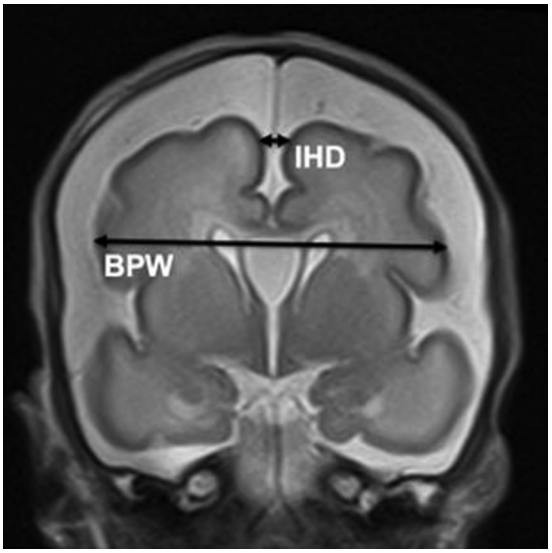
ON-LINE FIG 7. Cerebral WM, focal signal abnormality, linear, score 3 (axial T2).



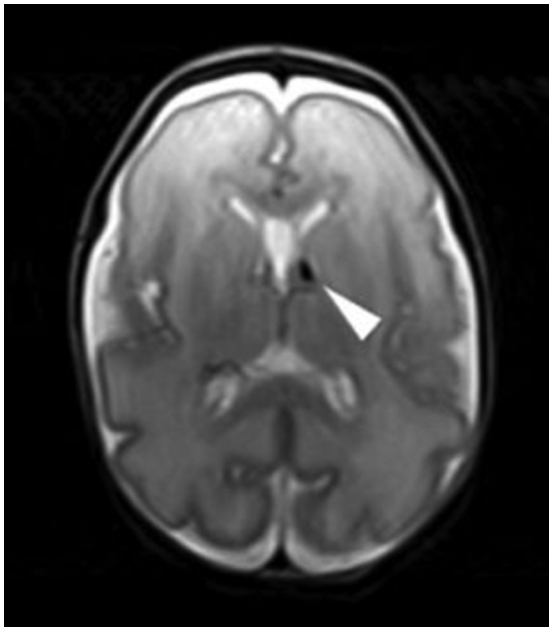
ON-LINE FIG 8. Cerebral WM, thinning of the corpus callosum. Measure genu, midbody, and splenium on a midsaggital section (T2) and correct genu and splenium for PMA at MR imaging by using the following equations: cGenu = Measured Genu + 0.03 × (40-PMA at MRI). cSplenium = Measured Splenium +0.03 × (40-PMA at MRI). Score 0: cGenu > 1.13 mm and midbody > 0.7 mm and cSplenium > 1.84 mm. Score 1: cGenu < 1.13 mm or midbody < 0.7 mm or cSplenium < 1.84 mm. Score 2: (cGenu <1.13 mm or midbody < 0.7 mm) and cSplenium < 1.84 mm.



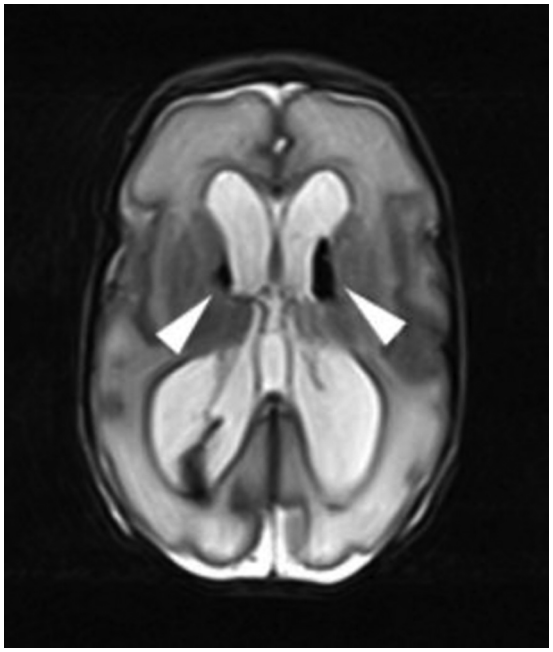
ON-LINE FIG 9. Cerebral WM, dilated lateral ventricles. Measure left (LV) and right ventricle (RV) at the level of the ventricular atrium (coronal T2) and correct for PMA at MR imaging by using the following equation: cRV = Measured RV + 0.15 × (40-PMA at MRI). cLV = Measured LV + 0.13 × (40-PMA at MRI). Score 0: cRV < 9.12 mm and cLV< 8.42 mm. Score 1: One or both: 9.12 mm < cRV < 10.39 mm; 8.42 mm < cLV < 9.39 mm. Score 2: One or both: cRV > 10.39 mm; cLV > 9.39 mm. Cerebellum, volume reduction. Measure transcerebellar diameter (TCD) at the level of the atria, maximal horizontal distance (coronal T2), correct for PMA at MR imaging by using the following equation: cTCD = Measured TCD + 1.78× (40-PMA at MRI). Score 0: cTCD > 50.02 mm. Score 1: 48.04 mm < cTCD < 50.02 mm. Score 2: cTCD < 48.04 mm.



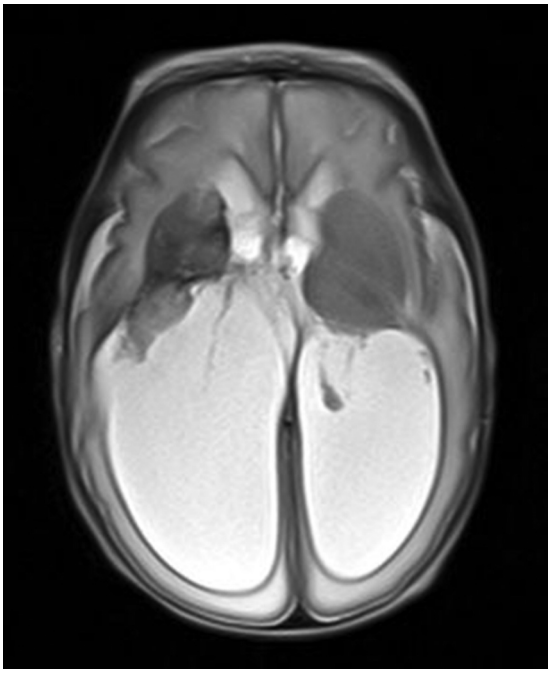
ON-LINE FIG 10. Cerebral WM, volume reduction. Measure biparietal width at level of the basilar turn of the cochlea (coronal T2) and correct for PMA at MR imaging by using the following equation: Corrected BPW = Measured BPW + 2.33×(40-PMA at MRI). Score 0: cBPW > 78.52 mm. Score 1: 74.6 mm < cBPW < 78.52 mm. Score 2: cBPW < 74.6 mm. Cortical GM, increased extracerebral space (coronal T2). Measure the interhemispheric distance (IHD) between the crowns of the superior frontal gyri at the same section as measurement for BPW. Correct for PMA at MR imaging by using the following equation: cIHD = Measured IHD + 0.16 × (40-PMA at MRI). Score 0: cIHD < 3.98 mm. Score 1: 3.98 mm < cIHD < 4.69 mm. Score 2: cIHD > 4.69 mm.



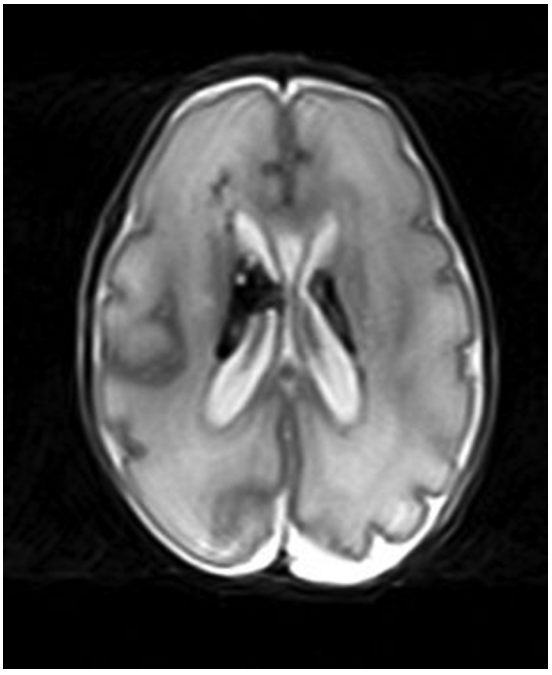
ON-LINE FIG 11. Deep GM, signal abnormality, focal unilateral, score 1 (axial T2).



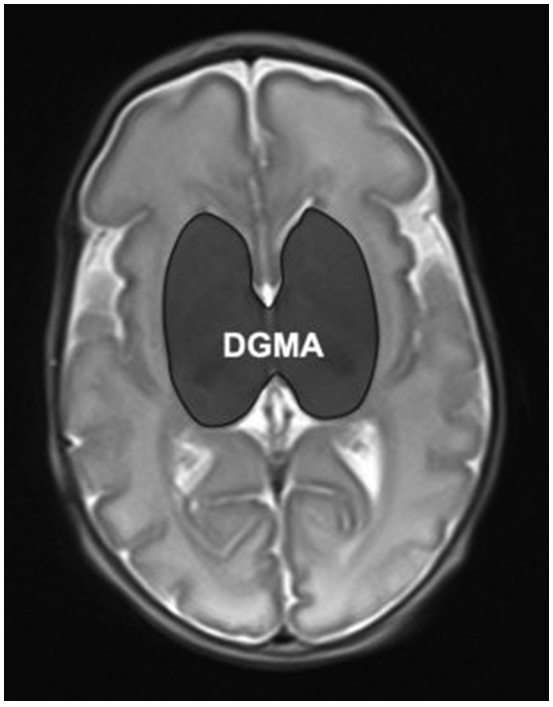
ON-LINE FIG 12. Deep GM, signal abnormality, focal bilateral, score 2 (axial T2).



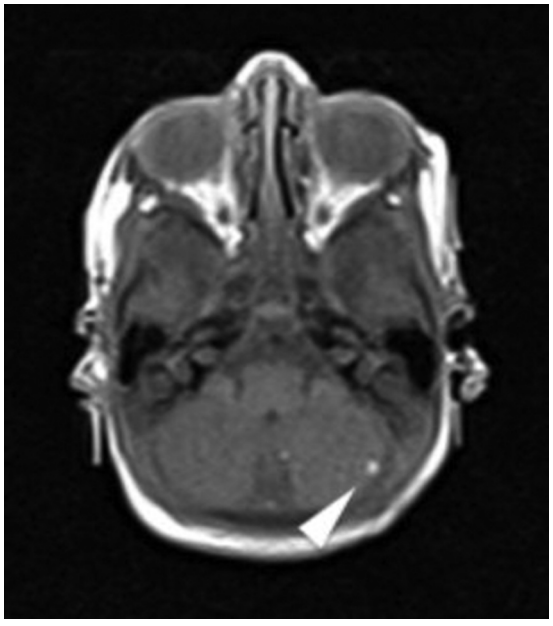
ON-LINE FIG 13. Deep GM, signal abnormality, extensive unilateral, score 3 (axial T2).



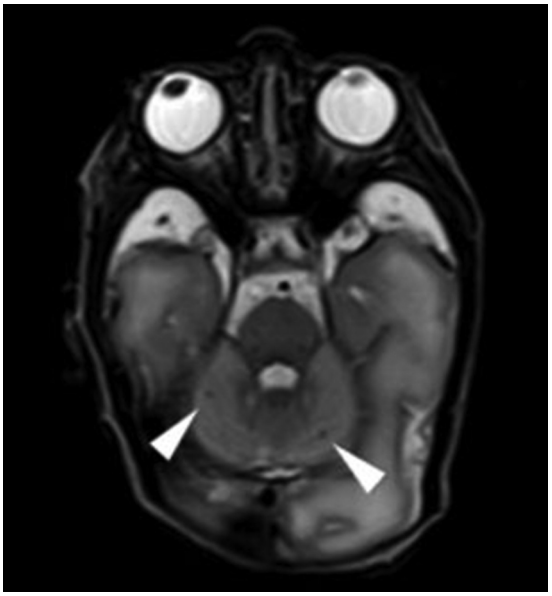
ON-LINE FIG 14. Deep GM, signal abnormality, extensive bilateral, score 4 (axial T2).



ON-LINE FIG 15. Deep GM, volume reduction. Measure deep gray matter area (DGMA) on a single axial section where the caudate heads, lentiform nuclei, and thalami are maximally visible (axial T2). Correct for PMA at MR imaging by using the following equation: cDGMA = Measured DGMA + 0.45 × (40-PMA at MRI). Score 0: cDGMA > 11.1 mm. Score 1: 10.51 mm < cDGMA < 11.1 mm. Score 2: cDGMA < 10.51 mm.



ON-LINE FIG 16. Cerebellum, signal abnormality, punctate unilateral, score 1 (axial T1).



ON-LINE FIG 17. Cerebellum, signal abnormality, punctate bilateral, score 2 (axial T2).

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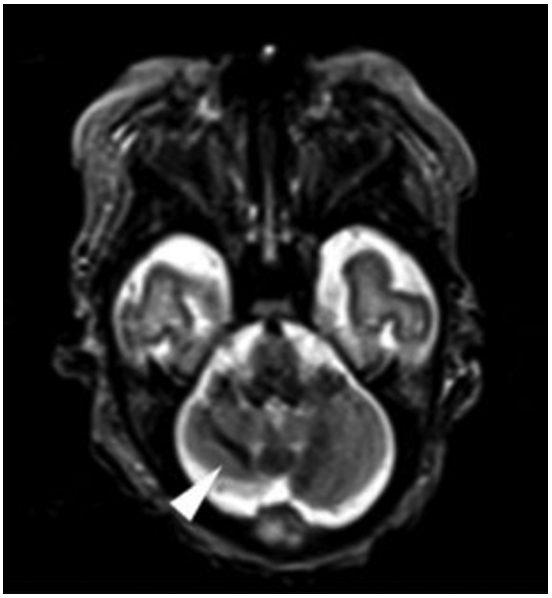

ON-LINE FIG 18. Cerebellum, signal abnormality, extensive unilateral, score 3 (axial T2).

On-line Table 1: Scoring parameters and findings in preterm sample early and term MRI, and term reference sample MRI[a]

	Score		Early MRI (*n* = 83) (t1)	Term MRI (*n* = 77) (t2)	Reference (*n* = 38)	Difference (t1–t2) (*P*)
Cerebral WM						
Cystic lesions	0	None	76 (92%)	73 (95%)	38 (100%)	.71
	1	Focal unilateral	5 (6%)	2 (3%)	0	
	2	Focal bilateral	1 (1%)	1 (1%)	0	
	3	Extensive unilateral	0	0	0	
	4	Extensive bilateral	1 (1%)	1 (1%)	0	
Focal signal abnormality	0	None	62 (75%)	66 (86%)	38 (100%)	.05
	1	Focal punctate	12 (14%)	4 (5%)	0	
	2	Extensive punctate	2 (2%)	2 (3%)	0	
	3	Linear	7 (8%)	5 (6%)	0	
Myelination delay	0	Myelinated PLIC and corona radiata	0	72 (94%)	38 (100%)	<.01[b]
	1	Only PLIC myelinated	0	1 (1%)	0	
	2	Minimal myelination; no myelin in PLIC	83 (100%)[c]	4 (5%)	0	
Thinning of corpus callosum	0	Genu, midbody, and splenium <2 SDs below mean	80 (96%)	61 (79%)	37 (97%)	<.01[b]
	1	Genu or midbody or splenium >2 SDs below mean	1 (1%)	14 (18%)	1 (3%)	
	2	Genu or midbody and splenium >2 SDs below mean	2 (2%)	2 (3%)	0	
Dilated lateral ventricles	0	Both sides within 2 SDs of mean	69 (83%)	55 (71%)	36 (95%)	.24
	1	One side >2 SDs but <3 SDs above mean	6 (7%)	15 (19%)	2 (5%)	
	2	One or both sides >3 SDs above mean	8 (10%)	7 (9%)	0	
Volume reduction	0	cBPW <2 SDs below mean	34 (41%)	31 (40%)	37 (97%)	.51
	1	cBPW >2 SDs below but <3 SDs below mean	29 (35%)	27 (35%)	1 (3%)	
	2	cBPW > 3 SDs below mean	20 (24%)	19 (25%)	0	
Cortical GM						
Signal abnormality	0	None	83 (100%)	76 (99%)	38 (100%)	.32
	1	Focal unilateral	0	0	0	
	2	Focal bilateral	0	1 (1%)	0	
	3	Extensive unilateral	0	0	0	
	4	Extensive bilateral	0	0	0	
Gyral maturation	0	Delay <2 weeks	63 (76%)	75 (97%)	38 (100%)	<.01[b]
	1	2 ≤ delay <4 weeks	13 (16%)	2 (3%)	0	
	2	Delay ≥4 weeks	7 (8%)	0	0	
Increased extracerebral space	0	cIHD within 2 SDs of mean	68 (82%)	55 (71%)	37 (97%)	.06
	1	cIHD >2 SDs and <3 SDs above mean	10 (12%)	7 (9%)	1 (3%)	
	2	cIHD >3 SDs above mean	5 (6%)	15 (19%)	0	
Deep GM						
Signal abnormality	0	None	75 (90%)	75 (97%)	38 (100%)	.01[b]
	1	Focal unilateral	5 (6%)	1 (1%)	0	
	2	Focal bilateral	3 (4%)	1 (1%)	0	
	3	Extensive unilateral	0	0	0	
	4	Extensive bilateral	0	0	0	
Volume reduction	0	cDGMA <2 SDs below mean	59 (71%)	50 (65%)	37 (97%)	.06
	1	cDGMA >2 SDs below and <3 SDs below mean	17 (20%)	13 (17%)	1 (3%)	
	2	cDGMA >3 SDs below mean	7 (8%)	14 (18%)	0	
Cerebellum						
Signal abnormality	0	None	78 (94%)	72 (94%)	38 (100%)	.32
	1	Punctate unilateral	4 (5%)	5 (6%)	0	
	2	Punctate bilateral	0	0	0	
	3	Extensive unilateral	1 (1%)	0	0	
	4	Extensive bilateral	0	0	0	
Volume reduction	0	cTCD <2 SDs below mean	69 (83%)	54 (70%)	37 (97%)	.09
	1	cTCD >2 SDs below and <3 SDs below mean	8 (10%)	16 (21%)	1 (3%)	
	2	cTCD >3 SDs below mean	6 (7%)	7 (9%)	0	

Note:— cBPW indicates corrected biparietal width; cDGMA, corrected deep GM area; cTCD corrected transcerebellar diameter; IHD, interhemispheric distance; PLIC, posterior limb of the internal capsule; t1–t2, difference between early and term MRI of preterm infants.

[a] Data are No. (%). Early MRI, 29 to 35 weeks PMA; term MRI, 40 to 42 weeks PMA; mean and SD refer to term reference sample data. $P < .05$ represents a significant difference between early and term MRI scores in the preterm sample.

[b] Significant.

[c] All early MRIs were scored 2 for myelination delay to represent "unmyelinated PLIC and corona radiata."

On-line Table 2: Structural MRI scoring system for use from 29- to 46-weeks PMA in preterm infants: score sheet[a]

Date:

Patient ID:

Postmenstrual age at MRI:

	Score 0	Score 1	Score 2	Score 3	Score 4	Total Score
Cerebral WM						
Cystic lesions	None	Focal unilateral (On-line Fig 1)	Focal bilateral (On-line Fig 2)	Extensive unilateral (On-line Fig 3)	Extensive bilateral (On-line Fig 4)	
Focal signal abnormality	None	Focal punctate (On-line Fig 5)	Extensive punctate (On-line Fig 6)	Linear (On-line Fig 7)		
Myelination delay	Myelinated PLIC and corona radiata	Only PLIC myelinated	Minimal myelination; no myelin in PLIC			
Thinning of corpus callosum (On-line Fig 8)	Measure genu, midbody, and splenium on a midsagittal section and correct genu and splenium for PMA at MRI using equations: cGenu = Measured Genu +0.03 × (40-PMA at MRI) cSplenium = Measured Splenium +0.03 × (40-PMA at MRI)					
	cGenu > 1.13 mm and midbody > 0.7 mm and cSplenium > 1.84 mm	cGenu < 1.13 mm or midbody < 0.7 mm or cSplenium < 1.84 mm	(cGenu < 1.13 mm or midbody < 0.7 mm) and cSplenium < 1.84 mm			
Dilated lateral ventricles (On-line Fig 9)	Measure left and right ventricle at level of ventricular atrium and correct for PMA at MRI using equations: cRV = Measured RV + 0.15 × (40-PMA at MRI) cLV = Measured LV + 0.13 × (40-PMA at MRI)					
	cRV < 9.12 mm and cLV < 8.42 mm	1 or both: 9.12 mm < cRV < 10.39 mm 8.42 mm < cLV < 9.39 mm	1 or both: cRV > 10.39 mm cLV > 9.39 mm			
Volume reduction (On-line Figure 10)	Measure biparietal width at level of the basilar turn of the cochlea and correct for PMA at MRI using equation: cBPW = Measured BPW + 2.33 × (40-PMA at MRI)					
	cBPW > 78.52 mm	74.6 mm < cBPW < 78.52 mm	cBPW < 74.6 mm			WM total = (range 0–15)
Cortical GM						
Signal abnormality	None	Focal unilateral	Focal bilateral	Extensive unilateral	Extensive bilateral	
Gyral maturation	34- to 36-wk PMA: marginal sulcus and paracentral gyrus present; secondary sulci in frontal lobes, superior and middle temporal and prerolandic, postrolandic, insula, and occipital regions present; 36- to 38-week PMA: additional secondary gyri in transverse and inferior temporal regions; anterior and posterior orbital gyri established; 40-week PMA: tertiary inferior temporal and inferior occipital gyri and sulci (Inder et al, 2003[8])					
	Delay <2 wk	2 ≤ delay <4 wk	Delay ≥4 wk			
Increased extracerebral space (On-line Fig 10)	Measure interhemispheric distance between crowns of superior frontal gyri at same section as measurement for BPW; correct for PMA at MRI using equation: cIHD = Measured IHD + 0.16 × (40-PMA at MRI)					
	cIHD < 3.98 mm	3.98 mm < cIHD < 4.69 mm	cIHD > 4.69 mm			Cortical GM total = (range 0–8)

Continued on next page

On-line Table 2: Continued

	Score 0	Score 1	Score 2	Score 3	Score 4	Total Score
Deep GM						
Signal abnormality	None	Focal unilateral (On-line Fig 11)	Focal bilateral (On-line Fig 12)	Extensive unilateral (On-line Fig 13)	Extensive bilateral (On-line Fig 14)	
Volume reduction (On-line Fig 15)	Measure DGMA on a single axial section where caudate heads, lentiform nuclei, and thalami are maximally visible; correct for PMA at MRI using equation: cDGMA = Measured DGMA + 0.45 × (40-PMA at MRI)					
	cDGMA > 11.1 mm	10.51 mm < cDGMA < 11.1 mm	cDGMA < 10.51 mm			Deep GM total = (range 0–6)
Cerebellum						
Signal abnormality	None	Punctate unilateral (On-line Fig 16)	Punctate bilateral (On-line Fig 17)	Extensive unilateral (On-line Fig 18)	Extensive bilateral	
Volume reduction (On-line Fig 9)	Measure transcerebellar diameter at level of atria, maximal horizontal distance; correct for PMA at MRI using equation: cTCD = Measured TCD + 1.78 × (40-PMA at MRI)					
	cTCD > 50.02 mm	48.04 mm < cTCD < 50.02 mm	cTCD < 48.04 mm			Cerebellum total = (range 0–6)
						Global total = (range 0–35)

Note:—BPW indicates biparietal width; c-, corrected; IHD, interhemispheric distance; RV, right ventricle; LV, left ventricle; TCD, transcerebellar diameter; DGMA, deep gray matter area; PLIC, posterior limb of the internal capsule.

[a] Global total range 0–35, global score category (0–3 normal; 4–7 mild; 8–11 moderate; 12+ severe).

On-line Table 3: Relationship between PMA at MRI and each regional measurement[a]

	Preterm Sample (*n* = 135) (*n* = 71 Early MRI, *n* = 64 Term MRI)			Term Reference Sample (*n* = 38)		
	Regression Coefficient	95% CI	*P*	Regression Coefficient	95% CI	*P*
Corpus callosum genu	0.03	0.01–0.05	.01[b]	0.28	0.02–0.53	.03[b]
Corpus callosum body	0.01	−0.01–0.02	.33	−0.03	−0.19–0.12	.64
Corpus callosum splenium	0.03	0.01–0.04	<.01[b]	0.04	−0.15–0.23	.67
Ventricular diameter right	0.15	0.11–0.18	<.01[b]	0.35	−0.06–0.76	.09
Ventricular diameter left	0.13	0.1–0.16	<.01[b]	0.10	−0.22–0.43	.51
Biparietal width	2.33	2.19–2.48	<.01[b]	0.00	−1.32–1.33	.99
Interhemispheric distance	0.16	0.12–0.2	<.01[b]	0.03	−0.21–0.27	.78
Deep gray matter area	0.45	0.42–0.47	<.01[b]	0.11	−0.09–0.3	.27
Transcerebellar diameter	1.78	1.72–1.84	<.01[b]	0.99	0.33–1.66	.01[b]

[a] Early MRI, 29 to 35 weeks PMA; term MRI, 40 to 42 weeks PMA. Preterm sample cases with focal brain lesions were removed to ensure that any linear relationship found was the result of age and not confounded by brain injury. Regression analyses were conducted separately for the preterm and term samples.
[b] Significant.

On-line Table 4: Corrected means and SDs of the regional measurements for early and term MRI for the preterm group and the term reference sample[a]

	Early MRI (*n* = 83)	Term MRI (*n* = 77)	Term Reference Sample (*n* = 38)
Corpus callosum genu	1.96 (0.43)	1.91 (0.67)	2.63 (0.75)
Corpus callosum body	1.33 (0.28)[b]	1.40 (0.43)[b]	1.60 (0.45)[b]
Corpus callosum splenium	2.71 (0.51)	2.61 (0.62)	2.98 (0.57)[b]
Ventricular diameter right	7.43 (3.29)	7.49 (3.58)	6.48 (0.97)[b]
Ventricular diameter left	7.51 (3.20)	7.70 (4)	6.58 (1.3)[b]
Biparietal width	77.40 (4.47)	77.40 (5.44)	86.38 (3.93)[b]
Interhemispheric distance	3.27 (0.79)	3.50 (1.33)	2.56 (0.71)[b]
Deep gray matter area	11.48 (0.82)	11.44 (1.01)	12.28 (0.59)[b]
Transcerebellar diameter	51.55 (2.53)	51.34 (2.73)	53.98 (1.98)

[a] For each measure that demonstrated a linear relationship with PMA at MRI in On-line Table 3, the regression coefficient (slope) was used to generate an equation for correction, written as: Corrected Value = Measured Value + Regression Coefficient × (40-PMA at MRI). A single equation was used to correct early and term MRI regional measures for the preterm group. The term reference sample data were corrected separately.
[b] Uncorrected values—that is, for regional measures in which no linear relationship was found and no correction was performed.

On-line Table 5: Inter- and intrarater reproducibility of early and term MRI scores[a]

	Interrater (*n* = 20)		Intrarater (*n* = 20)	
	Reliability ICC (95% CI)	% Agreement	Reliability ICC (95% CI)	% Agreement
Early MRI scores				
WM	0.79 (0.47–0.92)	70	0.97 (0.93–0.99)	95
CGM	0.08 (0.00–0.63)	95	0.92 (0.80–0.97)	100
DGM	0.86 (0.64–0.94)	85	0.92 (0.81–0.97)	90
Cerebellum	0.76 (0.40–0.91)	95	0.82 (0.51–0.93)	95
Global	0.89 (0.72–0.96)	80	0.97 (0.91–0.99)	95
Term MRI scores				
WM	0.93 (0.82–0.97)	90	0.96 (0.89–0.98)	90
CGM	0.66 (0.15–0.87)	90	0.75 (0.32–0.91)	95
DGM	0.86 (0.66–0.95)	90	0.96 (0.89–0.98)	100
Cerebellum	0.91 (0.78–0.97)	100	0.91 (0.77–0.97)	100
Global	0.93 (0.82–0.97)	80	0.97 (0.92–0.99)	95

[a] "% Agreement" is defined as an exact agreement ±1 point for subscale scores and exact agreement ±2 points for global scores.

On-line Table 6: Perinatal variables and grade of global brain abnormality in infants born <31-week gestational age[a]

Variables	Global Brain Abnormality								*P* Value	
	Normal (Score, 0–3)		Mild (Score, 4–7)		Moderate (Score, 8–11)		Severe (Score, ≥12)			
	Early MRI (*n* = 28)	Term MRI (*n* = 49)	Early MRI (*n* = 41)	Term MRI (*n* = 20)	Early MRI (*n* = 10)	Term MRI (*n* = 5)	Early MRI (*n* = 4)	Term MRI (*n* = 3)	Early MRI	Term MRI
Gestational age at birth (wk)	28^{+6} (1^{+5})	28^{+3} (1^{+6})	27^{+6} (1^{+6})	28^{+2} (1^{+3})	27^{+3} (2^{+0})	25^{+3} (1^{+0})	27^{+0} (2^{+4})	27^{+3} (2^{+6})	.04[b]	.03[b]
Birth weight (g)	1213 (266)	1145 (318)	1018 (305)	1001 (280)	913 (306)	820 (94)	974 (427)	878 (587)	<.01[b]	.04[b]
Male sex	17 (61%)	30 (61%)	24 (59%)	12 (60%)	5 (50%)	3 (60%)	3 (75%)	1 (33%)	.85	.64
Multiple births	8 (29%)	12 (25%)	12 (29%)	7 (35%)	4 (40%)	2 (40%)	0 (0%)	0 (0%)	.95	.58
Maternal PROM	10 (36%)	14 (29%)	7 (17%)	2 (10%)	1 (10%)	1 (20%)	1 (25%)	1 (33%)	.07	.23
Chorioamnionitis	8 (29%)	9 (18%)	5 (12%)	3 (15%)	0 (0%)	0 (0%)	1 (25%)	1 (33%)	.05	.66
Antenatal steroids	23 (82%)	36 (74%)	29 (71%)	17 (85%)	8 (80%)	1 (20%)	2 (50%)	3 (100%)	.30	.88
Higher social risk	11 (41%)	16 (33%)	19 (46%)	12 (60%)	7 (70%)	4 (80%)	2 (50%)	2 (67%)	.21	<.01[b]
PDA	7 (25%)	21 (43%)	24 (59%)	8 (40%)	5 (50%)	5 (100%)	3 (75%)	2 (67%)	.01[b]	.19
Maternal $MgSO_4$	16 (64%)	26 (59%)	20 (63%)	12 (75%)	6 (86%)	2 (100%)	1 (50%)	1 (100%)	.67	.11
Cesarean delivery	20 (71%)	34 (69%)	30 (73%)	15 (75%)	7 (70%)	4 (80%)	3 (75%)	3 (100%)	.95	.32
ROP	7 (25%)	14 (29%)	20 (49%)	13 (65%)	8 (80%)	4 (80%)	3 (75%)	2 (67%)	<.01[b]	<.01[b]
NEC	1 (4%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	2 (50%)	1 (33%)	.22	.50
Confirmed sepsis	2 (7%)	2 (4%)	1 (2%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	0 (0%)	.26	.41
TPN (days)	10 [6–13]	11 [8–14]	12 [8–15]	11 [7–14]	13 [8–14]	14 [14–19]	18 [6–28]	11 [ND]	.12	.17
Postnatal corticosteroids	1 (4%)	7 (14%)	7 (17%)	3 (15%)	3 (30%)	2 (40%)	3 (75%)	2 (67%)	<.01	.11
Ventilation (days)	2 [0–3]	2 [0–8]	3 [2–18]	3 [0–7]	3 [2–34]	30 [11–42]	31 [8–35]	20 [ND]	.02[b]	.04[b]
CPAP (days)	12 [4–21]	18 [6–46]	17 [8–32]	33 [9–52]	15 [10–27]	50 [37–55]	7 [3–23]	32 [ND]	.14	.12
Oxygen therapy (hr)	5 [1–42]	46 [2–386]	51 [5–253]	6 [1–62]	1 [1–774]	512 [ND]	665 [114–1358]	1958 [ND]	.01[b]	.57
BPD	NA	11 (22%)	NA	6 (30%)	NA	4 (80%)	NA	2 (67%)	NA	.02[b]
Home oxygen	NA	5 (100%)	NA	4 (20%)	NA	3 (60%)	NA	1 (33%)	NA	.02[b]

Note:—PDA indicates patent ductus arteriosus; PROM, premature rupture of membranes; ROP retinopathy of prematurity; TPN, total parenteral nutrition; $MgSO_4$, magnesium sulfate; NA, not applicable; ND, not determinable due to small sample size; BPD, bronchopulmonary dysplasia (oxygen requirement at 36 weeks PMA); NEC, necrotizing enterocolitis; CPAP, continuous positive airway pressure.

[a] Continuous measures reported as mean (SD) or median [IQR]. Categoric measures are reported as frequency (percentage). *P* value < .05 indicates a significant association between the perinatal variable and increasing severity of MRI global brain abnormality category score.

[b] Significant.