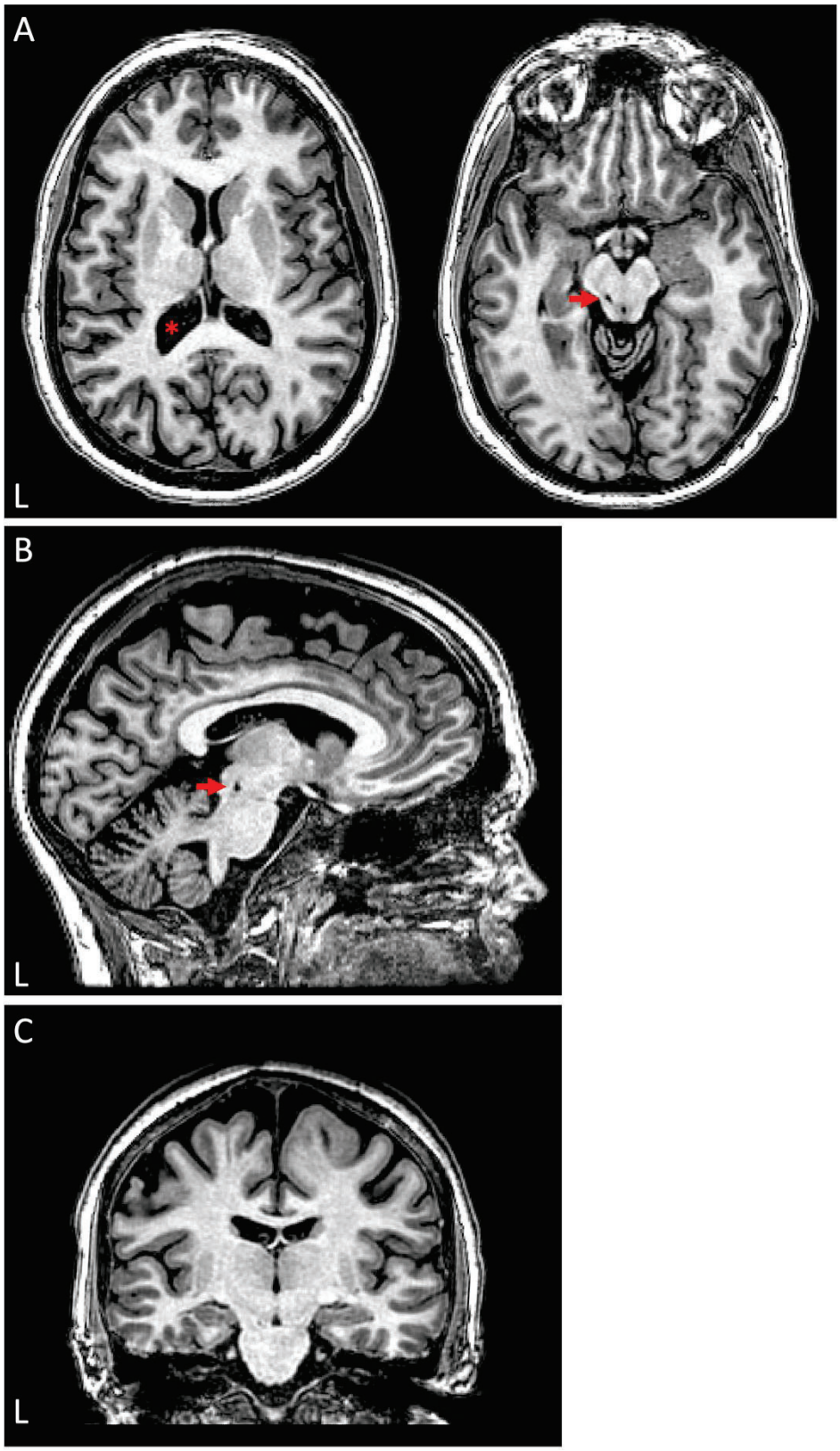
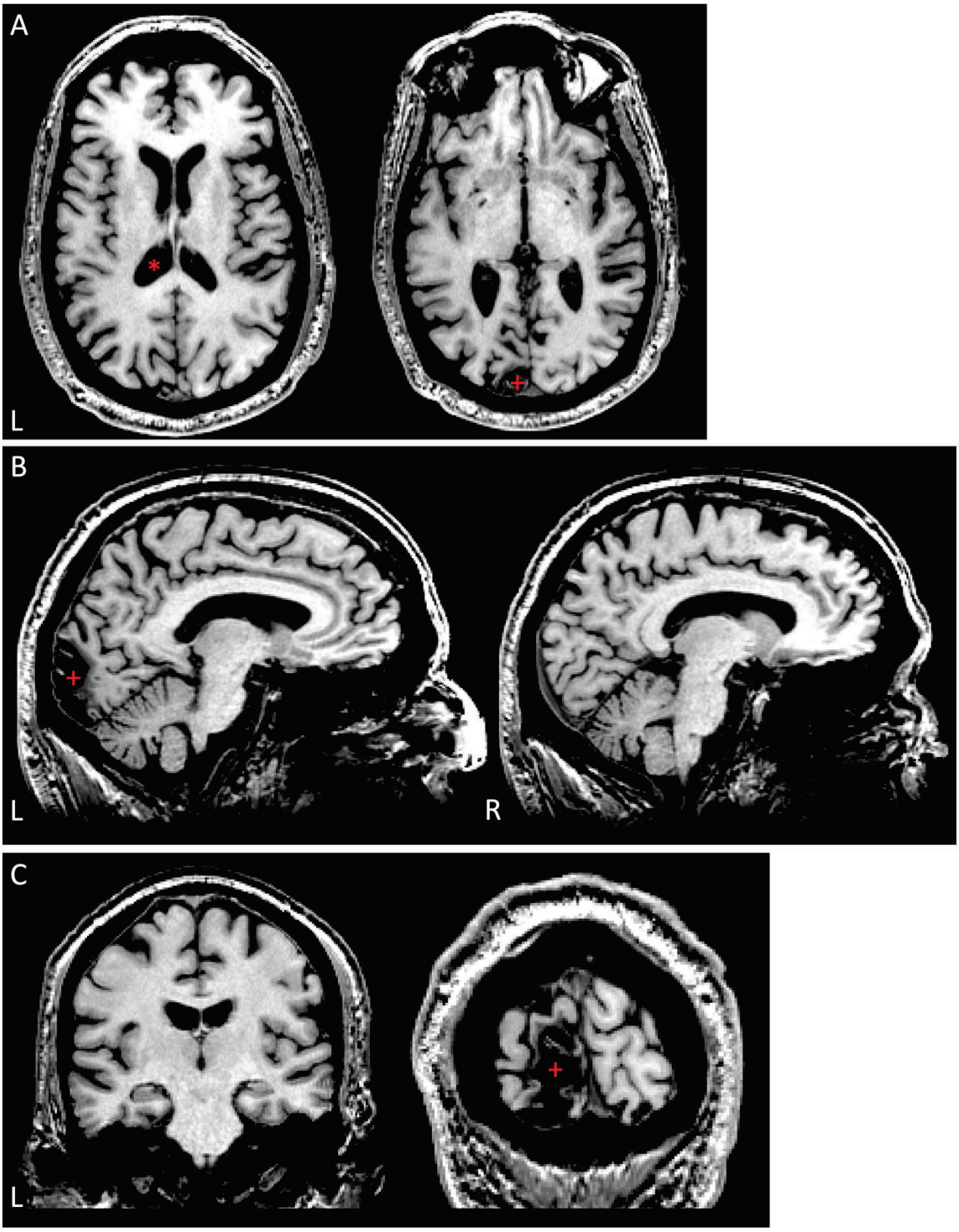
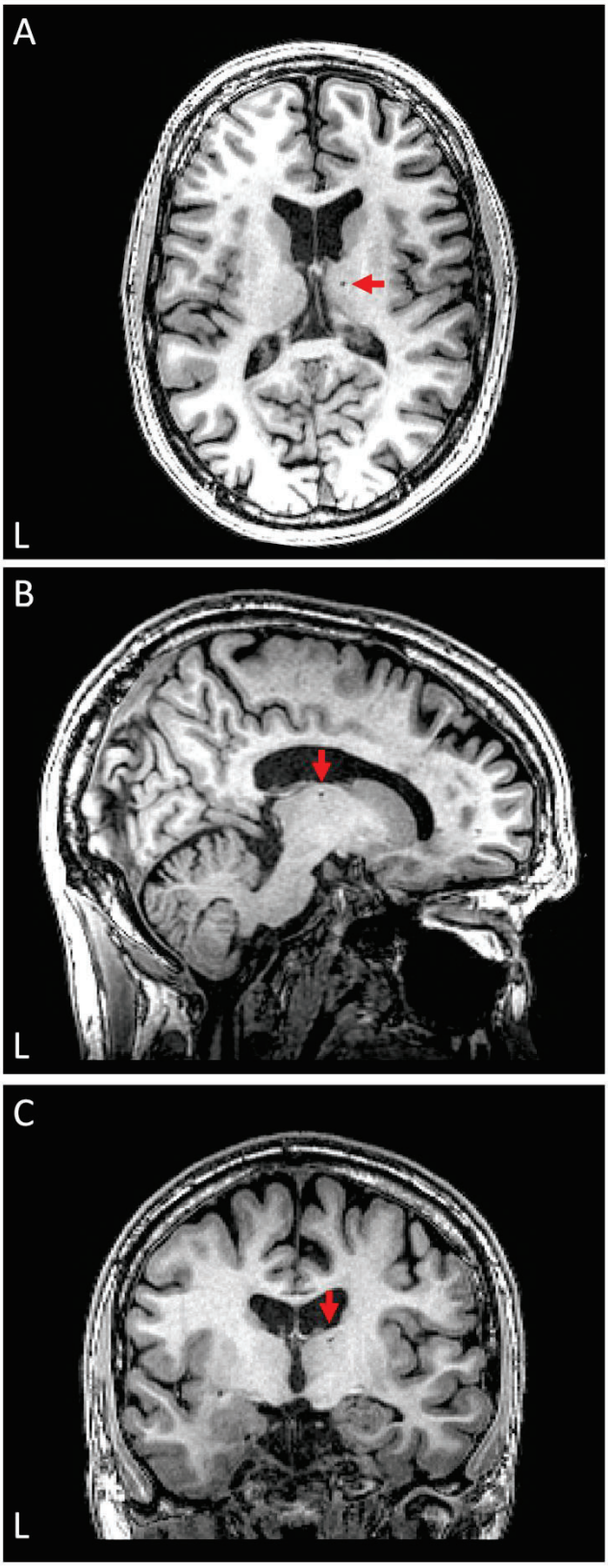


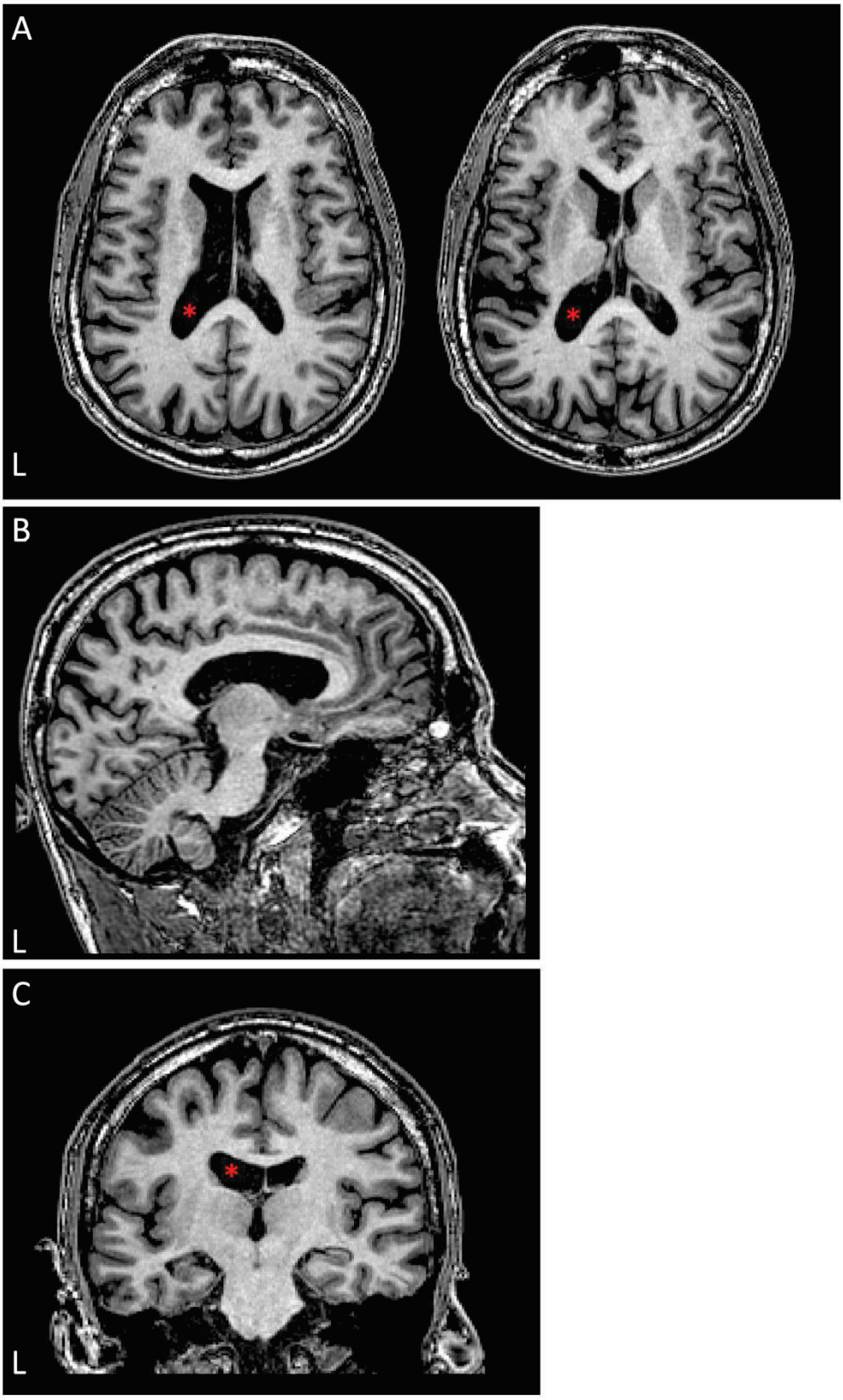
Supplementary Figure 1. P1 structural brain MRI. Representative (A) axial, (B) sagittal, and (C) coronal images from P1. Images illustrate increased left hemisphere atrophy near the temporal horn (asterisk) and residua from a small hemorrhage from diffuse axonal injury in the left midbrain (arrows). Coronal image illustrates generalized atrophy. L = Left.



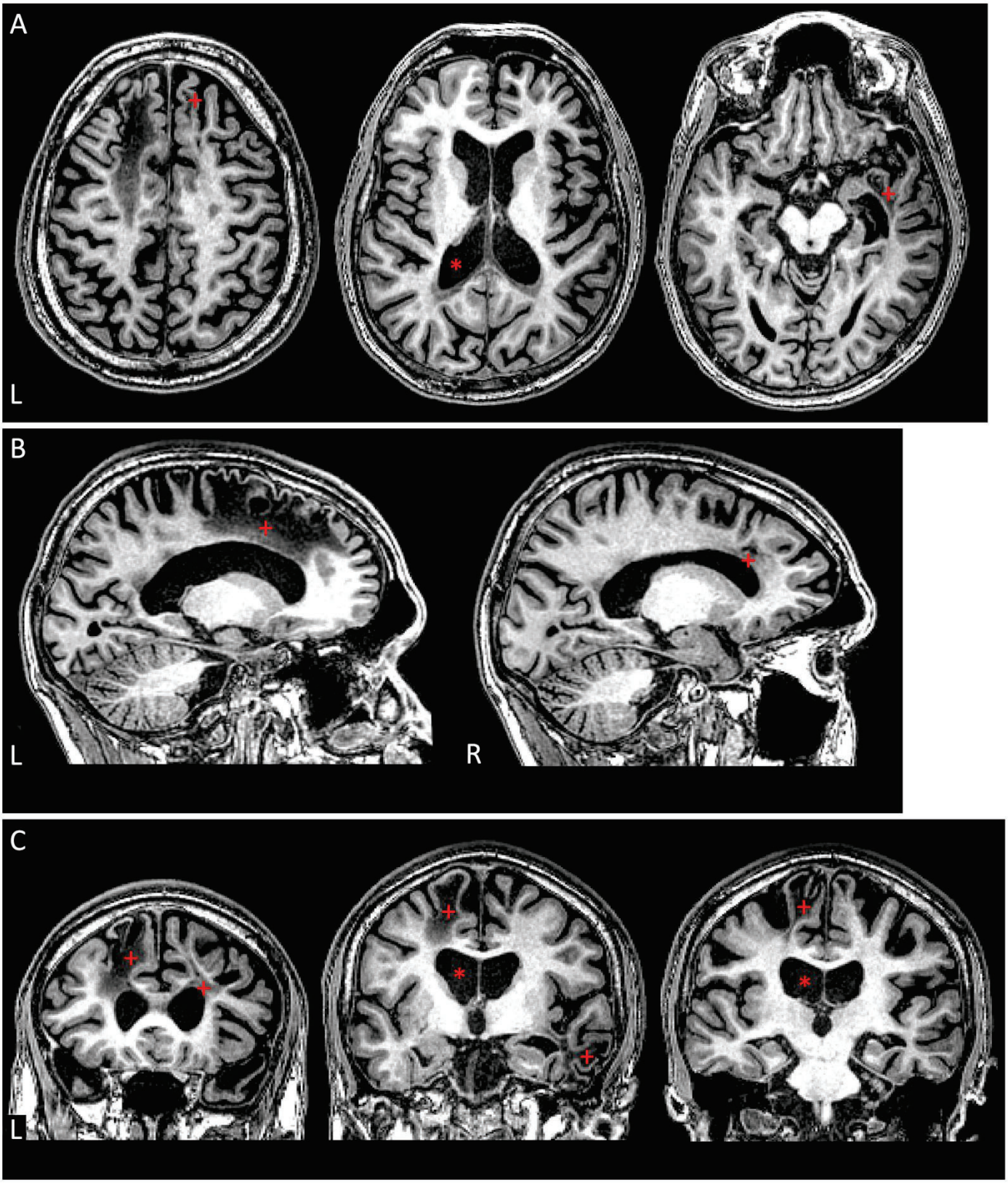
Supplementary Figure 2. P3 structural brain MRI. Representative (A) axial, (B) sagittal, and (C) coronal images from P3. Images illustrate increased left hemisphere atrophy near the temporal horn (asterisk) and a left visual cortical infarct (plus symbols). L = Left. R = Right.



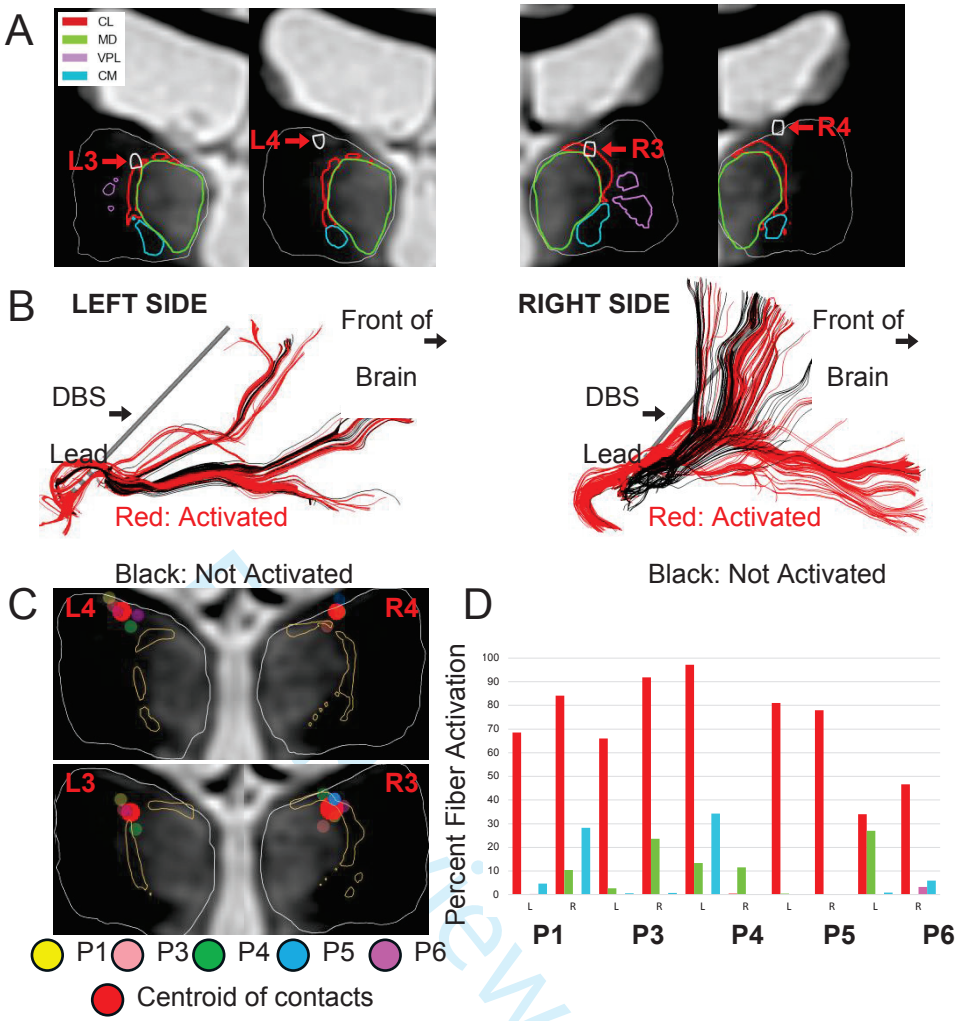
Supplementary Figure 3. P4 structural brain MRI. Representative (A) axial, (B) sagittal, and (C) coronal images from P4. Images illustrate right thalamic residua from a hemorrhage secondary to diffuse axonal injury (arrows). L = Left.



Supplementary Figure 4. P5 structural brain MRI. Representative (A) axial, (B) sagittal, and (C) coronal images from P5. Images illustrate dilated left ventricular system marking asymmetric hemispheric atrophy (asterisks). L = Left.



Supplementary Figure 5. P6 structural brain MRI. Representative (A) axial, (B) sagittal, and (C) coronal images from P6. Images illustrate severe bilateral fronto-temporal injuries (plus symbols) and left-greater-than-right dilation of the lateral ventricles (asterisks) secondary to the large medial frontal lesion. L = Left. R = Right.



Supplementary Figure 6. Activation of CL/DTTm fibers in a representative participant and group summary. Example placements of the therapeutic DBS contacts (left: L3, L4; right: R3, R4) are shown for participant P4 in **(A)** coronal slices in the participant's brain and in **(B)** P4's diffusion tensor imaging model showing that CL's connections to the prefrontal cortex via the DTTm were activated by DBS. **(C)** Therapeutic contacts for all participants are shown in coronal slices in a study-specific group brain. Light brown outline indicates CL. Small circles show the therapeutic contacts, color-coded for each participant, and rendered dim if out-of-plane or bright if in-plane. Bright red larger circles indicate the group centroid of all top or bottom contacts. **(D)** Histogram showing the percentage of activated fibers that were part of the targeted CL/DTTm fiber tract versus those of adjacent nuclei (MD, VPL, and CM) from each participant's diffusion tensor imaging model. Note that CL/DTTm was primarily activated over adjacent fibers in each participant. Modified with permission from Schiff ND, Giacino JT, Butson CR, *et al*. Thalamic deep brain stimulation in traumatic brain injury: a phase 1, randomized feasibility study. *Nat Med*. Dec 2023;29(12):3162-3174.

See Schiff *et al*. Extended Data Figures 3-7 for detailed localizations and histograms for each participant. CL = central lateral thalamic nucleus. DTTm = medial dorsal tegmental tract. MD = mediodorsal thalamic nucleus. VPL = ventral posterior lateral thalamic nucleus. CM = centromedian thalamic nucleus. DBS = deep brain stimulation. P = Participant. L = Left. R = Right.

Supplementary Table 1 Therapeutic DBS settings

Participant	Therapeutic Contacts*	Amplitude	Frequency (Hz)	Pulse Width (μs)
Left				
P1	L2-C, L3-C	3.4 V	160	90
P3	L2-C, L3-C	4.0 V	185	60
P4	L1-A, L2-C, L3-C	3.5 V	150	60
P5	L2-C, L3-C	3.1 – 3.2 V	150	60
P6	L2-C, L3-C	3 mA each contact	150	90
Right				
P1	R10-C, R11-C	3.3 V	160	60
P3	R10-C, R11-C	4.0 V	185	80
P4	R9-A, R10-C	3.5 V	150	60
P5	R10-C, R11-C	3.1 – 3.2 V	150	60
P6	R9-C, R10-C, R11-C	3 mA	150	90

*A = anode. C = cathode.

Reproduced with permission from Schiff ND, Giacino JT, Butson CR, *et al*. Thalamic deep brain stimulation in traumatic brain injury: a phase 1, randomized feasibility study. *Nat Med*. Dec 2023;29(12):3162-3174.

Supplementary Table 2 Participant-specific distant and recent time periods in the AM Recall task

Participant	Distant Time Period (Pre-injury) / Years Ago	Recent Time Period (Post-injury)
P1	High School / 25	6mo – 1yr ago
P3	Age 30's / 30	6mo – 1yr ago
P4	High School / 7	6mo – 1yr ago
P5	High School / 15	6mo – 1yr ago
P6	High School / 15	6mo – 1yr ago

Supplementary Table 3 Number of trials per response type in the AM Recall task

Participant	Baseline 1	Baseline 2	3 Months Treatment	6 Months Treatment	9 Months Treatment	13 Months Treatment
P1						
Timepoint Exceptions						
DBS on/off during testing	OFF		OFF			
Correct	21		34			
Omit	14		2			
Incorrect	1		0			
P3						
Timepoint Exceptions				5 months*	8 months*	
DBS on/off during testing	OFF			ON	ON	ON
Correct	9			9	10	13
Omit	11			10	9	9
Incorrect	16			17	17	14
P4						
Timepoint Exceptions						
DBS on/off during testing	OFF		ON	ON	OFF	
Correct	8		9	13	11	
Omit	15		15	19	16	
Incorrect	13		12	4	9	
P5						
Timepoint Exceptions				7 months*	10 months*	
DBS on/off during testing		OFF	ON	ON	ON	
Correct		17	18	20	19	
Omit		11	14	14	11	
Incorrect		8	4	2	6	
P6						
Timepoint Exceptions						
DBS on/off during testing	OFF	OFF	OFF	ON	OFF	
Correct	3	4	2	7	12	
Omit	0	17	5	23	20	
Incorrect	33	15	29	6	4	

Total number of trials per testing session = 36.
Correct refers to an AM recalled from the indicated memory time period within the 15-second time window. Incorrect refers to any other recollection that does not meet the criteria for a successful AM recall, such as a vague memory, semantic information, AM from a wrong memory time period, or a correct AM that appeared in a previous trial. Omit refers to nothing recalled during the 15-second time window.
*Small deviations in the 6-month and 9-month time points for P3 and P5.

Supplementary Table 4 Percent of distant/pre-injury recalled AMs in the AM Recall task

Participant	Baseline	Treatment
P1	23.8%	47.1%
P3	33.3%	46.9 %
P4	63.6%	58.8%
P5	52.9%	63.8%
P6	100%*	38.1%
Average	54.7%	50.9%
Paired t-test (*P*)		0.82

No significant difference in the frequency of memory time periods (distant/pre-injury or recent/post-injury) of successfully recalled AMs with CL/DTTm DBS treatment in the AM Recall task. Significance was assessed with a two-tailed paired t-test.
*Calculated from recalled AMs from two baseline timepoints.

Supplementary Table 5 Alertness and valence of recalled AMs in the AM Recall task

	Alertness			Valence		
Participant	**Baseline**	**Average Treatment**	**Percent Change**	**Baseline**	**Average Treatment**	**Percent Change**
P1	-	-	-	-	-	-
P3	4.6	3.9	-15.2	0.9	0.4	-55.6
P4	3.3	3.2	-3.0	0.3	0.1	-66.7
P5	3	3.3	10.0	0.0	0.3	-
P6	2.3*	3.1	34.8	1.7*	1.3	-23.5
Paired t-test (*P*)			0.83			0.34

No significant change in the alertness during testing or valence of successfully recalled AMs with CL/DTTm DBS treatment in the AM Recall task. Alertness was measured on a 5-point scale from 1 to 5. Valence was measured on a 6-point scale from -2 to 2. Significance was assessed with a two-tailed paired t-test.

*Average rating of recalled AMs from two baseline timepoints.

Supplementary Table 6 Vividness of AMs in the Autobiographical Interview task

Participant	Baseline	Average Treatment	Percent Change
P3	4.3	5	16.3
P4	3.5	3.5	0.0
P5	3.8	3.7	-2.6
P6	4.3*	2.8	-34.9
Average	4.0	3.8	-5.3
Paired t-test (*P*)			0.33

No significant change in the average vividness ratings ("how clearly can you visualize this event on a 1-6 scale?") of AMs in the Autobiographical Interview with CL/DTTm DBS treatment. Significance was assessed with a one-tailed paired t-test.
*Average score from AMs from two baseline timepoints.