Supplementary Materials

Methods

Immunohistochemistry for cholinergic neurons, amyloid-beta (Aβ) and phosphorylated tau (p-tau).

Paraffin-embedded tissue blocks of the NbM were cut at 20 µm (Leica Microtome) for 30 serial sections, and parahippocampal gyrus blocks were cut at 6 µm. All sections were mounted onto glass slides (Thermo Scientific, USA) for subsequent immunohistochemistry with Choline Acetyltransferase (ChAT), Aβ and p-tau pathology (see Table S2 for detailed information on antibodies).

From the 30 sections of the NbM blocks that were sliced, starting from the first section with visible anterior commissure and substantia innominata, three slides were taken at a distance of 200 um (e.g., every 1st, 11th and 21th, every 2nd, 12th and 22th, and every 3rd, 13th and 23rd slide) to account for variability within the NbM. These selected sections were deparaffinized and rehydrated in a graded series of xylene and ethanol. Subsequently, the sections underwent antigen retrieval in citrate buffer (pH 6.0) at a temperature of 95°C. Sections were first blocked for endogenous peroxidase by immersing the sections in 1% of H_2O_2 ,in tris-buffered saline (TBS, pH 7.4) for thirty minutes. Subsequently the sections were blocked with 0.1% Triton and 3% normal donkey serum. The NbM sections for ChAT and Aβ double staining underwent an additional second antigen retrieval step using 80% formic acid for five minutes in the fume hood before the first block. NbM sections were incubated with primary antibodies, ChAT, ChAT/p-tau (AT8) and ChAT/Aβ (6F/3D), whereas parahippocampal gyrus sections were incubated with p-tau (AT8) and Aβ (4G8). The incubated primary antibodies were diluted in TBS for two nights at 4°C, followed by Immpress (Vector, California, United State) detection. Finally, ChAT was visualized with 3,3'-Diaminobenzidine (DAB, Dako, Glostrup, Denmark) imidazole (50 mg DAB, 350 mg Imidazole and 30 uL of H_2O_2 per 100 mL of Tris-HCl 30mM, pH 7.6), AT8, 6F/3D and 4G8 were visualized using liquid permanent red followed by counter-staining with haematoxylin, and mounting with Entellan.

Supplementary Table 1. List of automated anatomical labeling (AAL) regions in each lobe.

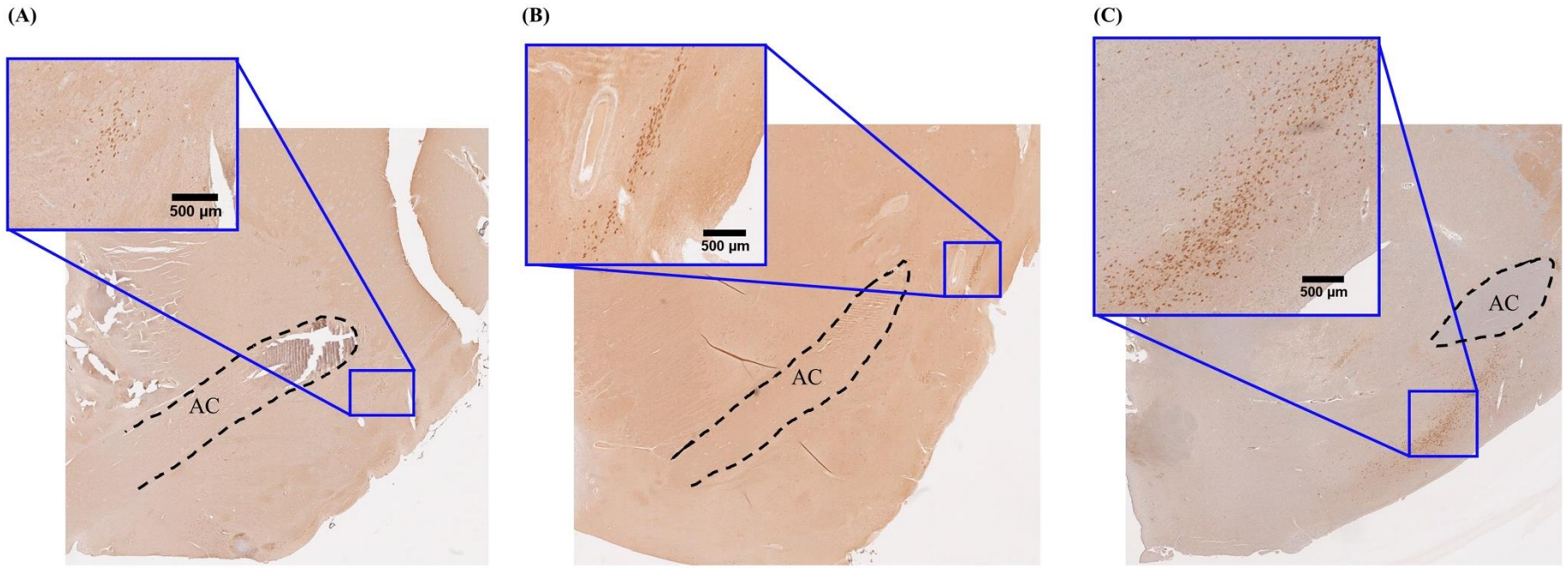
Frontal lobe	Temporal lobe	Parietal lobe	Occipital lobe	Cingulum	Insula
Inferior frontal gyrus, pars orbitalis	Heschl's gyrus	Postcentral gyrus	Superior occipital gyrus	Anterior cingulate & paracingulate gyri	
Superior frontal gyrus, dorsolateral	Superior temporal gyrus	Superior parietal gyrus	Middle occipital gyrus	Middle cingulate & paracingulate gyri	
Middle frontal gyrus	Middle temporal gyrus	Inferior parietal gyrus, excluding supramarginal and angular gyri	Inferior occipital gyrus	Posterior cingulate gyrus	
Inferior frontal gyrus, opercular part	Inferior temporal gyrus	SupraMarginal gyrus	Calcarine fissure and surrounding cortex		
Inferior frontal gyrus, triangular part	Temporal pole: superior temporal gyrus	Angular gyrus	Cuneus		
Superior frontal gyrus, medial	Temporal pole: middle temporal gyrus	Precuneus	Lingual gyrus		
Supplementary motor area	ParaHippocampal gyrus				
Precentral gyrus	Hippocampus				

Note: The AAL regions in each lobe applied to both left and right hemisphere[1]. The orbital part of superior and middle frontal lobe, rectus, olfactory cortex, paracentral lobule and rolandic operum in the frontal lobe, along with fusiform in the temporal lobe were excluded due to their susceptibility to DWI distortions.

Supplementary Table 2. Information on primary antibodies.

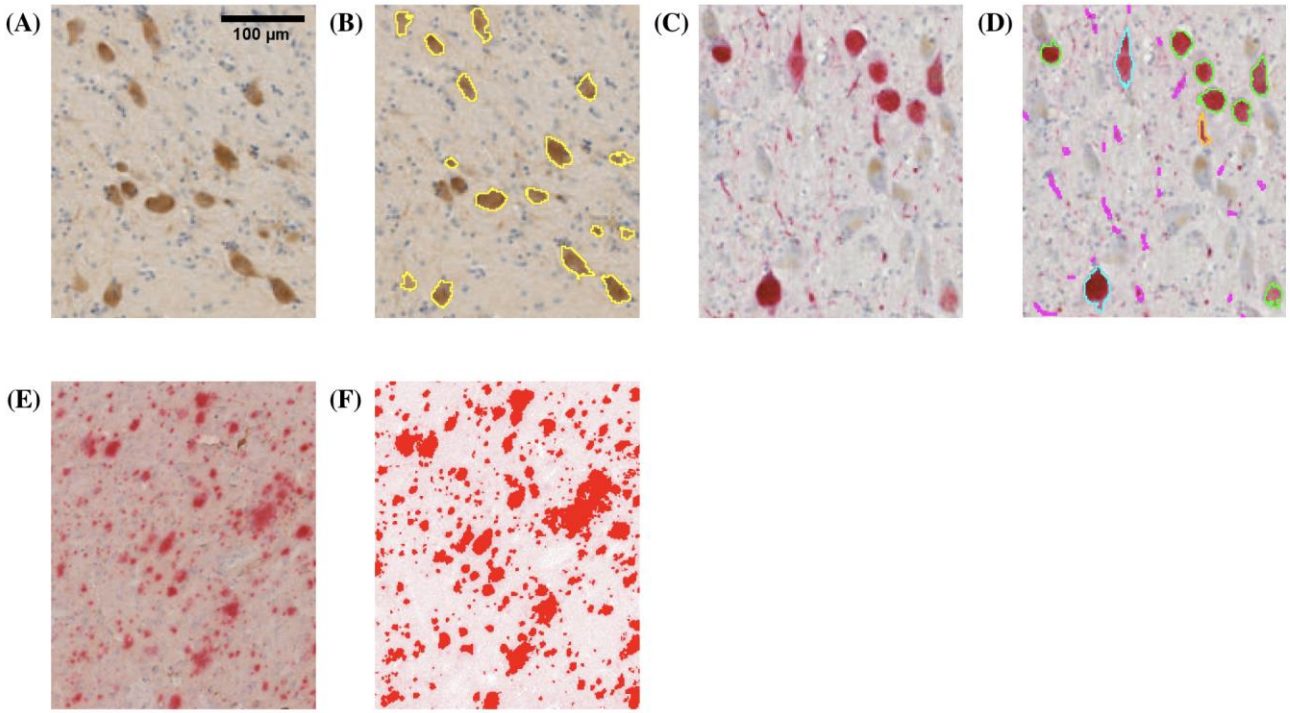
Antibody	Antigen	Species	Origin details	Dilution	Incubation time	Antigen retrieval	Detection method
ChAT	ChAT	Goat IgG	Chemicon, Darmstadt, Germany	1:200	4°C o.n.	Autoclave (pH 6.0, 10 min)	Impress
p-tau, clone AT8	Tau phosphorylated at Ser202 and Thr205	Mouse IgG1	ThermoFisher, Pittsburgh, USA	1:2000	4°C o.n.	Autoclave (pH 6.0, 10 min)	Impress for double staining and EnVision for single staining
Aβ, clone 6F/3D	Aβ amino acid sequence 8-17 and additional C-terminal cysteine coupled to keyhole limpet hemocyanin	Mouse IgG2b	Dako, Glostrup, Denmark	1:2000	4°C o.n.	Autoclave (pH 6.0, 10 min)	Impress
Aβ, clone 4G8	Aβ amino acid sequence 17-24	Mouse IgG2b	BioLegend, San Diego, USA	1:8000	4°C o.n.	Autoclave Citrate buffer (pH 6.0, 10 minutes)	EnVision

Abbreviations: ChAT=choline acetyltransferase, p-tau=phosphorylated tau, Aβ=amyloid-beta, o.n.=overnight, pH=potential of hydrogen.



Supplementary Figure 1. Subsections of the NbM in three control donors. The pre-anterior NbM of a control (78 year-old) showing ChAT cell reactivity at the lateral aspect and underneath the anterior commissure (AC, black dotted line) shown in (A). Anteroromediate NbM of a control (59 year-old) showing ChAT reactivity in a cluster at the lateral side of AC (black dotted line) shown in (B). Anterio-intermediate NbM of a control (71 year-old) showing ChAT reactivity in a cluster underneath the AC (black dotted line) shown in (C). Abbreviations: µm=micron. AC=anterior commissure.

Supplementary Figure 2. Selection of ChAT reactivity and pathology using automated ImageJ script.



ChAT reactivity shown in brown ellipsoids in (A) were selected and counted for ChAT count, as shown in the yellow outlines in (B). p-tau positivity shown in red in (C) were selected in turquoise, green, orange and magenta as shown in (D) and further measured as percentage surface area for p-tau load. Aβ plaques positivity was measured as percentage surface area for Aβ load, as shown in (E) and (F). The scale bar in (A) applies to all images. Abbreviation: µm=micron.

Supplementary Table 3. Detailed donor's information

Clinical and cognitive characteristics										Radiological characteristics					Pathological and genetic characteristics				
Case #	**Group**	**AD subtype**	**Gender**	**Age †**	**Disease duration**	**CDR**	**Dutch Education (level)[2]**	**Cause †**	**PMD (hr:min)**	**NBV(L)**	**NWMV (L)**	**NGMW (L)**	**NbM_R (mm^3)**	**NbM_L (mm^3)**	**Thal phase[3]**	**Braak NFT stage[4]**	**ABC[5]**	***APOE***	**CSF markers (ng/L)***
1	AD	Amnestic	M	60	2	2	7	Euthanasia	8:35	1.551	0.787	0.763	152.36	156.05	5	6	A3 B3 C3	33	$A\beta_{1-42}$: 628 / total tau: 830 / p-tau-181: 102
2	AD	Amnestic	M	68	6	3	7	Euthanasia	9:15	1.429	0.711	0.718	123.39	118.59	5	5	A3 B3 C3	33	NA
3	AD	Amnestic	M	69	11	3	6	Respiratory failure due to pulmonary infection	11:55	1.664	0.971	0.693	86.09	87.30	5	5	A3 B3 C3	34	NA
4	AD	Non-amnestic	M	65	7	2	6	Cardiac arrest	7:50	1.505	0.732	0.774	113.37	125.23	4	5	A3 B3 C3	33	NA
5	AD	Non-amnestic	M	59	NA	2	NA	Euthanasia	6:30	1.581	0.777	0.804	74.34	67.33	5	5	A3 B3 C3	44	NA
6	AD	Non-amnestic	F	78	4	3	5	Cachexia and dehyrdation	7:30	1.359	0.698	0.661	127.08	111.95	5	5	A3 B3 C3	34	NA
7	AD	Amnestic	M	84	13	1	5	Euthanasia	5:53	1.434	0.711	0.723	98.28	138.37	5	4	A3 B2 C2	34	NA
8	AD	Non-amnestic	M	62	8	3	6	Palliative sedation	8:15	1.155	0.623	0.532	122.14	118.40	5	6	A3 B3 C3	34	NA
9	AD	Non-amnestic	M	37	5	1	6	Euthanasia	11:11	1.510	0.779	0.732	142.03	103.79	5	6	A3 B3 C3	23	Aβ 1-42 (liquor): 349 / total tau 879 / p-tau181: 132
10	AD	Amnestic	F	80	7	1	4	Euthanasia	7:05	1.435	0.725	0.709	164.65	157.99	5	4	A3 B2 C2	33	NA
11	AD	Non-amnestic	M	67	9	3	7	Cachexia and dehyrdation	6:35	1.254	0.671	0.583	120.60	105.38	5	6	A3 B3 C3	34	NA
12	AD	Non-amnestic	M	77	4	1	6	Euthanasia	7:00	1.542	0.769	0.774	169.63	180.32	5	4	A3 B2 C2	34	Aβ1-42: 676 / total-tau: 662 / p-tau181: 85
13	AD	Amnestic	M	53	5	2	7	Palliative sedation	9:00	1.264	0.668	0.596	79.11	81.11	5	6	A3 B3 C3	33	Aβ1-42: 526 / total-tau: 603 / p-tau181: 84
14	AD	Amnestic	M	64	12	3	7	Cachexia and dehyrdation	7:55	1.251	0.683	0.568	65.70	59.72	5	6	A3 B3 C3	34	NA
15	AD	Non-amnestic	M	59	3	3	7	Dysphagia	5:35	1.321	0.676	0.645	69.42	64.08	5	5	A3 B3 C3	34	NA
16	AD	Non-amnestic	M	73	10	3	4	Cachexia and dehyrdation	7:20	1.366	0.873	0.493	34.67	40.44	5	5	A3 B3 C3	34	Aβ1-42: 514 / total-tau 318 / p-tau-181 44
17	AD	Amnestic	M	84	23	1	NA	Euthanasia	8:35	1.254	0.642	0.612	70.99	64.97	3	4	A2 B2 C2	33	NA

18	AD	Amnestic	M	77	10	NA	2	Suicide by drugs	9:05	1.400	0.728	0.672	101.43	75.39	5	6	A3 B3 C3	44	Aβ1-42: 389 / total-tau: 455 / p-tau-181: 65
19	AD	Amnestic	M	65	7	NA	5	Euthanasia	9:20	1.464	0.697	0.767	97.18	79.96	5	5	A3 B3 C3	34	NA
20	Control	NA	M	68	NA	NA	NA	Euthanasia	8:30	1.609	0.758	0.851	153.09	161.08	2	1	A1 B1 C0	34	NA
21	Control	NA	F	69	NA	NA	NA	Pulmonary embolism	12:40	1.375	0.671	0.704	182.56	244.86	1	1	A1 B1 C0	33	NA
22	Control	NA	M	59	NA	NA	NA	Euthanasia	8:00	1.494	0.730	0.765	151.78	154.37	2	1	A1 B1 C0	34	NA
23	Control	NA	F	78	NA	NA	NA	Unknown	5:25	1.516	0.738	0.777	164.08	199.24	1	1	A1 B1 C0	33	NA
24	Control	NA	F	59	NA	NA	NA	Euthanasia	8:10	1.460	0.677	0.783	179.02	215.40	0	0	A0 B0 C0	33	NA
25	Control	NA	F	71	NA	NA	NA	Lung carcinoma	6:40	1.477	0.708	0.769	178.95	141.12	2	1	A1 B1 C0	34	NA
26	Control	NA	M	72	NA	NA	NA	Hypovolemic shock	8:23	1.424	0.683	0.742	155.62	140.06	1	1	A1 B1 C0	NA	NA
27	Control	NA	F	87	NA	NA	NA	Urinary tract infection	8:35	1.367	0.652	0.715	131.62	145.92	0	1	A0 B1 C0	NA	NA
28	Control	NA	M	74	NA	NA	NA	Metastatic neuroendocrine tumor colon	16:00	1.516	0.715	0.801	141.83	128.06	2	0	A1 B0 C0	NA	NA

Abbreviations: AD= Alzheimer's disease, PMD=post-mortem delay, NBV=normalized brain volume, NWMV=normalized white matter volume, NGMV=normalized grey matter volume, L=liter, F/M=female/male, NFT=neurofibrillary tangle, CDR=clinical dementia rating, Aβ=amyloid-beta, NA=not applicable/available. *CSF (ng/L) $A\beta_{1\text{-}42}$ reference > 640 / total tau reference <375 / p-tau-181 reference <52, taken on average 25.7 months before death (range from 3 -53 months).

Supplementary Table 4. NbM volume difference between ante-mortem and post-mortem scans.

AD cases	Scans interval (year)	Ante-mortem volume (mm^3)	Post-mortem volume (mm^3)	Volume difference* (mm^3)
Case 9	<1	227,04	245,81	-18,78 (-8%)
Case 12	<1	332,34	349,95	-17,61 (-5%)
Case 14	10	230,45	125,42	105,03 (46%)
Case 17	8	194,64	135,97	58,67 (30%)
Case 19	<1	186,35	177,14	9,21 (5%)

*Negative volume difference of around ~3-7% could occur due to agonal effects and post-mortem swelling of white matter, as previously described.[6] Abbreviations: AD=Alzheimer's disease

Supplementary Table 5. Correlations between NbM volumes and the integrity of NbM and cortical tracts.

	Left hemisphere NbM volume	Right hemisphere NbM volume
NbM FA	r=0.22, p= 0.299	r=0.25, p= 0.236
Cingulum tract FA	r=0.10, p= 0.884	r=0.19, p=0.526
Frontal tract FA	r= 0.05, p= 0.884	r= 0.24, p= 0.402
Temporal tract FA	r= 0.03, p= 0.884	r= 0.52, p= 0.048*
Parietal tract FA	r= 0.20, p= 0.884	r= 0.25, p= 0.402
Occipital tract FA	r= -0.17, p= 0.884	r= 0.08, p= 0.692
Insula tract FA	r= 0.38, p= 0.564	r= 0.27, p= 0.402
NbM MD	r= -0.17, p= 0.421	r= -0.60, p= 0.001
Cingulum tract MD	r= -0.17, p=0.643	r= -0.39, p= 0.102
Frontal tract MD	r= -0.23, p=0.643	r= -0.46, p= 0.023^
Temporal tract MD	r= 0.01, p= 0.947	r= -0.58, p=0.018*
Parietal tract MD	r= 0.18, p=0.643	r= -0.43, p= 0.086
Occipital tract MD	r= 0.16, p=0.643	r= -0.40, p= 0.086
Insula tract MD	r= -0.30, p=0.643	r= -0.35, p= 0.102

Correlations were conducted using partial correlation with age and PMD as covariates. Abbreviations: FA=fractional anisotropy, MD= mean diffusivity, NbM=nucleus basalis of Meynert, r=rho. *p<0.05, FDR-corrected. ^p<0.05, uncorrected.

Supplementary Table 6. Mean and standard deviation of tract FA and MD to cortical lobes in AD and controls.

	AD (n=19)	Controls (n=9)	p-values
Right hemisphere tract FA			
Cingulum	0.464±0.100	0.460±0.080	ns
Frontal lobe	0.355±0.056	0.459±0.097	ns
Temporal lobe	0.371±0.059	0.480±0.070	ns
Parietal lobe	0.464±0.036	0.358±0.078	ns
Occipital lobe	0.483±0.051	0.342±0.052	ns
Insula	0.326±0.073	0.525±0.103	ns
Right hemisphere tract MD			
Cingulum	0.457±0.224	0.471±0.126	ns
Frontal lobe	0.640±0.164	0.459±0.097	ns
Temporal lobe	0.583±0.156	0.480±0.070	ns
Parietal lobe	0.425±0.151	0.358±0.078	ns
Occipital lobe	0.400±0.103	0.342±0.052	ns
Insula	0.709±0.229	0.525±0.103	ns

	AD (n=18)	Controls (n=9)	p-values
Left hemisphere tract FA			
Cingulum	0.517±0.097	0.470±0.053	ns
Frontal lobe	0.375±0.086	0.381±0.082	ns
Temporal lobe	0.370±0.067	0.381±0.046	ns
Parietal lobe	0.498±0.045	0.515±0.019	ns
Occipital lobe	0.516±0.047	0.505±0.029	ns
Insula	0.313±0.076	0.304±0.050	ns
Left hemisphere tract MD			
Cingulum	0.385±0.079	0.396±0.126	ns
Frontal lobe	0.666±0.337	0.456±0.139	ns
Temporal lobe	0.680±0.291	0.524±0.083	ns
Parietal lobe	0.360±0.096	0.337±0.062	ns
Occipital lobe	0.359±0.071	0.334±0.070	ns
Insula	0.746±0.289	0.563±0.158	ns

Group comparisons between AD and controls were conducted using GLM and corrected for multiple comparisons. MD reported in MD (10^{-3} mm^2/s). Abbreviations: AD=Alzheimer's disease, FA=fractional anisotropy, MD=mean diffusivity, ns=not significant.

Supplementary Table 7. Means and standard deviations of regional histopathological measures

		AD (n=15)	Controls (n=9)	p-values
NbM	**ChAT cell density**	9.92±8.45	17.31±27.58	p=0.434
	p-tau load (%area)	0.96±1.29	0.04±0.04	p=0.0002***
	Aβ load (%area)	2.10±1.75	0.20±0.23	p=0.002**
		AD (n=15)	**Controls (n=6)**	**p-values**
Parahippocampal gyrus	**p-tau load (%area)**	52.16±25.46	0.38±0.47	p=0.096
	Aβ load (%area)	5.84±4.05	1.72±1.96	p=0.0004***

Group comparisons between AD and controls were conducted using GLM. Abbreviations: AD=Alzheimer's disease, ChAT=choline acetyltransferase, p-tau=phosphorylated-tau, Aβ=amyloid-beta. **p<0.01. ***p<0.001.

Supplementary Table 8. Correlations between MRI-derived NbM volume and integrity with histopathological measures.

	NbM volume	NbM FA	NbM MD
ChAT cell density	r=0.37 p=0.112	r=0.27 p=0.246	r=-0.49 p=0.028*
Aβ load (%area)	r=-0.20 P=0.374	r=0,09 p=0.715	r=0.04 p=0.882
p-tau load (%area)	r=-0.18 p=0.437	r=0,17 p=0.464	r=-0.12 p=0.613

Pearson correlation was used to assess the correlations with age, PMD and gender as covariates. Abbreviations: NbM=nucleus basalis of Meynert, r=rho, FA=fractional anisotropy, MD= mean diffusivity, ChAT=cholinergic acetyltransferase, p-tau=phosphorylated-tau, Aβ=amyloid-beta. *p<0.05.

Supplementary Table 9. Associations between NbM tract integrity and histopathological measures.

	Tract FA					
	Cingulum	**Frontal lobe**	**Temporal lobe**	**Parietal lobe**	**Occipital lobe**	**Insula**
ChAT cell density	p=0.896	p=0.896	p=0.896	p=0.896	p=0.896	p=0.896
Aβ load (%area)	p=0.878	p=0.878	p=0.878	p=0.878	p=0.878	p=0.878
p-tau load (%area)	p=0.863	p=0.824	p=0.824	p=0.863	p=0.863	p=0.824
	Tract MD					
	Cingulum	**Frontal lobe**	**Temporal lobe**	**Parietal lobe**	**Occipital lobe**	**Insula**
ChAT cell density	p=0.272	p=0.189	**r= -0.70, p=0.024***	r= -0.75, p=0.057	p=0.142	p=0.369
Aβ load (%area)	p=0.501	p=0.811	p=0.811	p=0.722	p=0.162	p=0.811
p-tau load (%area)	p=0.958	p=0.870	p=0.920	p=0.870	p=0.870	p=0.920

Abbreviations: FA=fractional anisotropy, MD=mean diffusivity, ChAT=choline acetyltransferase, Aβ= Amyloid-β, p-tau=phosphorylated-tau
*p<0.05, FDR-corrected.

Supplementary Table 10. Donor characteristics of amnestic and non-amnestic AD.

	Controls	Amnestic AD	Non-amnestic AD
		Clinical and cognitive characteristics	
N (phenotype)	9	10	9 (6 B/D, 3 PCA)
Gender F/M (%M)	4/5 (56%)	2/8 (80%)*	2/7 (20%)*
Age at death years, mean ± SD	70.8 ± 8.8	70.4 ± 10.5	65.4 ± 12.4
Disease duration years, mean ± SD	-	7.5 ± 3.8	6.9 ± 3.1
Dutch education (level) N 2/3/4/5/6/7	NA	9 1/0/1/2/1/4	8 0/0/1/1/4/2
CDR N 0/1/2/3	NA	8 0/3/2/3	9 0/2/2/5
PMD, mean (hr:min) ± SD (hr)	9:10 ± 3	8:19 ± 2	7:13 ± 2
		Radiological characteristics	
NBV (L) mean ± SD	1.46 ± 0.07	1.42 ± 0.13	1.40 ± 0.14
NGMV (L) mean ± SD	0.70 ± 0.04	0.68 ± 0.07**	0.67 ± 0.11*
NWMV (L) mean ± SD	0.79 ± 0.04	0.73 ± 0.09	0.73 ± 0.08
		Pathological and genetic characteristics	
Thal phase N	9	10***	9***
0/1/2/3/4/5	2/3/3/1/0/0	0/0/0/1/0/9	0/0/0/0/1/8

Braak NFT stage N	9	10***	9***
0/1/2/3/4/5/6	1/7/1/0/0/0/0	0/0/0/0/3/3/4	0/0/0/0/1/5/3
ABC score N	9	10**	9**
A 0/1/2/3	2/6/1/0	0/0/0/10	0/0/0/9
B 0/1/2/3	1/8/0/0	0/0/3/7	0/0/1/8
C 0/1/2/3	9/0/0/0	0/0/3/7	0/0/1/8
APOE genotype N	8	10	9
ε4 non-carrier	5 (56%)	5 (50%)	2 (22%)
ε4 heterozygous	3 (44%)	4 (40%)	6 (67%)
ε4 homozygous	0	1 (10%)	1 (11%)

Abbreviations: B/D=behavioral/dysexecutive variant, PCA=posterior cortical atrophy, F/M= female/male ratio, CDR=clinical dementia rating, SD=standard deviation, N=sample size, L=liter, NBV=normalized brain volume, NWM=normalized white matter volume, NGMV=normalized grey matter volume, NFT=neurofibrillary tangles, NA=not available. *p<0.05, compared to controls. **p<0.01, compared to controls. ***p=0.001, compared to controls.

Supplementary Table 11. Group comparisons of MRI and histopathological measures between amnestic and non-amnestic AD.

	Controls (n=9)	Amnestic AD (n=10)	Non-amnestic AD (n=9)	Each subtype compares to controls and p-values	Compare between subtypes and p-values
NbM volumes					
Right	159.8±17.7	103.9±33.3	108.4±41.4	Controls>Amnestic, p=0.018^	ns
Left	170.0±40.2	101.9±37.5	109.6±36.3	Controls>Amnestic, p=0.029^	ns
NbM FA					
Right	0.443±0.079	0.437±0.102	0.400±0.106	ns	ns
Left	0.448±0.131	0.399±0.132	0.444±0.097	ns	ns
NbM MD					
Right	0.407±0.048	0.437±0.102	0.463±0.144	ns	ns
Left	0.389±0.090	0.399±0.132	0.384±0.041	ns	ns
Right hemisphere tract FA					
Cingulum	0.460±0.080	0.488±0.049	0.440±0.133	ns	ns
Frontal lobe	0.459±0.097	0.355±0.054	0.356±0.062	ns	ns
Temporal lobe	0.480±0.070	0.397±0.052	0.343±0.056	Amnestic>Controls, p=0.063^	Amnestic>Non-amnestic, p=0.036*
Parietal lobe	0.358±0.078	0.452±0.033	0.482±0.035	ns	ns
Occipital lobe	0.342±0.052	0.483±0.029	0.483±0.075	ns	ns
Insula	0.525±0.103	0.360±0.077	0.288±0.049	ns	Amnestic>Non-amnestic, p=0.026^
Right hemisphere tract MD					
Cingulum	0.471±0.126	0.491±0.294	0.423±0.135	ns	ns
Frontal lobe	0.459±0.097	0.666±0.149	0.613±0.183	ns	ns
Temporal lobe	0.480±0.070	0.537±0.155	0.634±0.150	ns	ns
Parietal lobe	0.358±0.078	0.463±0.182	0.372±0.075	ns	ns
Occipital lobe	0.342±0.052	0.422±0.109	0.369±0.091	ns	ns
Insula	0.525±0.103	0.621±0.184	0.807±0.243	ns	Amnestic>Non-amnestic, p=0.038^

	Controls (n=9)	Amnestic AD (n=8)	Non-amnestic AD (n=7)		
Histopathological load					
ChAT cell density	17.31±27.58	9.73±6.62	10.14±10.75	ns	ns
Tau load (%area)	0.04±0.04	1.26±1.69	0.63±0.58	Amnestic>Controls, p=0.001**; Non-amnestic>Controls, p=0.018*	ns
Aβ load (%area)	0.20±0.23	2.60±1.92	1.53±1.46	Amnestic>Controls, p=0.006**	ns

Group comparisons were performed with general linear model with age and post-mortem delay as covariates. MD reported in MD (10^{-3} mm^2/s). Abbreviations: AD=Alzheimer's disease, NbM=nucleus basalis of Meynert, FA=fractional anisotropy, MD=mean diffusivity, ChAT=cholinergic acetyltransferase, p-tau=phosphorylated-tau, Aβ=amyloid-beta, ns=not significant. *p<0.05, FDR-corrected. **p≤0.001, FDR-corrected. ^p<0.05, uncorrected.

Supplementary Table 12. Associations between tract integrity in cortical lobes and histopathological measures in amnestic and non-amnestic AD.

MRI-path association in amnestic AD						
	Tract FA					
	Cingulum	**Frontal lobe**	**Temporal lobe**	**Parietal lobe**	**Occipital lobe**	**Insula**
ChAT cell density	p=0.520	p=0.628	p=0.520	p=0.520	p=0.628	p=0.628
Aβ load (%area)	p=0.879	p=0.330	p=0.689	p=0.879	p=0.650	p=0.650
p-tau load (%area)	p=0.769	p=0.769	r= 0.89, p=0.018*	p=0.462	p=0.769	p=0.057
	Tract MD					
	Cingulum	**Frontal lobe**	**Temporal lobe**	**Parietal lobe**	**Occipital lobe**	**Insula**
ChAT cell density	p=0.075	r= -0.89, p=0.024*	r= -0.89, p=0.018*	r= -0.79, p=0.040*	p=0.241	p=0.560
Aβ load (%area)	p=0.977	p=0.977	p=0.977	p=0.977	p=0.977	p=0.977
p-tau load (%area)	p=0.923	p=0.923	p=0.923	p=0.923	p=0.923	p=0.534
MRI-path association in non-amnestic AD						
	Tract FA					
	Cingulum	**Frontal lobe**	**Temporal lobe**	**Parietal lobe**	**Occipital lobe**	**Insula**
ChAT cell density	p=0.786	p=0.786	p=0.839	p=0.839	p=0.786	p=0.839
Aβ load (%area)	p=0.844	p=0.844	p=0.844	p=0.844	p=0.844	p=0.844
p-tau load (%area)	p=0.827	p=0.827	p=0.827	p=0.827	p=0.827	p=0.570
	Tract MD					
	Cingulum	**Frontal lobe**	**Temporal lobe**	**Parietal lobe**	**Occipital lobe**	**Insula**
ChAT cell density	p=0.955	p=0.955	p=0.955	p=0.955	p=0.955	p=0.955
Aβ load (%area)	p=0.612	p=0.634	p=0.634	p=0.612	p=0.612	p=0.634
p-tau load (%area)	p=0.864	p=0.864	p=0.916	p=0.864	p=0.864	p=0.864

Abbreviations: AD=Alzheimer’s disease, FA=fractional anisotropy, MD=mean diffusivity, ChAT=cholinergic acetyltransferase, p-tau=phosphorylated-tau, Aβ=amyloid-beta. *$p<0.05$, FDR-corrected.

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