**Table S1.** Patient demographic information with unified Lewy body (LB) staging, Mini-Mental State Examination (MMSE) scores, Braak staging, RT-QuIC PAR values, and number of replicates that turned positive in the RT-QuIC assay for SMG tissues used from the BSHRI. Samples lacking enough LB pathology to confirm as PD were classified under ILBD (M: male; F: female; PMI: post-mortem interval in hours; PAR: protein aggregation rate). (Unified LB stages 0: No LB; I: Olfactory Bulb only; IIa: Brainstem Predominant; IIb: Limbic Predominant; III: Brainstem/Limbic; IV: Neocortical).

| S. No | Case ID | Gender | Age | PMI | Unified LB Stage | RT-QuIC PAR value | Number of positive replicates (out of 4) | MMSE score | UPDRS Score | Braak stages |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 13-49 | F | 75 | 2.5 | 0 | 0.05 | 3 | 28 | 5 | I |
| 2 | 10-63 | M | 79 | 3 | 0 | 0 | 0 | 29 | 3 | III |
| 3 | 10-70 | M | 74 | 3.25 | 0 | 0 | 0 | NA | NA | II |
| 4 | 9-57 | M | 80 | 3.5 | 0 | 0 | 0 | NA | NA | II |
| 5 | 10-22 | F | 59 | 3.15 | 0 | 0 | 0 | NA | NA | III |
| 6 | 11-102 | M | 93 | 2.08 | 0 | 0 | 0 | 25 | 6 | I |
| 7 | 12-41 | M | 97 | 2.5 | 0 | 0 | 0 | 29 | 14 | II |

| 8 | 14-19 | F | 90 | 2.5 | 0 | 0 | 0 | 30 | 6 | IV |
|---|---|---|---|---|---|---|---|---|---|---|
| 9 | 14-42 | M | 92 | 2.3 | 0 | 0 | 0 | 28 | 13 | IV |
| 10 | 13-40 | M | 73 | 4.12 | 0 | 0 | 0 | NA | NA | II |
| 11 | 16-10 | M | 83 | 4.25 | 0 | 0 | 0 | 29 | 5 | IV |
| 12 | 16-32 | M | 79 | 4.3 | 0 | 0 | 0 | 28 | 16 | III |
| 13 | 14-36 | F | 82 | 3.17 | 0 | 0 | 0 | 29 | 8 | III |
| 14 | 14-47 | F | 77 | 2.63 | 0 | 0 | 0 | 27 | 8 | II |
| 15 | 15-08 | M | 78 | 3.25 | 0 | 0 | 0 | 28 | 2 | II |
| 16 | 14-20 | F | 93 | 2.33 | 0 | 0 | 0 | 28 | 12 | I |
| 17 | 11-05 | M | 81 | 2.25 | I | 0.04 | 2 | 30 | 6 | IV |
| 18 | 11-28 | F | 79 | 2.22 | I | 0.05 | 3 | 30 | 13 | III |
| 19 | 12-28 | M | 80 | 2.67 | I | 0.04 | 2 | NA | NA | IV |

| 20 | 11-110 | F | 92 | 3.67 | IIb | 0.05 | 2 | 27 | 28 | III |
|----|--------|---|----|------|-----|------|---|----|----|-----|
| 21 | 12-29 | M | 86 | 3 | IV | 0.05 | 3 | 17 | 19 | III |
| 22 | 12-42 | M | 69 | 3.37 | IV | 0.11 | 4 | 24 | 4 | II |
| 23 | 13-05 | M | 80 | 2.83 | III | 0.05 | 4 | 27 | 12 | III |
| 24 | 13-11 | M | 81 | 3.62 | III | 0.13 | 4 | NA | NA | III |
| 25 | 13-17 | M | 83 | 3 | IIa | 0.14 | 4 | 29 | 4 | IV |
| 26 | 13-18 | M | 79 | 3.25 | IIa | 0.12 | 4 | 29 | 2 | IV |
| 27 | 16-02 | M | 89 | 2.4 | IV | 0.08 | 4 | 15 | NA | IV |
| 28 | 16-37 | M | 70 | 3.9 | IV | 0.08 | 4 | NA | NA | II |
| 29 | 16-39 | M | 70 | 4.12 | IV | 0.08 | 4 | 13 | 4 | IV |
| 30 | 16-47 | M | 83 | 2.47 | IV | 0.08 | 4 | 15 | 7 | IV |
| 31 | 15-84 | M | 81 | 2.38 | IV | 0.07 | 3 | 26 | 11 | IV |

| 32 | 16-14 | M | 80 | 2.6 | IV | 0.07 | 2 | 23 | 29 | IV |

**Table S2.** Complete pathological diagnostic summary of cases tested in the RT-QuIC assay.

| Case ID | Pathological diagnosis |
|---|---|
| 13-49 | Control; Normal aging changes only |
| 10-63 | Control; Normal aging changes; Cerebral white-matter rarefaction; Old microscopic infarct, left claustrum region |
| 10-70 | Control; Normal aging changes only |
| 9-57 | Control; Normal aging changes only |
| 10-22 | Control; Sparse diffuse amyloid plaques, temporal and occipital lobes |
| 11-102 | Control; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Non-specific glial tauopathy, mesial temporal lobe |
| 12-41 | Control (mild cognitive impairment); Neurofibrillary tangles and argyrophilic grains, mesial temporal lobe; Cerebral white-matter rarefaction |
| 14-19 | Control; Neurofibrillary tangles, mesial temporal lobe; Focal neurofibrillary tangles and non-specific glial tauopathy, lateral occipital lobe |
| 14-42 | Control; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Cerebral white matter rarefaction |
| 13-40 | Control; Neurofibrillary tangles, entorhinal cortex and hippocampus |
| 16-10 | Control; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Cerebral white-matter rarefaction; Old lacunar-sized and microscopic infarcts, cerebellar cortex |
| 16-32 | Control; Neurofibrillary tangles, mesial temporal lobe; Cerebral white-matter rarefaction, occipital lobe |
| 10-63 | Control; Normal aging changes; Cerebral white-matter rarefaction; Old microscopic infarct, left claustrum region |
| 10-70 | Control; Normal aging changes only |

| | |
|---|---|
| 14-36 | Mild cognitive impairment (history); Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Cerebral white-matter rarefaction |
| 14-47 | Mild cognitive impairment (history); Large subacute infarction, right cerebrum; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Argyrophilic grains, mesial temporal lobe |
| 15-08 | Control; Fibrotic, partially calcified and hyalinized right subdural vascular malformation; Old hemorrhagic infarct, left inferior parietal lobule; Cerebral white-matter rarefaction, parietal and occipital lobes; Neurofibrillary tangles, mesial temporal lobe; Amyloid angiopathy, cerebral and cerebellar cortex |
| 14-20 | Control; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Argyrophilic grains, mesial temporal lobe; Cerebral white-matter rarefaction; Status post bilateral thalamic deep-brain stimulator placement (history of essential tremor) |
| 11-05 | Incidental Lewy body disease; Neurofibrillary tangles, argyrophilic grains and non-specific glial tauopathy, mesial temporal lobe |
| 11-28 | Incidental Lewy body disease; Amyloid angiopathy, moderate to severe, cerebral cortex and cerebellar leptomeninges; Neurofibrillary tangles, mesial temporal lobe; Alzheimer type II astrocytosis |

| 12-28 | Incidental Lewy body disease; Mild cognitive impairment; Microscopic changes of Alzheimer's change, insufficient for diagnosis; Microscopic changes of Lewy body disease, insufficient for diagnosis |
|---|---|
| 11-110 | Parkinson's disease; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Cerebral white-matter rarefaction; Old microscopic cortical infarcts, left middle frontal gyrus and cerebellar cortex; Argyrophilic grains, mesial temporal lobe |
| 12-29 | Parkinson's disease; Dementia (clinical history) |
| 12-42 | Parkinson's disease; Dementia (history); Microscopic changes of Alzheimer's disease, insufficient for diagnosis |
| 13-05 | Parkinson's disease; Cerebral white-matter rarefaction, frontal lobe; Argyrophilic grains, hippocampus |
| 13-11 | Parkinson's disease; Dementia (history); Cerebral white-matter rarefaction; Argyrophilic grains with non-specific glial tauopathy, mesial temporal lobe |
| 13-17 | Parkinson's disease |
| 13-18 | Parkinson's disease; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Cerebral white-matter rarefaction, occipital lobe; Old cortical microscopic infarct, left inferior frontal gyrus |

| | |
|---|---|
| 16-02 | Parkinson's disease; Alzheimer's disease; Argyrophilic grains, mesial temporal lobe, insula and hypothalamus; Non-specific glial tauopathy, amygdala; Old microscopic infarct, left putamen |
| 16-37 | Parkinson's disease; Cognitive disorder (history); Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Status post deep-brain stimulator implants, bilateral subthalamic nuclei |
| 16-39 | Parkinson's disease; Dementia (history); Cerebral white-matter rarefaction; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Non-specific glial tauopathy, substantia nigra; Status post bilateral lenticular nucleus transplantation of fetal ventral mesencephalic tissue (1995) with alpha-synuclein and tau pathology within left-sided graft tissue |
| 16-47 | Parkinson's disease; Dementia (history); Neurofibrillary tangles, mesial temporal lobe |
| 15-84 | Parkinson's disease; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Mild cognitive impairment (history) |
| 16-14 | Parkinson's disease; Microscopic changes of Alzheimer's disease, insufficient for diagnosis; Mild cognitive impairment (history) **Note: Plaques seen only in occipital lobe so do not appear on our plaque total score. |

**Table S3.** Analysis of the effects of pathological diagnosis, sex, age, MMSE score, Braak staging, and the amount of pathological α-synuclein on results of the RT-QuIC assay. In control, ILBD, and PD cases, no effect of sex (p=0.8681), age (p=0.2809), MMSE score (p=0.2142), or Braak staging (p=0.5668) was observed on RT-QuIC assay results. Only pathological diagnosis and the amount of pathological αSyn based on unified LB staging differed significantly (p<0.0001) from RT-QuIC results.

| | RT-QuIC % positive | N (Total samples) | p value |
|---|---|---|---|
| **Pathological diagnosis** | | | <0.0001 |
| Control | 6% (1) | 16 | |
| ILBD | 100% (3) | 3 | |
| PD | 100% (13) | 13 | |
| **Unified LB stage** | | | <0.0001 |
| 0 | 0% (0) | 16 | |
| 1-2 | 100% (6) | 6 | |
| 3-4 | 100% (10) | 10 | |
| **Sex** | | | 0.5681 |
| Male | 58.3 % (14) | 24 | |
| Female | 37.5 % (3) | 8 | |
| **Age (years)** | | | 0.2809 |
| <63 | 0% (0) | 1 | |

| | | | |
|---|---|---|---|
| ≥63 and <72 | 100% (3) | 3 | |
| ≥72 | 46.4% (13) | 28 | |
| **MMSE scores*** | | | 0.2142 |
| 10-20 | 100% (4) | 4 | |
| 21-30 | 42.8% (9) | 21 | |
| **Braak stages** | | | 0.5668 |
| 0/+ | 0% (0) | 0 | |
| 1-2 | 18% (2) | 11 | |
| 3-4 | 66.6% (14) | 21 | |

* MMSE scores are not available for some cases.