QEEG-based differentiation between Alzheimer's disease with or without alpha synucleinopathy

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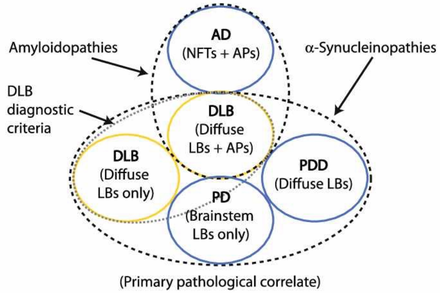
"Identify dementia pathologies through QEEG"

INTRODUCTION

- As existence of alpha synucleniopathy could affect progression of cognitive impairment in Alzheimer's disease (AD), it's very important to differentiate comorbidity of alpha synucleniopathy in AD to predict progression.



- Lewy body dementia can be clinically diagnosed through visual hallucination, cognitive fluctuation, and parkinsonism.
- However, there is no biomarker that directly confirms pathological findings, so the sensitivity of diagnosis is very low.
- When Alzheimer's disease and Lewy body dementia coexist, the exacerbation of the disease is accelerated compared to only Alzheimer's disease is occurred.

METHODS

- We gathered 3 type of PET scans [18F-Florbetaben brain amyloid-beta PET, FDG-PET, DAT-PET] for patients complaining of cognitive problems.
- Based on pattern of cognitive impairment and PET scan findings, dementia due to Alzheimer's disease [called **pureADD**] or Lewy Body (called **pureLBD**) or **mixed type** (AD with alpha synucleniopathy, AD with LB or it is also involved vice versa) were clinically classified.
- We measured 19ch EEG based on international 10-20 system which is on eye-closed resting state.
- To find statistically significance in QEEG, 3 labeled groups were performed for each independent t-test comparison which is provided at iSyncBrain®. In each comparison, test of normality for each QEEG features was confirmed.

	PureADD	Mixed	PureLBD
Age (Mean±std)	75.48 ±8.3	77.13 ±8.32	78.12 ±6.27
Male/Female	10/22	63/90	41/39

Table 1. Participants information

RESULTS

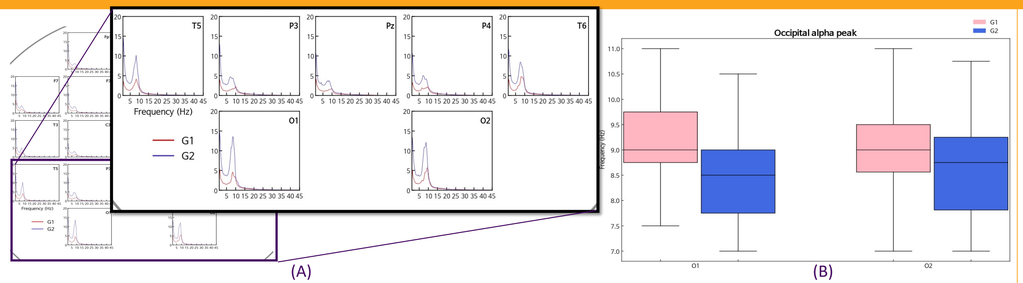


Figure 1. Group analysis between PureADD(G1) and PureLBD(G2); (A) Independent t-test with Power Spectral Density(PSD), (B) Occipital Alpha peak frequency comparison

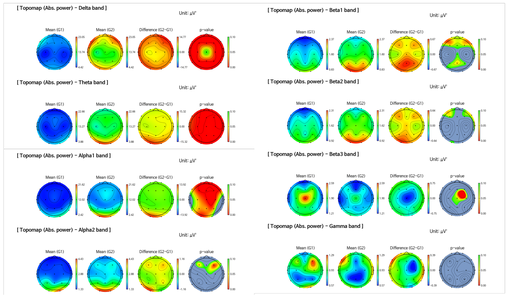


Figure 2. Topomap Comparison between PureADD(G1) and PureLBD

- Pure ADD showed the characteristics that general EEG slowing with low total power(Figure 1. (A), Figure 2), relative delta enhancement and desynchronized alpha with low amplitude.
- Pure LBD showed the pattern of slow alpha peak frequency(Figure 1. (B) with intact synchronization, relatively higher EEG total power and frontotemporal theta enhancement.
- Compared to pure ADD, ADD with LB showed mixed pattern of ADD and LDB.

Unit : μV2	Theta			Alpha1		
	Pure ADD	Pure LBD	P-value	Pure ADD	Pure LBD	P-value
Frontal(mean±std)	5.08±5.64	12.06±11.46	0.0000	2.83±2.03	5.69±6.38	0.0005
Central(mean±std)	4.54±4.74	11.22±11.61	0.0000	2.96±2.25	5.46±5.63	0.0011
Temporal(mean±std)	7.21±8.40	16.55±16.89	0.0002	5.79±4.90	9.39±12.29	0.1120
Parietal(mean±std)	5.17±6.72	13.63±15.52	0.0001	3.49±3.10	6.96±8.49	0.0267
Occipital(mean±std)	7.90±8.87	22.12±23.23	0.0000	8.823±8.75	20.61±29.93	0.0018

Table 2. Independent t-test table of frequency band power(Theta(4~8Hz), Alpha1(8~10Hz))

* All statistical test is satisfies normality

Conclusion

- These findings imply that ADD could have different EEG oscillation characteristics according to the Lewybody disease.
- Next step, we will develop the machine-learning algorithm to discriminate the Lewybody disease based on specific EEG features and validate it.

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