Erythrocytic Proteins as Biomarkers for Dementia

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INTRODUCTION

Currently, diagnosing dementia in the elderly requires both specialist memory consultations, mental state examinations, and various brain imaging investigations.(1) This timely protocol will delay diagnosis and initiation of treatment in early stages when available drugs are most effective.

It is therefore essential to establish a swift blood test that can be incorporated in routine medical examination for the screening and rapid diagnosis of various dementia.

AIMS

- Identify biomarkers for dementia based on previous proteomic studies in erythrocyte (ERC)
- Detect any differences in these biomarkers between various dementia and healthy control subjects.

METHOD

- We used Scopus to identify potential dementia biomarkers from erythocytic proteins:
  - Ubiquitin (Ubi)
  - IgG
  - Ferritin
- We prepared 69 ERC at pH5.7, 29 control, 20 vascular dementia (VaD), 13 Alzheimer's disease (AD) and 7 dementia with Lewy bodies (DLB)
- We used ELISA to detect levels of Ubi, IgG, and Ferritin in the bloods above

RESULT AND DISCUSSION

1) Ubiquitin

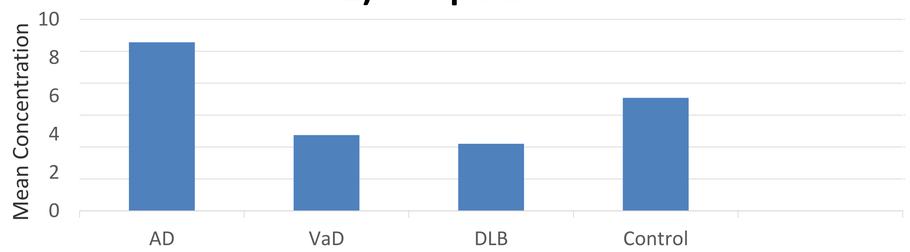

Figure 1: Ubiquitin levels in erythrocytes of AD, VaD, DLB, and control

- Based on Figure 1, high levels of Ubi were found in AD, while lower levels were seen in VaD and DLB, as compared to the control.
- Statistical analysis of T-test ($p<0.05$) shows significant difference between: AD and control, DLB and control, VaD and control.
- It was suggested that Tau/Amyloid aggregates in a AD brain is due to an overload of cerebral Ubi (2).This excessive cerebral ubiquitin might be derived from AD ERC which contains high levels of Ubi.
- The primary pathology of DLB is the accumulation of Ubi (Lewy bodies) in the brain(3). This excessive Ubi utilization might lead to a drop in its systemic levels, i.e. the levels in ERC.
- Following cerebral hypoxia (VaD), large amount of Ubi could be utilized to remove products of cell injury, leading to a decline in its ERC level.

2) IgG

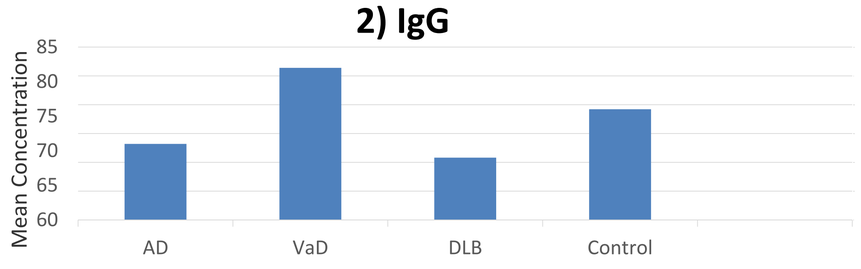

Figure 2: IgG levels in erythrocytes of AD, VaD, DLB, and control

- Based on Figure 2, high levels of IgG were found in VaD as compared to the control.
- Statistical analysis of T-test ($p<0.05$) shows significant difference between: DLB and control **but** no significant difference between: AD and control, VaD and control.

RESULT AND DISCUSSION

3) Ferritin

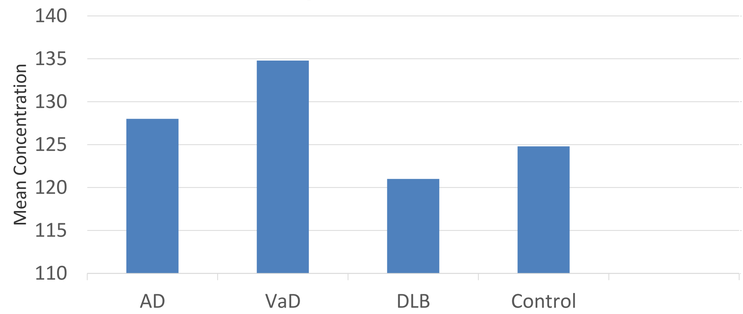

Figure 3: Ferritin levels in erythrocytes of AD, VaD, DLB, and control

- Based on Figure 3, high level of Ferritin was found in VaD and AD, as compared to the control.
- Statistical analysis of T-test ($p<0.05$) shows no significant difference between: AD and control , DLB and control, VaD and control.

CONCLUSION

- The data suggest the potential use of Ubiquitin, IgG, Ferritin as erythrocytic biomarkers in screening and diagnosing dementia.
- Further work should be carried out to integrate the mental state examinations and brain imaging with these novel biomarkers in refining the detection of dementia.

ACKNOWLEDGEMENT

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Reference: 1)Galvin, James E., and Carl H. Sadowsky. "Practical guidelines for the recognition and diagnosis of dementia." *The Journal of the American Board of Family Medicine* 25.3 (2012): 367-382.
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