

# Association of Dysphagia with Thalamic and Cerebellar Volumes in Alzheimer's Disease: A Pilot MRI Study

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Patients with dysphagia showed lower thalamic volumes than those without dysphagia.

Lower cerebellar volumes were also observed in patients with dysphagia.

These findings suggest that subcortical structures may contribute to swallowing dysfunction in Alzheimer's disease.

Prospective studies with larger cohorts are needed to confirm these preliminary findings.

## INTRODUCTION

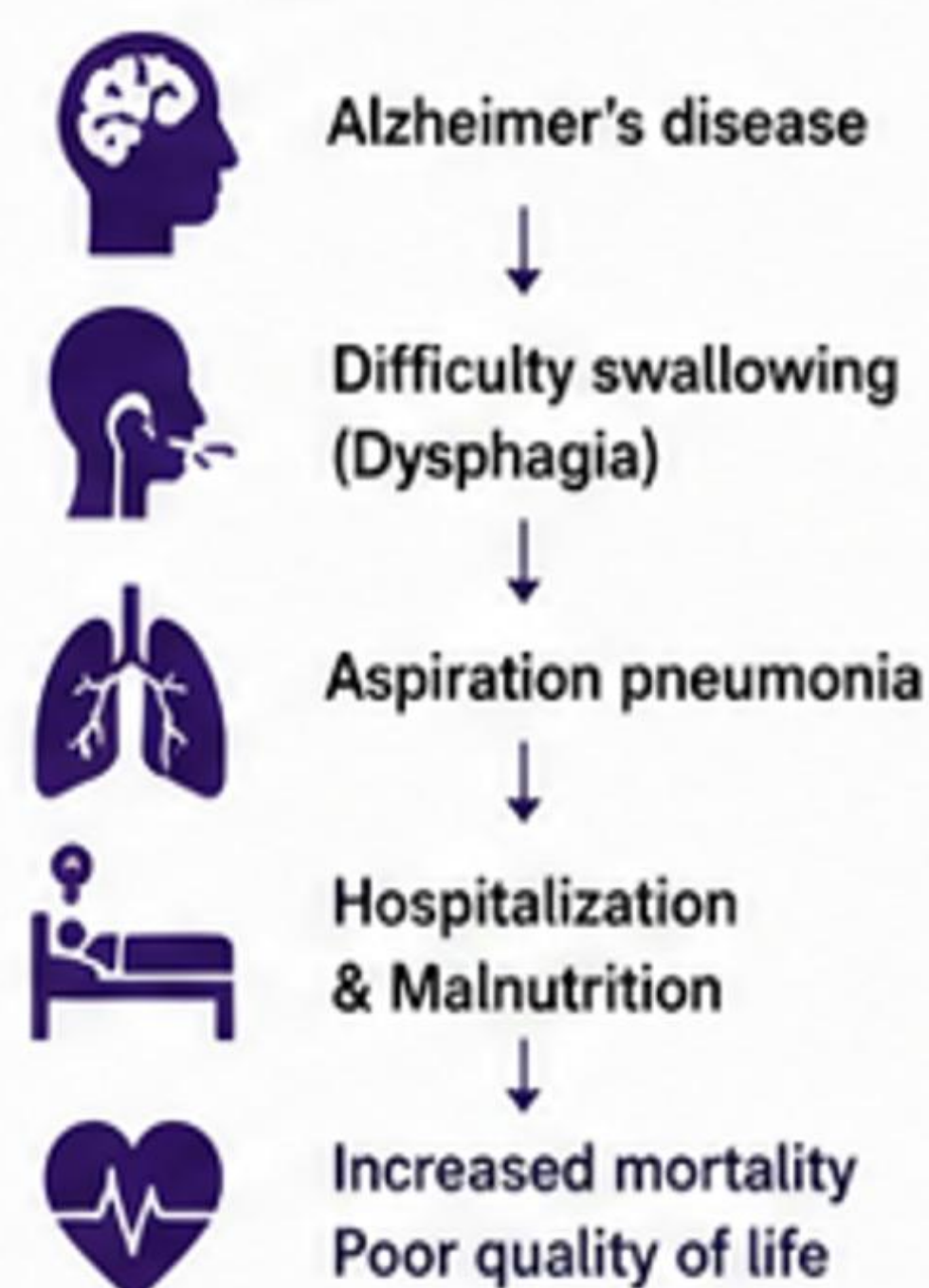
## METHODS

## RESULTS

## CONCLUSIONS

## REFERENCES

### Why does this matter?



Little is known about the structural brain changes underlying dysphagia in Alzheimer's disease.

### Objective

To investigate the association between regional brain volumes and dysphagia in patients with Alzheimer's disease using MRI-volumetric analysis.

### Study Population

847 patients with dementia diagnoses were screened.

Exclusions:  
• Non-Alzheimer dementias  
• Patients without brain MRI and VFSS performed at our institution or with incomplete data

Brain MRI  
(3D T1-weighted)

VolBrain  
Volumetric Analysis

Fluoroscopic Swallowing  
Assessment (VFSS)

Penetration-Aspiration Scale  
(PAS) > 1

Dysphagia (-)  
n = 14  
(PAS ≤ 1)

Dysphagia (+)  
n = 7  
(PAS > 1)

21 patients with Alzheimer's disease were included in the final analysis.

21 patients

Mean age: 78.1 ± 6.2 years

Female: 42.9%

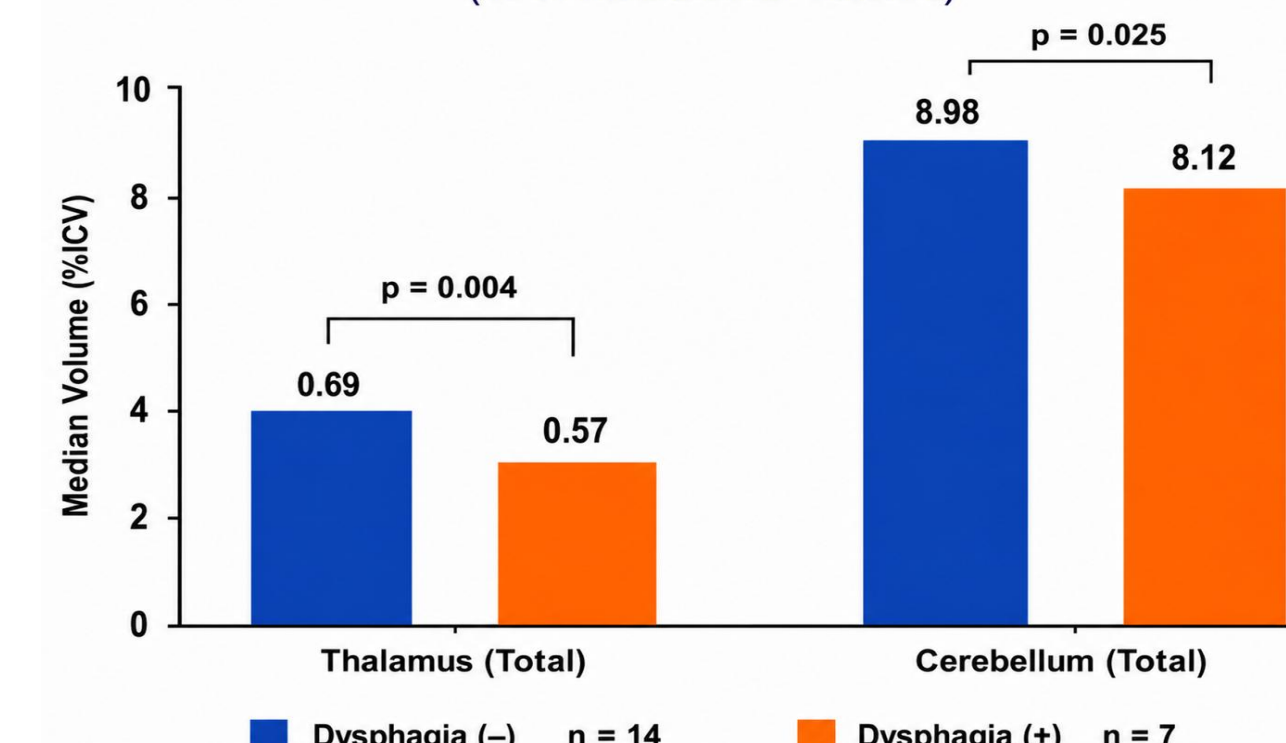
Dysphagia: 33.3% (n = 7)

Regional brain volumes according to dysphagia status  
(% of Intracranial Volume)

| Brain region (%ICV) | Dysphagia -<br>(n = 14) | Dysphagia +<br>(n = 7) | p     |
|---------------------|-------------------------|------------------------|-------|
| Thalamus (R)        | 0.35                    | 0.30                   | 0.014 |
| Thalamus (L)        | 0.35                    | 0.24                   | 0.004 |
| Cerebellum (R)      | 4.52                    | 3.97                   | 0.017 |
| Cerebellum (L)      | 4.43                    | 4.15                   | 0.037 |
| Caudate (Total)     | 0.44                    | 0.31                   | 0.101 |
| Putamen (Total)     | 0.51                    | 0.38                   | 0.086 |
| Pallidum (Total)    | 0.20                    | 0.19                   | 0.456 |

Values are presented as median.  
Abbreviation: ICV, intracranial volume.

Thalamic and Cerebellar Volumes by Dysphagia Status  
(% of Intracranial Volume)



After adjustment for age and sex, thalamic volume remained strongly associated with dysphagia (p<0.001)



Reduced thalamic and cerebellar volumes are independently associated with dysphagia.



Thalamic volume showed the strongest association with dysphagia (adjusted p < 0.001).



Cerebellar volume was also significantly lower in patients with dysphagia (adjusted p = 0.025).

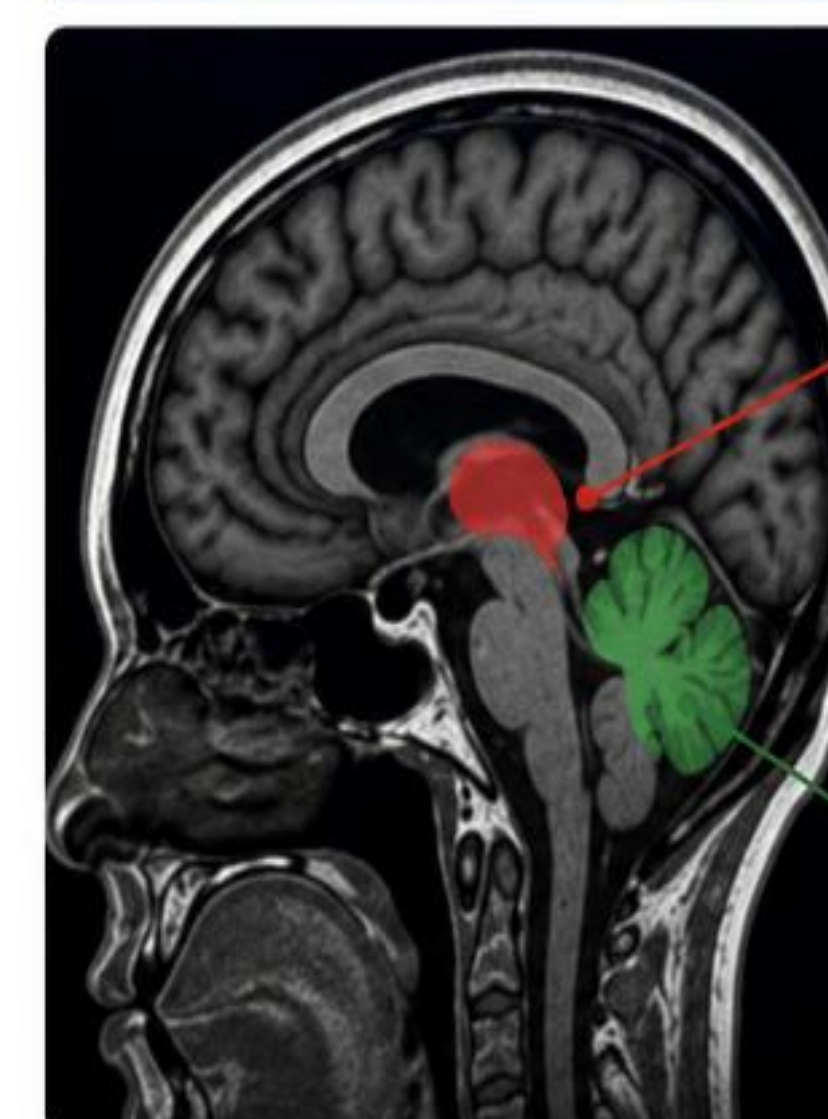


No significant differences were observed in volumes of the hippocampus (p = 0.881), putamen (p = 0.086), or caudate nucleus (p = 0.101).



These findings highlight the involvement of thalamocerebellar networks in swallowing and may guide future assessment and rehabilitation strategies.

### MID-SAGITTAL T1-WEIGHTED MRI



**THALAMUS**  
Integrates sensory input and modulates motor signals important for the initiation and regulation of swallowing.

**CEREBELLUM**  
Coordinates timing, precision, and sequencing of the oropharyngeal swallowing reflex.

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**3.Humbert IA et al.** Early deficits in cortical control of swallowing in Alzheimer's disease. **J Alzheimers Dis.** 2010;19(4):1185-97.

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