

Mapping Amygdalar structural differences in Alzheimer's patients with 3T MRI

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Background: Histological and *in vivo* MRI studies show that the amygdala is affected by Alzheimer's Disease (AD) pathology; its shape is altered [1,2] especially in its medial aspect [3]. **Aim:** To assess *in vivo* local amygdalar changes in AD patients using high resolution MRI at 3 Tesla, and identify the involved nuclei. **Methods:** 19 AD patients (age 76 ± 6 years, Mini Mental State Examination (MMSE) 13 ± 4) and 19 healthy elderly (age 74 ± 5 years, MMSE 29 ± 1) were enrolled. The Radial Atrophy Mapping technique was used to reconstruct the 3D shape of the amygdala, based on manual tracings. In statistical maps of group differences, permutation tests were run to correct for multiple comparisons. The 3D reconstructions from an atlas of the normal amygdala was used to infer which anatomical nuclei were involved. **Results:** Both right and left amygdalar volumes were significantly smaller in AD patients (right: 1508 ± 418 mm³, left: 1646 ± 419 , $p=0.009$) than controls (right: 2129 ± 316 , left: 2077 ± 376). 3D maps of structural deficits were significant by permutation test ($p=0.004$). Local atrophy mapped to the medial part of the amygdala bilaterally. Dorsally, the local tissue loss involved the medial nucleus, anterior amygdaloid area, anterior and posterior cortical nuclei; ventrally, the basolateral ventral medial nucleus and the lateral nuclei were involved. **Conclusions:** These results confirm pathology and *in vivo* MRI findings. The affected nuclei are primarily connected to the hippocampus (basolatero-ventro-medial and posterior cortical) [4], and to the olfactory circuitry (medial and anterior cortical) [5].

[1] Braak et al., Journal of Neural Transmission; 1998;53:127-140.

[2] Qiu A. et al., Neuroimage; 2009;45,3:656-661.

[3] Corsellis et al., Alzheimer's Disease; 1970; 37-50.

[4] Pikkarainen et al., Journal of Comparative Neurology; 1999;403:229-260.

[5] Price JL et al., Ann. N.Y. Acad. Sci.; 2003; 985:50-58.