High Resolution MRI Neuromorphometric Assessment of the Amygdala in Mood Disorders

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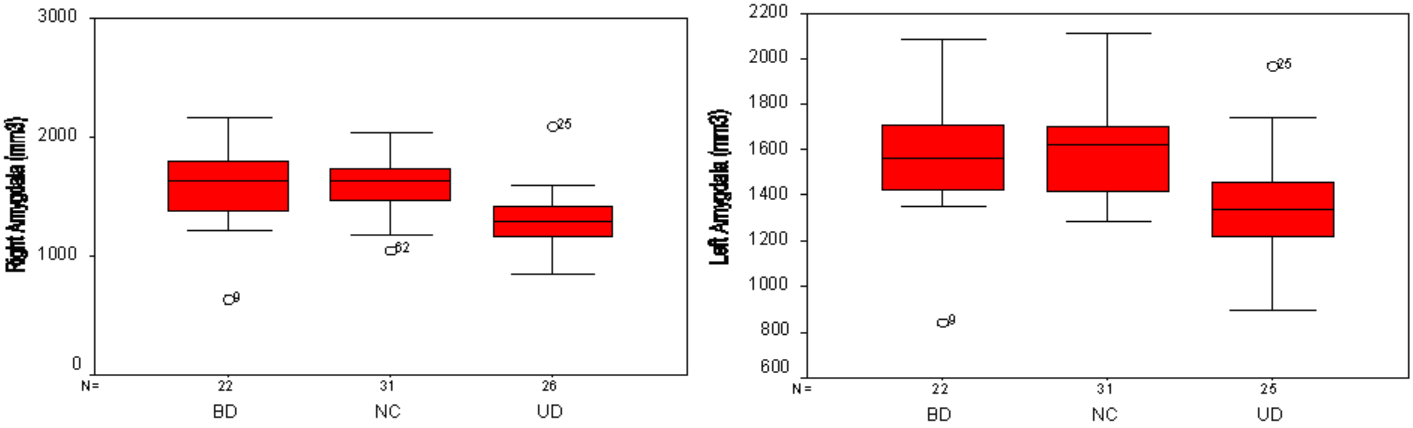
Background: Neuromorphometric MRI studies have produced conflicting results in the measurement of amygdala volume in unipolar depression (UD). While some studies showed reduced volume (Sheline, et. al.), other studies showed enlargement (Elst, et. al.) or only asymmetry of amygdalar volumes (Mervaala, et. al.). In bipolar disorder (BD), both amygdala enlargement (Strakowski, et. al) and reduction (Pearlson, et. al.) relative to controls. These discrepancies may reflect relatively high unreliability inherent to the low volumetric resolution of these studies.

Methods: Medically healthy subjects ages 19 to 60 who were psychiatrically healthy (n=31; 17 female; mean age = 38.16 ± 10.3), had bipolar disorder type I or type II (n=22; 13 female; mean age = 38.09 ± 8.95), or had unipolar depression (symptomatic or remitted phase; n=26; 14 female; mean age 38.27 ± 10.55) were imaged using a GE 3T MRI scanner, running an MP-RAGE pulse sequence optimized for tissue contrast resolution, and voxel size of 0.6 x 0.6 x 0.6 mm. Between two and four 11.5 min scans were acquired and summed. The amygdala was manually segmented by a rater blind to diagnosis using MEDx 3.4.1. Intra-rater reliability was assessed by having the same rater segment the images on two separate days.

Results: Assessments of intra-rater reliability showed mean volumes in mm^3 (SD) for measurements 1 and 2 of 1664 (146) and 1634 (138) on the left, respectively, and 1691 (155) and 1716 (155) on right, respectively, with correlation coefficients for day 1 vs 2 measures of: left, r =0.840; right, r =0.808. Mean volumes in mm^3 (SF) for right amygdala of BD, NC, and UD subjects were 1611 (334), 1585 (232), and 1499 (295), respectively. Mean volumes in mm^3 (SD) for the left amygdale of BD, NC, and UD subjects were 1581 (250), 1605 (205), and 1334 (243), respectively. ANOVA corrected for multiple comparisons using the Tukey HSD test gave p-values of 0.000 for a significant reduction in right amygdala volume of UD subjects as compared to either BD or NC subjects. The reduction in the left amygdala was also significant for UD as compared to BD (p=0.0001) or NC (p=0.000) subjects. Whole brain volumes did not vary between groups, and amygdala volumes normalized to whole brain volume were also significantly reduced on the right side for UD as compared to BD (p=0.002) and NC (p=0.002), as well as the left (p=0.003 for UD v. BD; p=0.001 for UD v. NC).

Discussion: The volume of the human amygdala region can be reliably measured in high resolution 3T MRI images. The inconsistency of previous results in this region may reflect methodological differences of the study samples, spatial resolution of the MRI images acquired, and the magnitude of contrast between gray and white matter in these images. The amygdala is an important region in the pathophysiology of mood disorders. The amygdala plays a major role in evaluating the emotional significance of sensory and social stimuli, and in organizing the behavioral, autonomic, and neuroendocrine system manifestations of emotional expressions. This study shows a robust decrease in the amygdala volume in unipolar depression, in both remitted and currently depressed subjects, that is not seen in either healthy controls or subjects with bipolar disorder. The reduction shown in this study in the amygdala in unipolar depression may underlie the functional abnormalities seen in this region in subjects with mood disorders (reviewed in Drevets, 2001).



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