

NEUROIMAGING SCHIZOPHRENIA

several sub-regions, therefore it is difficult to study as a whole. Some studies do attempt to investigate these specific sub-regions of the frontal cortex. Undersized dorsolateral prefrontal cortex volume has been demonstrated in patients with schizophrenia.^{22,23} Again this finding of prefrontal abnormalities has been correlated with the negative symptoms of schizophrenia. Additionally, in patients with schizophrenia, abnormally smaller volume of the orbitofrontal cortex has been correlated with negative symptoms.²⁴

A SUMMARY OF NEUROCHEMICAL IMAGING FINDINGS IN SCHIZOPHRENIA

Consistent with the dopamine hypothesis of schizophrenia,^{25,26} neuroimaging studies have confirmed hyperactivity of dopaminergic transmission relative to serotonergic and other neurotransmitter systems in patients with schizophrenia. PET and SPECT imaging studies demonstrate acutely psychotic patients with schizophrenia to have an abnormally high release of dopamine compared to controls when given an amphetamine challenge.^{27,28} This abnormally heightened dopaminergic reaction was further shown not to be a result of antipsychotic medications as it also occurs in first episode patients with schizophrenia.²⁹ A meta-analysis of PET and SPECT studies of schizophrenia unveiled a statistically significant elevation of D_2 receptors, which is consistent with dopaminergic dysregulation, in patients with schizophrenia compared to controls.⁹

A REVIEW OF NEUROPATHOLOGIC CORRELATES TO IMAGING FINDINGS

Macroscopic post-mortem findings in schizophrenia are consistent with the above neuroimaging findings. Post-mortem studies of patients with schizophrenia demonstrate abnormally small volume in the amygdala-hippocampal complex as well as increased volume of the temporal horn of the lateral ventricle.³⁰ Neuropathological abnormalities of cellular organization have been found in the hippocampus³¹ and entorhinal cortex³² of patients with schizophrenia. Again these same regions have also been identified as abnormal by MRI³³ as well as PET.⁸

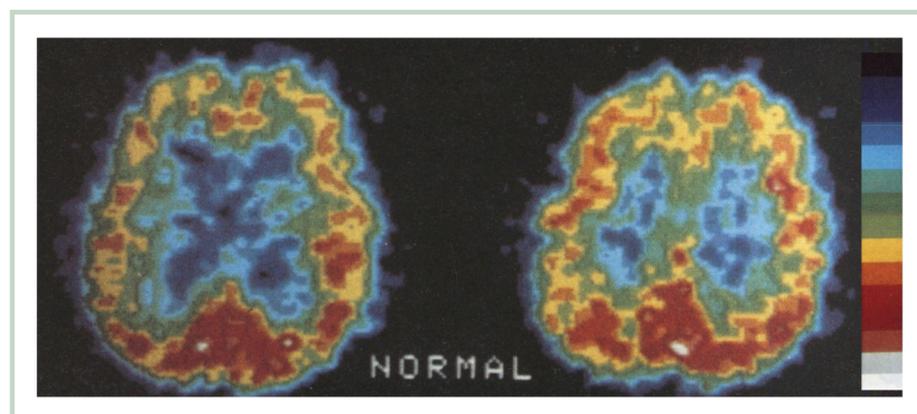
Consistent with the neuroimaging findings mentioned above, the superior temporal gyrus has been observed to be decreased in size compared to controls in post-mortem studies.^{34,35} This is a post-mortem finding in schizophrenia which dates back to 1910.³⁶

Post-mortem studies have also identified prefrontal abnormalities in schizophrenia^{37,38} consistent with imaging findings mentioned above. Direct evidence of abnormal dopamine terminals in the prefrontal cortex in schizophrenia has been demonstrated by post-mortem examinations³⁹ which is again consistent with dopaminergic dysregulation observed with PET and SPECT.

Patients with schizophrenia have been noted to demonstrate decreased neurons in the white-matter subplate of the pre-frontal and temporal lobe cortices, however these neurons are increased 3mm deeper from

SINGLE PHOTON EMISSION COMPUTED TOMOGRAPHY (SPECT) IMAGE

Figure 4



(Weinberger DR from *Textbook of Clinical Psychiatry*, Hales and Yudofsky, 2003. Permission from Hales RE)

Kile SJ. *Mental Fitness*. 2004;3(3):24-31.