ABNORMAL *IN VIVO* BRAIN TEMPERATURE GRADIENT IN SCHIZOPHRENIA PATIENTS AND IT'S POSSIBLE CORRELARTION TO PSYCHOPATHOLOGY– A MAGNETIC RESONANCE SPECTROSCOPY STUDY

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Introduction: Schizophrenia is a heterogeneous disorder having a wide variety of symptoms, with no clear and, apparently, no single etiology. Theoretically, schizophrenia patients' mental status may be related to their core temperature due, mainly, to the presumed involvement of similar neurotransmitters (biogenic amines and especially, dopamine) both in schizophrenia and in core temperature regulation. Furthermore, preliminary research suggests that thermoregulatory dysfunction may represent a possible factor in the pathophysiology of schizophrenic psychosis and that current anti-psychotic drug treatment may affect brain thermoregulation (1).

Purpose: To assess potential association between *in vivo* brain temperature of schizophrenia patients and their mental status.

Methods: Nine neuroleptic- treated schizophrenia patients and eleven healthy controls (all of them males) participated in the study. Informed consent was obtained in accordance with the guidelines of the institutional review board. The subjects underwent partially water-suppressed single-voxel proton magnetic resonance spectroscopy (^{1}H-MRS) at the frontal cortex (Fr), occipital cortex (Oc), and anterior thalamus (Th) of the right hemisphere using 3 Tesla (Signa EXCITE 3 HD, GE) MRI. The ^{1}H-MRS voxels (4-5 cm^3), acquired using a point resolved spectroscopy (PRESS) sequence with TR/TE 1500/144, SW 5000, 2048 time points) were positioned using T1-weighted 3D SPGR images, as shown in fig. 1. ^{1}H MRS is sensitive to temperature via the known right shift of 0.0106 ppm / ^{o}C of the water peak with increasing the temperature. The chemical shift difference between the central resonance frequencies of water and NAA methyl's peak was thus used as a measure of temperature (2). The NAA signal was used here as a temperature-independent internal reference.

Results: No statistically significant difference was found between schizophrenia patients and healthy controls in the average absolute brain temperature of the three different locations (37.42±0.27 and 37.82±0.33; p=0.14, respectively). The occipital region displayed the highest temperature values. However, a substantial (1.27±0.96ºC) and statistically significant (p=0.004) gradient in temperatures was found between the occipital and frontal cortices *only* in the schizophrenia patients. In addition, a potential trend towards significance was found between the above mentioned occipital-frontal temperature gradient and the severity of schizophrenia patients' psychopathology, as assessed by the Positive and Negative Syndrome Scale (PANSS) scores (fig. 2, r=0.61; p=0.083).

Conclusions: Our findings corroborate previous results, which demonstrated potential association between environmental/core temperature and the mental status of schizophrenia patients (1). In addition, the MRS technique seems an efficient and reliable non-invasive method to measure *in vivo* absolute brain temperature. More research, in both medicated- and drug-free schizophrenia patients versus comparison healthy and non-schizophrenia mentally-ill subjects is needed to substantiate our findings and their relevance to the pathophysiology of schizophrenia.

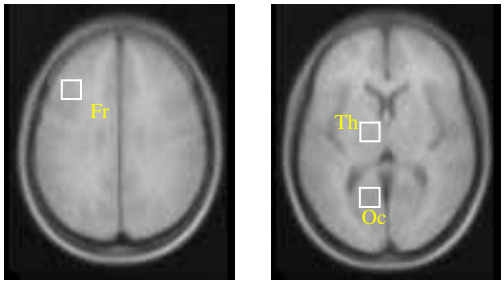

fig. 1: single volume locations

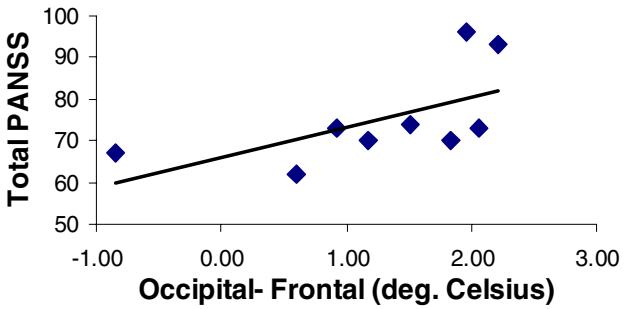

fig. 2: temperature gradient - symptoms correlation

References: 1. Shiloh R, et al (2001), *European Neuropsychopharmacology* 11:285-288
2. Cady EB et al (1995), *Magnetic Resonance in Medicine* 33:862-867.