PET SCANER

A positron emission tomography (PET) scan is a unique type of imaging test that helps doctors see how the organs and tissues inside your body are actually functioning.

The test involves injecting a very small dose of a radioactive chemical, called a radiotracer, into the vein of your arm. The tracer travels through the body and is absorbed by the organs and tissues being studied. Next, you will be asked to lie down on a flat examination table that is moved into the center of a PET scanner—a doughnut-like shaped machine. This machine detects and records the energy given off by the tracer substance and, with the aid of a computer, this energy is converted into three-dimensional pictures. A physician can then look at cross-sectional images of the body organ from any angle in order to detect any functional problems.

CAPS vs PCL

For the PCL as a whole, the correlation with the CAPS was 0.929 and diagnostic efficiency was 0.900 versus CAPS.

Blanchard, Edward B., et al. "Psychometric properties of the PTSD Checklist (PCL)." *Behaviour research and therapy* 34.8 (1996): 669-673.

Summary

Patients with combat-related posttraumatic stress disorder (PTSD) show altered cognitive and affective processing and symptomatic responding following exposure to trauma reminders. Previous symptom provocation studies using brain imaging have involved Vietnam veterans…Oxygen water and positron emission tomography were used to measure regional cerebral blood flow (rCBF) in patients with war- and combat-related chronic PTSD during exposure to combat and neutral sounds. Self-reports and heart rate confirmed symptomatic responding during traumatic stimulation... RCBF also increased in the right amygdala...Symptom provocation in PTSD promote sensorimotor, amygdaloid and midbrain activation…

Pissiota, Anna, et al. "Amygdala and anterior cingulate cortex activation during affective startle modulation: a PET study of fear." *European Journal of Neuroscience* 18.5 (2003): 1325-1331.

The clinical efficacy of psychodynamic psychotherapy (PDT) has undergone extensive study and review. Recently, researchers have studied the effects of this treatment on brain metabolic or synaptic activity, but the collective findings have never been reviewed. The objective of this review was to describe the findings of all neuroimaging studies of any form of PDT treatment. An extensive literature search through databases along with surveying of research groups were undertaken to acquire all available published studies. Eleven series were included in the final sample, consisting of 2 randomized controlled trials, 5 controlled trials and 4 case series, altogether involving 210 people: 94 healthy controls and 116 people with mood disorders, panic disorder, somatoform disorders and borderline personality disorder. A variety of neuroimaging techniques were used to examine regional metabolic activity and synaptic neurotransmission before and after treatment.

The common finding was normalization of synaptic or metabolic activity in limbic, midbrain and prefrontal regions, occurring in association with improved clinical outcomes. PDT has demonstrable effects on brain function in diverse clinical populations as evidenced by a modest group of mixed neuroimaging studies.

Abbass, Allan A., et al. "Review of psychodynamic psychotherapy neuroimaging studies." *Psychotherapy and psychosomatics* 83.3 (2014): 142-147.

Effects of Cognitive-Behavioral Therapy (CBT) or Citalopram Treatment on Brain Activity in Patients With Social Phobia While Carrying Out a Public Speaking Task. Cognitive-Behavioral Therapy (left) and Citalopram (right) Treatment are Both Associated With Decreased Activation of the Amygdala During Performance of an Anxiogenic Public Speaking Task After Therapy, Compared With Before Therapy. Depicted Are Regions Showing a Significant Postversus Pretreatment Decrease in Activity. (Reprinted with permission from Furmark et al. 2002.)

Etkin, Amit, et al. "Toward a neurobiology of psychotherapy: basic science and clinical applications." *The Journal of neuropsychiatry and clinical neurosciences* (2014).

Control/Tracking Number: 15-A-3003-ASAHQ
Activity: Abstract
Current Date/Time: 4/4/2015 10:38:54 PM

TITLE:
Neuroimaging Suggests that Stellate Ganglion Block Improves Post-Traumatic Stress Disorder (PTSD) Through an Amygdala Mediated Mechanism

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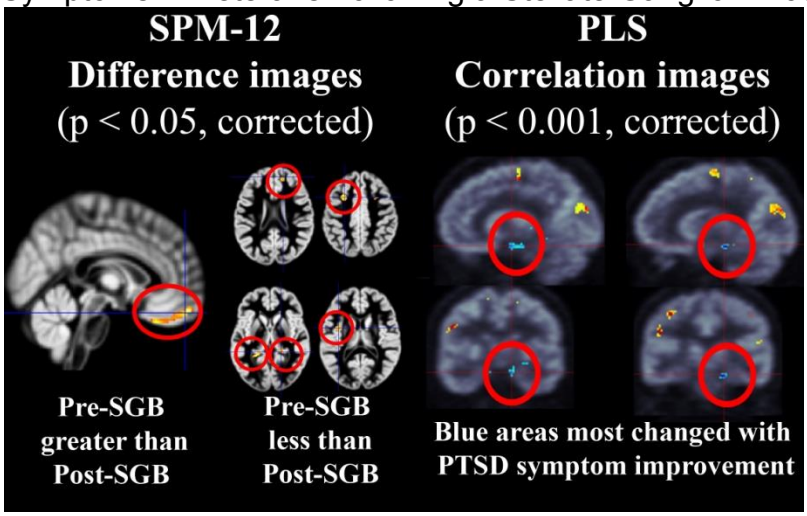
ABSTRACT:
INTRODUCTION: Stellate ganglion block (SGB) is a known part of treating chronic pain. Recently, it was found to result in rapid and sustained relief of post-traumatic stress disorder (PTSD) symptoms [1,2]. The neural mechanisms by which this happens remain unknown. We investigated the neurobiology of PTSD by imaging functional brain metabolic activity with positron emission tomography (PET) before and after the SGB procedure.
METHODS: Following IRB approval, informed consent was obtained from five male veterans (mean age 31 ± 4) with chronic combat-related PTSD having prominent hyperarousal symptoms. Subjects underwent two separate fluorodeoxyglucose (FDG) PET brain scans on a GE Discovery 600 PET/CT. The first scan was obtained one week prior to undergoing a single right-sided SGB using 8cc of 2% lidocaine and 0.25% bupivicaine under fluoroscopic guidance. The second scan was obtained one week following the SGB. PTSD symptoms were formally assessed using the Clinician Administered PTSD Scale (CAPS) score (a structured interview) one week before and again one week after the SGB. Preliminary data were analyzed for regional relative brain activity differences using statistical parametric mapping (SPM-12) and functional connectivity changes using partial least squares (PLS).

RESULTS: All subjects tolerated the procedure well. **SGB dramatically reduced PTSD symptoms in 3 of 5 (60%) subjects**. Overall, the CAPS showed a 47% reduction in PTSD symptom severity at one week following SGB, with a baseline mean (±SD) score of 89 ± 12 (severe PTSD) that was reduced to 48 ± 12 (mild/moderate PTSD) after the block ($P<0.05$, paired t-test). The only brain region that was relatively more active in the pre-SGB scans contrasted with the post-SGB scans was the orbital frontal cortex (see figure). At the same time, the brain regions that were relatively less active included; the left insula, right frontal cortex, left dorsolateral prefrontal cortex and bilateral portions of the posterior hippocampus. **Importantly, brain regions that correlated with the individual CAPS scores and their functional improvement following SGB centered on the amygdala and hippocampus, primarily in the right hemisphere.**

DISCUSSION: We found SGB had efficacy for significantly reducing PTSD symptoms in a rapid and sustained manner that allowed functional brain activity to be compared in the same subjects when they were suffering with PTSD symptoms versus when their symptoms were greatly diminished. In this small pilot study, the behavioral difference between experiencing and not experiencing severe PTSD symptoms appeared to be correlated primarily with differences in right amygdala and nearby hippocampal functional activity. **The right amygdala/hippocampal areas appear to be relatively overactive when PTSD symptoms are prominent.** This may be due to the observed differences in orbital frontal cortex activity (or other network effects), a finding that suggests a dysregulation of orbital frontal cortex to amygdala inhibition likely exists when PTSD symptoms are severe. The study also shows that the SGB effect on PTSD symptoms, even if ultimately proven to be no more than a placebo, still has substantial

neural substrates that can be indentified in a relatively small number of brain scans.

REFS: [1] Lipov EG, et al.: Cervical Sympathetic Blockade in a Patient with Posttraumatic Stress Disorder: a Case Report. Ann Clin Psychiatry. 2008;20:227-228. [2] Alkire MT, et al.: Prolonged Relief of Chronic Extreme PTSD and Depression Symptoms in Veterans Following a Stellate Ganglion Block. ASA abstract A1046, 2014.



SUMMARY:
We found stellate ganglion block had efficacy for significantly reducing PTSD symptoms in a rapid and sustained manner that allowed functional brain glucose metabolic activity to be compared in the same subjects when they were suffering with PTSD symptoms versus when they were not. *In this small pilot study, the behavioral difference between having and not having PTSD symptoms appeared to be correlated primarily with differences in right amygdala and nearby hippocampal functional activity changes.*
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