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BRAIN PERFUSION REPORT

PATIENT	CLINICAL
FIRST NAME XXX	EXAM Quantitative Single Photon Emission Computed Tomography (qSPECT)
LAST NAME XXX	REFERRING PROVIDER XXX
MR # XXX	INDICATIONS FOR REFERRAL Attention-deficit hyperactivity disorder, unspecified type (F90.9)
DOB XXX	INTERPRETING PHYSICIAN Reading Doctor 1
AGE 63	EXAM DATE XXX
HANDED Left	INTAKE CLINICIAN Clinician 1

RADIOLOGIC FINDINGS

High-resolution, brain SPECT imaging was performed at baseline and with a concentration battery. No abnormal motion or artifact was detected. A blind review of the tomographic images was performed.

At rest, the overall cortical activity is slightly reduced.

Focal areas of abnormal cortical hypoperfusion were noted in the left anterior and orbitofrontal, bilateral anterior temporal, right dorsolateral prefrontal, bilateral superior frontoparietal and superior parietal (these latter two areas being fairly profound), bilateral posterior cingulate, bilateral occipital to include bilateral calcarine fissures and bilateral anterior cerebellar areas.

Focal areas of abnormal subcortical hypoperfusion were not noted.

Focal areas of abnormally increased cortical perfusion were noted scattered amongst areas of cortical hypoperfusion.

Focal areas of abnormally increased subcortical perfusion were noted in the left caudate and bilateral lentiform areas.

Cortical deactivation is noted with the concentration task.

CereMetrix cluster analysis comparisons of the patient's baseline data to a 1000 patient composite average sample, as well as the 3D/surface-rendered images, revealed abnormalities consistent with those seen on the tomographic images.

RADIOLOGIC IMPRESSIONS

1. This is an abnormal brain SPECT study demonstrating focal areas of abnormal cortical hypoperfusion in the frontal, temporal, parietal, occipital and cerebellar areas as previously described. There is a fairly profound, focal area of abnormal cortical hypoperfusion at the vertex involving elements of both the superior frontal and parietal lobes bilaterally. Paradoxical cortical deactivation is noted with the concentration task. The nature, location, and pattern of these abnormalities is primarily consistent with the scientific literature pertaining to traumatic brain injury (TBI) and the patient's clinical history, as obtained, which was received after the blind review. The finding of focally profound cortical hypoperfusion at the vertex is anatomically consistent with the patient's reported mechanism of brain injury in 2010. Cortical deactivation with the concentration task is an abnormal finding associated with either a non-specific brain injury process and/or an ADHD process. Alternative considerations for these findings, such as neurodegenerative, neurovascular and toxic/hypoxic processes were considered, but were considered to be less likely given the patient's specific clinical history, which was obtained after the blind review.

2. The finding of orbito-frontal hypoperfusion, along with the patient's clinical history, has been associated by several authors with various mood disorders.

3. The finding of increased activity in the basal ganglia, along with the patient's clinical history, has been associated by several authors with various anxiety disorders.

4. The finding of decreased cortical activity with the concentration task is consistent with both the patient's clinical history of ADHD and TBI.

Close clinical correlation with the patient's entire medical history is advised.

QSPECT BRAIN IMAGING

The patient was seen for the following high-resolution brain SPECT imaging studies, which were performed within the criteria, established guidelines and quality controls for imaging set by the American College of Radiology including the *ACR-SPR Practice Parameter for the Performance of Single Photon Emission Computed Tomography (SPECT) Brain Perfusion Imaging, Including Brain Death Examinations.*

Methods

During the baseline scan, the patient is placed in a comfortable chair and an IV line is started. The patient is then allowed to acclimate to a quiet semi-darkened room with sound-dampening headphones on and their eyes closed for 15 minutes, in accordance with the ACR practice guidelines. The Tc99-m labeled HMPAO tracer is then injected through the IV line and flushed with saline. The tracer is then taken up by the brain within the next 2 minutes. This results in a perfusion pattern that is analyzed and interpreted. After injection, the patient remains in the quiet semi- darkened room for an additional 5 minutes. The SPECT scan is acquired a minimum of 60 minutes post injection.

During the concentration task, the patient is placed in a quiet room and an IV line is started. The patient performs a concentration battery on a tablet. Approximately 5 minutes into the task, the Tc99-m labeled HMPAO tracer is then injected through the IV line and flushed with saline. The patient completes the task and scan is acquired a minimum of 60 minutes post injection.

Scans are obtained using a Siemens E-Cam SPECT gamma camera with a low energy high resolution (LEHR) parallel hole collimator. Counts are collected in a 128X128 matrix with 32 stops of 5.625 degrees each, with a zoom of 1.78. Total counts exceeded 5 million. Data is filtered using a Butterworth filter at .25 with an order of 5, corrected for motion as needed and attenuation correction is performed. The volume is masked to exclude as much non-neural structure as possible. There is no post-filtering. Data is presented in axial, sagittal and coronal views in 2mm sections. Statistical analysis is performed using CereMetrix software relative to a composite database of average perfusion containing 1000 individuals.

Date	Status	TC99-HMPAO Dose	Count
XXX	SPECT - Concentration	28.90 mCi Tc99 HMPAO	5.51 million
XXX	SPECT - Baseline	28.30 mCi Tc99 HMPAO	5.621 million

Procedures

The utilization of SPECT in the diagnostic evaluation of various neurological disorders is well established. The procedure and practice guidelines of the American College of Radiology, the Society of Nuclear Medicine and the European Association of Nuclear Medicine establish the utility and scientific validity of SPECT functional brain imaging for detection and evaluation of cerebrovascular disease and stroke, evaluation of dementia and Alzheimer's disease, pre-surgical localization of epileptic foci, diagnostic evaluation of encephalitis and evaluation of suspected brain trauma. These procedure and practice guidelines are adhered to in all of our acquisition and processing protocols. Research has also demonstrated regional perfusion patterns associated with other neurological disorders and with exposure to neurotoxins, hypoxia and substances of abuse.

Although there is a very large body of peer-reviewed scientific articles showing certain brain patterns associated with certain psychiatric conditions, the utilization of SPECT for the evaluation of psychiatric disorders is still considered an emerging science and therefore in the investigational stage. Although we will report on brain patterns of certain psychiatric conditions such as Attention Deficit Hyperactivity Disorder, Bipolar Disorder, Anxiety, Obsessive Compulsive Disorder, etc., based on patterns published in peer-reviewed journals, such findings are not considered stand alone or diagnostic per se and should always be considered in conjunction with the patient's clinical condition. These data should only be used as additional information to add to the clinician's diagnostic impression.

The brain SPECT imaging studies were performed under the general supervision of a qualified state licensed physician.

Sincerely,

Reading Doctor 1

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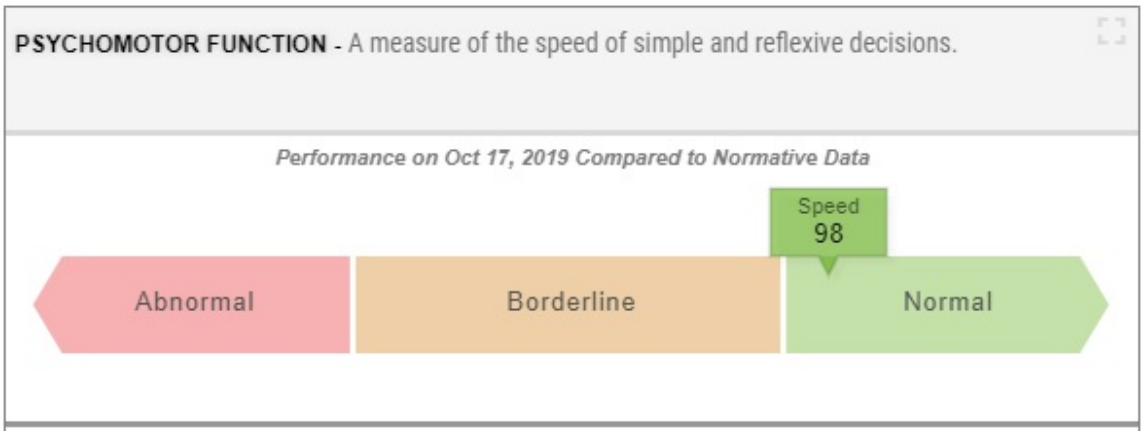
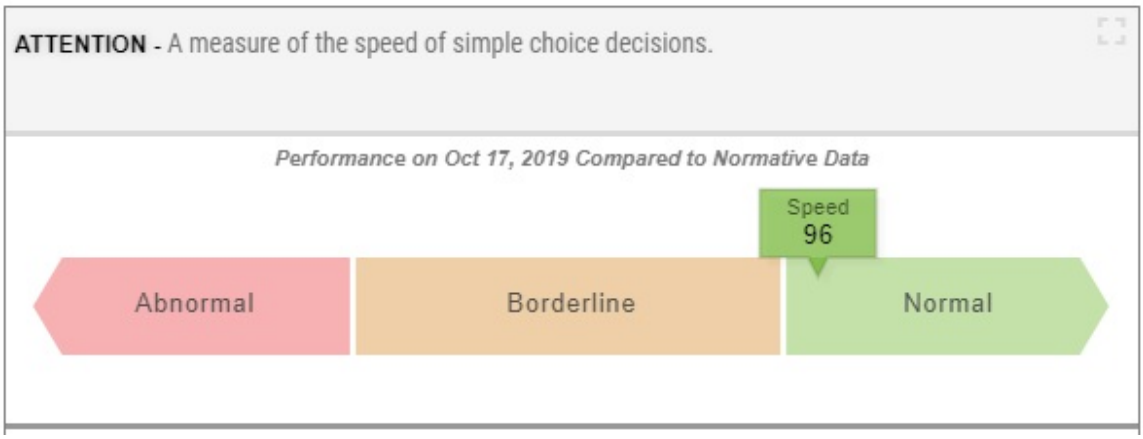
CLINICAL HISTORY REPORT

NEUROPSYCHIATRIC AND COGNITIVE ASSESSMENTS

1. The Mini International Neuropsychiatric Interview was administered on XXX Accordingly, she did not meet any diagnostic criteria.

2. The Cognigram Cognitive Assessment was administered on XXX. Her cognitive status profile generated the following results:





LEARNING - A measure of the ability to learn new information.

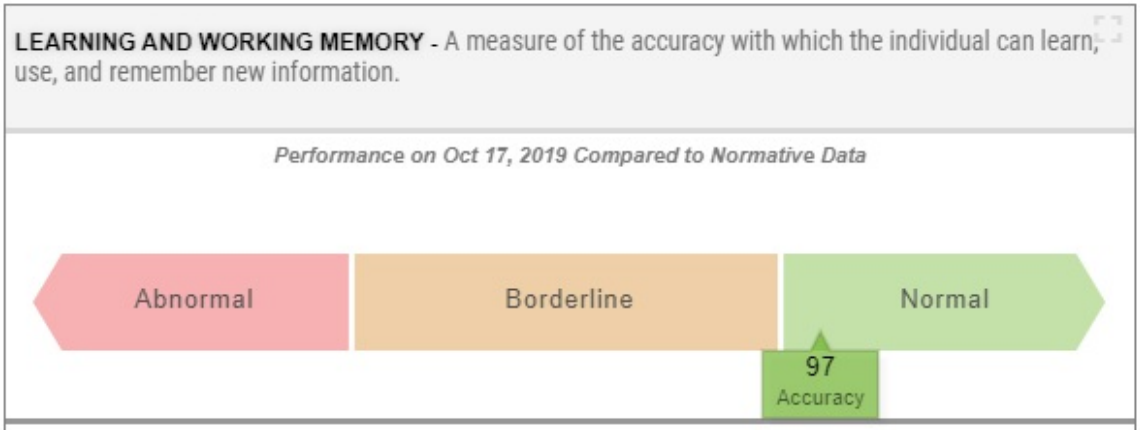
Performance on Oct 17, 2019 Compared to Normative Data

WORKING MEMORY - A measure of the ability to use and remember new information.

Performance on Oct 17, 2019 Compared to Normative Data

PSYCHOMOTOR FUNCTION AND ATTENTION - A measure of the speed with which the individual can make simple reflexive decisions.

Performance on Oct 17, 2019 Compared to Normative Data



CLINICAL OVERVIEW OF CHIEF COMPLAINT

Patient XXX is a 63-year-old left handed female.

The patient presents with a diagnosis of ADHD and depression. She taught preschool for many years and learned about ADHD and suspected that she may have it. Approximately 10-12 years ago the patient started taking Adderall which was immensely helpful and she reports never having a problem with it, up until the Spring of 2019. She reports developing nightmares that she believed was related to the Adderall. If she missed a dose, the nightmares worsened. She asked her doctor to try a different medication, and started on 60mg of Vyvanse. This resulted in the nightmares worsening further and becoming night terrors. About three weeks ago, the patient developed an acute, severe headache that would not go away. She went to see her doctor after a few days with this headache and thinks that the Vyvanse was to blame. Her doctor agreed, and recommended that the patient stop the Vyvanse and to take a Benadryl, which relieved her of the headache. After stopping the Vyvanse a few weeks ago, the patient started taking methylphenidate at the recommendation of her psychiatrist, but she does not think that this medication is effective.

The patient is looking for confirmation of an ADHD diagnosis, and is also wanting to explore her depression diagnosis. She reports being prescribed Prozac which is extremely helpful. She added that the medication also keeps panic attacks at bay, which she has experienced in the past.

PATIENT'S SELF-REPORTED SYMPTOMS

- Difficulty with concentration
- Disorganization
- Distractibility
- Loss of interest in things
- Nightmares
- Panic attacks
- Problems paying attention
- Talkativeness

MEDICAL HISTORY

History of Brain Injury

- Other Accident (2010): In 2010, the patient was trying to take an umbrella down that was covering her patio furniture during a rainstorm. She explained that the umbrella fell on top of her and she believes she lost consciousness for a few seconds. Her last memory was of trying to move the umbrella, and her first memory after regaining consciousness was thinking she should go to her neighbors house so she wasn't alone. The patient walked to her neighbors house and sat with them for a while, until she felt comfortable that she was not going to lose consciousness or need to go to the hospital. The patient reports developing a headache that subsided on its own.
- Fall (1959): At the age of three, the patient reports climbing on a dresser that fell on top of her. She recalls having a large black eye (right) and has a scar on her forehead from stitches. She does not remember any other details.

Incoming Diagnoses

- ADD/ADHD (2005)
- Anxiety (2005)
- Depression (1988)
- Sleep apnea

Current Medications

- Imitrex (100 mg as needed)
- Methylphenidate (10 mg three times a day)
- Prozac (20 mg every day)

Past Medications

- Aderall XR (20 mg every day)
- Vyvanse (60 mg every day)

Pre-Scan Medication Recommendations

Certain classifications of medications may have an impact on blood flow in the brain. The patient was advised to review CereScan's recommendations regarding the use of stimulants, benzodiazepines, opiates and barbiturates, among other substances and medications, and discuss them with his/her physician.

Allergies

None reported

Surgeries/Hospitalizations

- cesarean section (05/02/1988)
- cesarean section (08/06/1985)

Family History of Major Medical and Psychiatric Illness

- Brother: ADD/ADHD
- Brother: Obsessive Compulsive Disorder
- Father: Brain Tumor (Malignant)
- Maternal Grandmother: Cardiac Disease
- Mother: Aneurysm, Stroke, Glaucoma, Osteoporosis, Melanoma

- Maternal Grandfather: Cardiac Disease
- Paternal Grandmother: Leukemia

BRAIN IMAGING HISTORY

- MRI (Unknown, 2016), Report Unavailable

DEVELOPMENTAL HISTORY

The patient was told she had an incomplete esophagus at birth.

CURRENT USE OF ALCOHOL AND RECREATIONAL SUBSTANCES

Alcohol: 1 drinks per week

Caffeine: 2 per day

Nicotine: None reported

Drugs: None reported

The patient reports smoking cigarettes in the past, but quit approximately one year ago.

PAST HISTORY OF ALCOHOL OR DRUG ABUSE

Alcohol

None reported

Drugs

None reported

EDUCATIONAL AND EMPLOYMENT STATUS

The patient's highest education level is High School Diploma.The patient's employment status is Retired.

VETERAN HISTORY

None reported

Sincerely,

Clinician 1

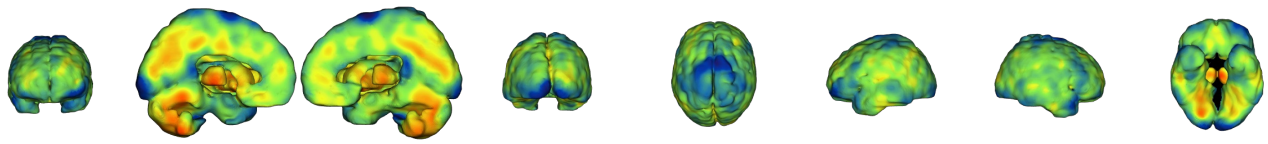
We are happy to communicate with any of your treating clinicians. Thank you for this opportunity to participate in your care with this consultation.

APPENDIX

ANNOTATIONS

Id: 1151

Chang Brain Tomo Baseline_TRA - 2019-10-18



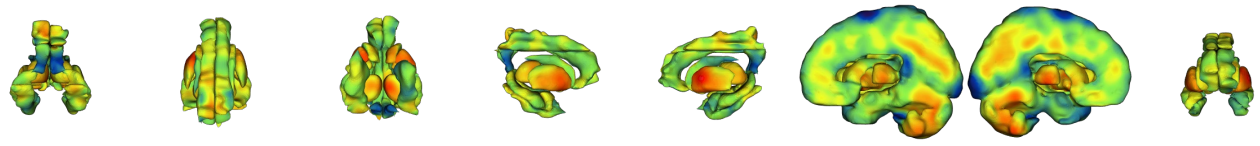
Dataset(s): Cortical Surface, Medial (Left-Hemisphere), Medial (Right-Hemisphere)

Colored By: Average Intensity

- Focal areas of cortical hypoperfusion in the left anterior and orbitofrontal, bilateral anterior temporal, right dorsolateral prefrontal, bilateral superior frontoparietal, bilateral superior parietal (the latter two areas more profound than the others), bilateral posterior cingulate, bilateral occipital to include calcarine fissure and bilateral anterior cerebellar areas.

Id: 1152

Chang Brain Tomo Baseline_TRA - 2019-10-18



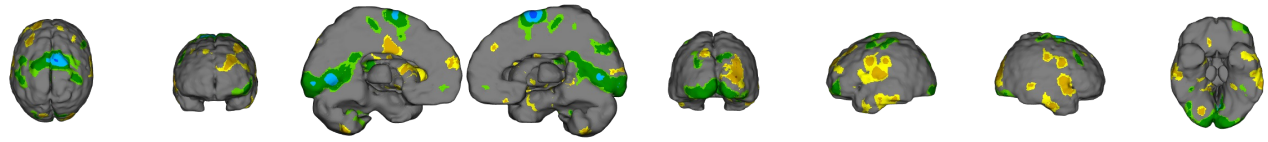
Dataset(s): Sub-Cortical, Medial (Right-Hemisphere), Medial (Left-Hemisphere)

Colored By: Average Intensity

- Areas of increased subcortical perfusion in the bilateral lentiform and left caudate nuclei.

Id: 1153

Chang Brain Tomo Baseline_TRA - 2019-10-18



Dataset(s): Cortical Surface, Medial (Left-Hemisphere), Medial (Right-Hemisphere)

Colored By: Average Z-Score

- Focal areas of abnormal cortical hypoperfusion in the frontal, temporal, parietal, occipital and cerebellar areas as previously described. There is an area of particularly profound cortical hypoperfusion noted in the superior fonto-parietal/parietal noted. There are scattered areas of increased cortical perfusion of uncertain significance, possibly vicarious to the areas of hypoperfusion.