

Pre-Course Preparation – Case History #3 Part II Answers from Part 1

Exercise: Review the anatomical and metabolic regions involved with the case and determine what clinical examination tests would be most important.

In part III I will disclose the examination findings.

NEUROANATOMICAL REGIONS OF CASE #3

Frontal Cortex Developmental Delay into Adulthood (Adult Attention Deficit Disorder)

The main complaints in case #3 suggest lack of frontal cortex development with symptoms of attention deficit impacting focus, concentration, and cognition. These functions involve the prefrontal cortex and associated with the diagnosis of attention deficit disorder.

Being a bed wetter is common with frontal cortex delays since the micturition centers are in the parasagittal regions of the frontal cortex. This region of the brain is located near the foot regions. When these individuals are kids they are typically toe-walkers. The region of the frontal cortex in the parasagittal region involves the homuncular region of the foot and it is near the micturition center. When this region is not developed it leads to spastic planter flexion that is most noticeable during ambulation.

The combination of the attention deficit (prefrontal cortex) and bedwetting (parasagittal frontal/micturition centers) with continuation of symptoms into adulthood suggest the role of frontal cortex development delay into adulthood commonly labeled as Adult Attention Deficit Disorder (Adult ADD).

Case #3 had the following complaints suggesting frontal cortex developmental delay into adult ADD:

- “Throughout childhood I suffered from ADD, digestive problems, and asthma.”
- “I was a bed wetter until almost 13 years old.”

- “I always had a brain fog and delayed cognition. This along with severe fatigue and low energy has taken over my life to the point where it is holding me back from my destiny and potential.”

Frontal Cortex Therapy Improves Function

Identifying from patient history and comments brain activities that improve or decrease function can suggest regions of the brain involved. Generally, activation to specific regions of the brain increase cerebral circulation to those specific areas and promote plastic change.

In many instances, patient’s report various activities that improve their brain function without knowing it. For instance, case #3 reveals that meditation and prayer help him. Both meditation and prayer activate the frontal cortex.

Other activities may exhaust or fatigue specific areas of the brain. This is because the activation exceeds the neurons’ capacity for activity, or the neurons do not have the metabolic capacity to respond to the demands of stimulation.

In summary, any therapies that either improve the patient or make them crash help identify the regions of the brain involved. They also suggest types of therapies that can be used or avoided based on the patient’s neuron integrity.

Case #3 said the following regarding frontal cortex therapy:

- “I have found that meditation helps me too, as well as prayer.”

Traumatic Brain Injury as A Child

The case history indicates significant trauma at age two falling from a two-story building. Damage directly to the brain from impact or jarring to the brain from impact to other areas of the body can lead to significant traumatic brain injury (TBI). It is possible such an injury contributed to brain function impairment. We know brain injury can lead to post-traumatic encephalopathy that may last for decades. Ongoing brain inflammation combined with other variables can promote brain developmental delays.

Case #3 had the following complaints suggesting the effects of traumatic brain injury:

- “I have been in several car accidents growing up in my adolescence.”
- “I fell out of a second-story window at age two.”

Basal Ganglia Indirect Pathway Related Tics

Tics are hyperkinetic movement disorders characterized by an uncontrollable urge to engage in some type of movement or vocal response, referred to as a “motor” or a “phonic tic.” Case #3 suffered from both types, which both involve the basal ganglia indirect pathway.

You cannot determine from facial tics which side of the cortex is involved since the corticobulbar (brainstem cranial nerves) motor nuclei are bilaterally innervated. Hemispheric discharge from either side will lead to bilateral contracture to the face but contralateral discharge to the extremities.

In other cases, if a hyperkinetic response on a limb was involved, the side of abnormal movement disorder would suggest contralateral basal ganglia involvement since pathways to the limb are crossed.

In case # 3, the tics involving the eyes and voice do not allow us to identify the involved side of the basal ganglia since the pathways to motor regions of the eyes and voice box are bilateral.

It is very common for children to develop various types of hyperkinetic movement disorders with frontal cortex development delays because the frontal cortex activates the basal ganglia striatum. It is this initial activation that leads to activation of both dopaminergic and GABAergic projections in the basal ganglia.

It is not uncommon for these tics to improve as the frontal cortex develops, and it is also not uncommon for the tics to return as the frontal cortex becomes fatigued or impaired later in life in those individuals with frontal cortex developmental patterns.

Case #3 had the following complaints suggesting involvement of the the basal ganglia indirect pathway:

- “Throughout my life I have also had tics off and on. Some were facial tics with my eyes and others were sound with my voice.”
- “Supplementing with magnesium has help eliminate tics for the most part.”

Neurological Genetic Susceptibility in Family History

Genotype variables impact brain development. Neuron proteomic responses, neurochemical channel disorder, neurochemical receptor disorders, neurochemical degradation disorders, etc. all can increase the genetic susceptibility for various



neurodevelopmental disorders. In case #3 the family history suggests these potential susceptibilities.

Case #3 had the following complaints suggesting neurological genetic susceptibility:

- “On my father’s side there are plenty of neurological problems including tics, ADHD, anxiety, and panic attacks.”

Brain-Gut Axis Disorders

Impaired brain development can profoundly impact the brain-gut axis. Reduced activation of the cortex impacts the brain-gut axis via the hypothalamospinal projections, mamillotegmental tract, and the dorsal longitudinal fasciculus. This can lead to altered viscera autonomic processing and vagal output response impacting gut motility, enzyme release, altered intestinal blood flow, etc. These responses can then lead to the development of dysbiosis, intestinal permeability, impaired intestinal valve control, bacterial translocations from the large intestine to the small intestine (small intestine bacteria overgrowth), etc.

Whenever an individual has ongoing gastrointestinal and intestinal permeability symptoms despite a good diet, the causes of intestinal dysregulation need to be evaluated. With case #3, the patient is eating an anti-inflammatory diet and taking numerous digestive supplements yet still continues to have digestive complaints. This in combination with his brain-based symptoms suggest the possibility of altered-brain gut axis.

Additionally, some symptoms indicate vagal motor nuclei issues involved with motility, such as the need to use coffee enemas to feel better.

There are also signs of intestinal autonomic dysregulation most likely impacting the vagal parasympathetic division of the nucleus ambiguus and the dorsal nucleus of the vagus nerve. For instance, the patient reports fatigue when taking supplements during the day and he can only take supplements at night. This suggests abnormal autonomic tone that occurs with abnormal intestinal shunting of blood. This is a common complaint in individuals with intestinal autonomic dysregulation when they eat or take supplements.

Case #3 had the following complaints suggesting involvement of the Brain-Gut Axis and Gut-Brain Axis:

- “I have severe food reactions towards such foods as dairy, corn, soy, gluten, eggs, nuts, shellfish.”



- “Throughout childhood I suffered from ADD, digestive problems, and asthma.”
- “I have found when I take supplements during the day I feel sleepy and fatigued afterwards. That’s why I take most of my supplements at night. Even supplements that are supposed to help with energy fatigue me immediately afterwards.”
- “Most of my diet includes 70 percent plant-based foods and grass-fed beef bone broth which has helped tremendously. The rest is organic grass fed meats and poultry as well as occasional wild caught Alaskan salmon. Fruits I eat include organic banana, red organic apples, organic kiwis and organic berries with lots of avocados on a daily basis and organic cilantro, organic parsley and organic lettuce.”
- “However, my low energy and overall health has been a constant obstacle limiting my potential. I realize I have lost weight without the intention of losing weight. I believe it could be malabsorption or parasites, or both.”
- “I try to do coffee enemas a couple times a week. This has been a big help to me.”

METABOLIC REGIONS OF CASE #3

Formaldehyde Exposure

Case #3 had the following complaints suggesting potential neurotoxicity:

Formaldehyde is a toxic challenge to the nervous system, especially during early development. It is difficult to determine the degree to which this chemical exposure impacted this patient’s brain symptoms.

- “My mother worked in an environment filled with formaldehyde fumes when pregnant with me.”

Circulation

Anytime a patient has impaired brain endurance with symptoms of poor circulation then cerebral circulation should be considered. Impaired circulation to the brain can impact neuron mitochondria ATP production, leading to impaired endurance and the promotion of neurons closer to threshold. Additionally, impaired circulation to the brain can impact neuron plasticity development and neuron degeneration.

Identify causes for impaired brain circulation should be attempted and nutritional strategies to impact circulation are a priority in these types of cases since healthy circulation to the brain is absolutely critical for improving brain function, developing plasticity, improving neuronal endurance, etc.

Case #3 had the following complaints suggesting poor circulation:

- “My hands and feet are constantly cold.”

Hypoxia

In this case poor circulation is a factor in overall hypoxia, however additional mechanisms include a history of asthma and significant compromise of the nasal septum, critical for ideal oxygenation. Poor oxygenation can lead to symptoms of brain fog.

Case #3 had the following complaints suggesting mechanisms impacting optimal brain oxygenation:

- “I have a deviated septum which effects my breathing. I feel like a 95-year-old man, not a 30-year old young guy. My energy is constantly low and have constant brain fog.”
- “I had to use machines for my asthma. I grew out of my asthma when I reached middle school.”
- “I have gone through two nose procedures, both for breathing. In 2007, after my second nose surgery, an injury fractured my nose and caused a deviated septum, which I have to this day.”

Autoimmune Susceptibility

Anytime a patient has irresolvable chronic complaints and a family history of autoimmunity, an underlying autoimmune mechanism should be considered.

Case #3’s comment suggests the potential role of autoimmunity.

- “My mom has lupus.”

Coffee Intolerance

Intolerances to caffeine can suggest inability to metabolize and clear catecholamines, such as those involving the catechol-O-Methyltransferase (COMT) pathway. This is a magnesium dependent pathway and the subject found magnesium supplementation improved symptoms of tics. Catecholamines support hyperkinetic neurotransmission pathways.

It's also possible the flavonoids in caffeine trigger a TH-2 dominant autoimmune response. In case #3 it would be important to determine the cause of the patient's response to caffeine. If the patient reports anxiety and exaggerated stimulation from coffee, this suggests caffeine clearance issues or increase sensitivity of catecholamine receptors (generally genetic). If the patient complains of an inflammatory reaction to caffeine, such as pain, swelling, brain fog, etc., this suggests an immune response triggered by abnormal TH-2 dominance found within a subset of autoimmune individuals.

- “Caffeine does not agree with my body.”

Energy Production

Any time a patient complains of ongoing stamina and energy issues, a complete metabolic evaluation and detailed physical examination should be considered. Necessary is routine blood work that includes a CBC to evaluate for anemia, a thyroid panel to rule out thyroid dysfunction, blood glucose markers to rule out dysglycemia, white blood cells to rule out immune challenges, and a general panel to rule out any underlying disease. Additional laboratory tests can also be ordered to identify mechanisms that promote fatigue, but a routine blood chemistry is the most important and efficient profile to evaluate first.

Impaired energy production also suggests to carefully evaluate for signs of metabolic disease, pulmonary diseases, and cardiovascular disease.

- “I have ambitious goals but with my current health condition I don't have the stamina and energy to sustain me in any way.”